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Nutritional Content Test of Tembakul Fish (Periophtalmodon Schlosseri) in Ratulodong Village, East Flores Regency

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ABSTRACT

The Java sparrow is a unique fish species because it can live in two different habitats, on land and at sea. Java sparrow (Periophtalmodon schlosseri) often spends its time outside the water and uses mangrove forests as its habitat. The abundance of Java sparrow (Periophtalmodon schlosseri) in East Flores Regency allows for in-depth research on the nutritional content of Java sparrow. This study aims to determine the nutritional content of Java sparrow in Ratulodong Village. This research method uses a Mixed Research approach with quantitative and qualitative data. The study was conducted in July–August 2024. Samples of fresh Java sparrow (300g) were collected from the mangrove area of Ratulodong Village. Analysis was carried out at the Food Chemistry Laboratory of Nusa Cendana University using the AOAC method (2005). The results of the study showed that the nutritional content testing of the tobacco fish took place in the Food Chemistry Laboratory of the Faculty of Animal Husbandry and Fisheries, Nusa Cendana University, Kupang, by following the procedures of AOAC (Association of Official Analytical Chemists) 2OO5, namely: the kjedahl method for testing protein content, gravimetry for testing water and ash content, soxhlet for testing fat content, by difference method for calculating carbohydrate content. The analysis results obtained from this study were as follows: 80% water, 50.1% protein, 35% ash, 7.1% carbohydrate, 6.1% fat.

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1. INTRODUCTION

The mudskipper fish, scientifically known as Periophtalmodon schlosseri, represents a unique and ecologically significant species that thrives in both terrestrial and aquatic environments. Unlike most fish, mudskippers are amphibious and capable of surviving outside the water for extended periods by relying on specialized adaptations such as cutaneous respiration and modified pectoral

fins for locomotion on muddy surfaces (Sunarni, 2015). This distinctive behavior allows them to occupy mangrove ecosystems and tidal flats, which serve as their primary habitats. Globally, mudskippers have attracted scientific attention not only because of their extraordinary ecological adaptations but also due to their potential as a food resource rich in essential nutrients. In countries such as the Philippines, China, and Japan, mudskipper fish are already consumed as part of traditional diets, valued for their protein and mineral contents (Lestari et al., 2022). However, in several regions of Indonesia, particularly in East Nusa Tenggara, this fish remains underutilized, often overlooked due to its elusive behavior and slippery texture that makes it difficult to catch.

The coastal village of Ratulodong, located in Tanjung Bunga Subdistrict, East Flores Regency, provides an ideal setting for the study of mudskippers. This area is characterized by extensive mangrove forests that support a wide range of marine biodiversity, including abundant populations of Periophtalmodon schlosseri. The local community commonly refers to the mudskipper with the vernacular name "dosidot," reflecting their observations of the fish's frequent jumping movements on muddy surfaces. Despite their abundance, local residents rarely consume this fish, primarily because of its elusive nature and the general perception that it is not a significant food source. As a result, mudskippers in Ratulodong are often neglected as a potential source of animal protein, even though scientific evidence suggests that they are nutritionally valuable. This creates a paradox: while communities in other Asian countries recognize mudskippers as a food resource, in East Flores, their nutritional potential remains largely untapped.

Previous studies have demonstrated the nutritional richness of mudskipper fish. For example, research conducted by Girsang et al. (2018) reported that mudskippers contain approximately 79.13% water, 92.83% protein, 4.54% ash, 1.13% fat, and 1.50% carbohydrates. Such findings highlight the species' importance as a source of high-quality protein and essential minerals. However, the available literature on the nutritional content of mudskippers in Indonesia is still limited, with most studies focusing on general ecological aspects or species identification rather than systematic nutritional profiling. Moreover, nutritional composition is known to vary across regions, influenced by factors such as habitat type, diet availability, and environmental conditions. Therefore, the nutritional content of mudskippers inhabiting the mangroves of Ratulodong may differ significantly from those reported in other regions. This lack of localized scientific data presents a research gap that needs to be addressed.

