# Length-length and Length-weight relationship of bullet tuna (*Auxis rochei*) and frigate tuna (*Auxis thazard*) from the coastal of west Sumatra, Indonesia

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## ABSTRACT

The length-weight relationship (LWR) and length-length relationship (LLR) have been applied for basic uses in order to make fish stocks and population assessment. The aims of this paper were to provide the baseline information of the length-length relationship and the length-weight relationship of *A. rochei* and *A. thazard* collected from the coastal of west of Sumatra. The samples were collected from several landing ports around west of Sumatra, i.e. Lampulo. Sibolga, Padang, Bengkulu, and Lampung. A total of 722 bullet tuna and 707 frigate tuna were measured (FL and TL) and weighed during the study. The relationship between length was determined using linear regression, whereas the length-weight relationship was done by using power regression. The equation (FL-TL. FL-W, TL-W) were reliable with R2 close to 1. The bullet tuna and frigate tuna from all port samplings were hyperallometric.

**Keywords**: Neritic tuna, length-weight, length-length. Indian Ocean

## INTRODUCTION

Fish resources is a common and also open access property. Everybody can utilize it in the same time and place. When it is considered to have a high-economical value, the pressure of the fisheries will be stronger. If it is not being managed well enough in a sustainable manner, it will tend to be utilized excessively and would threaten the resource. Hence, an effective management is required to sustain the optimum productivity in the long run.

*Auxis* spp is a part of neritic tuna which is managed jointly by several countries through the Indian Ocean Tuna Commission (IOTC) (Herrera & Pierre, 2009). This particular species is an important commodity in small-scale fisheries along the Indian Ocean. *Auxis* was distributed throughout the tropical and subtropical waters. *Auxis* is the most abundant species in the Mediterranean Sea and the most widely exploited fish on a small scale tuna fisheries (Sabates & Recasens 2001).

The length-weight relationship (LWR) and length-length relationship (LLR) have been applied for basic uses in order to make fish stocks and population assessment. In fish, size more biologically relevant than age, since several ecological and physiological factors are more size-dependent than age-dependent. Length-weight relationship have been used frequently to estimate weight from length because direct weight measurements can be time-consuming in the field. The aims of this paper were to provide the baseline information of the length-length relationship and the length-weight relationship of *A. rochei* and *A. thazard* collected from the coastal of west of Sumatra and south of Java waters. These equations could be meaningful for the bridge for different measurement method for the length of these both species.

## METHODS

The fish were collected from several landing ports along the west coast of Sumatera, i.e. Lampulo. Sibolga, Padang, Bengkulu, and Lampung in 2020. The sampler randomly picked some fish as the representative of the landed vessel catch, measured the total length (TL) and fork length (FL) to the nearest 1 mm, and weighted the body (BW) to the nearest 1 gram using a digital weight scale.

The length-length relationships were calculated by comparing each type of length measurement using linear regression, y = $a$ + $b$x, where x and y are the different length measurements. The length-weight relationship was calculated using the formula, W = $a\mathrm{L}^b$ regression, where W is body weight (gram), L is body length (mm), $b$ is the slope of the relationship and $a$ is the intercept.

The student t-test was applied to test whether the value of b from the regression equation of the length-weight relationship was significantly different from 3 or not. The hypothesis was used such as $\mathrm{H}_0$ where the value of b is equal to 3 (b = 3) which indicates the growth pattern is isometric and $\mathrm{H}_1$ where b $\neq$ 3 indicates the allometric pattern of growth. It is considered as hyperallometric if the b is more than 3 and hypoallometric if it is lesser than 3.

