

## Review Abstract

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## Review Manuscript

[ISFFS] REVIEWED MANUSCRIPT 

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ISFFS 2021 Organizing Committee  
Indonesian Ichthyological Society (Masyarakat Ichthyologi Indonesia)  
Widyaiswasta, Division of Zoology,  
Research Center for Biology, Indonesian Institute of Science (LIPI)  
J. Raya Jakarta-Bogor Km 46, Cibinong 16911

**Length-weight relationship and condition factor  
of Toothpony (*Gazza minuta* Bloch 1795) from Pabean Bay, Kabupaten  
Indramayu, Indonesia**

**Abstract**

This study is aimed to determine length-weight relationship and to evaluate relative condition factor of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay, Indramayu, West Java. These two growth parameters of fish growth report, may be useful in various studies related to the biology and taxonomic status of genus *Gazza*. Fish collection was carried out monthly from January to December 2016. A total of 190 individual fishes were caught using gillnet with mesh sizes varying from 1 to 2 inches. The fish samples length and weight ranged from 30 – 138 mm in length and 0.41 – 35.83 g, respectively in weight. The length-weight relationship was  $W = 1.73 \times 10^{-3} L^{1.7384}$ . The results indicated that the length weight relationship was highly correlated ( $R^2 > 0.945$ ). The condition factors of fish varied from 0.0995 to 0.8588. These results indicate that toothpony exhibited a negative allometric growth the growth pattern of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay. The relative condition factor fluctuated between 0.32 and 2.080.0995 and 0.8588, indicating a state of frailness to robustness for this species. ~~g..... was allometric negatif.~~

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**Keywords:** condition factor, length-weight relationship, Pabean Bay, toothpony, West Java.

# The Length-weight Relationship and The Condition Factor of Toothpony (*Gazza minuta* Bloch 1795) from Pabean Bay Indramayu, West Java

**Abstract.** The purpose of this study is to specify the length-weight relationship and to evaluate the relative condition factor of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay, Indramayu, West Java. ~~These two parameters of fish growth report, may be useful in various studies related to the biology and taxonomic status of genus Gazza.~~ Fish collection was carried out monthly from Januari 2016 to Desember 2016 and total of 190 individual fishes were caught using gillnet with mesh sizes varying from 1 to 2 inches. The fish samples ranged from 30 – 138 mm in length and 0.41 – 35.83 g in weight. The length-weight relationship was  $W = 1.51 \cdot 10^{-4} L^{2.388}$  and the condition factors of fish varied from  $1.1 \pm 0.22$  to  $2.03 \pm 2.29$ . These results indicate that the growth pattern of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay was allometric negatif.

**Key Words:** length-weight relationship, condition factors, *Gazza minuta*

## 1. Introduction

Pabean bay is located in the northern part of Indramayu, West Java, Indonesia. There are about 78 species from 39 families are occurred in ~~pabean-Pabean~~ bay and one of them is the *Leiognathidae* family [1]. *Gazza minuta* (Bloch 1795) from the family *Leiognathidae* is a small-sized (< 300 mm in standar length) body frame oval and particularly compressed; dorsal and ventral profiles similarly convex, reasonably deep. Mouth pointing ahead while protracted, with a wonderful caniniform tooth in each jaw [2,3]. *Gazza minuta* Bloch, 1795 is known locally as peperek fish and these species are often encountered in Pabean Bay. However, information about the biological characteristics of these species is very limited.

One important factor in the study of fish biology are length-weight relationship and condition factor to provides information on stock condition in fisheries management [4]. Fish biomass is often calculated from abundance by length using length-weight relationship in the yield assessment [5–7]. The tools for analyzing growth or morphometric that used which many researchers have used the length-weight relationship of fish in an area/water for an individual species such as *Mystus nigriceps*, ~~#*lapia*~~ *Tilapia mossambica*, *Johnius belangerii*, and *Sardinella lemuru* Bleeker [8–11].

The length-weight relationship provides an overview of information related to the growth pattern and the fish body status condition [12]. The fish body that increases in all dimensions in the same proportion of growth is called isometric allometric whereas

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have been reported caught  
*Leiognathidae* family [1]

negative allometric growth means that the fish's body becomes leaner as it gains weight while the fish becomes relatively fatter or deeper due to increasing length is called positive allometric [13].

