



Research Note

Length-weight Relationships for Five Species of Clupeidae Caught from Mumbai Coast, India

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Length-weight relationship of five commercially important marine fish species of Clupeidae family landed by gillnetters along Mumbai coast between December 2010 to November 2011 is reported in the present communication. The species studied were *Escualosa thoracata*, *Sardinella longiceps*, *Ilisha melastoma*, *Anodontostoma chacunda* and *Tenualosa toli* and the regression coefficient 'b' values were estimated as 3.23, 2.95, 2.62, 1.99 and 2.82 respectively. The correlation coefficient (r^2) between length and weight for the species in the same order were estimated as 0.90, 0.73, 0.90, 0.74 and 0.98 respectively. Significantly positive correlation between length and weight indicates that all the five species maintain their shape throughout their life.

Length-weight relationship of fishes are of considerable importance in fishery biology and are very relevant to study fish population dynamics and growth patterns of fish stocks. Huxley (1883) was the first to propose the allometric growth formula to describe the relationship between length and weight. The length-weight of a fish has vital importance in fisheries science as it not only helps to establish the mathematical relationship between two variables but also enables to convert one variable to other (Le Cren, 1951). The length-weight relationship is particularly important in parameterizing yield equations and in estimating stock size (Abdurahim et al., 2004), in estimating biomass from length frequency distributions (Petrakis & Stergiou 1995, Dulcic & Kraljevic, 1996) and

calculating fish condition (Petrakis & Stergiou, 1995). Many studies have been conducted on length-weight relationship for predicting average weight of fishes for a given length (Acosta et al., 2004; Mendes et al., 2004).

Clupeidae group of fishes contribute nearly 50% of the total marine pelagic catch in India. Among them, *S. longiceps* remained the most important single species contributing 13.1% of the total marine landings in the country and 26% to the pelagic fishery in 2010 (Anon, 2011). Marine fish landings in Maharashtra during 2010-11 have been estimated provisionally at 4.13 lakh t and among the major fishery resources landed, clupeids contributed 8.0% (Anon, 2011). Clupeidae fishery is important in Mumbai coast; hence information about the length-weight relationships of fishes of the family is vital. Length-weight relationships of few clupeids along Maharashtra coast were previously studied viz., Dhulkhed (1963) and Deshmukh et al. (2010) on *S. longiceps* and Raje et al. (1994) on *E. thoracata*.

Thus, the present study was envisaged on the length-weight relationship of these fishes. In the present communication, the length weight relationship of *E. thoracata*, *S. longiceps*, *I. melastoma*, *A. chacunda* and *T. toli* and along Mumbai coast is reported.

Samples were collected from commercial gillnetters operating at Cuff Parade, Mahim and Versova located on Mumbai coast with varying mesh sizes of 14, 26, 36 and 54 mm. Samples were collected from December 2010 to November 2011. Length and weight of individual species were measured to the nearest mm and mg, respectively for a total of 1 402 specimens viz., 1 027 specimens of *E. thoracata*, 134 of *S. longiceps*, 130 of *I. melastoma*, 71 of *A. chacunda*

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and 40 of *T. toli*. The length weight relationship was derived by the equation of Le Cren (1951).

$$W = aL^b$$

where, W= body weight (g), L= total length (cm), 'a' is a coefficient related to body form and 'b' is an exponent indicating isometric growth (Beverton & Holt, 1957).

Student's t-test was employed to predict any significant deviation from isometric growth taken as 3. Significance was determined at 0.01 & 0.05 levels.

Mean length and mean weight of *E. thoracata* were 9.09 ± 0.021 cm and 6.217 ± 0.046 g respectively (Table 1). The 'b' value of *E. thoracata* was 3.2367 and the r^2 value was 0.900 (Fig. 1A). Student's t-test of regression coefficients revealed that 't' value is significant at 5% level indicating positive allometric growth for *E. thoracata*. Raje et al. (1994) established the LWR of *E. thoracata* from Versova of Mumbai coast and the length weight relationship was found as $W = 0.000001508L^{3.3946}$ for males and $W = 0.000002561L^{3.2706}$ for females.