Another important consideration is the methodological rigor in nutritional analysis. Many previous studies have relied on conventional proximate analysis, but few have consistently employed standardized methods such as those outlined by the Association of Official Analytical Chemists (AOAC). This raises questions about comparability and reliability of results across studies. In this research, the AOAC (2005) procedures including the Kjeldahl method for protein determination, gravimetric analysis for moisture and ash content, Soxhlet extraction for fat quantification, and carbohydrate determination by difference are applied to ensure accuracy and scientific validity. By adhering to these internationally recognized protocols, the present study seeks to provide reliable and reproducible data that can serve as a scientific reference for future research and practical applications.

The problem that emerges from this context is twofold. First, despite the abundance of mudskippers in East Flores, particularly in Ratulodong Village, the fish remains underutilized by local communities, representing a missed opportunity for nutritional improvement and food security. Second, there is a lack of comprehensive nutritional studies on Periophtalmodon schlosseri in this region, making it difficult to evaluate its potential contribution to local diets or to promote its utilization as a sustainable food resource. Addressing these problems requires empirical evidence on the nutritional composition of the species, which can in turn inform local policy, public awareness, and community practices regarding alternative food resources.

This study is therefore unique in two main respects. First, it is one of the few research efforts conducted in East Flores that focuses explicitly on the nutritional profiling of mudskippers. While ecological research on mangrove biodiversity has been relatively common, systematic nutritional

analyzes of specific species remain rare. Second, the study combines quantitative laboratory analysis with qualitative contextual observation, thus adopting a mixed-method approach. This allows for not only the determination of nutritional content but also the exploration of local perceptions and practices concerning mudskipper utilization. Such an integrative approach ensures that the scientific findings are grounded in the local socio-cultural context, making them more relevant for practical application (Girsang et al., 2018).

The aim of this research is to analyze the nutritional content of mudskipper fish (Periophtalmodon schlosseri) collected from the mangrove ecosystem in Ratulodong Village, East Flores Regency, using standardized AOAC methods. Specifically, the study seeks to determine the levels of moisture, protein, ash, fat, and carbohydrates contained in the species. The findings are expected to contribute to both scientific knowledge and local community development. Scientifically, the study provides reliable data on the nutritional composition of mudskippers in East Flores, which has not been documented before. Practically, the results can serve as a basis for promoting mudskippers as an alternative source of protein and other nutrients for local communities, thereby contributing to improved food security, better utilization of coastal resources, and diversification of local diets. Ultimately, it is hoped that the results of this research will raise awareness among local communities and policymakers about the nutritional value of mudskippers and encourage their utilization in daily diets.

2. METHODS

Method study This use approach Mixed Research with data quantitative and qualitative. Study done on July–August 2024. Sample in the form of fish gun fresh (300g) collected from area mangrove Village Ratulodong. Analysis done in Laboratory Chemistry Food University Nusa Sandalwood use method AOAC (2005), that is:

Water Content Analysis (Gravimetry)

The cup is cleaned first and then dried in an oven at 100-105 ^{0}C for 30 minutes or until a constant weight is obtained. It is then cooled in a desiccator for 30 minutes and weighed. A sample of 5 grams (B1) is weighed in a cup and then dried in an oven at 100-105 ^{0}C for 8-12 hours. The sample is then cooled in a desiccator for 30 minutes and then weighed again (B2).

Calculation:

$$\text{Water content \%} = \%\frac{B1-B2}{Berat\ bersih}X100$$

Ash Content Analysis (Gravimetry)

The cup is first dried in an oven at 100-105 ^{0}C until a constant weight is obtained or for about 30 minutes. Next, the cup is cooled in a desiccator for 30 minutes and then weighed (B1). Then, put a sample of 5 salts into the cup with a known constant weight, then burned on an electric stove until there is no smoke. Then put it in an ashing furnace, then burned at a temperature of 400 ^{0}C until the ash looks gray or a constant weight. Next, the furnace temperature is raised to 550 ^{0}C for 12-24 hours. Next, the sample is cooled for 30 minutes in a desiccator and weighed (B2).