Condition factor is a value that indicates fish fatness, which can be used as an instrument to show changes in fish condition throughout the year, thereby contributing to fish management activities [14]. Various ecological and biological factors on the environment concerning the feeding condition are measured by this conditioning factor. The higher condition factor means the fish condition is better. Factors that affect the condition of fish such as fish biology (size, age and sex) [15], season [16,17], water quality parameters [13,18], and availability of feeds [19]. The length-weight relationship and evaluating conditional factors of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay are the objectives of this study.

## 2. Materials and method

The study was conducted in Pabean bay Indramayu district West Java Province, Indonesia (figure-Figure 1). *Gazza minuta* Bloch, 1795 is known locally as peperek fish (figure-Figure 2), was carried out monthly from Januari 2016 to Desember 2016. Data were taken from a total of 190 individual fishes by measuring each fish's length-weight and group quarterly using digital weighing balance respectively were caught using gillnet with mesh sizes varying from 1 to 2 inches.

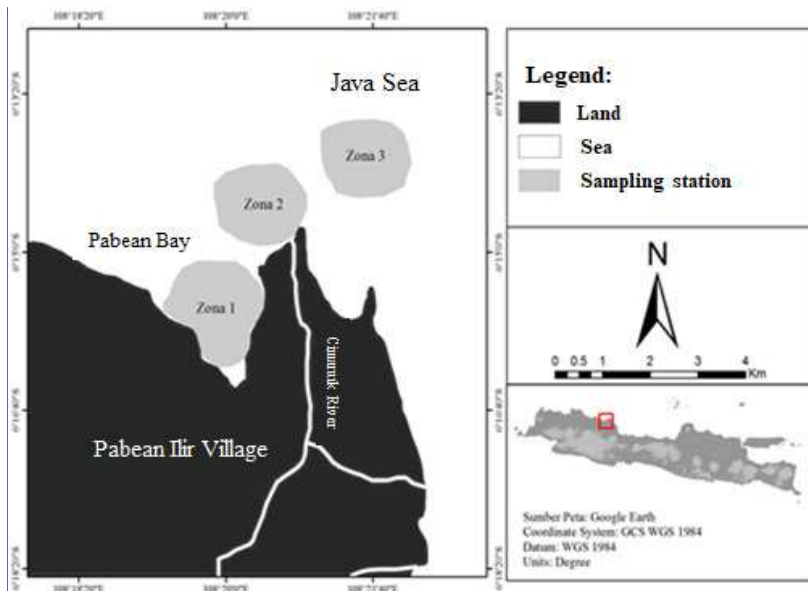
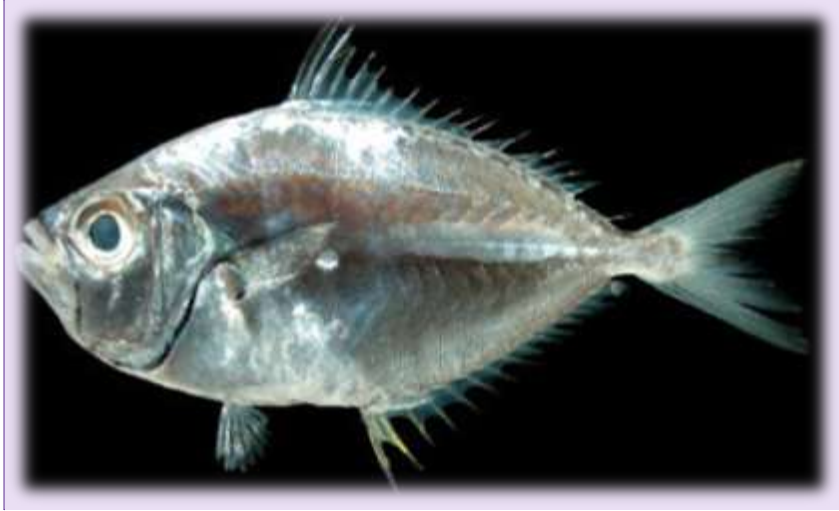


Fig. 1. The site for study in Pabean Bay, Indramayu, Indonesia.

