Journal of **Coastal Development**
Vol. 1, No. 1, 1997: 31-36.

THE BEAK AND MORPHOMETRY OF THE BIGFIN REEF SQUID *Sepioteuthis lessoniana* LESSON IN EASTERN INDONESIAN SEAS

Abdul Ghofar

Faculty of Fisheries and Marine Science, Diponegoro University, Semarang - Indonesia

ABSTRACT

The study aims at investigating the morphometric and beaks relationships in the Bigfin Reef Squid, Sepioteuthis lessoniana Lesson 1830. It is shown that fin length and tentacle length linearly correlates with dorsal mantle length. Unlike fin-mantle relation which exhibits no sexual differences, tentacle tends to develop relatively more rapidly in females when mantle attains 70 mm. It is also evident that dorsal mantle length linearly correlates with lower hood length, with slope (b) and intercept (a) of 30.3 and -4.57 respectively. Logarithmic relationship is found between total body weight and lower hood length, with corresponding values of 2.84 and 0.611. Their application for coastal cephalopod biomass estimation from beaks is discussed.

Key words: beaks, morphometry, squid, cephalopod, mantle, tentacle, fin, hood.

RINGKASAN

Penelitian dimaksudkan untuk mengkaji hubungan-hubungan morfometrik dan paruh ('beak') pada Cumi Lamun, Sepioteuthis lessoniana Lesson 1830. Adanya hubungan linier antara panjang sirip dan panjang tentakel dengan panjang mantel ditunjukkan. Berbeda dengan hubungan sirip-mantel yang tidak berkaitan dengan jenis kelamin, tentakel cenderung berkembang lebih cepat pada cumi-cumi betina, mulai ukuran mantel 70 mm. Hasil kajian juga menunjukkan adanya korelasi linier positif dan panjang topi-bawah pada paruh, dengan lereng (b) dan intersep (a) masing-masing 30.3 dan -4.57. Hubungan logaritmik diperoleh antara berat tubuh total dan panjang topi, dengan nilai b dan a masing-masing 2.84 dan 0.611. Penggunaan hubungan-hubungan tersebut untuk estimasi biomasa Cephalopoda dibahas.

I. Introduction

Commonly named as Bigfin Reef Squid (English), Calmar tonnelet (French), Calamar manopla (Spanish), Cumi Buluh, Cumi Lamun (Indonesia), this species has a number of synonyms: *Sepioteuthis quinensis, Sepioteuthis lunulata* Quoy & Gaimard, *Sepioteuthis sinensis* Orbigny, *Sepioteuthis artipinnis* Gould, *Sepioteuthis brevis* Owen, *Sepioteuthis indica* Goodrich, *Sepioteuthis malayana* Wulker and *Sepioteuthis krempfi* Robson (Roper *et al*, 1984; Voss, 1963).

The species grows to a large size, and may attain a dorsal mantle length of about 30 cm, or a weight of around 2.5 kg, with thick mantle and good flesh. Little information is available about the biology of the Indonesian species. The geographical distribution of the species in Indonesia covers the whole islands. It is quite abundant in Eastern Indonesian seas, particularly between Sulawesi and Maluku islands (Roper *et al*, 1984; Ghofar, 1995). To support its rational management, biological studies of the species is needed. Morphometric description is vital in understanding both its taxonomy and stock identity, whereas a study of beak-body size relation is significant in biomass study (Clarke, 1962; 1983) independent of conventional catch and fishing effort data.

II. Material and Methods

Fresh specimens were collected from South Sulawesi sea and Ambon Bay, and used in this study. Some specimens were also preserved in 4% formalin for reference collection and further laboratory observation.

Measurements and separation were carried out concerning: dorsal mantle length (DML, in mm), total body weight (W, in g), sex (male = 1, female = 2, unidentified = 3), fin length (FL, in mm) fin weight (FW, in g), tentacle length (TcL, in mm) and tentacle weight (TW, in g). Morphometric relationships were derived after plotting the above measurements. Observation was also carried out for beak characters, after standard preparation following the procedure described by Clarke (1986). Measurement was made particularly for lower hood length (LHL in mm), which is defined as the distance between the tip of the rostrum to the posterior margin of the hood. Plots of LHL against dorsal mantle length and total body weight were made to understand the resulted relationships.

III. Results and Discussion

3.1. Morphometric relationships

Among the Order Teuthoidea, *Sepioteuthis lessoniana* is characterized by a broad fin covering almost throughout the body. Figure 1 shows the relationship between fin length (FL, mm) and dorsal mantle length (DML, mm):

$$FL = 0.926DML - 1.379$$

$$(r = 0.99)$$

($P < 0.05$; $n = 142$). No significant difference is found in relation to sexes; the slopes (b) and intercepts (a) of

regressions are 0.925 and -1.888 in males, and 0.909 and -0.274 in females.

