DETERMINATION OF LENGTH-WEIGHT RELATIONSHIP OF SQUID (*LOLIGO DUVACELI*) FOUND ALONG PAKISTAN COAST

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ABSTRACT: Common squid (*Loligo duvauceli*) is caught as by-catch of shrimp trawlers in shallow coastal waters off Pakistan. Size frequency data of squid for sexes combined collected from Karachi Fish Harbour were analyzed. The length-weight relationship of the form \( W = aL^b \) was determined and to mean length of squid sample measured compared with mean length derived from inverse equation was tested for any significant differences, none were observed and it was inferred that the equation \( W = 0.243xL^{2.2424} \) describe the relationship.

KEY WORDS: Squid, *Loligo duvauceli*, Pakistan coast.

INTRODUCTION

*Loligo duvauceli*, (Orbigny, 1884) is the only species of squid found widely distributed on the shelf off Pakistan. Squids are not caught as target species but are taken in substantial quantity as by-catch by local shrimp trawlers. Good stocks of coastal squids occur on the Sindh and Makran coasts. A squid biomass of 9100 t and 900 t of cuttlefish in 10 to 200 m depth of shelf was estimated by Khalil (1986). Abilgaard *et al.*, (1986) have given a squid biomass of 9500 t and yield potential 4800 t/year for the same area and depth.

The hand book of Fisheries Statistics, an annual publication of Marine Fisheries Department, publishes the annual catches of fish, shellfish including cephalopods caught and exported by deep sea fishing trawlers. However the catches of squid and cuttlefish taken by local shrimp trawlers are not recorded anywhere within the fishery. Through a survey sampling scheme of fish and shell fish landing at Karachi Fish Harbour, the catch and efforts data of squids was obtained. The average annual landing of squids by the Hella Fishery (one day fishing) was estimated at 280 t. However, the shrimp trawlers who sustain fishing operations for longer duration usually discard squids and cuttlefish catch. The total discard of squid by these vessels could not be ascertained due to lack of relevant information, but it is easily possible that their catches is many time greater than those landed by the Hella fishermen.

In view of the growing demand for squid as food and high prices in world markets, Majid and Khalil (1992) conducted an economic study, high-lighting its local marketing, importance, handling, disposal and revenue earned by its export. This paper deals with the length-weight relationship in squid *L. duvauceli* and its application to stock assessment.

MATERIALS AND METHOD

Samples of squids were collected from Karachi Fish Harbour on weekly intervals.
These samples were fairly well separated for species identification. The specimen for *L. duvauceli* (all sizes available in the commercial landings) were precisely measured in dorsal mantle length (DML) to the nearest millimeters using a divider and a scale. The body weight (W) to within 1 gram was recorded from an automatic top loading balance. The natural logarithm or (Log$_e$) of length and average body weight plot fits to a straight line relationship. (Fig.1), and the regression coefficient (a) and (b) determined. A simple version of the length-weight relationship based on the measurement of 244 specimen from January, 1992 to December 1992 for both sexes combined was expressed in exponential form as $W = aL^b$. The confidence limits of (b) were estimated.

Using the inverse function of the length-weight equation, the body weight of squid sample collected was transformed into DML. The statistics of observed and estimated DML was tested for significant difference. The value of t was calculated from formula given below as suggested by Fisher (1926).

$$t = \frac{\overline{x} - \overline{y}}{S} \sqrt{\frac{n_1 + n_2}{n_1 \cdot n_2}}$$

Where $\overline{x}$ and $\overline{y}$ are respectively the means of observed and estimated DML, $S$ is the combined standard deviation and $n_1 + n_2 - 2$ the degree of freedom.

![Fig.1. Loligo devauceli Orbigny, length-weight relationship.](image)
RESULT

The length-weight equation written from the Loge transformation in figure-1 is,
\[ \log_e W = 1.5882 + 2.2424 \times \log_e L \]

or \[ W = 0.2043 \times L^{2.2424} \]

The confidence limit of the estimated slope (b) was calculated using a probability \( P=0.05 \) and \( df = (n-2) \), the coefficient of variance \( (S_b)^2 \) was determined.

\[ (S_b)^2 = \frac{1}{n-2} \left( \frac{Sy^2}{Sx^2} - b^2 \right) \]

\[ = \frac{1}{23-2} \times \frac{0.374/1.44}{2.2424^2} = -0.2271 \]

\[ S_b = \sqrt{0.2271} = 0.4765 \] and \( t(n-2) = 2.09 \)

The 95% confidence limits for (b) was estimated as
\[ b \pm S_b t(n-2) = (1.25 \text{ to } 3.24) \]

The estimated value of \( b=2.24 \) is well within the range. The relevance of the equation developed was checked by t test. The observed body weight of a squid sample was converted into lengths using the inverse equation i.e. \( L=2.0306 \times W^{0.466} \). The apparent differences between the estimated mean length and the observed mean lengths was non-significant using a probability level \( P>0.05 \).

DISCUSSION

The weight as function of length, especially in animals having streamline body i.e. fish, shrimp, lobster and cephalopods is an important part of biological studies. The study is undertaken to determine how the weight in fishes and allied species was affected by an increase in the body length. The relationship has been found a useful tool in generating the length frequency data for subsequent study population dynamics of squid. Since acquisition of length frequency data by direct measurement is bit cumbersome than weighing squid Zalinge et al., (1986) adopted this technique and generated \( LF \) data for study the population dynamics of \( P. merguiensis \) from the \( LW \) equation of this species established by Zalinge (1986) as under:

Female \( W = 0.0009 \times L^{2.788} \quad r^2 = 0.990 \)

or \( L_C = 2.42 \times W \)

Male \( W = 0.001 \times L^{2.77} \quad r^2 = 0.994 \)

or \( L_C = 12.10 \times W^{0.361} \)

Where \( (W) \) is the tail weight in grams and \( (L_C) \) is carapace length in millimeters.

Earlier length-weight equation estimated in \( L. duvauceli \) by Meiyppan and Srinath (1987) off Cochin south India an exponent \( b = 2.143 \) for males, and \( b = 2.889 \) for females was given. The exponent \( b = 2.2424 \) in this study for combined sexes is close to the mean 2.22 of sex separated study.
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