

Introduction

Production of tuna, mackerel tuna, and skipjack in Indonesia reaches 1.3 million tonnes base on KKP 2019. This shows that one of the highest capture fisheries products is mackerel tuna. The high volume of capture fisheries production requires fishermen and traders to maintain the quality of the fish to keep it fresh. In addition, mackerel tuna is a fish that has a high protein content (21,6-26,3 g / 100 g) and is one of the most popular fish because the protein content is almost the same as tuna, but the price is more affordable [1].

The deterioration of fish quality can be grouped into three stages, namely pre-rigor mortise, rigor mortise, and post-rigor mortise stages [2]. If it is not handled properly, fresh fish will quickly decline in quality. The freshness of fish can be determined by physical testing, chemical testing, microbiological testing, and organoleptic testing [3]. Organoleptic testing is a subjective testing method that uses senses aimed at the eyes, gills, body surface mucus, meat, smell, and texture in fish [4].

Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are traditional markets. Traditional markets are places where sellers and buyers meet and are characterized by direct buyer-seller transactions, buildings usually consist of stalls or outlets, booths, and open bases opened by a seller or a market manager. The handling of the three markets are almost the same, namely the fish that come directly placed on the table and doused with water, but the freshness of the fish varies. Therefore, research on the freshness level of mackarel tuna based on organoleptic characteristics must be conducted.

Materials and Methods

Time and Place of Research

The research was carried out from January to February 2020 at Rancaekek Market, Resik Jatinangor Market, Tanjungsari Market as a sampling point for mackarel tuna and Fishery Product Processing Laboratory (PHP), Faculty of Fisheries and Marine Sciences, Padjadjaran University used to test the freshness of mackarel tuna.

Tools and Materials

The equipment used in this research was 25 trays, 25 name labels, 3 vol boxed of 15 liters, 1 portable hardness tester, and 1 pH meter. The materials used in this research consisted of ice, mackarel tuna from the Resik Jatinangor Market, Tanjungsari Market, and Rancaekek Market, each with a weight of 400-600 grams, and buffer solutions of 4 and 7.

Research Methods

The method used in this research is the survey method. Organoleptic testing uses the freshness score test that has been determined in the SNI 01-2346-2006 [5] scoresheet modified [6]. Other test results such as pH test using a Duplo pH meter and hardness using a Duplo Portable Hardness Tester mackarel tuna in the back, middle, and tail.

Data analysis

Data analysis in this study used descriptive statistical analysis. The data obtained were then tabulated and their quality values were determined by looking for the mean results for each panelist at the 95% confidence level. To calculate the interval of the mean quality value of each panelist, the SNI 01-2346-2006 formula is used :

$$P(\bar{x} - (1,96 \cdot s/\sqrt{n})) \leq \mu \leq (\bar{x} + (1,96 \cdot s/\sqrt{n})) \cong 95\%$$

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$S^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})}{n}}$$

With the details of the formula as follows:

n is the number of panelists; S^2 is the diversity of quality values; 1.96 is the coefficient of standard deviation at the 95% level; \bar{x} is the average quality score; x_i is the quality value of the i th panelist, where $i = 1,2,3 \dots n$; s is the standard deviation of quality values; P is the value interval.

The criteria for Fresh Fish Assessment (SNI 01-2729.1-2006) [7]:

Organoleptic values ranged from 7-9 in the fresh category, organoleptic values ranged from 5 to 6 in the slightly fresh category and organoleptic values ranged from 1 to 4 in the non-fresh category.

Result And Discussion

The Surface appearance and mucus

The appearance of the surface and mucus can be judged by the sight and touch that was captured by the entire surface of the skin. The appearance of the surface and mucus is one part of the fish's body that can be used as a parameter of the freshness of the fish. The results of organoleptic observations based on the surface appearance and mucus parameters of mackerel tuna from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 1.

Table 1. Observation Results of Mackerel Tuna Surface Appearance And Mucus from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Location	Value Organoleptic		Information
	Average Observation Results	SNI 01-2729.1-2006	
Rancaekek Market	7,4 ≈ 7	7-9	Fresh
Resik Jatinangor Market	3,7 ≈ 4	1-4	Not Fresh
Tanjungsari Market	6,8 ≈ 7	7-9	Fresh

The organoleptic value of mackerel tuna in Rancaekek Market and Tanjungsari Market, when compared to SNI 01-2729.1-2006, is in the fresh category because it has an average value of 7 or a range of values 7-9. It is known from the surface and mucus of brilliant mackerel tuna, the mucus is thin / somewhat transparent. Fresh fish have mucus characteristics on a clear and transparent surface [8]. Based on the SNI 01-2729.1-2006 value, it can be said that mackerel tuna in the Resik Jatinangor Market is categorized as not fresh. This is known from the appearance of the surface and mucus of tuna rather dull, milky white mucus, uneven viscous. The mucus is a good growth medium for bacteria. The more mucus, the more bacteria will grow, causing the fish to rot [9].

