Length-weight relationship and condition factors of layang fish (*Decapterus macrosoma*) that landed at Lampulo Ocean Fishing Port, Banda Aceh

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Abstract. Length-weight relationship and condition factors in biological fisheries are one of the complementary information that needs to be known in relation to fisheries resource management. This research aims to know the growth pattern and condition factors of Layang fish (*Decapterus macrosoma*) that caught in Aceh’s province water. The sampling used simple random sampling method conducted from February to March 2019. The sample is the catch of fishermen from the Aceh’s water area that landed at Lampulo Ocean Fishing Port. The Data were analyzed by Linear Allometric Model (LAM), relative weight and Fulton’s condition factors. The results showed that layang fish (*Decapterus macrosoma*) had a negative allometric growth pattern with a value of $b = 2.61$. The value of 103.46 from the relative weight conditions factor indicates a stable water condition and the value of 3.00 from the factor of Fulton’s conditions allows the availability of abundant food that support the life of *Decapterus macrosoma* fish well.

1. Introduction

Layang fish (*Decapterus macrosoma*) is one of pelagic fish component which is dominant being caught in Aceh. Exploitation of Layang fish (*Decapterus macrosoma*) resources is committed continously because of high demand of Aceh citizen. The caught which continously commited to a resource of fisheries must be balanced by scientific information and fisheries bio-ecology knowledge, so as resource of fisheries can be maintained contionously.

Length-weight relationship fish in fisheries biology is one of complementary information must be known in resources management connectionsaja [1]. Length-weight relationship is one of fisheries biology information that important to be known, because of the knowledge aboutthe study is usefull to gain better understanding of perpetuity of life and growth of fish stock, becuase based on biology information all consequencess that possible appear by all alternatives can be decreased[2]

This research objectives to know growth pattern and condition factor of Layang fish (*Decapterus macrosoma*) which caught in Aceh waters that landed at Lampulo Ocean Fishing Port, Banda Aceh.
2. Materials and Methods

Study Site and Sampling

The research was held on February till March 2019. Data retrieval is using Simple random sampling method and frequency of sampling is once a week at Lampulo Ocean Fishing Port. Fish sample are catches from fisherman in Aceh waters, it gained from landed ship at Lampulo Ocean Fishing Port which derived randomly from some basket. The total of researched sample are 100 fishes.

Parameter which measured of fish are two, those are: the total length of fish (measured from mouth till tail of fish) it measured by ruler with accuracy degree is millimeter (mm), and weight of fish is weighed by digital scale with degree of accuracy is 1 gram. Next, the data of length and weight of fish are written and utilized to data analyzing of growth pattern and factor of fish condition.

Data Analysis

The length-weight relationship of fish can be counted by using Linear Allometric Model (LAM) [3], the formula is:

\[ W = (aL^b) \]

Where \( W \) is weight of fish (gram), \( L \) is length of fish (mm), \( a \) is linear regression intercept, and \( b \) is coefficient regression. Value of \( b \) from counting result shows growth pattern of fish. If \( b=3 \) then the growth of pattern tends isometric and if \( b \neq 3 \) then the growth pattern tends allometric. Allometric pattern divided into two, those are positive allometric and negative allometric. If \( b<3 \) called as negative allometric (accretion of length is faster than accretion of weight), and if \( b>3 \) called positive allometric (accretion of weight is faster than accretion of length).

The relative weight condition factor counted by using formula [4], as follows:

\[ W_r = \left( \frac{W}{W_s} \right) \times 100 \]

Where \( W_r \) is relative weight, \( W \) is weight of fish (gram), and \( W_s \) is predicted fish based on LAM model.

The Fulton condition factor or called as coefficient K counted [5] by using formula as follows:

\[ K = WL^{-3} \times 100 \]

Where \( K \) is Fulton condition factor, \( W \) is weight of fish (gram), \( L \) is length of fish (mm), and \( -3 \) is coefficient of length or correction factor.

