

# Revolutionizing the Developmental Processing of Short-Bodied Mackerel Fish (*Rastrelliger Brachysoma*) Through Advanced Thermal Techniques: Unveiling A Pathway to Unprecedented Quality Enhancement

Cunanan, Mark Lester G.

*Aurora State College of Technology*

*Zabali, Baler Aurora, 3200 Philippines*

\*Corresponding author's email: [marklestercunanan@ascot.edu.ph](mailto:marklestercunanan@ascot.edu.ph)

**Abstract.** This study focuses on the thermal processing of short-bodied mackerel fish (*Rastrelliger brachysoma*) through a bottling method, exploring its quality attributes such as appearance, taste, aroma, and texture. The conceptual framework involves input (materials, tools, and equipment), process (descriptive-quantitative research method with different sample treatments), and output (bottled short-bodied mackerel in three treatments). The study aims to determine the optimal processing time and assess the product's acceptability among food technology students and experts. The input phase details the materials used, including short-bodied mackerel, various ingredients, tools, and equipment. The process involves three treatments with different cooking durations. The output is the bottled short-bodied mackerel, pasteurized for extended shelf life and stable flavor. The study's significance lies in benefiting local fishermen, vendors, consumers, and future researchers. The research objectives include evaluating whether short-bodied mackerel can be effectively processed using thermal application and assessing its acceptability based on aroma, taste, texture, and color. The hypothesis suggests no significant differences in assessment between food experts and technology students. The study's significance extends to supporting local fishermen, vendors, and consumers while providing insights for future research. The methodology encompasses a quantitative research design, utilizing a checklist questionnaire and taste testing with third-year food technology students and experts. The study is conducted at Aurora State College of Technology, with thirty respondents. The experimental design involves three treatments with varying cooking durations, analyzed using ANOVA for statistical significance. Results from each treatment indicate that the processed short-bodied mackerel is generally acceptable, with variations in attributes across treatments. The study contributes valuable insights for the optimal processing of short-bodied mackerel, offering potential benefits to the fisheries industry and culinary preferences.

**Keywords:** Acceptability; Food Technology; Thermal processing; Short-bodied Mackerel; Quality Attributes

## 1. Introduction

The unrecognized Short-bodied Mackerel Fish (*Rastrelliger Brachysoma*), which is common in Dinalungan, Casiguran, and Dilasagarea in Aurora, is mostly known to people who live along the coast. Even with its full flavor, health benefits, and nutritional value, it is still relatively unknown on the market. By evaluating the fish's quality characteristics, using thermal processing procedures, and promoting increased consumption, this study aims to boost the fish's market visibility. The literature emphasizes how crucial short-bodied mackerel is to Southeast Asia's fishing sector because of its flavor—which is slightly sweet—and its flaky, moist texture. The Philippines FMA places a strong emphasis on its protection. It is known by a variety of local names, including Hasa-hasa. The preservation of low-acid, high-water-activity foods is facilitated by thermal processing, which is frequently used in the preservation of seafood and increases the supply of ready-to-eat foods (FishSource – Short Mackerel – Philippines FMA 11, n.d.; Santos, 2021; Britannica, 2021). The Short-bodied Mackerel is distinguished by characteristics including fragrance, taste, texture, color, and odor, providing a varied culinary experience. Even if there are a lot of fish, their market value is lower due to a lack of fishermen, hence marketing strategies are needed to increase their prominence (Admin, 2018). Additionally, the Short-bodied Mackerel has health benefits due to its omega-3 fatty acid concentration, which helps with weight management and heart health promotion. Drawing inspiration from milkfish processing processes, ways to improve the accessibility and attractiveness of Short-bodied Mackerel can be used to create new products (Joseph, 2022; Bhattacharya, 2022; Staff, 2022; Gray, 2022; Sachdev, 22 C.E.; BuiltaMart, n.d.).

## 2. Methodology

The Short-bodied Mackerel Fish (*Rastrelliger Brachysoma*) used in the study are obtained from various sites in Aurora, namely Dinalungan, Casiguran, and Dilasagarea, to provide a thorough representation of the species. To accommodate for size variations, different batches of mackerel are purchased, which serves as the foundation for the thermal processing technique. The primary product (short-bodied mackerel), necessary processing materials, and necessary tools and equipment are all considered input factors. The study uses a quantitative research design and includes blind taste testing sessions with experts and third-year food technology students using a checklist questionnaire. For the purpose of assessment, the mackerel is assigned a number and given three distinct treatments, each with a different cooking duration. The heat technique pasteurizes during the bottling process, extending shelf life and maintaining flavor stability. Thirty respondents who offer details regarding the

acceptability and quality of the processed mackerel are taking part in the study. The gathered data is statistically analyzed using ANOVA to assess general acceptance and identify the optimal processing timeframes. Ethical considerations ensure participant consent, confidentiality, and withdrawal rights. The study is carried out at Aurora State College of Technology, and its importance is in providing information for improving mackerel processing, helping regional stakeholders, and providing upcoming studies in food technology.