The formula for calculating ash content:

$$\text{Ash content (\%)} = \%\frac{B2-B1}{Berat\ sampel}X100$$

Fat Content Analysis (Soxhlet)

Make sure. The fat flask is placed in an oven to be dried at a temperature of 105 ^{0}C for 30 minutes. Next, the fat flask is removed to be cooled using a desiccator for 15 minutes and then weighed (A). Weigh a sample of 5 grams (S) then wrap it in filter paper and then put it into the fat sleeve. Cover the fat sleeve with fat-free cotton and then put it into the soxhlet tube extractor chamber, then hexane (fat solvent) is poured into it, then the fat tube is installed in the soxhlet apparatus. After the fat flask is ready, the distillation apparatus is immediately installed on an electric heater with a temperature of 80 T (Thermoelectric). Reflux is carried out for at least 5 hours until the solvent returns to the fat flask and is clear. The solvent in the fat flask is then distilled, then the flask

containing the extraction sac is heated in an oven at a temperature of 105 ^{0}C for 60 minutes or until it reaches a constant weight. Next, the fat flask is cooled in a desiccator for 20-30 minutes and weighed (B).

Calculation:

$$\text{fat content (\%)} = 100\frac{(B-A)}{Berat\ sampel}\ X$$

Protein Content Analysis (Kjeldhal)

There are several stages in carrying out protein analysis using the Kjeldhal method, namely:

Destruction stage

Weigh a sample of 0.1-0.5 grams and then put it into a Kjeldhal flask, then 40 mg of HgO, 1.9 mg of K2SO4, and 2 ml of H2SO4 are also put into the flask. The flask filled with the solution is then placed in a heating device at a temperature of 430 ^{0}C in an acid room. Destruction is carried out until the solution becomes clear, about 1-1.5 hours.

Distillation stage

The Kieltec system tool is prepared, if the preparation of the analysis tool is complete, it is carried out with the sample that has been destroyed. The sample from the destruction in the Kjeldahl flask is transferred to the distillation tool, then rinse and wash the flask 5-6 times with 1-2 ml of distilled water then transfer the rinse and wash water to the distillation tool. A 125 ml Elenmeyer containing 5 ml of HBO3 solution is placed (boric acid) and 2-4 drops of 0.2% methyl red indicator (mix 1 part 0.2% methyl blue and 2 parts 0.2% methyl red in alcohol) before distillation begins. The tip of the condenser must be submerged under the HBO3 solution (boric acid). Then add the sample from the destruction that was transferred using NaOH-Na2S2O3 solution (sodium thiosulfate). Next, distillation is carried out until about 15 ml of distillate is collected in the Elenmeyer. Then, wash the condenser tube with distilled water, then transfer the washings to the same flask. Dilute the contents of the flask to approximately 50 ml. The next step is titration.

Titration stage

During the titration stage, 0.02 N HCl is added to the distilled sample from a burette. The sample solution turns pink. Record the volume of HCl used.

Calculation:

$$\%\ N = \%\frac{(A-B)\ x\ N\ HCL\ x\ 14}{mg\ sampel} X100$$

Protein content = % N x Conversion factor

Description:

A = ml titration sample

B = ml blank titration

Conversion factor = 6.25

Carbohydrate Content Analysis (By Difference)

The analysis is directly calculated using the following calculation model:

Carbohydrate content analysis (%) = 100 – (%water +%ash +%protein + %fat)

Information :

% water: water content test results

% ash: ash content test results

% protein: protein content test results

% fat: fat content test results

The thing thatPlease note: in the formula abovecan be used to calculate total carbohydrates in test materials that do not contain alcohol.

3. FINDINGS AND DISCUSSION

The nutritional content of the Javanese mackerel fish which was successfully obtained from the Food Chemistry Laboratory of the Faculty of Animal Husbandry, Nusa Cendana University, Kupang using the AOAC 2005 method is shown in the following table:

Table 1. Results of Analysis of the Nutrient Content of Tembakul Fish

Level Water	Level Protein	Level Ash	Level Carbohydrate	Level Fat
80.0%	50.8%	35.0%	7.1%	6.1%