Mean length of *S. longiceps* was 18.187 ± 0.109 cm and mean weight was 45.243 ± 0.919 g (Table 1). The length-weight relation of *S. longiceps* was found to be $W = 0.0084L^{2.9537}$ where $r^2 = 0.9014$ (Fig. 1B) revealing that their growth is fairly isometric in nature. Student's t-test of regression coefficients revealed that 't' value is not significant at 5% level indicating fairly isometric growth for *S. longiceps*. Deshmukh et al. (2010) observed the length-weight relationship of *S. longiceps* in Ratnagiri waters of Maharashtra coast as $W = 0.0321L^{2.5225}$ while,

Dhulkhed (1963) reported it as $W = 6.4662 + 3.2123 \log L$ in Mangalore waters.

Mean length and weight of *I. melastoma* were 19.298 ± 0.185 cm and 53.02 ± 1.537 g respectively (Table 1). Growth of *I. melastoma* is negative allometric as its 'b' value was 2.6191 and the length-weight relationship was $W = 0.0221L^{2.6191}$ depicting negative allometric growth (Fig. 1C). The r^2 value of length and weight was 0.9014. Student's t-test of regression co-efficients shows that 't' is significant at 5% level indicating negative allometric growth for *I. melastoma*. Khalid et al. (2012) estimated 'a' and 'b' values as -1.66 and 2.68 respectively for *I. melastoma* in northern Arabian sea of Pakistan.

Mean length and weight of *A. chacunda* were 16.378 ± 0.126 cm and 57.270 ± 0.979 g respectively (Table 1). The length-weight relationship was found as $W = 0.2207L^{1.9857}$ (Fig. 1D) showing negative allometric growth where the 'b' value was 1.9857 and the r^2 value was 0.7393. Student's t-test of regression coefficients shows that 't' value is significant at 5% level indicating negative allometric growth for *A. chacunda*.

Mean length and weight of *T. toli* were 18.725 ± 0.735 cm and 55.974 ± 4.75 g respectively (Table 1). The value of 'b' for *T. toli* was 2.8221 and the r^2 value was 0.9898. The length-weight relationship of *T. toli* was found to be $W = 0.0125L^{2.8221}$ (Fig. 1E). Student's t-test of regression coefficients show that 't' value is significant at 5% level indicating negative allometric growth for *T. toli*. Dutta et al. (2012) estimated length-weight relationship of *T. ilisha* from Northern Bay of West Bengal as $W = 0.00305L^{3.381}$.

Table 1. Descriptive statistic parameters of length and weight for five species of Clupeidae caught by gillnet in Mumbai coast

Sl. No.	Species	N	Length range (cm)	Mean length (L) $\pm$ SE Mean (cm)	Weight Range (g)	Mean weight (W) $\pm$ SE Mean (g)	r ²	b	a
1	<i>Escualosa thoracata</i>	1 027	4.9-10.9	9.095 $\pm$ 0.021	0.9-10.36	6.217 $\pm$ 0.046	0.9002	3.236	0.0048
2	<i>Sardinella longiceps</i>	134	14.2 - 21.2	18.187 $\pm$ 0.109	25.38-69.5	45.243 $\pm$ 0.919	0.7263	2.953	0.0084
3	<i>Ilisha melastoma</i>	130	15.5-27.9	19.298 $\pm$ 0.185	22.27-142.28	53.042 $\pm$ 1.527	0.9014	2.619	0.0221
4	<i>Anodontostoma chacunda</i>	71	13.7-18.9	16.378 $\pm$ 0.126	34.93-77.05	57.270 $\pm$ 0.979	0.7393	1.985	0.2207
5	<i>Tenulosa toli</i>	40	11.1-26.4	18.725 $\pm$ 0.735	19.61-102	55.974 $\pm$ 3.75	0.9826	2.822	0.0125