3. Result

The analysis results of the length weight relationship of Layang fish (Decapterus macrosoma) obtained from the measurement by 100 Layang fish can be seen in Table 1.

| No. | Parameter                  | Result                  |
|-----|----------------------------|-------------------------|
| 1.  | Total sample (n)           | 100 fishes              |
| 2.  | Average of length (mm)     | 233.37                  |
| 3.  | Average of weight (g)      | 133.71                  |
| 4.  | Determination (R²)         | 0.78                    |
| 5.  | Correlation (r)            | 0.88                    |
| 6.  | Regression coefficient (b) | 2.61                    |
| 7.  | Growth pattern             | Allometric negative     |
4. Discussion
Based on observation result at 100 *Decapterus macrosoma* fishes which landed at Lampulo Ocean Fishing Porton February till March 2019 their range of weight about 70-250 gram and average of weight is 233,37 mm. Various size of *Decapterus macrosoma* which landed at Lampulo Ocean Fishing Port it is possibile that there is no separation and grouping based on sex. Layang fish (*Decapterus* sp.) which caught in North Maluku water has various of size, where the average of length and average of weight belong to female fish is bigger than male [6].

![Figure 1. Linear regression](image_url)

The result of regression gained of value $b=2,61$ shows the growth patterns of *Decapterus macrosoma* is negative allometric ($b<3$) it means accretion of length is faster than accretion of weight, besides growth pattern negative allometric is also signed by slimmer fish.

Habit and behaviour of *Decapterus macrosoma* active swimmer fish is suspected affects the low value of $b$ on *Decapterus macrosoma*. The fish which live at heavy current water has lower $b$ value and vice versa, the fish which live in calm current will result higher $b$ value. This phenomenon possible caused by the behaviour of fish, generally active swimmer fish (pelagic fish) shows lower value of $b$ compared to passive swimmer fish (demersal fish), it is related to energy allocation expanded by the fish [7].

Correlation value gained from regression analysis is $(r=0,88)$. The value shows the close relation between accretion of length and accretion of weight. The value of determination coefficient $(R^2)=0,78$. It means 78% of accretion of fish weight caused by the length of fish body. Value of determination coefficient close to 1 shows that the total length of fish body is highly affects to the total weight of body fish [8]. While the letovers is 22% of weight accretion of body of fish caused by another unknown factor.

Graphic of growth pattern of *Decapterus macrosoma* the result of observation shows that the nearly same pattern with the predicted value. The growth pattern that similar to the result of prediction shows good condition of water to support the growth of fishes [9]. It is proven by the number of value of condition factor more than 100.
The relative weight condition factor \((W_r)\) the analysis result length-weight of *Decapterus macrosoma* is 103.46. The value shows that the condition of water is stable. The value of condition factor reaches 100 shows the availability of good feed to existence of predator at this fish community and water quality still adequate to support community of fish especially to researched fish [10]. As accretion, The value of relative weight condition factor \((W_r)\) reaches 100 signed the balancing of prey and predator, because of the water in good condition and support to the health of fish growth [11].

Fulton’s condition factor \((K)\) is 3.00. the range of fulton condition factor value is 2.49 till 3.01 indicates a very good condition of waters[12]. That the high value of condition factor indicates the existence of deritus that consisted protein, high fat and carbohydrate as fish fish is abundant in a water [13]. The number of condition factor value is based on the number of the existence of organism, availability of food and condition of water environment. [14]

5. Conclusion
Growth pattern of Layang fish (*Decapterus macrosoma*) in Aceh water tends negative allometric (the growth of length is faster than weight). The existence of *Decapterus macrosoma* in Aceh is quite good and balanced. It looks from the high value of condition factor \((W_r = 103.46\) and \(K = 3.00\)) it means *Decapterus macrosoma* and water environment are appropriate, the good condition of water seen from the existence of quite food for fishes and good water environment to continuity of fish life.