In contrast to the above feature, the relationships between dorsal mantle and tentacle length varies in relation to sexes. The resulted general relationship:

$$TcL = 1.592DML + 13.105$$
$$(r = 0.95)$$

($P < 0.05$; $n = 136$), has variations according to sexes where the values of b and a are 1.524 and 17.53 in males, and 1.712 and 4.452 in females. This implies that the development of the tentacles is more rapid in females than that of males, especially when the dorsal mantle attains 70 mm in length or more.

3.2. Beak-body size relationship

Unlike most Teuthoid squid where the lower beak exhibits a clear feature of the jaw angle, this portion of the lower beak in *Sepioteuthis lessoniana* is not easily recognized. The anterior part of the angle is generally eroded, probably because of their feeding habit. Ghofar (1989) indicated that the major proportion of stomach content of this species consisted of hard-food including fin-fishes, compared to crustaceans which were the main constituent of other squid food.

Analysis were therefore carried out upon the lower hood length (LHL). The relationship between dorsal mantle length (DML, mm) and LHL (mm) is presented in the following linear regression:

$$DML = 30.30\ LHL - 4.57$$
$$(r = 0.98)$$

($P<0.05$; $n = 67$) (Figure 2). The relationship may therefore be used to estimate squid length from lower hood size within the size range. Figure 2 also shows the exponential relationship between lower hood length and total body weight (W, g), indicated in the following equation:

$$\ln W = 0.611 + 2.84\ \ln LHL$$
$$(r = 0.98)$$

($P<0.05$; $n = 67$). This result implies that conversion of beaks to body weight is possible in this species. Such an equation is vital in assessing squid predation, which allows biomass estimation to be made when squids or squid beaks are removed from predators' stomachs.

There has been almost no studies on beaks and their relations to body size for the species, although an intensive observation has been made for other species of the genus, i.e. *Sepioteuthis sepioidea* and *Sepioteuthis australis.* In any case, although the Loliginid squids are better known than the Oegopsid squids, they are in need of revision. In any particular shelf area there are always rather few species found, so that identification of the beak taken from predators' stomachs usually involves only two or three alternatives. This feature may best be approached locally by comparison with local reference collection (Clarke, 1986). Furthermore, it is always necessary to derive the relationships between beak measurement with both mantle length and total body weight of specimens from as many localities as possible. It is obvious that study of beak is significant in understanding the predator-prey relationship involving Cephalopods. As the species generally

occurs in coastal and neritic waters, such findings can be particularly significant in understanding the coastal biological processes including the more specific aspect of its trophic relationship.

IV. Conclusions

It is shown from the study that linear relationships are evident among fin, tentacle and dorsal mantle lengths. Unlike fin-mantle relationships, tentacle-mantle features tend to vary according to sexes. Lower hood length shows a linear correlation with mantle length, and a logarithmic correlation with total body weight. These findings can be significant in at least two aspects. First, in understanding the existing coastal biological process in particular its trophic relationships; secondly, further application of the beak-biomass relation is feasible for estimating the cephalopod biomass from predation in the coastal waters.

