



vol. 17 / 2023



The 7th International Conference on Science Technology

organized by
Faculty of Social Science and
Law Universitas Negeri Manado and
Consortium of International Conference
on Science and Technology

The Innovation Breakthrough in Digital and Disruptive Era

POPULATION STRUCTURE OF CROAKERS FISH (FAMILY: SCIAENIDAE) FROM FISH BOATS AT NUSANTARA FISHERY PORT, MERAUKE REGENCY

Modesta R. Maturbongs^{1*}, Marius A. Welliken K,¹, and Nurdini Sholikatur Nisa²

¹ Department of Aquatic Resource Management, Faculty of Agriculture, Musamus University

² Alumni of the Department of Aquatic Resource Management, Faculty of Agriculture, Musamus University

Abstract. *This study aims to determine the structure of body size based on length and weight class, length-weight relationship, and the condition factor of croaker fishes, the Sciaenidae family landed at the Merauke Nusantara Fisheries Port. Sampling was conducted from June to September 2020 using a random sampling method. The data analysis used in this study included the length and body size structure of the croaker fishes, the length-weight relationship, and the condition factor. Croaker fishes landed at the Nusantara Fisheries Port, Merauke Regency, obtained 2 species, namely Nibea saldado and Johnius amblycephalus with a total sample size of 170 individuals. Nibea saldado's body length ranges from 210-665 mm with body weights ranging from 200-2,500 grams, while Johnius amblycephalus has body length ranges from 570-740 mm with body weights ranging from 1,800-4,000 grams. The long-weight relationship of Nibea saldado and Johnius amblycephalus in June - September showed negative allometric growth, but for Johnius amblycephalus in July the growth was allometric positive. The condition factor for Nibea saldado has a value range between 0.645 - 2.874, while Johnius amblycephalus has a value range between 0.291 - 1.079.*

Keywords: *Population structure, croaker fishes, Sciaenidae, Nusantara Fisheries Port, Merauke.*

* Corresponding author: modesta.ranny@gmail.com

1 Introduction

Merauke Regency, which includes the Fisheries Management Area (FMA/WPP) NRI 718, is very strategic to be developed into an integrated marine fisheries center location because it is directly adjacent to neighboring countries such as Australia and Papua New Guinea (Srialdoko, 2019). In the last 3 years (2017-2019) the amount of fish production landed at the Merauke Archipelago Fisheries Port (AFP/PPN) has increased quite significantly (Munfaati, 2019). Perbowo et al., (2016) confirmed that the WPP NRI-718 area is one of the most fertile waters in the world, seen from its abundant water resources, and especially for shrimp and demersal fish. One of the potential demersal fisheries landed at the PPN Merauke is croakers, the Sciaenidae family of the species *Nibea saldato* and *Johnius amblycephalus*.

According to Zahra et al., (2019) if the demand for fish is higher, it will result in a higher number of fish caught. If fishing is carried out continuously without seeing the recovery of fish stocks, there will be overfishing or overfishing (Sharfina, 2014). The species of fish from the Sciaenidae family is one of the fish that has a swim bladder which is a commodity and has a high value, therefore this fish is the most targeted by fishermen. Sunarni and Maturbongs (2018) in their research stated that most types of croakers were caught by fishermen in Merauke sea waters. Furthermore Siagian et al. (2017) explained that many croakers are caught using trammel nets, gill nets, payang and trawls.

Several previous studies related to croakers such as the level of exploitation of croakers in Cilacap Waters by Saputra et al (2008) population structure of croakers in the Barumun River (Siagian et al., 2017) and research on growth and reproduction in estuaries and in the Kumbé River, Merauke (Sunarni and Maturbongs 2018; Mote, 2018). For this reason, research on population structure and management of croakers, family Sciaenidae landed at the Merauke Archipelago Fishing Port, needs to be carried out. This research is the first step which aims to determine the size structure based on length and weight class, length-weight relationship, and condition factors of croakers.

2 Material and Method

This research was conducted at Merauke Archipelago Fishing Port (AFN/PPN). The sample fish obtained were caught landed at the Merauke Archipelago Fishing Port. Sampling was carried out from June - September 2020.

2.1 Fish Data

Data taken using primary data and secondary data. Primary data was obtained based on per ship trip that arrived and landed gulamah fish at the research location. The secondary data obtained from the Merauke Marine and Fisheries Resources Supervisory

Unit (SATWAS SDKP) office is data on the number of ships arriving and the production of croakers reported at the study site.