## RESULT

The size of bullet tuna was about 17–30 cmFL , while the frigate tuna was 16 – 46 cmFL (Figure 1). Most of the bullet tuna and the frigate tuna were 19-21 cmFL and frigate tuna was 27-29 cmFL.
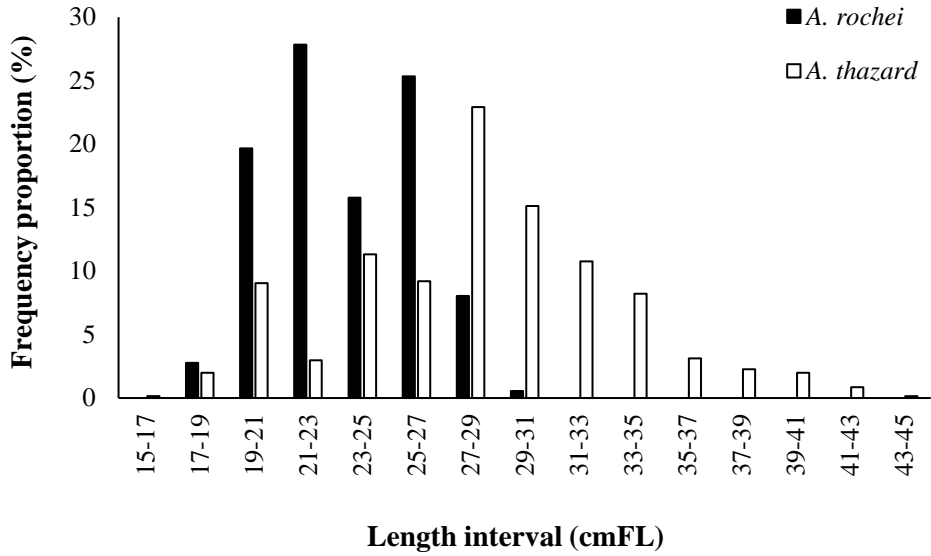
Figure 1. Length frequency of *A. rochei* and *A. thazard*

The length-length relationship of *A. rochei* (Figure 2) and *A. thazard* (Figure 3) showed that the formed equations to estimate the weight from the length were reliable with closer to 1 coefficient of determination ($R^2$). Similar things were also found in the length-length relationship (Figure 4).
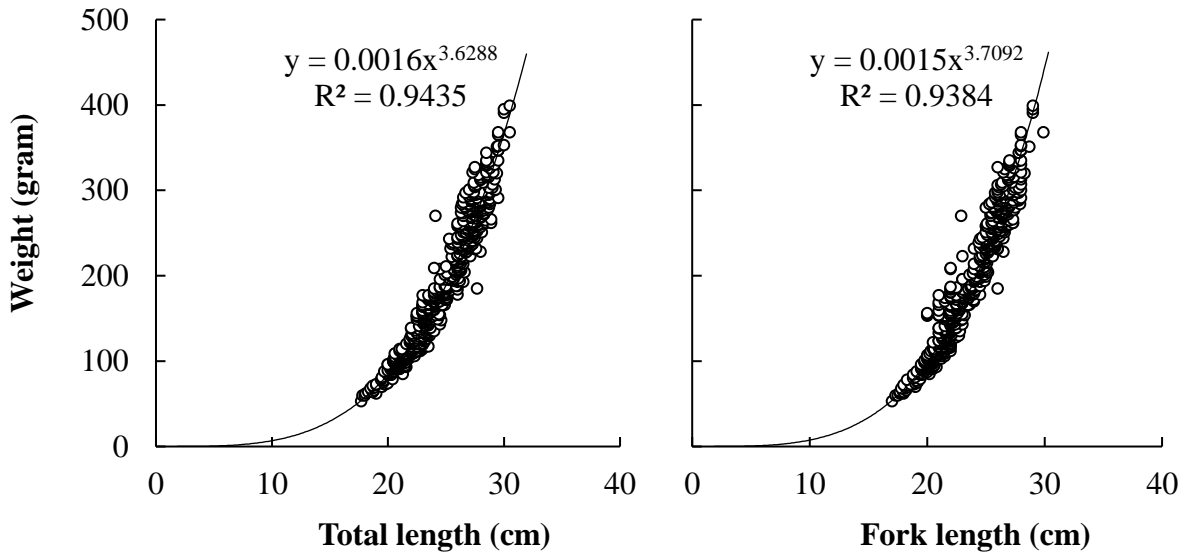