The Eye

Eyes are an indicator of freshness that consumers can see when buying fresh fish. The eye of mackerel tuna can be judged by human sight. The results of organoleptic observations with mackerel tuna eye appearance parameter from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 2.

Table 2. Observation Results of Mackerel Tuna Eyes from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Location	Value Organoleptic		Information
	Average Observation Results	SNI 01-2729.1-2006	
Rancaekek Market	6,3 ≈ 6	5-6	Slightly Fresh
Resik Jatinangor Market	3,3 ≈ 3	1-4	Not Fresh
Tanjungsari Market	4,6 ≈ 5	5-6	Slightly Fresh

Based on the results of organoleptic observations, mackerel tuna eye parameter from Rancaekek Market shows an average of 6 or in the value range of 5-6. This shows that mackerel tuna in Rancaekek and Tanjungsari markets belong to the fresh fish category it shows to have flat eyes, cloudy corneas, and grayish pupils. According to SNI 01-2346-2006, the characteristics of fresh fish are flat eyes, cloudy cornea, and grayish pupils. The organoleptic value of mackerel tuna in the Resik Jatinangor Market shows the lowest average of 3 or is in the value range 1 - 4, this means that mackerel tuna in the Resik Jatinangor Market is included in the category of fish that is not freshly seen from the slightly sunken eyes. , cornea cloudy or milky white, pupil white gray, and drowning. Changes in the appearance of the fish eye from convex to concave occur due to damage to the cornea and pupil of the fish caused by microbial activity.

The Gill

The condition of the gill is often used as an indicator of the stage of spoilage of the fish. Discolored and slimy gill are an indication of poor fish quality. The results of organoleptic observations based on mackerel tuna gill parameters from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 3.

Table 3. Observation Results of Mackerel Tuna Gills from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Location	Value Organoleptic		Information
	Average Observation Results	SNI 01-2729.1-2006	
Rancaekek Market	5,6 ≈ 6	5-6	Slightly Fresh
Resik Jatinangor Market	3,5 ≈ 3	1-4	Not Fresh
Tanjungsari Market	4,6 ≈ 5	5-6	Slightly Fresh

Based on the results of organoleptic observations of mackerel tuna gills parameter from Rancaekek Market and Tanjungsari Market, it shows an average of 6 and 5 or is in the value range 5 - 6, this shows that mackerel tuna in Rancaekek and Tanjungsari Markets are categorized as somewhat fresh fish seen from the color of the gills is brownish red, the tip of the filament is pale, the arrangement is sparse, there is no distinct smell yet, the mucus is slightly thick. The characteristics of the gills that have experienced a decline in quality are the color of the gills that have turned brown and covered in thick mucus [10]. The organoleptic value of mackerel tuna gill parameter in the Resik Jatinangor Market shows an average value of 3 or is in the range 1 - 4, this means that mackerel tuna in the Resik Jatinangor Market is included in the category of non-fresh fish. Fish gills are among the organs most susceptible to deterioration of quality and experience rapid decay compared to other organs due to the accumulation of bacteria in high numbers in gills [11].

The Smell

The smell is an indicator of fresh fish. The smell can be judged by the sense of smell. The results of organoleptic observations based on mackerel tuna smell parameters from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 4.

Table 4. Observation Results of Mackerel Tuna Smells from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Location	Value Organoleptic		Information
	Average Observation Results	SNI 01-2729.1-2006	
Rancaekek Market	6,2 ≈ 6	5-6	Slightly Fresh
Resik Jatinangor Market	4,4 ≈ 4	1-4	Not Fresh
Tanjungsari Market	6,1 ≈ 6	5-6	Slightly Fresh

Based on the results of mackerel tuna organoleptic observations, the mackerel tuna's smell parameters from Rancaekek Market and Tanjungsari Market show an average of 6 or in the range 5-6. This means that mackerel tuna in Rancaekek Market and Tanjungsari Market is categorized as slightly fresh fish which is known from the condition that the smell is rather fresh and the specific odor has begun to disappear (SNI 2006). The organoleptic value of mackerel tuna smell in the Resik Jatinangor Market shows an average value of 4 or is in the range of values 1-4. This means that mackerel tuna in the Resik Jatinangor Market is included in the category of non-fresh fish because it has a non-fresh smell and has a different odor, such as from the distinctive smell of fish to foul odors. One of the compounds released by this unpleasant aroma is a trimethylamine compound [12]. The decline in the quality of mackerel tuna in odor parameters is caused by the chemical compound trimethylamine which causes a foul odor in marine fish [13].

The Texture

The results of organoleptic observations based on the texture parameters of mackerel tuna from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 5.