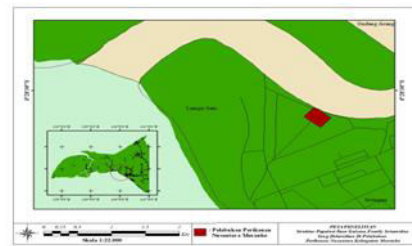


Fig. 1. Research site, Merauke Archipelago Fisheries Port (AFP/PPN)

2.2 Data Analysis

2.2.1 Body Size Structure

Body size measured includes the total length and body weight of the sampled fish. To see the range of sizes in the size class, each body size group is analyzed using Sturges' rules (Harlan, 2004; Purwanto, 2011), as follows:

- determines the range between maximum and minimum body size.
- determine the number of size classes;

$$1 + (3.3) \log n \quad (n = \text{number of sampels})$$

- then determine the class length interval and frequency distribution using excel. Size class data and frequency distribution are presented in the form of a histogram graph.



Fig. 2. *Nibea saldato*



Fig. 3. *Johnius amblycephalus*

2.2.2 Length-Weight Relationships

The relationship between fish length and weight was analyzed using the formula from Hile (1963) in Effendi (1997) and Le Cren (1951):

$$W = a L^b$$

Where: W = weight (grams), L = length (mm), a and b = constants converted into logarithmic form.

$$\text{Log } W = \log a + b \log L$$

The value of b obtained in linear regression is significantly different from the isometric value (b=3) or allometric range (negative allometric : b<3 or positive allometric : b>3) when t-test (h0: b=3) with level 95% accuracy is described by the following formula:

$$t_s = ((b-3)/sb)$$

$$sb = \sqrt{[(sW/sL) - b^2] / (n-2)}$$

Where: $t_s = t\text{-test}$

b = slope

sb = standard error of slope

sW = variance of body weight

sL = total length variance

n = sample size

The percentage of the relationship between fish weight and length was measured using the following correlation analysis:

$$r = \frac{N(\sum \log L * \sum \log W) - (\sum \log L)(\sum \log W)}{\sqrt{\{N(\sum \log^2 L) - (\sum \log L)^2\} \{N(\sum \log^2 W) - (\sum \log W)^2\}}}$$

Where : r = correlation coefficient; N=total number of individual species; L = total length of fish; W = the total weight of the fish

2.2.3 Condition Factors

Condition factor analysis is stated by Effendi (1979) using the formula:

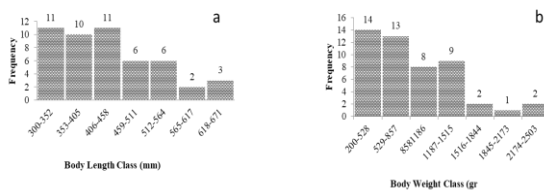
- a. Condition factor (Kn) with isometric growth pattern (b = 3):

$$K_n = \frac{10^5 W}{L^3}$$

- b. Relative condition factor (Kn) with allometric growth pattern (b ≠ 3):

$$K_n = \frac{W}{aL^b}$$

Where: K = condition factor; W = weight (gr); L= length (mm); a, b = constant



The results of the analysis showed that the samples of croakers that could be measured during the study were 170 individuals with the largest class intervals every month. For June, one species was obtained, namely Soldier croaker (*Nibea salgado*) with a total of 14 individuals with the longest class interval at the interval of 430-469 mm with the highest weight at the interval of 980-1089 gr totaling 6 fish (Figure 4).

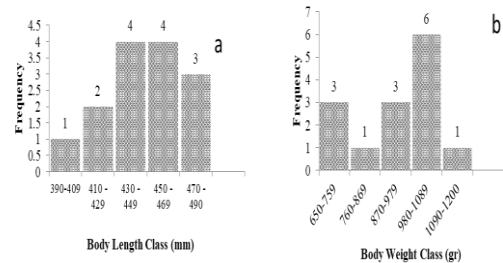


Fig. 4. Body length class distribution (a) and body weight class distribution (b) *Nibea salgado* in June.

In July, two species of croakers were landed, namely the soldier croaker (*Nibea salgado*) and the bearded croaker (*Johnius amblycephalus*). The *Nibea salgado* species had the highest frequency between length classes at intervals of 390 - 449 mm obtained by 12 ind and the highest weight at intervals of 584-967 gr. While the species *Johnius amblycephalus* obtained the highest length class intervals at intervals of 620-643 mm and 716-740 mm, each of which amounted to 3 ind with the highest weight at intervals of 1800-2239 gr and 3560-4000 gr each of which obtained 3 ind (Figure 5).

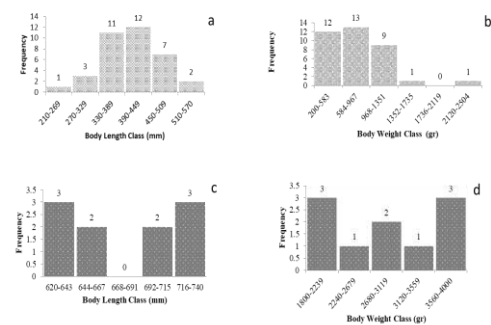


Fig. 5. (a,b) Distribution of body length and weight classes of *Nibea salgado* in July; (c,d) distribution of body length and weight classes of *Johnius amblycephalus* in July.