References
[1] Nurhayati, Fauziyah dan S.M. Bernas. 2016. Hubungan Panjang-Berat dan Pola Pertumbuhan Ikan di Muara Sungai Musi Kabupaten Banyuasin Sumatera Selatan. Maspari Journal. Vol.8(2): 111-118.
[2] Taunay P.N., E. Wibowo, dan S. Redjeki.2013. Studi Komposisi Isi Lambung dan Kondisi Morfometri untuk Mengetahui Kebiasaan Makan Ikan Manyung (*Arius thalassinus*) Yang Diperoleh di Wilayah Semarang.Journal of Marine Research.Vol.2(1):87-95.
[3] De-Robertis, A.William. 2008. Weight-length Relationship in Fisheries Studies: The Standard Allometric Model Should be Applied with Caution. Transaction of The American Fisheries Society. Vol. 137(1) :707-719.
[4] Rypel A.L., T.J. Ritcher. 2008. Emperical Percentile Standard Weight Equation for the Blacktail Redhorse. North American Jurnal of Fisheries Management. Vol. (28): 1843-1846.
[5] Okgerman, H. 2005. Seasonal Variation of The Lenght Weight and Condition Factorof Rudd (*Scardinius erythrophthalamus L*) in Spanca Lake. International Journal of Zoological Research. Vol. 1(1) : 6-10.

[6] Irham dan H.K. Iksan. 2009. Pertumbuhan dan reproduksi Ikan layang biru (*Decapterus macarellus*) di Perairan Maluku Utara. Jurnal Iktoologi Indonesia. Vol. 9(2): 163-174.

[7] Muchlisin, Z.A., M. Musman, M.N. S. Azizah, 2010. Lenght Weight Relationships and Condition Factors of Two Threatened Fishies, *Rasbora tawarensis* and *Proporopuntius twarensis*, endemic to Lake Laut Tawar, Aceh Province, Indonesia. Journal of Applied Ichtiology. Vol. (26): 949-953.

[8] Batubara, A. S., Muchlisin, Z. A., Efizon, D., Elvyra, R., Irham, M. 2019. Length-Weight Relationships and Condition Factors of the Naleh Fish, *Barbonymus gonionotus* (Pisces, Cyprinidae) Harvested from Nagan Raya Waters, Indonesia. VestnikZooloii, 53(1), 75-82.

[9] Fuadi Z., I. Dewiyanti, S. Purnawan. 2016. Hubungan Panjang Berat Ikan yang Tertangkap di Krueng Simpoe, Kabupaten Bireun, Aceh. Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah. Vol.1(1):169-176.

[10] Muchlisin, Z.A., A.S. Batubara, M.N.S. Azizah, M. Adlim, A. Hendri, N. Fadli, A.A. Muhammadar, S. Sugianto. 2015. Feeding Habit and Length Weight Relationship of Keureling Fish, *Tor tambra* Valenciennes, 1842 (Cyprinidae) from the western region of Aceh Province, Indonesia. Biodiversitas. Vol. 16 (1): 89-94.

[11] Muchlisin, Z.A., V. Fransiska, A.A. Muhammadar, M. Fauzi, A.S Batubara. 2017. Lenght-Weight Relationships and Condition Factors of The Three Dominant Spesies of Marine Fishes Caught by Tradisional Beach Trawl in Ulelhee Bay, Banda Aceh City, Indonesia. Croatian Journal of Fisheries. Vol (75): 104-112. DOI: 10.1515/cjfl-2017-0014

[12] Muchlisin, Z.A., V. Fransiska, A.A. Muhammadar, M. Fauzi, A.S Batubara. 2017. Lenght-Weight Relationships and Condition Factors of The Three Dominant Spesies of Marine Fishes Caught by Tradisional Beach Trawl in Ulelhee Bay, Banda Aceh City, Indonesia. Croatian Journal of Fisheries. Vol (75): 104-112. DOI: 10.1515/cjfl-2017-0014

[13] Wahyudewantoro, G. dan Haryono. 2013. Hubungan Panjang Berat dan Faktor Kondisi Ikan Belanak (*Liza subviridis*) di Perairan Taman Nasional Ujung Kulon-Pandeglang, Banten. Bionatura-Jurnal Ilmu-ilmu Hayati dan Fisik. Vol. (15): 175-178.

[14] Effendie, M. I. 1997. Biologi Perikanan, dalam Studi Kebiasaan Makanan Ikan Layur (superfamili trichiuroidea) di Perairan Palabuhan ratu, kabupaten Sukabumi Jawa Barat. F.W. Sari. IPB. Bogor, hlm 2