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# Population Parameters and Length-Weight relationship of striped piggy (*Pomadays stridens*) in northwest of Persian Gulf (Khuzestan Coastal Waters, Iran)

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**ABSTRACT:** During this study from December 2009 to November 2011, 396 striped piggy fish were caught and their weight and length were measured. Total number of caught fishes included, 101 males, 246 females and 49 immature fishes. The Mean, maximum and minimum total lengths were 196±78, 235 mm and 111 mm respectively. The Mean, maximum and minimum total weight for this species was 110±89 gr, 26 gr and 234gr respectively. The length-weight relationship were calculated as $W=0.00003FL^{2.88}$ (n=100, $R^2$= 0.90) for females,$W=0.00008FL^{2.66}$ (n=101, $R^2$=0.80) for males and $W=0.000009FL^{3.04}$ (n=100, $R^2$ =0.89) for total fishes verifying calculated b with 3, using Students t-test there was significant difference between calculated b and 3 (P>0.05), growth pattern is isometric. Population parameters were calculated for total fish as below, $L_\infty$: 26 (cm); K: 0.7(year$^{-1}$); $t_0$: -0.65 and Φ': 2.82 respectively. Based on result, this species is classified as mediate vulnerable group fishes.

***Keywords*:** Population parameters, striped piggy, Persian Gulf

## INTRODUCTION

The Persian Gulf is a semi enclosed sea that laying almost between the latitudes of $25^0$-$32^0$ N and longitudes of $48^0$-$56^0$ E. This water basin is shallow continental shelf and average of depth was 35m, which is increasing from Arvend estuary and reach to maximum in strait of Hormuz Strata. This local is considered one of the richest areas in fishery resources where large quantities of fish and shrimps are concentrated in different locations, particularly in the territorial waters of the State of Iran (Hashemi *etal*., 2011).
Overall purpose of fisheries science is to provide decision-makers with advice on the relative merits of alternative management. Demography rates are fundamental to fisheries stock assessment and estimated of potential yield (King, 2007). In tropical waters; lack of distinct seasonality has made such analyses more difficult (Spare and Venema, 1998).
*P. stridens* is a species of Haemulidae family that mainly live in marine waters and Reef-associated .They are found in shallow tropical seas around the coastlines of Indian Ocean: Red Sea (including the eastern Mediterranean Sea), off South Africa, and off western India. *P. stridens* found in coastal waters down to a depth range 65 - 68 m (Weitkamp and Sullivan, 2003). The striped piggy feeds mainly on crustaceans and fishes (Fischer *et al*., 1990) and caught mainly with bottom trawls and on hook and line (Carpenter et al., 1997).
Different aspects of biological Parameters of *P. stridens* have been studied by different authors are those of Pauly *et al*., (1998), in Philippines waters, and Fischer *et al*., (1990) in Mozambique water and Ben-Tuvia and McKay.,

(1986) in north-eastern Atlantic and the Mediterranean. However, no study so far has been made on this species biology in Khuzestan Coastal Waters (northwest of Persian Gulf).
In this context, the aim of the present study was twofold: (i) to estimate its population parameters via length frequency methods (ii) to determine the length-weight relationship of the population of this species in Khuzestan Coastal Waters (northwest of Persian Gulf). Results will greatly contribute to elaborating management programmes for this economically important fish species of the region under study.

## MATERIALS AND METHODS

The main fishing areas of *P. stridens* in the northwest of Persian Gulf are located in Liphe-Busafe and Bahrekan fishing area between 29° 44' to 07 'N and 48° 45' to 49° 50' (Fig. 1). A total number of 396 individuals of *P. stridens* were captured during 2009 to 2011 using bottom trawl and gill net. Also, this collected from recreational fishermen and then transferred in ice box to the laboratory. In the laboratory, Fork length (±1.0 mm), sex, and weight (±0.001 g wet weight) were recorded for each fish. Parameters of the length weight relationship were obtained by fitting the power function $W = a \times FL^b$ to length and weight data where: W is the total wet weight, (a) is constant determined empirically, FL is the fork length (Biswas, 1993). In order to verify if calculated b was significantly different from 3, the Students t-test was employed (Zar, 1996).

The data were then pooled monthly from different landing sites and subsequently grouped into classes of three centimeter intervals. The data were analysis using FiSAT II (FAO-ICLARM Stock Assessment Tools) as explained in details by Gayanilo *et al*. (1996).
Growth was calculated by fitting the von Bertalanffy growth function to length frequency data. The von Bertalanffy growth equation is defined as follows (Sparre and Venema, 1998): $L_t=L_\infty [(1-\exp (-K (t-t_0))]$, Where $L_t$ is length at time t, $L_\infty$ the asymptotic length, K the growth coefficient and $t_0$ is the hypothetical time at which length is equal to zero. The $t_0$ value estimated using the empirical equation (Pauly, 1979).
$\text{Log}_{10} (-t_0) = - 0.3922 - 0.2752 \text{Log}_{10}L_\infty - 1.038 \text{Log}_{10}K$

The fitting of the best growth curve was based on the ELEFAN I programm (Pauly and David 1981), which allows the fitted curve through the maximum number of peaks of the length-frequency distribution. With the help of the best growth curve, growth constant (K) and asymptotic length (L∞) were estimated.

