

Morphometric Characteristics of Silver Pomfret, *Pampus argenteus* from Southern Mon Coastal Areas, Myanmar

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Abstract

This study was conducted to analyze some useful morphometric parameters of different specimen of *Pampus argenteus* of family Stromateidae in order to analyze their significance in systematics. A total of 72 samples of this species ranging in size from 13 cm to 28.5 cm in total length were collected from the fish landing centres of Mon Coastal Areas during the period from June 2018 to December 2018. About 13 morphometric characters were analyzed during this study. The relationship between variables observed that negative correlation between total length and other body parts ($b < 1$) except head length and pre and post orbital length.

Keywords: Morphometric Characters; Analysis; *Pampus argenteus*; Kyaikkhami and Asin Landing Areas; Mon Coast; Myanmar

Introduction

The silver pomfret, *Pampus argenteus* belong to family Stromateidae is one of the commercially important edible fishes consumed in East Asian countries. *P. argenteus* can be found Indo-Pacific Region, Persian Gulf of Indonesia, north of Hokkaido, Japan, coastal waters off the Americas and Western Africa. No recorded from Australia. In Myanmar, *P. argenteus* distribute along the Rakhine, Ayeyarwaddy and Gulf of Matarban and Taninthayi Coastal Regions. Locally, *P. argenteus* are considered the most dominant and commercially important species.

In Myanmar fishery sector, the pomfret fishery is primarily comprised of three species, the silver pomfret, *P. argenteus* (Euphrasen, 1788); the Chinese pomfret, *Pampus chinensis* (Euphrasen, 1788) under family Stromateidae and the black or brown pomfret, *Parastromateus niger* (Bloch, 1795) under family Carangidae. In Mon State, among of export marine fishes, the silver pomfret, *P. argenteus* (Nga moke phyu) is one of the important export marine fish species of Myanmar.

P. argenteus are caught by drift nets and trawl nets from Mon fishing ground (Mon state) area. *P. argenteus* is usually silver or

white color, with few small scales. Their maximum weight 4-6 kg (8-13lb) is more commonly seen. *P. argenteus* is commonly known as Nga Moke Phyu and is regarded commercial fishes of Myanmar. *P. argenteus* is pelagic fish and inshore species, it lives depth range from 5-110 m, but generally in school over muddy bottom of the continental shelf, down to 10 m, but generally to 20 m usually found in school, associated with fish species like Nemipterus and Leiognathus enter brackish water, feed on medusa, invertebrate, particularly benthic worms and other zooplankton.

Knowledge of morphometric characters is very essential in identification and classification of fish. The study of various morphometric characters in relation to each other is one of the most fascinating subjects of biology, which gives a great clue of different changes occurring in the body parts and relating to the correlation of the growth rate of different body parts to a specific morphometric character in any particular environment. These growth rates may be directly or inversely proportional to each other [1]. The objective of this study is to analyze the relationship of various morphometric characters with the total length and head length of *Pampus argenteus* from Mon Coastal Areas.

Materials and Methods

Sample collection

The samples of silver pomfret, *Pampus argenteus* were collected from Kyaikkhami fish landing centre (16°05'N and 97°34'E) and Asin fish landing centre (15°19' N and 97°76' E) of Mon Coastal Waters in the month from June 2018 to November 2018 (Figure 1).

Figure 1: Map showing the study area.

Morphometric analysis

In the present study, 72 specimens of *Pampus argenteus* ranging from (13cm) to (28.5cm) in total length and were measured. Samples were collected from Kyaikkhami landing center and Asin landing center during July 2018 to November 2018. Morphometric characters (in cm) that included Total length (TL), Standard length (SL), Body depth (BD), Dorsal fin height (DFH), Dorsal fin length (DFL), Pectoral fin height (PFH), Pectoral fin length (PFL), Anal fin height (AFH), Anal fin length (AFL), Head length (HL), Pre orbit length (PreOL), Post orbit length (PostOL) and Eye diameter (ED) were studied as described by Zubia., *et al.* Dars., *et al.* and Wajeeha., *et al.* as cited in Iqbal., *et al.* [2].

