Growth pattern and length-weight relationship of
*Rhyacichthys aspro*, in The Cisadea River, West Java, Indonesia

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Abstract. During development, the organisms such as fish species generally increase in size (length, weight). Length-weight relationships or condition factor in *R. aspro* species were analyzed separately by sex and location. This study aims to determine the growth patterns and Length-weight relationships in the *R. Aspro* fish species that were captured in the Cisadea River, West Java, Indonesia. This research was conducted from June 2012 to February 2013. Fish sampling from the field was carried out for six months from June to November 2012. Sampling was carried out at the station that had been determined by Purposive Sampling which could represent the upstream, middle and downstream of the river. The parameters measured consisted of growth patterns and factors conditions for fish (Length-weight relationships). The data then analyzed using the Excell 2007 computer program and uses the FAO-ICLARM Stock Assessment Tool II (FISAT II) program. The results showed that the correlation coefficient (r) *R. aspro* showed a value of 0.90 for male fish and 0.78 for female fish. Based on different sexes, the fish growth pattern in all gender has a positive allomatic (b> 3). Based on location, the fish growth pattern has positive and negative alomatric patterns. There are differences in conditions both based on gender and location. The length-weight relationship *R. aspro* is allometric with condition factor values ranging from 0.16 - 2.05. As conclusion, the length-weight relationship of *R. aspro* is allometric with different condition factor. The results of this study can be used as baseline data for the management of aquatic resources in these locations or other locations.

1. Introduction
Cisadea river is located at Cianjur Regency, West Java, Indonesia. This river have fisheries potential such as perikanan laut, tambak and sungai. Several species fish that have economic value has been live
in this river and most be captured by fisherman around the water such as soro (Tor soro), kakap (Caranx ignobilis), baronang (Siganus vermiculatus) and Sidat (Anguilla marmorata). It’s fish to be main target of fisherman for used as food resourch or traded. The actifity intencity of fish capture by community can threatening of existance its species in Cisadea river. Therefore, preservation efforts and capture management is needed for supporting of fish live sustainability in it river.

In fisheries biology, information about length-weight relationship is the one of aspect that to know in relate with management of fisheries resourch such as in determination of catching tool selectivity so that only the fish caught are of a reasonable size [1]. Moreover, Richter [2] and Blackweel et al. [3] stated that purpose of length-weight relationship measurment is to know of wight and length variation from fish individually or in as information about obesity, healthy productivity, phisiological condition gonadal development. And Everhart and Youngs stated that the analisisy of length-weight relaysionship can estimation of condition factor, which is one of the important things of growth to compare conditions or the relative health conditions of fish populations or individuals [4].

The study of length-weight relationship has been carried out by researchers, in Indonesia, especially in especially that live in Cisadea river not reported yet. Therfore, this research is important as an effort to provide basis data on the factor condition of fish in Cisadea river. This research aims to determine the length-weight relationship and condition factor from fish Menga (Rhyacicthys aspro) in Cisadea river so that it can be identified about its growth patternsWest Java has reported by Yuanda et al. [5] about fish species of nila in Cimanuk river (upsteram) and tetet fish in Mayangan coastal [6]. However, study about other fish species. So this study aims to determine the growth patterns and Length-weight relationships in the *R. Aspro* fish species that were captured in the Cisadea River, West Java, Indonesia.

### 2. Material and methods

The measurment parameters consists of growth pattern and condition factor of fish. The data that used in this research is results data from measurment of fish length and weight. The length data that used is the standard length data (from the tip of the mouth to the tip of the tail base) using calipers with accuracy 1 mm. The fish weight is weighed using analitycal scales with accuracy 0,01 gr.

The aspect growth were analyzed using length-weight relationship data and then analyzed using computer program of Excell 2007 and using program of FAO-ICLARM Stock Assessment Tool II (FISAT II) [7]. The growth pattern of fish is known by calculating the length-weight relationship of fish. The length-weight relationship was analyzed using the exponential regression equation: \( W = LB \), where \( W \) is body weight (gr), \( L \) is body length (mm), and values \( a \) and \( b \) are obtained from the results of regression calculations. The regression calculation is calculated based on location and gender. The value of \( b \) obtained from the curve of the length-weight relationship is tested t to evaluate whether the value of \( b \) is equal to 3 or not. If the value of \( b \) is equal to 3, the length and weight is increase proportionally (isometric) and growth is negative and positive allometric if the value of \( b \) is not equal to 3 [8]. The results form t value then compared to the t table value. The hypothesis used is H0: \( b = 3 \) (isometric) and H1: \( b \neq 3 \) (allometric). From these hypotheses, the conclusions is H0 has rejected if t-count > t-table and H0 has accepted if t-count < t-table.

The values of \( a \) and \( b \) has obtained from the exponential regression equation are used to calculate the condition factor of each individual fish with the equation \( K = W x aL^{-b} \) where \( K \) is a condition factor, \( W \) is the weight of fish (gr), and \( L \) is the length of fish (mm) [9].