The growth performance (Φ') of *P. stridens* population in terms of length growth was computed using the index of Pauly and Munro (1984). $\Phi' = \text{Log}_{10} K + 2 \text{Log}_{10}L_\infty$
Statistical analyses were performed with SPSS 14 software package and a significance level of 0.05 was adopted.

## RESULTS AND DISCUSSION

During this study from December 2009 to November 2011, 396 striped piggy fish were caught and their weight and length were measured. Total number of caught fishes included, 101 males, 246 females and 49 immature fishes. The Mean, maximum and minimum total lengths were 196±78, 235 mm and 111 mm respectively. The Mean, maximum and minimum total weight for this species was 110±89 gr, 26 gr and 234gr respectively (Table, 1).

### *Length-weight relationship*

The length-weight relationship were calculated as $W=0.00003FL^{2.88}$ (n=100, $R^2$= 0.90) for females, $W=0.00008FL^{2.66}$ (n=101, $R^2$=0.80) for males and $W=0.000009FL^{3.04}$ (n=100, $R^2$ =0.89) for total fishes verifying calculated b with 3, using Students t-test there was significant difference between calculated b and 3 (P>0.05), growth pattern is isometric(Fig 2, 3).

### *Growth Studies*

As the study has allowed the estimation of several pairs of growth constant values, a mean value was sought by trying the Response Surface Analysis routine. The best fit given by method, Population parameters were calculated for total fish as below, $L_\infty$: 26 (cm); K: 0.7($year^{-1}$); $t_0$: -0.65 and Φ': 2.82 respectively (Fig, 4).

### *Discussion*

The length-weight relationship in fish is of great importance in fishery assessments (Haimovic and Velasco, 2000). Length and weigh relationship in conjunction with age data can give information on the stock composite, age at maturity, life span, mortality, growth and production. The relative robustness or degree of well-being of a fish

expressed as the coefficient of condition (condition factor) is an important tool for the study of fish biology, mainly when the species lies at the base of the higher food web (Diaz *et al*., 2000).

The difference in the 'b' value of female and male indicated that the female were heavier than the males of the same length group. In present study the mean value of 'b' is 2.66 in males and 2.96 in females. It means the value of 'b' in females is more than the males. This represents females are heavier than males at equal length.

The b values in the weight-length model were measured close to 3.04 for *P. stridens* fishes that indicating that weight increased allometrically with length. The value of b for Philippines waters was estimated 3 for both sexes (Pauly *et al*., 1998). The variation of b in the different regions could be by seasonal fluctuations in environmental parameters, physiological conditions of the fish at the time of collection, sex, gonad development and nutritive conditions in the environment of fish (Biswas, 1993). In present study, length- weight (a) value was 0.000009 and the value of (a) for Philippines waters was estimated 0.011 for both sexes (Pauly *et al*., 1998). In length- weight (a) value is related to fish condition. Also (a) depends on weight and it can be used as status value (King, 2007).

Length–weight relationship is a practical index of the condition of fish, and may vary over the year according to several exogenous and endogenous factors such as food availability, feeding rate, health, sex, gonad development, spawning period and preservation techniques (Bagenal, 1978; Tesch, 1968). According to Martine (1994) the range of "b" could be from 2.5 to 4 and Tesch (1968) believed "b=3 in fish with isometric growth. ″

Unfortunately, no references from other studies for $L_\infty$ and K are available regarding *P. stridens***.** Iqbal, (1988) estimated infinity length and growth coefficient of *Pomadasys kaakan* 62.5 cm and 0.57 $y^{-1}$ from Pakistan Northern Arabian Sea. Fakheri *et al*,.(2011) estimated $L_\infty$ and K of *P. kaakan* 64.61 cm and 0.24 $y^{-1}$ in Persian Gulf. $L_\infty$ and K estimated 62.2 cm and 0.27 $y^{-1}$ in Kuwait's waters, respectively (Al-Husaini *et al*., 2002). Lee *et al*., (1992), estimated infinity length and growth coefficient of *P. kaakan* 94 cm and 0.18 $y^{-1}$ in Kuwait waters and Majid and Aimad, (1992), $L_\infty$ and K of this species estimated 62.5 cm and 0.24 $y^{-1}$ in Pakistan's waters, respectively. Differences between recorded $L_\infty$ and K are influenced by ecological characteristics, population size and gene frequency of species considering their habitat and according to natural selection, appear different adaptation pattern during their life (Adams, 1980). $L\infty$ and K amounts have reverse correlation and with decrement $L_\infty$, amount of K increases and vice versa (Sparre and Venema, 1998). Differences in growth rates between regions indicated a stock separation (Devaraj, 1981) which has, in some cases, supported a genetic difference (Begg and Sellin, 1998).