Water content

The water content value of the tobacco fish obtained was 80%, the water content in fish is the highest chemical element followed by protein, ash, fat. The water content value obtained is in accordance with the average water content in fish in general, which is around 60-80% (Ndahawali et al., 2018). The water content test in this study used the gravimetric method based on AOAC (Association of Official Analytical Chemists), 2005. The water content value obtained from this study is very reasonable, because the samples tested were not treated with cooking (raw) or went through a process using a certain high temperature before being analyzed so it can be said that there was almost no significant reduction in water content in the sample. The use of high temperatures can affect the loss of water content in a food ingredient (Girsang et al,. 2018). The purpose of knowing the water content of this tobacco fish is to be able to predict the resistance of the fish to damage during storage. The high water content in fish can also contribute to the rapid growth of spoilage microorganisms (Hayati and Hafiludin, 2023). Water content needs to be tested because it significantly impacts the shelf life of a product, as the higher the water content, the greater the risk of spoilage (Aventi, 2015).

Ash Content

Ash content is an inorganic residue in the form of minerals and impurities that are not burned along with organic matter during the drying process on a material. The ash content obtained in this study was very high at 35%, because the ash content in fresh fish ranges from 1-2% (Astuti and Ningsi, 2019). The high ash content in this study was due to the fish bones that were also ashed, because fish bones naturally contain 10% water content, 20% organic matter, 70% inorganic matter (Rohma et al,. 2019). This high ash content presentation can also indicate the presence of abundant minerals, because in fish bones themselves there are several minerals such as calcium, potassium, etc. (Adawiyah and Selviastuti, 2014).

Fat Content

The fat content of the Javanese mackerel fish in this study was 6.1%, indicating that the Javanese mackerel fish is classified as a medium-fat fish. Fish are classified into three groups based on their fat content: low-fat fish (fat content ranging from 2-5%), medium-fat fish (fat content ranging from 5-6%), and high-fat fish (fat content ranging from 6-25%). The results of this study also showed a very significant difference from previous research, which showed a difference of only 1.80% (Lestari et al., 2022). The fat composition of each fish varies, this is caused by several factors, namely age, metabolic rate, fish movement, and reproductive period (Hafiludin, 2015).

Protein Content

The protein content of the Javanese mackerel from Ratulodong village was 50.8%, obtained from three repetitions. These results also indicate that the Javanese mackerel in this study has a fairly high protein content. The Javanese mackerel in this study is classified as a high-protein fish. The protein content of fresh fish is generally around 16% (Dika et al., 2017), while the protein content of this Javanese mackerel has exceeded this figure. The high percentage of protein value in this Javanese mackerel sample is likely due to the abundance of food sources and its habitat. The heating temperature factor also significantly influences the value of fish protein content; the higher the heating temperature used and the longer the processing process, the higher the risk of protein

damage in a food ingredient (Utami et al., 2019). This may indicate that the protein content of this Javanese mackerel could actually exceed the protein value obtained, but because it has gone through a series of tests, the protein content has decreased.

Carbohydrate Content

The carbohydrate content obtained from testing the meat of the Javanese mackerel was 7.1%. The method used to analyze the carbohydrate content in this fish was the By Difference method. Javanese mackerel has a high carbohydrate content; according to Nur (2018), the carbohydrate content in fresh fish ranges from 0-1%. The presence of carbohydrates in fish can function as an energy source, replacing protein and fat in the fish's body (Yanto et al., 2019).

4. CONCLUSION

The abundance of the Javanese mackerel in the mangrove forest area of Ratulodong village is very abundant, but limited information causes this fish not to be optimally utilized as a good source of nutrition for consumption. The Javanese mackerel obtained on the coast of Ratulodong village, Tanjung Bunga District, in this study is said to have quite high nutritional value. The nutritional values successfully obtained are as follows: 80%, water content, 35% ash content, 6.1% fat, 50.8% protein, 7.1% carbohydrates. This study used the Kjedhal method for protein analysis, gravimetry for ash and water content analysis, Soxhlet to measure fat content, by difference for carbohydrate analysis. The results of this study are expected to provide new insights to encourage the use of the abundant Javanese mackerel in this area, so that the abundance of Javanese mackerel can become one of the biological resources that can benefit the wider community.

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