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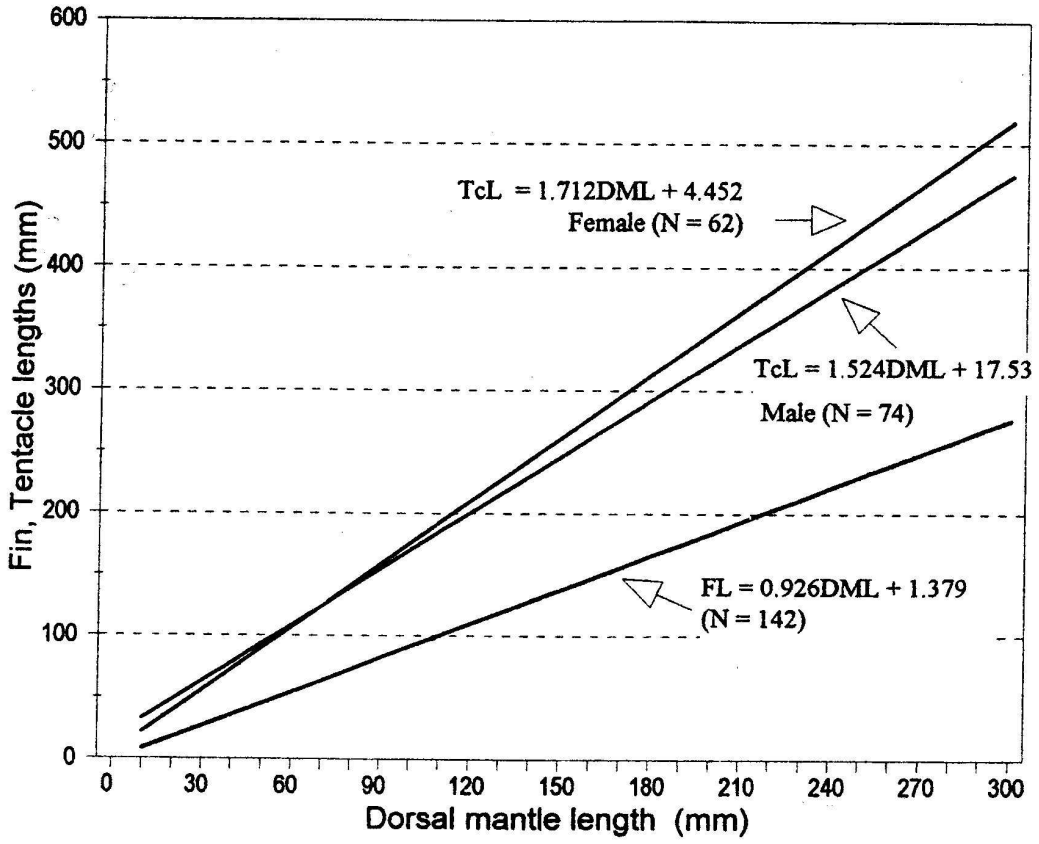

Figure 1.

Relationships of mantle, tentacle and fin lengths in male and female Bigfin Reef Squid

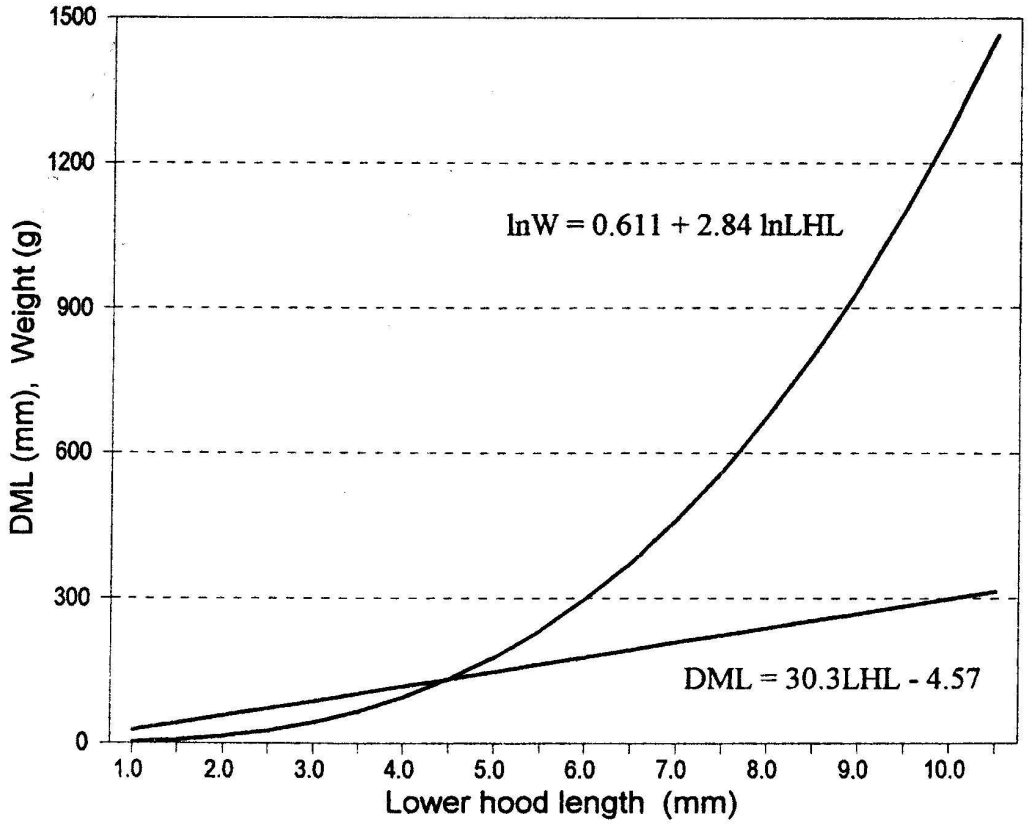

Figure 2.

Relationships of lower hood, mantle lengths and body weight in the Bigfin Reef Squid (N=67)