Table 5. Observation Results of Textures Mackerel Tuna from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Location	Value Organoleptic		Information
	Average Observation Results	SNI 01-2729.1-2006	
Rancaekek Market	7,8 ≈ 8	7-9	Fresh
Resik Jatinangor Market	4,5 ≈ 5	5-6	Slightly Fresh
Tanjungsari Market	7,6 ≈ 8	7-9	Fresh

Based on the results of organoleptic observations, the texture parameter of mackerel tuna from Rancaekek Market and Tanjungsari Market each show an average of 8 or in the range 7 - 9. This means that mackerel tuna in Rancaekek Market and Tanjungsari Market is included in the visible fresh fish category from a rather elastic and dense texture. The organoleptic value of mackerel tuna texture in the Resik Jatinangor Market shows an average value of 5 or is in the range of 5 - 6, this indicates that mackerel tuna in the Resik Jatinangor Market is categorized as rather fresh fish, seen from the fish texture which is somewhat elastic and rather solid. Changes in the texture of fish meat are influenced by increased enzyme activity in the autolysis process, causing the texture of fish meat to become soft, bacteria have started to damage the fish by reducing meat protein [4].

The Freshness Level of Mackerel Tuna (*Euthynnus affinis*) from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

The freshness level of mackerel tuna was tested using a scoring test through organoleptic observation by 20 semi-trained panelists and the quality value was determined by looking for the mean results of each panelist using the SNI 01-2346-2006 formula. Organoleptic observations of mackerel tuna from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 6.

Table 6. Freshness Results Of Mackerel Tuna from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Parameters	Average		
	Rancaekek Market	Resik Jatinangor Market	Tanjungsari Market
Surface Appearance and Mucus	7,4	3,7	6,8
The Eye	6,3	3,3	4,6
The Gill	5,6	3,5	4,6
The Smell	6,2	4,4	6,1
The Texture	7,6	4,5	7,6
Interval Value	5,93 ≤ μ ≤ 7,31	3,22 ≤ μ ≤ 4,54	5,25 ≤ μ ≤ 6,63
Final Score	6	3	5

Based on the above values of the three markets, it is known that the markets have different freshness levels. The best quality of freshness is in the Rancaekek Market because it has a higher final value, namely 6. The freshness of mackerel tuna in the Tanjungsari

Market has the same assessment criteria, namely 5-6 in the slightly fresh fish category, but what distinguishes mackerel tuna in Tanjungsari Market which is less good than mackerel tuna in Rancaekek Market based on organoleptic test.

pH Test

The pH value is an indicator used to determine the freshness level of fish. pH measurements were carried out using a pH meter for 2 repetitions. Observation results of mackerel tuna pH from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 7.

Table 7. Mackerel Tuna Ph Test Results From Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Repetition	Rancaekek Market	Resik Jatinangor Market	Tanjungsari Market
1	5,7	5,5	5,7
2	5,4	6	5,6
Mackerel Tuna pH Test Results	5,55	5,75	5,65

Based on the pH value above, it can be concluded that the three markets have pH values that are not much different. This shows that mackerel tuna in Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market belong to the fresh fish quality category. The pH of 5.8 has deviated somewhat, and a pH of 5.2 or less is a sign of rot or acidity [14]. Decrease in pH occurs because when the fish is just dying there is a decrease in ATP and keratin phosphate through the active process of glycolysis, where glycolysis converts glycogen into lactic acid which causes a decrease in Ph [1].

Hardness Test

Physical testing on mackerel tuna in this study was carried out by testing the hardness of the fish on the surface of the fish body. This test is used to determine the hardness of texture in mackerel tuna samples. The results of mackerel tuna hardness test measurements from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market are presented in Table 8.

Table 8. Mackerel Tuna Hardness Test Results from Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market

Repetition	Rancaekek Market (kg/cm ²)	Resik Jatinangor Market (kg/cm ²)	Tanjungsari Market (kg/cm ²)
1	0,87	0,77	0,82
2	0,81	0,83	0,82
Mackerel Tuna Hardness Test Results	0,84	0,80	0,82

Based on Table 7, it can be seen that the results of mackerel tuna hardness test from Rancaekek Market have a value of 0.84 kg / cm², Resik Jatinangor Market has a value of 0.8 kg / cm², and Tanjungsari Market has a value of 0.82 kg / cm². Based on the results of observations, it shows that mackerel tuna from the three markets has a texture of meat that is less elastic and somewhat soft. The factors that affect the decrease in the hardness of the fish are the occurrence of actomyosin as a result of the interaction of actin and myosin proteins, causing the meat to lose its hardness [16].

Conclusion

The freshness level of mackerel tuna based on organoleptic in Rancaekek Market, Resik Jatinangor Market, and Tanjungsari Market has different freshness levels. The average value of mackerel tuna freshness quality is based on the organoleptic test at Rancaekek Market with a value of 6, in the Tanjungsari Market of 5 and in the Resik Jatinangor Market of 3. Based on the SNI 01-2729.1-2006 fresh fish assessment criteria, the organoleptic value ranges from 5- 6 are in the fresh category and 1-4 are not fresh.

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