The above mentioned morphometric characters are defined as described by Lowe-McConneri (1971) and Grant and Spain (1975) (as cited in Balli, 2005), Qadri., *et al.* [3] and Fatima [1].

- **Total Length:** Distance from tip of snout to tip of the lower lobe of the caudal fin.
- **Standard Length:** Distance from tip of the snout to origin of the caudal fin.
- **Body depth:** Distance between dorsal and ventral surface at the deepest point.
- **Dorsal fin height:** Distance from the base of anterior margin of dorsal fin to tip of 1st dorsal fin ray.
- **Dorsal fin length:** Distance from tip of the snout to posterior margin of dorsal fin.
- **Pectoral fin height:** Distance from the base of anterior margin of pectoral fin to tip of 1st pectoral fin ray.
- **Pectoral fin length:** Distance from tip of the snout to posterior margin of pectoral fin.
- **Anal fin height:** Distance from the base of anterior margin of anal fin to tip of 1st anal fin ray.
- **Anal fin length:** Distance from tip of the snout to posterior margin of anal fin.
- **Head length:** Distance from tip of the snout to posterior margin of the operculum.
- **Pre orbit length:** Distance from tip of the snout to anterior ends of eye.
- **Post orbit length:** Distance between posterior ends of eye to end of the operculum.
- **Eye diameter:** Distance from the anterior margin to posterior margin of the eye.

Morphometric characters were measured to the nearest centimeter (nearest ± 0.01 cm) with the help of a measuring scale. To obtain the length - length relationship among the various parameter with dependent variables Total length (TL) and independent variables various lengths was established with the formulae.

$$Y = a + b X$$

Where, 'Y' is the dependent variable, 'X' is the independent variable, 'a' is constant (intercept) and 'b' is the regression coefficient (slope). All statistical analysis of data was calculated by Microsoft Excel 2010 version.

Results

Morphometric analysis of silver pomfret, *Pampus argenteus* from mon coastal areas

In the case of various morphometric characters study, the body length for combined sexes was ranged from 13 to 28.5 cm. In or-

der to determine the linear regression relationships between total length (TL) and various morphometric characteristics, the total length (TL) was taken as X (Independent variable) and various morphometric measurements were taken as Y (dependent variables). The regression coefficient 'b' and the correlation coefficient 'r' of different variable characters (Y) including standard length, dorsal fin length, pectoral fin length, anal fin length etc., on the total length (X) and different variable characters (Y) including pre-orbital length, post orbital length and eye diameter on the head length (X) were list in Table 1.

The morphometric study of *P. argenteus* indicated strong correlation between Total Length (TL) against Standard length (SL), Body Depth (BD), Dorsal Fin length (DFL), Pectoral Fin Length (PFL), Anal Fin Length (AFL). And then correlation moderate showed between Total length and Dorsal Fin Height (DFH), Anal Fin Height (AFH) and Head length (HL) and between Head Length (HL) and Post Orbital Length (PostOL). Furthermore, the correlation weak indicated between Total Length (TL) against Pectoral Fin Height (PFH) and between indicated between Head Length (HL) against Pre Orbital Length (PreOL), Eye Diameter (ED). The rela-

tionship showed negative allometric growth and degrees of correlation between the compared characters as evident from 'r' values (Table 1).

The coefficient of correlation of Total Length against other morphometric characters ranged from 0.4066 to 0.840. When Head Length was compared against other morphometric characters, its range was between 0.3347 and 0.6936. The regression coefficient 'b' ranged from 0.5447 to 0.9540 (TL and other morphometric characters) and ranged from 0.7027 to 1.1624 (HL and other morphometric characters). The relationship of Total Length with other morphometric characters and Head Length and other characters showed negative allometric growth ($b < 1$) while Head Length/Post Orbital Length and Head Length/Pre Orbital Length showed positive allometric ($b > 1$). In relationship Total length against other morphometric characters, the slowest growth found in Pectoral Fin Height (0.5447) and the fastest growth in Body Depth (0.9540) as indicated by the "b" values. Comparisons with the Head Length revealed the Eye Diameter (0.7027) had the lowest and the Post Orbital Length (1.1624) was the fastest growth (Table 1).