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**Fig. 2.** Toothpony, *Gazza minuta* (Bloch 1795)

The standard length (SL) and total length (TL) have a measurement accuracy of 1mm and standard weight with an accuracy of 0.1 g [20]. The Allometric equation used to determine the relationship between length and weight of fish expressed in the form [19]:

$$W = aL^b \quad (1)$$

where W means the total weight (g), a means the coefficient constant for the growth index, L means the total length (mm), and b means the slope for the growth coefficient. Biological factor expressed with b value; if a fish body that increases in all dimensions in the same proportion of growth or an equivalent shape and grows increases isometrically (b=3). It shows an allometric positive if the body weight increases more than length mean that the fish becomes relatively fatter or deeper due to increasing length (b>3). It shows allometric negative if the body length increases more than weight (b<3) means that the fish's body becomes leaner as it gains weight [21,22].

The equation below is used to evaluate the condition factor of fish [23]:

$$K = \frac{100W}{L^3} \quad (2)$$

Where K means the condition factor, W means the total weight (g), L means the total length (cm) and 3 means the cubic length-weight relationship. The collected data is analyzed using descriptive statistics.

### 3. Result

The total sample fish of *Gazza minuta* (Bloch 1975) taken are 190 samples. The fish body sizes ranged from 30 – 138 mm length and 0.41 – 35.83 g weight. All estimated data of body size, length-weight relationships and condition factors of *Gazza minuta* (Bloch 1975) from Pabean bay are shown group quarterly in [table-Table 1](#) and [table-Table 2](#).

**Table 1.**Total length and weight of *Gazza minuta* (Bloch 1795) Pabean Bay

Times	n	Total length (mm)			Weight (g)		
		Min	Max	Mean $\pm$ SD	Min	Max	Mean $\pm$ SD
January – March (Q1)	80	30	105	62.66 $\pm$ 18.24	0.52	15.62	4.73 $\pm$ 4.18
April – June (Q2)	25	34	121	63.28 $\pm$ 23.52	0.54	18.45	3.62 $\pm$ 4.70
July – September (Q3)	57	36	138	65.63 $\pm$ 21.76	0.52	35.83	4.44 $\pm$ 6.23
October – December (Q4)	28	34	112	57.79 $\pm$ 15.50	0.41	11.46	3.06 $\pm$ 2.44
Year (Y)	190	30	138	62.92 $\pm$ 19.75	0.41	35.83	4.15 $\pm$ 4.74

n = Number of fish samples, SD = standard deviation

**Table 2.** Length-weight relationship and condition factor of *Gazza minuta* (Bloch 1795) Pabean Bay

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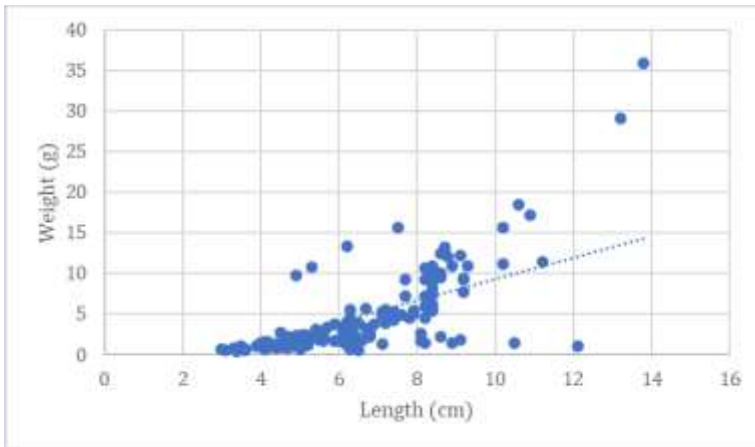
Times	n	a	b	AllometricPattern	K
					Mean $\pm$ SD
January – March (Q1)	80	$1.67 \cdot 10^{-3}$	1.847	Negatif	2.03 $\pm$ 2.29
April – June (Q2)	25	$1.73 \cdot 10^{-3}$	1.738	Negatif	1.27 $\pm$ 0.63
July – September (Q3)	57	$7.9 \cdot 10^{-6}$	3.075	Positif	1.10 $\pm$ 0.22
October – December (Q4)	28	$1.7 \cdot 10^{-5}$	2.937	Negatif	1.36 $\pm$ 0.35
Year (Y)	190	$1.51 \cdot 10^{-4}$	2.388	Negatif	1.42 $\pm$ 0.89

n = Number of fish samples, SD = standard deviation, a = constant, b = slope, K = condition factor

