

# Length-weight relationship and condition factor of Hamilton's thryssa fish (*Thryssa hamiltonii*) from Pabean Bay, West Java, Indonesia

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**Abstract.** The length-weight and condition factor can be used as an indicator of the condition for fish growth and to determine the suitability of the environment. The research objective was to evaluate the relationship between length-weight and condition factor of Hamilton's thryssa fish (*Thryssa hamiltonii*) from Pabean Bay West Java Indonesia. The researchers have been carried out to analyze the two essential parameters: the length-weight relationship that can be used to evaluate and investigate stock density and condition factor of Hamilton's thryssa fish (*Thryssa hamiltonii*). A total of 195 fish samples were collected over the 8<sup>th</sup> month from the sea estuary and measured and weighed during a field survey conducted from April to December 2015. Samples of fish were collected using gillnet and set net. The total length of the fish ranged from 47-186 mm, with body weights ranging from 0.47 - 45.37 g. The results of the length-weight relationship were shown as regression was  $Y = 7E-07 X^{3.4339}$  or  $W = 7.45 \times 10^{-7} L^{3.43389}$ , and the condition factors ranged from 0.77 to 1.39. These research results indicated that the growth pattern of Hamilton's Thryssa fish (*Thryssa hamiltonii*) was positive allometric.

## 1 Introduction

Geographically, Pabean Bay is located in Indramayu Regency, West Java. It is a place where fresh and seawater mixes or is an estuary area located at the mouth of the Cimanuk River. The existence of Customs Bay provides benefits both directly and indirectly. Customs Bay is directly adjacent to the high seas and is one of the semi-open waters. According to [1] found 15 species of fish inhabit the waters of Pabean Bay, the estuary of the Cimanuk River, where 11 of them are marine/brackish fish, and the other four are freshwater fish. Typologically, Pabean Bay has a depth ranging from 0.2 - 2 meters with a type of water with a mud substrate with one of the habitats of living fish belonging to the Eugraulidae family and the thryssa genus. One of the species that has been identified from the family Eugraulidae of the genus thryssa is *Thryssa hamiltonii*. This fish with the name Hamilton's thryssa is considered to have no selling price in Pabean Ilir Village, Indramayu, West Java, and belongs to the group of fish by-catch.

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Hamilton's thryssa fish (*T. hamiltonii*) has a flat and elongated body shape, with an average size of a Hamilton's thryssa fish that is often caught of 15.2-22.2 cmSL and maximum size that can be reached up to 27 cmSL [2]. Hamilton's thryssa fish is one of the fish that is used for needs, namely for alternative food or other food. In addition, anchovies also have economic value for the people of Mayangan Beach, West Java [3]. Anchovies have an economic role for communities in the northwest of the Persian Gulf. In addition, anchovies are also one of the target species for catches in regional countries around the Persian Gulf [4]. Anchovies have a high protein content of 82.73% and fat of 17.27% [5].

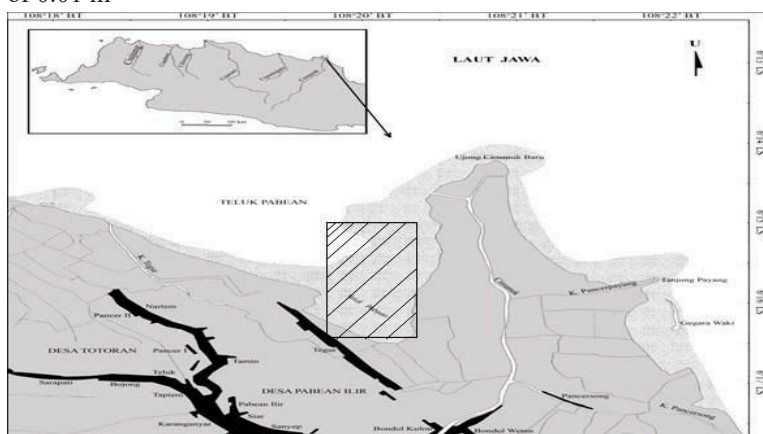
A study is needed to explain the length-weight relationship, and condition factors, Hamilton's thryssa fish (*Thryssa hamiltonii*) in the waters of Pabean Bay, Indramayu, West Java because several important aspects contained in Hamilton's thryssa fish are considered to be lacking. From the results of this study, it is hoped that later it can provide biological information about Hamilton's thryssa fish as a basis for sustainable and wise fish management. According to [6], an important parameter that plays a role in maintaining population dynamics, growth and mortality, and fish balance in nature is the relationship between length and weight and condition factors