Species landed in August were only *Nibea salgado* species with the highest long class interval frequency at intervals of 300-352 mm and 406-458 mm, each totaling 11 ind. The highest weight frequency was obtained at the class interval of 200-528 g, which totaled 14 ind (Figure 6).

Fig. 6. Body length class distribution (a) and body weight class distribution (b) *Nibea salgado* in August.

3 Result and Discussion

Body Size Structure

In September, 2 species were obtained where Nibea soldado had the highest frequency between length classes at intervals of 394 – 413 mm with a total of 13 ind and the frequency of fish at the highest weight class intervals at intervals of 743-1035 gr with a total of 35 ind. Meanwhile, for Johnius amblycephalus, the highest frequency of class intervals was obtained at the interval of 650-730 mm, totaling 4 ind and the highest frequency of weight classes at intervals of 2626-2900 gr with 4 ind (Figure 7).

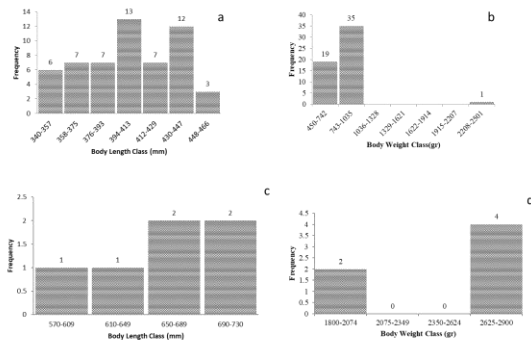


Fig. 7. (a,b) distribution of body length and weight classes of Nibea soldado in September, (c,d) distribution of body length and weight classes of Johnius amblycephalus in September.

The results of this study are close to those of Suradi et al., (2008) in Cilacap, with 1322 croakers obtained during the study. The highest frequency of length at 15.0 –15.6 cm or 150 – 156 mm. While the results of a study by Siagian et al., (2017) which took place in the Barumun River, Labuhan Batu Regency obtained the highest length frequency (modus) at 18.5 - 20 cm or 185 - 200 mm.

From the results obtained it can be said that the length of the croakers landed at PPN Merauke Regency was close to the length of the croakers in the Barumun River, Labuhan Batu Regency and longer than the length of the croakers from research in Cilacap. This is possible because the Arafura Sea is an ideal habitat for croakers which are classified as demersal fish, this is in accordance with the statement of Perbowo et al. (2016) that Arafura waters are one of the most fertile waters suitable for demersal fish and shrimp. Furthermore, according to Effendie (2002) and Sekharan (1959) in Radhakrishnan (1964) explained differences in fish length structure are influenced by heredity, sex, age, parasites, disease, environmental conditions, and time of data collection.

Lenght-weight relationships of the croakers

The results of the analysis of the relationship between length and weight showed that in June only Nibea soldado was landed with the LWRs equation, $W = 0.0021 L^{2.1258}$. In July, the Nibea soldado species

obtained the equation $W = 0.0012 L^{2.2237}$, while for Johnius amblycephalus it had the equation $W = 0.000002 L^{3.7242}$. In August, Nibea Salado obtained the equation $W = 0.00009 L^{2.63909}$. In September, the LWRs equation for Nibea soldado obtained $W = 0.00012 L^{2.62191}$, while for Johnius amblycephalus it was obtained $W = 0.0227 L^{1.7824}$. The graph of the long-weight relationship is presented in Figure 8-11.

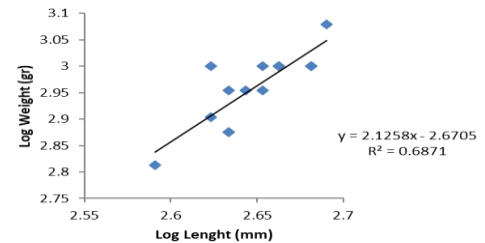


Fig. 8. LWRs of Nibea soldado in June.

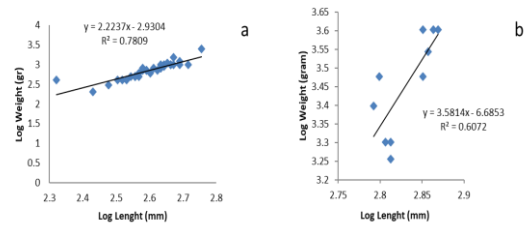


Fig. 9. (a) LWRs of Nibea soldado; (b) LWRs of Johnius amblycephalus in July.