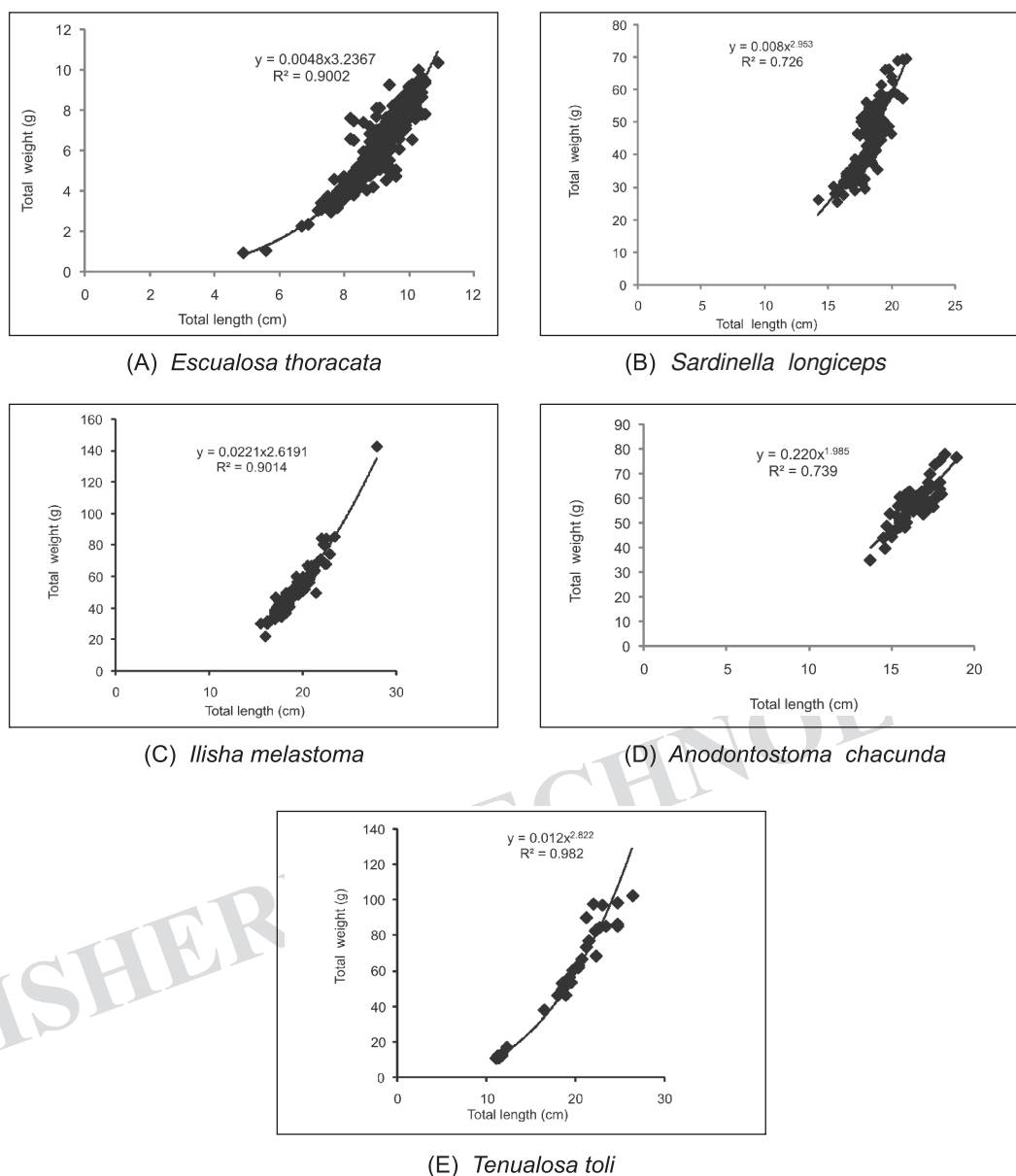


Fig. 1. Scatter diagrams showing length weight relationship for five species of clupeidae family

As a result of the size selectivity characteristics of fishing gear, the samples may not have included all available lengths. For more precise weight estimations, the application of these length-weight relationships should be limited to the observed length ranges; otherwise it may be erroneous (Petrakis & Stergiou, 1995; Froese, 1998). Season, habitat, gonad maturity, sex, diet, fullness of stomach and health may influence the length weight relationships.

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