## 2 Materials and methods

Hamilton's thryssa fish samples were obtained through fishing activities carried out in Pabean Bay, Pabean Ilir District, Indramayu Regency, West Java Province (Fig. 2). Hamilton's thryssa fish sampling activities started from April to December 2015 with a sampling time that had 30-day intervals and was carried out nine times. After the sampling activity, it was continued with data analysis activities at the Macro Biology Laboratory I, Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University.

The technique of catching sample fish is to use gill nets and set nets. Fish caught, either using gill nets with a length of 72 m, 1.5 m high and a net size of 1.5 inches; as well as set nets have a mesh size of 1 mm with a height of 1 m, a width of 3 m, and a length of 100 m for the header.

The fish samples that have been caught are then collected and preserved in a 10% formalin solution. After entering the fourth day, the fish samples were then transferred to a 70% alcohol solution. Scales with an accuracy of 0.001 gram were used to measure the weight of the sample fish, while for the measurement of total length using a digital caliper which had an accuracy of 0.01 m



**Fig. 2.** Map of research locations (Source: modification from Bakosurtanal, 2015).

The total length of the fish ranged from 47-186 mm, with a weight ranging from 0.47-45.37g. For the length-weight relationship using the following equation [7]:

$$W = aL^b \tag{1}$$

W: Fish body weight (g), L : Fish length (L), a : Constant, b: Length-weight relationship pattern estimator

In carrying out the calculations, the relationship between length and weight analysis is carried out using the relative condition factor (Kn). This condition states the fatness of the fish and is calculated. The fish condition factor was calculated using the following equation [15]:

$$Kn = \frac{W}{W^*} \tag{2}$$

W: Fish weight, W\*: Fish weight from LWR value

3 Results

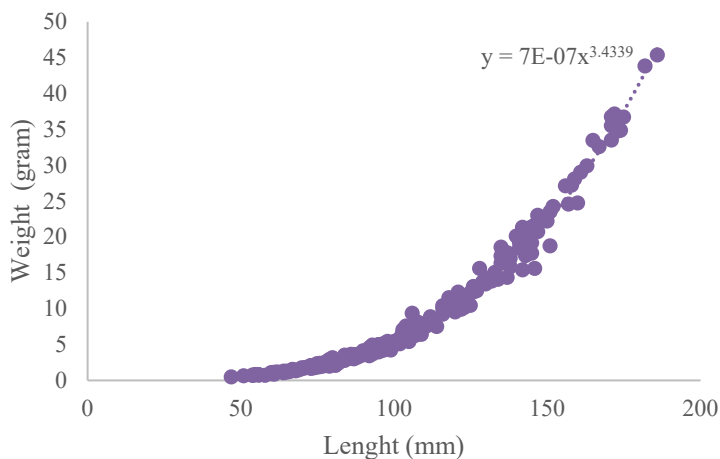
The growth pattern of Hamilton's thryssa fish can be known through the length-weight relationship. The results of the analysis of the length-weight relationship of Hamilton's thryssa fish are presented in Table 1 and Fig. 3.

**Table 1.** The results of the analysis of the length-weight relationship of Hamilton's thryssa (*Thryssa hamiltonii*) fish in Pabean Bay, Indramayu (April – December 2015)

| Parameter                                  | Value                   |
|--|-------------------------|
| Fish Sample                                | 195                     |
| L range(mm)                                | 47-186                  |
| a (intercept)                              | 7,45 x 10 <sup>-7</sup> |
| b (slope)                                  | 164,27                  |
| R (correlation coefficient)                | 0,9923                  |
| Test b is equal to 3, T <sub>hit</sub>     | 1147,039                |
| T <sub>tab</sub> (confidence interval) 95% | 164,27                  |

The length-weight relationship model and condition factors in Hamilton's thryssa fish (*Thryssa hamiltonii*) obtained the equation  $W = 7.45 \times 10^{-7} \cdot L^{3.43389}$  with a correlation coefficient of  $r=0,9923$ . The r-value shows the close relationship between the length and weight of fish. The close relationship is also supported by a positive t-value which tells a positive allometric growth pattern. The growth in length and weight of this fish can be classified as good.