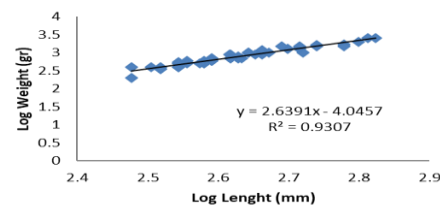


Fig. 10. LWRs of Nibea soldado in August.

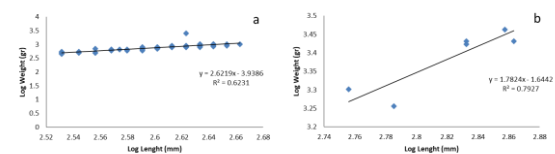


Fig. 11. (a) LWRs of Nibea soldado and (b) LWRs of Johnius amblycephalus in September.

According to Syahrir, (2013) states that growth patterns may be determined by comparing the b value of the t-test analysis. The results of the 2 types of croakers for Nibea soldado and Johnius amblycephalus in June-September obtained a value of $b < 3$ which means that the increase in length is faster in weight gain. This is in accordance with the statement of Gayon (2002) in Putra (2014) that if the value of b is less than 3, it can be interpreted that the increase in length of the fish is faster than the increase in weight or what is called negative allometric. However, for Johnius

amblycephalus in July, a value of $b > 3$ was obtained, which means that the weight gain is faster than the increase in length or what is called positive allometric, this can happen at any time due to physiological factors from fish or it can also be from environmental conditions in the waters and it can be from technique. fishermen's harvest.

In accordance with Mulfizar et al, (2012) where the factors that affect fish growth include physiological and environmental conditions such as temperature, pH, salinity, geographical location and sampling techniques. According to Okomoda et al, (2018) Differences in the value of "b" in fish growth in the same aquatic habitat are related to several influencing factors including internal and external factors. Differences in fish growth, according to Nikolsky (1969) in Hardjamulia (1987) stated that this might be caused by differences in growth patterns of the fish themselves and differences in the age of the fish and the maturity of the gonads for the first time.

Fish have different growth rates at different age levels, where when they are young their growth is fast and when they are old it becomes slow, parasites and diseases really affect the organs of contamination that are attacked. The main external factors that influence are food and water temperature, food with good nutritional content will support fish growth while temperature will affect the chemical process of growth (Effendi, 2002).

Condition Factors

The condition factor is an efficient instrument that shows changes in fish conditions throughout the year (Rahardjo & Simanjuntak, 2008). While the condition factor "K" according to Ribeiro et al, (2004); Rahardjo & Simanjuntak, (2008); Syahrir, (2013) is an important parameter derived from length data and fish body weight relationship data, showing fish growth patterns, including obesity, and is also useful in evaluating the importance of various fish spawning areas. Condition factors of the 2 species of croakers landed at the PPN Merauke were considered to be in good condition (Table 1).

Table 3. Condition factor of Croaker Fishes, family scienidae in June-September.

	<i>Nibea soldado</i>				<i>Johnius amblycephalus</i>			
	June	July	August	September	June	July	August	September
K Range	0.900 - 1.262	0.668- 2.337	0.645- 1.325	0.838- 2.874	-	0.291 - 0.545	-	0.860- 1.079
Average K±SD	1.020 ± 0.094	1.028 ± 0.288	1.010 ± 0.126	1.018 ± 0.267	-	0.401 ± 0.079	-	1.003 ± 0.085

*K = condition factor; SD = standard deviation; (-) = not found

Based on Table 1, it is explained that each month of the study showed *Nibea soldado* had a value of the "K" range between 0.645 - 2.874, while for *Johnius*

amblycephalus in July and September it had a value of "K" between 0.291 - 1.079. Differences in relative condition factor values are interpreted as indications of various biological characteristics of the fish, such as fatness, suitability of the environment, and gonadal development (Le Cren 1951 in Merta 1993).

The increase in condition factor values can be expected due to the spawning season, condition factor values will increase towards the peak of spawning and decrease after spawning. This was also found in the fish species *Johnius belangerii* (Rahardjo & Simanjuntak 2008) and the fish species *Trachurus mediterraneus* (Tzikas et al., 2007) . Sparre and Venema (1998) added that differences in K values can also be caused by environmental conditions of a waters. Furthermore, Effendie (1997) explained that if the condition factor values ranged from 1 - 2, it indicated that the shape of the fish was less flat (fat).

Conclusion

Nibea soldado and *Johnius amblycephalus* are two types of croakers that are reported to always land at the Merauke Archipelago Fishing Port. The body structure in terms of body length frequency distribution for *Nibea soldado* and *Johnius amblycephalus* is ideal. The relationship between length and weight for *Nibea soldado* and *Johnius amblycephalus* in June - September showed negative allometric growth, but for *Johnius amblycephalus* in July the growth was positive allometric. The condition factor value of *Nibea soldado* and *Johnius amblycephalus* seen from morphology can be said that they have good plumpness.

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