Morphometric characters		Range (X)		Range (Y)		Mean ± SD	Regression coefficients			Linear Equation	Correlation Type
X	Y	Min	Mix	Min	Mix		a	b	r		
TL	SL	13	28.5	11.9	23.1	14.638 ± 2.746	-0.0048	0.8896	0.8552	Y=-0.0048+0.8896x	***
TL	BD	13	28.5	11.9	14.4	9.829 ± 2.057	-0.2638	0.954	0.8088	Y=-0.2638+0.954x	***
TL	DFH	13	28.5	1.2	3.7	2.131 ± 0.552	-0.7109	0.7848	0.5360	Y=-0.7109+0.7848x	**
TL	DFL	13	28.5	10.3	18.6	13.359 ± 2.368	0.0288	0.8339	0.8210	Y=0.0288+0.8339x	***
TL	PFH	13	28.5	1.5	4	2.872 ± 0.641	-0.6231	0.5447	0.4066	Y=-0.6231+0.5447x	*
TL	PFL	13	28.5	10.6	20.1	13.204 ± 2.634	-0.4342	0.9024	0.8401	Y=-0.4342+0.9024x	***
TL	AFH	13	28.5	0.7	1.9	1.258 ± 0.279	-0.6676	0.8517	0.5780	Y=-0.6676+0.8517x	**
TL	AFL	13	28.5	4.1	8.9	5.665 ± 1.091	-0.0709	0.9053	0.8223	Y=-0.0709+0.9053x	***
TL	HL	13	28.5	2.8	4.9	3.850 ± 0.092	-0.2641	0.6062	0.7488	Y=-0.2641+0.6062x	**
HL	PreOL	13	28.5	0.2	1.7	0.796 ± 0.261	-0.713	1.1145	0.4184	Y=-0.713+1.1145x	*
HL	PostOL	13	28.5	1.2	2.6	1.665 ± 0.394	-0.4044	1.1624	0.6936	Y=-0.4044+1.1624x	**
HL	ED	13	28.5	0.3	1.7	1.159 ± 1.435	-0.3877	0.7027	0.3347	Y=-0.3844+0.7027x	*

Note. *** shows strong correlations when $r > 0.70$, ** shows correlation moderate when $r > 0.50$, * shows correlation weak when $r < 0.50$; SD is Standard deviation;

Table 1: Range, Mean, S.D., Correlation coefficient (r), Regression equation (Y=a+bX) and Correlation type between different morphometric characters of *Pampus argenteus* from Mon Coast.



Figure 2: Relationship of morphometric characterizes; A) Total Length and Standard Length, B) Total Length and Body Depth, C) Total Length and Dorsal Fin Height, D) Total Length and Dorsal Fin Length, E) Total Length and Anal Fin Height and F) Total Length and Anal Fin Length.



Figure 3: Relationship of morphometric characterizes; G) Total Length and Pectoral Fin Height, H) Total Length and Pectoral Fin Length, I) Total Length and Head Length, J) Head Length and Pre-Orbital Length, K) Head Length and Post-Orbital Length and L) Head Length and Eye Diameter

Discussion

Morphometric study is fundamental tool for knowing about ontogeny, growth, systematic, variation and demographic characteristics of fish [4]. The morphometric measurement of a species is important in the context of management of fisheries [5]. The coefficient correlation (r) values showed that the relation of TL with SL, BD, DFL, PFL and AFL are highly significant ($r > 0.7$) while the relation of TL with DFH, AFH, HL and the relation of HL with Post-OL observed moderately significant ($r > 0.5$) and the relation of TL with PFH and relation of HL with PreOL and ED found correlation weak in present study. Iqbal, *et al.* [2] reported the relationship between total length and morphometric characters of *Pampus argenteus* was observed to be weakly positive, except the pectoral fin length and head length that found negative types of correlation with total length. The strong correlation relation of TL with SL and DFL ($r > 0.7$) was similar to present study. However, the relationship between TL and PFL show moderate correlation. This result was differed with present study.