$$y = 0.0016x^{3.6288}$$
$$R^2 = 0.9435$$

$$y = 0.0015x^{3.7092}$$
$$R^2 = 0.9384$$

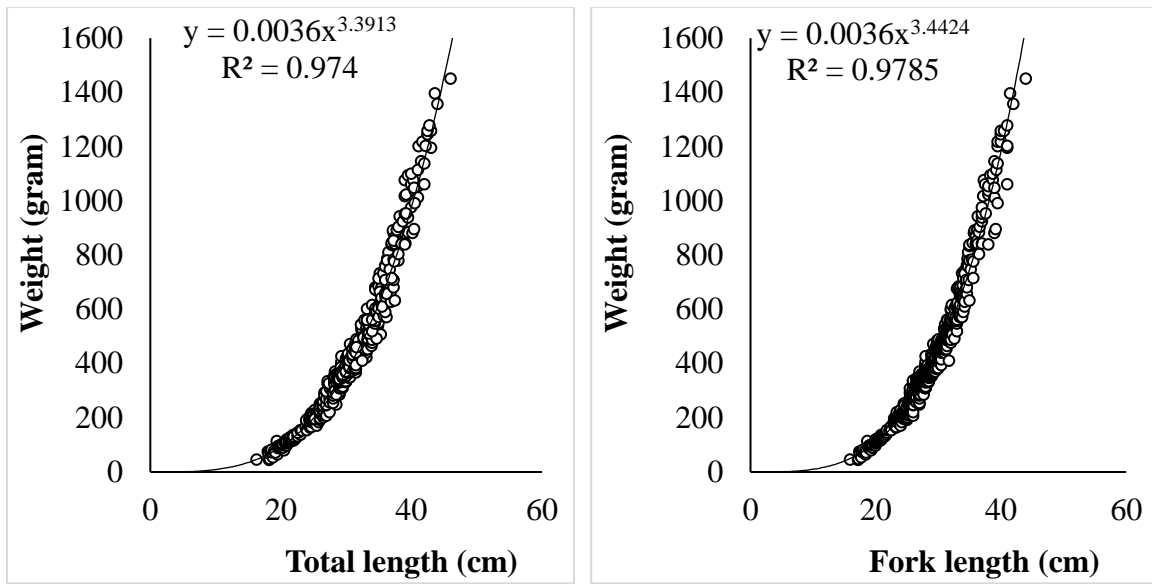Figure 2. Length weight relationship of *A. rochei*
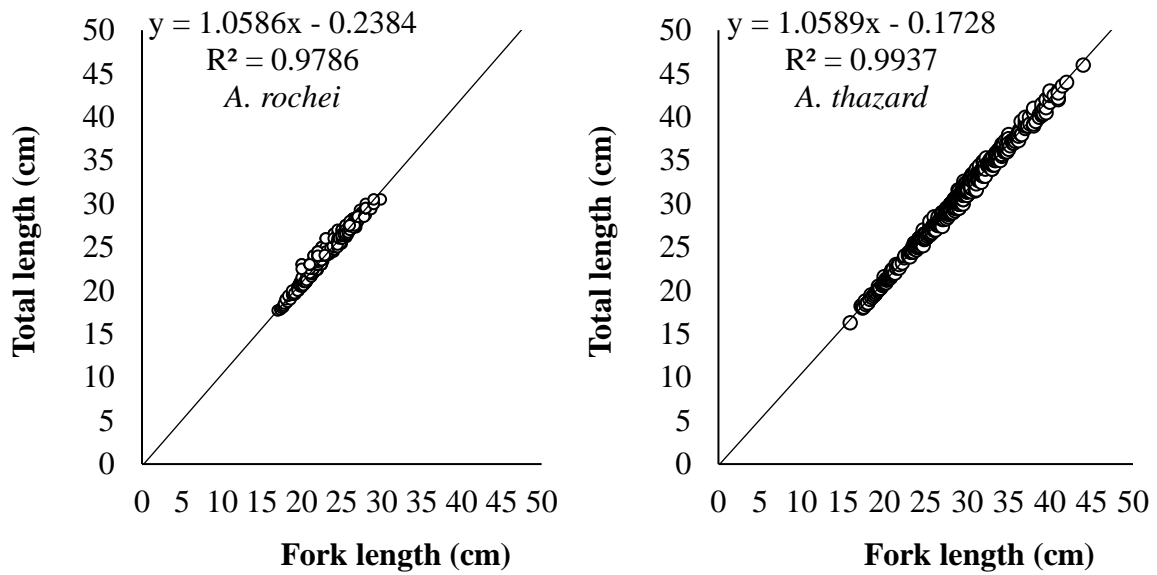
Figure 3. Length weight relationship of *A. thazard*



Figure 4. Length-length relationship of *A. rochei* and *A. thazard*