The collected data shown that the length-weight relationship equation for *Gazza Minuta* (Bloch 1795) is expressed as follow  $W_{Q1} = 1.67 \cdot 10^{-3} L^{1.847}$ ,  $W_{Q2} = 1.73 \cdot 10^{-3} L^{1.739}$ ,  $W_{Q3} = 7.9 \cdot 10^{-6} L^{3.075}$ ,  $W_{Q4} = 1.7 \cdot 10^{-5} L^{2.937}$ , and  $W_{year} = 1.51 \cdot 10^{-4} L^{2.388}$ . The collected data shown that the length-weight relationship equation for *Gazza Minuta* (Bloch 1795) is expressed as follow  $W_{Q1} = 1.67 \cdot 10^{-3} L^{1.847}$ ,  $W_{Q2} = 1.73 \cdot 10^{-3} L^{1.739}$ ,  $W_{Q3} = 7.9 \cdot 10^{-6} L^{3.075}$ ,  $W_{Q4} = 1.7 \cdot 10^{-5} L^{2.937}$ , and  $W_{year} = 1.51 \cdot 10^{-4} L^{2.388}$ . The result of the study shows, most of the times had a negative allometric growth. The b value on Q1-Q4 except Q3 shown that  $b < 3$  likewise group Y. The b values on the length-weight relationship equation are subject to the shape and fatness of the *Gazza Minuta* (Bloch 1795) and it is also dependent on factors such as biological and environmental condition, temporal sampling factor, season, water quality and food availability [4,13,24–27].

#### 4. Discussion

The results that are shown in figure 3 indicated that the length-weight relationship on annual growth (Y) was a significant positive correlation where coefficient r (R square) = 0.6315.



**Fig. 3.** The relationship between body weight and total length of *Gazza minuta* (Bloch 1795) from Pabean Bay (annual growth pattern Y) that fish grew negatively allometric.

Several studies have been conducted for several species of fish that temperature, spawning season, sex, species diversity affects the condition factor [7,18,28,29]. The condition factor increased with weight when the temperature drops on the contrary when the temperature rises which affects the length-weight relationship [18,24]. These factors were not considered in the present study.

The past study showed that Pabean bay is an aquatic ecosystem that has characteristics that are influenced by the environment [1]. Table 2 shown the condition factor for the fish that used in this study. The condition coefficient is used as an indicator of variability due to the growth coefficient (b) which is one of the standard fishery practices. Result of the study shows, condition factor ( $K_{\text{mean}}$ ) varied from  $1.1 \pm 0.22$  to  $2.03 \pm 2.29$  and most of the times had a condition factor  $K > 1$ . *Gazza minuta* (Bloch 1795) is a small to medium sized fish with short life span range from 1.5 to 1.8 years with small L and large K value. The past study showed that the short-lived species have a small L and a high K value and long-lived species have a higher L with a low K value[24].

## 5. Conclusion

This study result provided the data about the relationship length and weight, evaluation of condition factor for *Gazza Minuta* species collected from the Pabean Bay, Indramayu, Indonesia. Almost all length-weight relationship showed a negative allometric growth of fish which mean indicating that the growth of this fish is getting leaner along with the increase in length and a slimmer body. This may be due to biological and environmental conditions or linked to morphological characteristics specific.

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# The Length-weight Relationship and Condition Factor of Toothpony (*Gazza minuta* Bloch 1795) from Pabean Bay Indramayu, West Java

O.D. Soebhakti Hasan<sup>1</sup>

<sup>1</sup> Jakarta Technical University of Fisheries, Jakarta, Indonesia

**Abstract.** The purpose of this study is to specify the length-weight relationship and to evaluate the relative condition factor of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay, Indramayu, West Java. Fish collection was carried out monthly from Januari 2016 to Desember 2016 and total of 190 individual fishes were caught using gillnet with mesh sizes varying from 1 to 2 inches. The fish samples ranged from 30 – 138mm in length and 0.41 – 35.83 g in weight. The length-weight relationship was  $W = 1.51 \cdot 10^{-4} L^{2.388}$  and the condition factors of fish varied from  $1.1 \pm 0.22$  to  $2.03 \pm 2.29$ . These results indicate that the growth pattern of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay was allometric negatif.