Regarding to $T_{max}$= 3/k(King, 2007), maximum age for this species was found to be 4.28 year. Results indicated have short life. Absorbed energy is used for body maintenance, activity, reproduction and less than 1/3 for growth. In difference species growth ratio and life cycle is different (King, 2007).

Age at zero length ($t_0$) were calculated as -0.65 for this species. With negative $t_0$ values, juveniles grew more quickly than the predicted growth curve for adults, and with positive $t_0$ values, juveniles grew more slowly (King,2007)

Unfortunately, no references from other studies for Φ' are available regarding *P. stridens***.** Iqbal, (1988) estimated growth performance indices (Φ') of *Pomadasys kaakan*, 2.98 from Pakistan Northern Arabian Sea. Fakheri *et al*,. (2011) estimated Φ' of *Pomadasys kaakan*, 3 in Persian Gulf. Φ' estimated 3.004 in Kuwait waters (Al-Husaini *et al*., 2002). Lee *et al*., (1992), estimated Φ' of *Pomadasys kaakan*, 3.2 in Kuwait waters and Majid and Aimad, (1992), estimated Φ' of *Pomadasys kaakan*, 2.98 in Pakistan waters. The estimate obtained in our study (2.82) compares with the upper of other studies. A method of validating growth parameters involves the comparison of growth performance indices (Φ') in terms of growth in length with other estimates obtained for the same or a similar species (Gayanilo and Pauly, 1997).

According to biological characteristics and with compare to American Fisheries Society (AFS) indices (Chenung *etal*, 2005), this species is classified as mediate vulnerable group fishes. Further research as stock assessment is needed in order to obtain an adequate and comprehensive understanding of biology and ecology in this important order in future.

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Table 1. Length characteristics (mm) and Weight characteristics (g) of striped piggy in northwest of Persian Gulf (2009-11)

| Sex | Length characteristics (mm) | | | | Weight characteristics (g) | | |
|---|---|---|---|---|---|---|---|
| | n | min | max | Mean ± SD | min | max | Mean± SD |
| Males | 101 | 160 | 195 | 260±94 | 60 | 157 | 241±231 |
| Females | 246 | 130 | 199 | 305±101 | 26 | 213 | 379±290 |
| Immature | 49 | 111 | 184 | 218±103 | 47 | 172 | 118± 101 |
| Total | 396 | 111 | 196 | 236±82 | 26 | 234 | 184±150 |

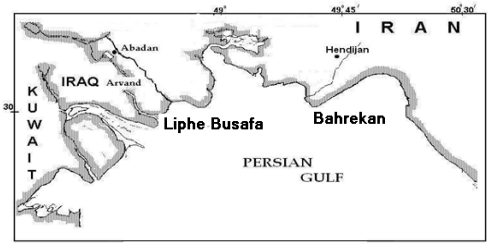


Figure 1. Location of two landing sites of striped piggy in northwest of Persian Gulf (Iran)

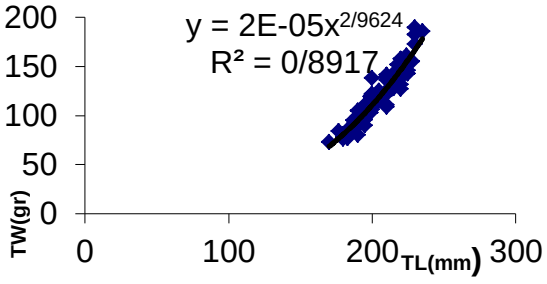


Figure 2. The length-weight relationship curve for Female fish of striped piggy in northwest of Persian Gulf

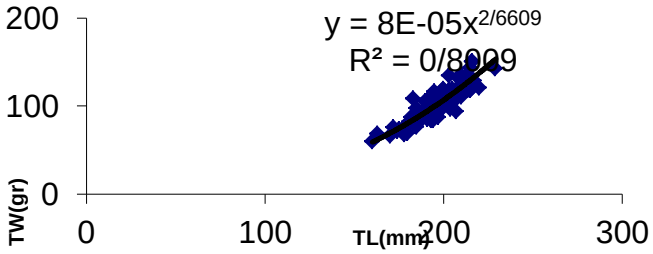


Figure 3. The length-weight relationship curve for Male fish of striped piggy in northwest of Persian Gulf

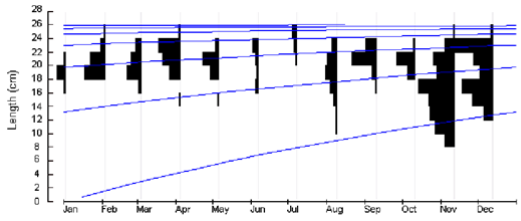


Figure 4. Growth curve of striped piggy in northwest of Persian Gulf ($L\infty$ = 26 cm and K = 0.7 $yr^{-1}$.)

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Table 1: Average values (±S.D.) of size corresponding of bartail flathead in Khuzestan Coastal Waters (2009-11).