The value of " b " = 1.0 shows an isometric pattern of growth between length to length of various parts of fish body, $b > 1$ shows allometric growth (positive) while $b < 1$ for allometric growth (negative) [6]. In the case of present study, the range of regression coefficient " b " was from 0.5447 to 0.9540 (Total Length and other morphometric characters) and was from 0.7027 to 1.1624 (Head Length and other morphometric characters). The allometric growth found because the range of ' b ' was 0.5447 to 1.1624 in study period.

The regression coefficient ' b ' of head length on total length, standard length on total length and fork length on total length of *P. argenteus* was 0.1354, 0.6425 and 0.6772 respectively was reported by Devi [5]. In present study, the regression coefficient ' b ' of head length on total length and standard length on total length of *P. argenteus* was 0.6062 and 0.8896 respectively.

Qadri, *et al.* [3] reported the relationship between total length and various character such as total length/standard length, total length/pre dorsal length, total length/pre pectoral length, total length/pre pelvic length, total length/pre anal length, total length/head length, head length/snout length and head length/eye diameter. Standard length showed maximum degree of correlation (0.94) with total length while head length showed minimum degree of correlation (0.72) with total length; all are indicating very strong correlation of relationship between the characters compared.

However, the relationship between total length/head length and between head length/eye diameter was correlation moderate and correlation weak in present study.

The characters viz; standard length, predorsal distance, preanal distance, head length in relation to total length was high value of correlation coefficient was reported by Brraich and Akhter [7]. Moreover, Khalid and Naeem [6] reported pectoral fin length (PtFL), pelvic fin length (PvFL), anal fin length (AFL) and caudal fin width (CFW) indicated b -value more than unity ($b > 1$), with total length (TL), representing positive allometric growth. Standard length (SL), head length (HL), body girth (BG), body depth (BD) and dorsal fin length (DFL) were found to have isometric growth, while negative allometric growth was indicated in head width (HW), eye diameter (ED) and Caudal fin length (CFL) in length-length relationships.

In Hossain and Sultana [8], all the morphometric characters examined exhibit a significant positive correlation ($p < 0.01$) between dependent and independent variables (total length and morphometric characters), but the level of significance vary with features indicate that different organs grow differently. Among them the total length and standard length ($r = 0.98$); total length and head length ($r = 0.91$) show significant relationship. Thus the increase of total length synchronized with different degree of the increase to the various factors.

The morphometric data indicated that there is direct relationship between total body length with Head length (HL), snout length (Sn. L), Eye diameter (E.D) and Length of Caudal peduncle (CPL) was reported by Safi, Atiqullah Khan and Zaheer Khan [9]. According to Daneshvar, Keivany and Paknehad [10], all mean values of the morphometric characters, except eye diameter and pectoral fin base length, were significantly higher. The correlation between morphometric measurements and total length, except for the pectoral fin base length, were high.

Sharma, *et al.* [11] observed that positive correlation between total length and other body parts. The highly correlated body parameters in relation to total length were fork length ($r = 0.999$) and post orbital length (PoOL) was found least correlated ($r = 0.776$) and strong correlations was observed between head length (HL) and PrOL ($r = 0.991$) and least correlation ($r = 0.929$) between HL and eye diameter (ED). Out of eighteen characters, ten characters show high values of correlation coefficient indicating that these

characters are directly proportional to each other and eight characters show moderate correlation coefficient. In percentage of head length, five were genetically controlled and two are intermediate. Three characters show least correlation coefficient and four shows moderate correlation [12].

The significant correlation coefficients indicate the standard length, forked length, depth of body, head length; head width, inter-orbital width, caudal peduncle length, pre-dorsal length and gut length respectively are highly correlated with total length in both the sexes [1].

Conclusion

The relationship of different morphometric characters showed a negative growth ($b < 1$) but the relation of head length with pre orbital length and post orbital length showed positive growth ($b > 1$). A high significant correlation was observed between the different morphometric parameters (dependent variables) such as standard length, body depth dorsal fin length, pelvic fin length and anal fin length ($r > 0.7$) with total length (independent variable).

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