**Key Words:** length-weight relationship, condition factors, *Gazza minuta*

## 1. Introduction

Pabean bay is located in the northern part of Indramayu, West Java, Indonesia. Roughly 78 species from 39 families have been reported caught in Pabean bay, and one of them is the *Leiognathidae* family [1]. *Gazza minuta* (Bloch 1795) from the family *Leiognathidae* is a small-sized (< 300 mm in standar length) body frame oval and particularly compressed; dorsal and ventral profiles similarly convex, reasonably deep. Mouth pointing ahead while protracted, with a wonderful canini form tooth in each jaw [2,3]. *Gazza minuta* Bloch, 1795 is known locally as peperek fish and these species are often encountered in Pabean Bay. However, information about the biological characteristics of these species is very limited.

One important factor in the study of fish biology are length-weight relationship and condition factor that provides information on stock condition in fisheries management [4]. Fish biomass is often calculated from abundance by length using length-weight relationship in the yield assessment [5–7]. The tools for analyzing growth or morphometric that used which many researchers have used the length-weight relationship of fish in an area/water for an individual species such as *Mystus nigriceps*, *Tilapia mossambica*, *Johnius belangerii*, and *Sardinella lemuru* Bleeker [8–11].

The length-weight relationship provides an overview of information related to the growth pattern and the fish body status condition [12]. The fish body that increases in all dimensions in the same proportion of growth is called isometric allometric whereas negative allometric growth means that the fish's body becomes leaner as it gains weight while the fish becomes relatively fatter or deeper due to increasing length is called positive allometric [13].

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*Leiognathidae* family [1]

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Condition factor is a value that indicates fish fatness, which can be used as an instrument to show changes in fish condition throughout the year, thereby contributing to fish management activities [14]. Various ecological and biological factors on the environment concerning the feeding condition are measured by this conditioning factor. The higher condition factor means the fish condition is better. Factors that affect the condition of fish such as fish biology (size, age and sex) [15], season [16,17], water quality parameters [13,18], and availability of feeds [19]. The length-weight relationship and evaluating conditional factors of toothpony (*Gazza minuta* Bloch 1795) in Pabean Bay are the objectives of this study.

## 2. Materials and method

The study was conducted in Pabean bay Indramayu district West Java Province, Indonesia (Figure 1). *Gazza minuta* Bloch, 1795 (Figure 2) [20], was carried out monthly from Januari 2016 to Desember 2016. Data were taken from a total of 190 individual fishes by measuring each fish's length-weight and sampling was grouped according to the time of data collection on a quarterly using digital scales respectively were caught using gillnet with mesh sizes varying from 1 to 2 inches.

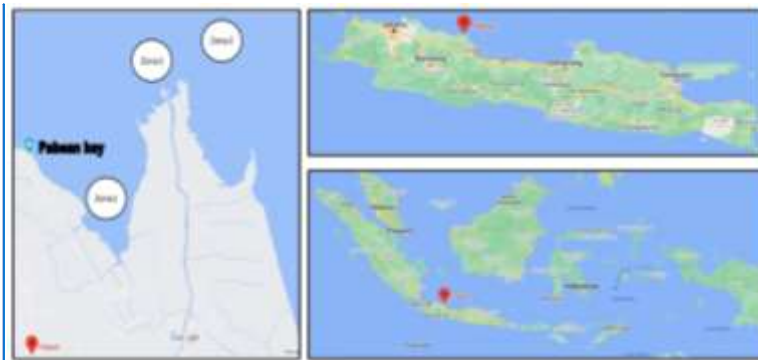


Fig. 1. The site for study in Pabean bay, Indramayu, Indonesia.