### 3. Result and discussion

The length-weight relationships in *R. aspro* species were analyzed separately by sex and location. The results of the analysis of the relationship between the body weight-length of *R. aspro* fish are presented in Tables 1 and 2. Based on Table 1, the correlation coefficient (\( r \)) *R. aspro* is 0.90 for male fish and 0.78 for female fish. This value shows that the length-weight relationship of *R. aspro* fish both male and female fish has a strong correlation, this means that if the fish body length increases it will affect to the body weight gain.
Based on the results of the t test show that the regression coefficient in the species is not equal to three (≠ 3) where the value of t count is greater than t table. This means that both species have allometric growth patterns, which means that the increase of length is not as fast as the growth of body weight or otherwise. Based on the equation of the relationship of length-weights on \( R. aspro \) with different sexes, all samples have growth patterns of positive allometric (\( b > 3 \)).

Based on Table 2, the correlation coefficient (r) on the length-weight relationship of fish based on different locations ranged from 0.77-0.92. At the location of LC1.2, LC2.1 and LC2.2, the coefficient of \( R. aspro \) correlation is more than 80%, while in the location of LC1.1 it is less than 80%. The correlation coefficient indicates that the length-weight relationship \( R. aspro \) fish in the four locations has a strong correlation or it can be interpreted that the body weight gain of fish is strongly influenced by the increase in body length.

The results of t-test show that it both species have growth pattern of allometric which indicated that increase of length size not as fast as increase of body weight. It’s can be seen from the values of regression coefficient in both species that the value not equal with three (≠3).

The growth pattern based on location have pattern of positive and negative allometric. In the species of \( R. aspro \), this species have growth pattern of negative allometric in location LC2.2, and in other location have positive allometric pattern. So this case show that location LC2.2 not supporting for growth of \( R. Aspro \), and the same time in the location LC1.1 and LC2.1 give support for fish growth.

**Table 1.** The result of length-weight relationship of \( R. aspro \) for different sexes.

| Sex         | Equation           | r    | n  | t-count | t-table | Growth pattern |
|-------------|--------------------|------|----|---------|---------|----------------|
| Male        | \( W = 1E - 05 L^{3.692} \) | 0.90 | 49 | 14.50   | 2.01    | Allometric (+) |
| Female      | \( W = 7E - 07 L^{3.055} \) | 0.78 | 51 | 8.89    | 2.01    | Allometric (+) |
| Male-Female | \( W = 6E - 06 L^{3.183} \) | 0.80 | 10 | 13.25   | 1.98    | Allometric (+) |

**Table 2.** The result of length-weight relationship of \( R. aspro \) in different location.

| Location | Equation           | r    | n  | t-count | t-table | Growth pattern |
|----------|--------------------|------|----|---------|---------|----------------|
| LC1.1    | \( W = 3x10^{-7} L^{1.856} \) | 0.77 | 22 | 5.50    | 2.07    | Allometric (+) |
| LC1.2    | \( W = 2x10^{-6} L^{1.477} \) | 0.92 | 26 | 11.89   | 2.06    | Allometric (+) |
| LC2.1    | \( W = 7x10^{-6} L^{1.160} \) | 0.84 | 30 | 8.36    | 2.04    | Allometric (+) |
| LC2.2    | \( W = 3x10^{-5} L^{1.848} \) | 0.85 | 22 | 7.18    | 2.07    | Allometric (-) |

**Table 3.** The condition factor (K) of \( R. aspro \) based on different sexes.

| Species | Male | STDEV | Female | STDEV |
|---------|------|-------|--------|-------|
| \( R. aspro \) | 0.35-1.91 | ±0.27 | 0.16-2.05 | ±0.31 |

**Table 4.** The condition factor (K) of \( R. aspro \) based on location.

| Component | Location |
|-----------|----------|
| Range     | LC1.1    | LC1.2   | LC2.1   | LC2.2   |
| STDEV     | 0.19-2.30 | 0.42-1.15 | 0.48-1.92 | 0.43-1.63 |

The value of condition factors (K) were analyzed based on different sexes and location (the results can be seen at Table 3 and 4). Based on the table, condition factor in \( R. aspro \) there are differences in both based on sexes and location. Based on different sexes, the condition factor of \( R. aspro \) around between
0.35-1.91 for male and 0.16-2.05 for female. Based on location, highest condition factor was founded in location LC1.1 and LC2.1.

There are relation between length with growth in fish. The growth of organism can influenced by several factors where the fish live. So that the growth pattern in location can describe the environmental condition where the fish live. Based on sexes, the growth pattern of _R. aspro_ has allometric (b≠3) and can be interpretef that length not equal with weight increase. The growth pattern of _R. aspro_ not reported yet before, so that are limited for comparing with the same fish species in other location. _R. Guilberti, Protogobius_ and _R. aspro_ is the members of Rhyacichthidae [10] and in it’s family not reported yet about growth pattern and condition factor. Ecological factors (food availibility and competition) and biologic is the one of factors that effect to fish condition [9], so there are different growth pattern of fish.

Based on location, the growth pattern of _R. aspro_ is negative allomatric in location LC2.2. This pattern describe that weight increas in it location not as fast as increse length. If increse length more fast than it weight, so it fish condition not good (thin). Based on sexes and location, condition factor of male more smaller than female. The highest condition factor was founded in location LC1.1 and LC2.1. The different of condition factor can influenced by food, ages, sexes and gonadal development [11].

4. Conclusion

The correlation coefficient (r) _R. aspro_ showed a value of 0.90 for male and 0.78 for female. Based on different sexes, the fish growth pattern in all gender has a positive allometric (b> 3). Based on location, the fish growth pattern has positive and negative alomatric patterns. There are differences in conditions both based on gender and location. The length-weight relationship _R. aspro_ is allometric with condition factor values ranging from 0.16-2.05.

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