The condition factor is a condition that describes the plumpness of the fish. The condition factor of both male and female fish fluctuates or changes that are not fixed. The value of the condition factor of Hamilton's thryssa fish (*Thryssa hamiltonii*) ranges from 0.77 to 1.39, which means that the value of Hamilton's thryssa fish (*Thryssa hamiltonii*) is in good condition.



**Fig. 3.** Model of the length-weight relationship of Hamilton's thryssa fish (*Thryssa hamiltonii*).

## 4 Discussion

The length-weight relationship model in Hamilton's thryssa fish (*Thryssa hamiltonii*) is obtained by the equation  $W = 7.45 \times 10^{-7} L^{3.43389}$ . The correlation coefficient on Hamilton's thryssa fish (*Thryssa hamiltonii*) obtained  $r=7E-07X^{3.4339}$ . The r-value shows that the relationship between the length-weight of Hamilton's thryssa fish is very close. The t-value test supports this phenomenon, Hamilton's thryssa fish has an allometric growth pattern which means that the growth in length and weight growth is excellent. Furthermore, based on research results from [8,9,10,11]. Hamilton's thryssa fish (*Thryssa hamiltonii*) have negative isometric and allometric growth patterns [12], differences in growth patterns of Hamilton's thryssa fish species (*Thryssa hamiltonii*) are influenced by research location, fish habitat, food availability.

Mangrove forest areas dominate this bay, and there is an estuary flow of the Cimanuk River, which is directly opposite the sea. This situation makes Customs Bay a potential natural resource for fisheries. One of the organisms that have an essential role in the bay is phytoplankton. These organisms have chlorophyll, which can convert inorganic materials into organic materials through photosynthesis. The organic matter from phytoplankton is utilized by zooplankton, fish larvae, and other aquatic organisms as a food source. Phytoplankton has an important role in the food chain in the waters. Almost all small pelagic fish and larvae use plankton (phytoplankton or zooplankton) [13].

Groups of fish of different genera and families in the family Platycephalidae have a model of the length-weight relationship of the species *Platycephalus fuscus*, this is based on research conducted by [14] in the NSW Estuary of Australia, and the results obtained equations for male fish  $W = 2,86 \times 10^{-3} L^{3.213}$  and female  $W = 2.09 \times 10^{-3} L^{3.282}$  with each correlation coefficient equal to  $(r) = 0,9923$ , it is suspected that fish belonging to the Platycephalidae group have an isometric growth pattern. In contrast, the difference in growth patterns within the genus and species is influenced by the fishing season, fish habitat, distribution of fish, fish roaming in search of food.

During the research activities, the number of Hamilton's thryssa fish caught varies each month. Sometimes male and female anchovies are not caught at the same time. Male fish are not caught in July and September, while female fish are not caught in November. The value of the condition factor also varies each month. According to [8], the condition factor peaks

when the fish are still young and will decline after the fish become old. In line with the opinion of [10] in female fish, the condition factor value tends to increase in line with the increase in the total length of the fish, including the average length. Determining the plumpness of fish is necessary to determine the condition factors that were previously carried out by detecting the aquatic environment.

The condition of the TKG and body weight will affect the value of various factors. The increase in gonadal maturity (TKG) in fish will be directly proportional to the increase in body weight in fish. The difference in the number of fish catches according to [3] depends on the composition of male and female gonads mature fish and is characterized by fish that have TKG III and IV, which female fish dominate. The following is in line with the statement by [3] that gender is one of the characteristics that influence condition factors other than age and season. It is assumed that both male and female anchovies that are not caught in certain months are saving their energy for other activities such as finding a comfortable place to reproduce (recognizing partners, adjusting spawning times, and orienting spawning sites) [3].

## 5 Conclusion

Hamilton's thryssa fish has an allometric growth pattern which means growth in length and weight is good. Based on the condition factor, which has a value of 1.39 Hamilton's thryssa fish are also classified as having a good condition. The values of  $a$  and  $b$  expressed by  $W = 7.45 \times 10^{-7} L^{3.43389}$ , show that Hamilton's thryssa fish has positive allometric growth.

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