Fig. 2. Toothpony, *Gazza minuta* (Bloch 1795) [20]

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The standard length (SL) and total length (TL) have a measurement accuracy of 1mm and standard weight with an accuracy of 0.1 g [21]. The Allometric equation used to determine the relationship between length and weight of fish expressed in the form [19]:

$$W = aL^b \quad (1)$$

where W means the total weight (g), a means the coefficient constant for the growth index, L means the total length (mm), and b means the slope for the growth coefficient. Biological factor expressed with b value; if a fish body that increases in all dimensions in the same proportion of growth or an equivalent shape and grows increases isometrically (b=3). It shows an allometric positive if the body weight increases more than length mean that the fish becomes relatively fatter or deeper due to increasing length (b>3). It shows allometric negative if the body length increases more than weight (b<3) means that the fish's body becomes leaner as it gains weight [21,22].

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$$K = \frac{100W}{L^3} \quad (2)$$

Where K means the condition factor, W means the total weight (g), L means the total length (cm) and 3 means the cubic length-weight relationship. The collected data is analyzed using descriptive statistics.

### 3. Result

The total sample fish of *Gazza minuta* (Bloch 1975) taken are 190 samples. The fish body sizes ranged from 30 – 138 mm length and 0.41 – 35.83 g weight. All estimated data of body size, length-weight relationships and condition factors of *Gazza minuta* (Bloch 1975) from Pabean bay are shown group quarterly in Table 1 and Table 2.

**Table 1.** Total length and weight of *Gazza minuta* (Bloch 1795) Pabean Bay

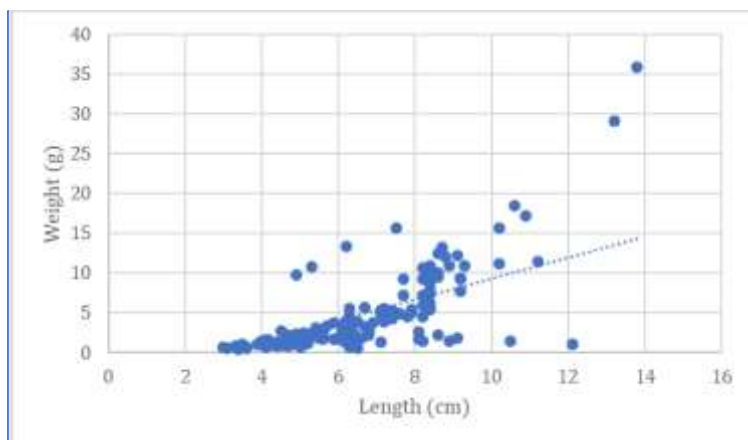
Times	n	Total length (mm)			Weight (g)		
		Min	Max	Mean ± SD	Min	Max	Mean ± SD
January – March (Q1)	80	30	105	62.66 ± 18.24	0.52	15.62	4.73 ± 4.18
April – June (Q2)	25	34	121	63.28 ± 23.52	0.54	18.45	3.62 ± 4.70
July – September (Q3)	57	36	138	65.63 ± 21.76	0.52	35.83	4.44 ± 6.23
October – December (Q4)	28	34	112	57.79 ± 15.50	0.41	11.46	3.06 ± 2.44
Year (Y)	190	30	138	62.92 ± 19.75	0.41	35.83	4.15 ± 4.74

n = Number of fish samples, SD = standard deviation

**Table 2.** Length-weight relationship and condition factor of *Gazza minuta* (Bloch 1795) Pabean bay

Times	n	a	b	AllometricPattern	K
					Mean ± SD
January – March (Q1)	80	$1.67 \cdot 10^{-3}$	1.847	Negatif	$2.03 \pm 2.29$
April – June (Q2)	25	$1.73 \cdot 10^{-3}$	1.738	Negatif	$1.27 \pm 0.63$
July – September (Q3)	57	$7.9 \cdot 10^{-6}$	3.075	Positif	$1.10 \pm 0.22$
October – December (Q4)	28	$1.7 \cdot 10^{-5}$	2.937	Negatif	$1.36 \pm 0.35$
Year (Y)	190	$1.51 \cdot 10^{-4}$	2.388	Negatif	$1.42 \pm 0.89$

n = Number of fish samples, SD = standard deviation, a = constant, b = slope, K = condition factor



**Fig. 3.** The relationship between body weight and total length of *Gazza minuta* (Bloch 1795) from Pabean bay (annual growth pattern Y) that fish grew negatively allometric.

The collected data shown that the length-weight relationship equation for *Gazza Minuta* (Bloch 1795) is expressed as follow  $W_{Q1} = 1.67 \cdot 10^{-3} L^{1.847}$ ,  $W_{Q2} = 1.73 \cdot 10^{-3} L^{1.739}$ ,  $W_{Q3} = 7.9 \cdot 10^{-6} L^{3.075}$ ,  $W_{Q4} = 1.7 \cdot 10^{-5} L^{2.937}$ , and  $W_{year} = 1.51 \cdot 10^{-4} L^{2.388}$ . The collected data shown that the length-weight relationship equation for *Gazza Minuta* (Bloch 1795) is expressed as follow  $W_{Q1} = 1.67 \cdot 10^{-3} L^{1.847}$ ,  $W_{Q2} = 1.73 \cdot 10^{-3} L^{1.739}$ ,  $W_{Q3} = 7.9 \cdot 10^{-6} L^{3.075}$ ,  $W_{Q4} = 1.7 \cdot 10^{-5} L^{2.937}$ , and  $W_{year} = 1.51 \cdot 10^{-4} L^{2.388}$ . The result of the study shows, most of the times had a negative allometric growth. The b value on Q1-Q4 except Q3 shown that  $b < 3$  likewise group Y. The b values on the length-weight relationship equation are subject to the shape and fatness of the *Gazza Minuta* (Bloch 1795) and it is also dependent on factors such as biological and environmental condition, temporal sampling factor, season, water quality and food availability [4,13,24–27].

#### 4. Discussion

The results that are shown in figure 3 indicated that the length-weight relationship on annual growth (Y) was a significant positive correlation where coefficient r (R square) = 0.6315.

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Several studies have been conducted for several species of fish that temperature, spawning season, sex, species diversity affects the condition factor [7,18,28,29]. The condition factor increased with weight when the temperature drops on the contrary when the temperature rises which affects the length-weight relationship [18,24]. These factors were not considered in the present study.

The past study showed that Pabean bay is an aquatic ecosystem that has characteristics that are influenced by the environment[1]. Table 2 shown the condition coefficient is used as an indicator of variability due to the growth coefficient (b) which is one of the standard fishery practices. Result of the study shows, condition factor ( $K_{\text{mean}}$ ) varied from  $1.1 \pm 0.22$  to  $2.03 \pm 2.29$  and most of the times had a condition factor  $K > 1$ . *Gazza minuta*(Bloch 1795) is a small to medium sized fish with short life span range from 1.5 to 1.8 years with small L and large K value. The past study showed that the short-lived species have a small L and a high K value and long-lived species have a higher L with a low K value[24].

## 5. Conclusion

This study result provided the data about the relationship length and weight, evaluation of condition factor for *Gazza Minuta* spesies collected from the Pabean Bay, Indramayu, Indonesia. Almost all length-weight relationship showed a negative allometric growth of fish which mean indicating that the growth of this fish is getting leaner along with the increase in length and a slimmer body. This may be due to biological and environmental conditions or linked to morphological characteristics specific.

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Bogor, October 30<sup>th</sup> 2021

## LETTER OF ACCEPTANCE

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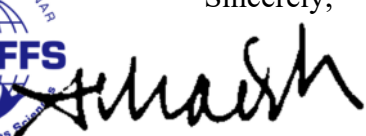
Dear Authors,

On behalf of the ISFFS Proceedings Editors, we are pleased to inform you that your paper entitled “The Length-Weight Relationships and Condition Factor of Toothpony (*Gazza minuta* Bloch, 1975) from Pabean Bay, Indramayu, West Java” written by O. D. Soebhakti Hasan has been accepted and will be proceeded to publication in the E3S Journal (e-ISSN: 2267-1242; SCOPUS Indexed).

We congratulate you for your achievement, the technical details about the publication will be informed later. The publication of the accepted paper will be provided by the end of December 2021. We will encourage more quality submissions from you and your colleagues in future.



Sincerely,

  
Prof. Dr. Endi Setiadi Kartamihardja MSc  
Editor-in-Chief of ISFFS Proceedings