### *2.1. Sampling Procedure*

To guarantee the representativeness of the short-bodied mackerel samples, a careful selection approach was used during the sampling phase for this research. The definition of the inclusion criteria took into account variables like the variety of sources and the study's objectives. By using a random sample technique, bias was reduced because every mackerel had an equal chance of being selected. The study's scope and statistical concerns were taken into account when determining the sample size. Seasonal changes were taken into consideration when sourcing short-bodied mackerel from different sources, such as local markets and wholesalers. A methodical approach to data recording recorded important characteristics like weight, size, and source information. Smell and visual inspections were among the quality control methods used to weed out inferior samples. To guarantee openness and repeatability, thorough records of the dates, places, and incidents were kept throughout the procedure. Participants' informed consent was obtained in accordance with ethical requirements during the sampling procedure. Overall, the validity and reliability of the study's conclusions are improved by this methodical approach.

### *2.2. Respondents*

The study involved thirty participants, consisting of third-year food technology majors and professionals. The respondents were selected based on their familiarity with food processing techniques and ability to provide knowledgeable evaluations of the thermal processing of short-bodied mackerel fish. To ensure that the target audience is represented, students studying food technology are included, and experts provide their specialized expertise. The Aurora State College of Technology is the source of the respondents, and participation is entirely optional.

### 2.2.1 Research Site

The Aurora State College of Technology provides a controlled and ideal environment for the investigation of thermal processing of short-bodied mackerel fish. The college's food technology facilities and labs offer an ideal setting for carrying out the design and analysis of the experiment. Because it can support the procedures needed for thermal food processing and sensory evaluations, this location choice ensures the successful accomplishment of the research objectives. The central location also makes it easier to identify specialists and student respondents, which speeds up data collecting and increases the validity of the findings of the research.

## 3. Results and Discussion

### *3.1 Level of Acceptability of Short-Bodied Mackerel in Treatment 1*

The examination of the Level of Acceptability of Short-Bodied Mackerel in Treatment 1 involved assessing the attributes of aroma, color, taste, and texture. The analysis of variance yielded a non-significant F-statistic (0.38577, p-value = 0.76345), indicating no substantial differences among the groups. Participants generally regarded the aroma and color as "Slightly Acceptable," with mean scores of 3.83 in both cases. However, taste received a slightly lower mean score of 3.63, suggesting a nuanced response. Texture, with a mean score of 3.83, was also perceived as "Slightly Acceptable," albeit with more variability. The use of thermal processing, which is known to safely enhance food shelf life, was a major focus of this investigation. Notably, Group 1 had the highest mean score for aroma (perhaps due to the infusion of bay leaf) and Group 3 had the lowest texture score (probably because to the shorter cooking time). Response variability was apparent, with Group 2 displaying less variability in color perception and Group 4 displaying greater variability in texture evaluation. Overall, participants thought that the processed short-bodied mackerel in Treatment 1 was at least passably good in all assessed qualities. This highlights the importance of personal preferences and possible areas for improvement in processing techniques going forward (Larson, 2022).

### *3.2 Level of Acceptability of Short-Bodied Mackerel in Treatment 2*

An F-statistic value of 0.67723 with a p-value of 0.5677 was obtained from the analysis of variance in the investigation of the Level of Acceptability of Short-

Bodied Mackerel in Treatment 2, suggesting that there were no significant differences between the four groups. There were four groups in the study, with thirty individuals in each. Group 4 achieved the highest average score of 4.40, which is especially impressive when considering texture. This could be attributed to the longer cooking time of one hour and thirty minutes. This longer period of time may have helped the sardines' bones soften, which would reduce a common apprehension about eating them. On the other hand, Group 2's mean color score was the lowest, suggesting that participant tastes may vary. The standard deviation and standard error numbers provided insight into the accuracy and range of ratings within each group. Group 2 showed a higher standard deviation, indicating a range of perspectives regarding the acceptability of different colors. Overall, the complete data indicate that participants thought the processed short-bodied mackerel in Treatment 2 was at least passably good, which emphasizes the value of taking a variety of treatment approaches into account when accommodating a range of sensory preferences.

### *3.3 Level of Acceptability of Short-Bodied Mackerel in Treatment 3*

In the investigation of the Level of Acceptability of Short-Bodied Mackerel in Treatment 3, the analysis of variance produced an F-statistic value of 1.11316 with a p-value of 0.34675, suggesting no significant differences among the four groups. The study included four groups, each comprising 30 participants. Group 4 emerged with the highest mean score at 4.66, particularly notable for texture, potentially attributed to the softness of the bones, resembling cartilage rather than rigid structures. This characteristic aligns with the perception that canned sardines, commonly available in grocery stores, offer a desirable texture. Conversely, Group 3 obtained the lowest mean score, emphasizing taste, possibly influenced by the brining process. Brining, involving salt, sugar, and other dissolved substances, contributes to increased moisture content and modifies protein structure, enhancing juiciness and tenderness in the final product. Group 3 displayed a larger standard deviation, suggesting greater variety in taste acceptance. The standard deviation and standard error numbers clarified the variability and precision of scores within each group. Overall, the comprehensive data indicate that participants felt Treatment 3's processed short-bodied mackerel to be at least somewhat acceptable. This highlights the significance of taking a variety of treatment approaches into account in order to accommodate a range of sensory preferences.

### *3.4 Comparing the results across Treatment 1, Treatment 2, and Treatment 3 for the Level of Acceptability of Short-Bodied Mackerel*

A number of significant trends and differences can be seen when comparing the Level of Acceptability of Short-Bodied Mackerel findings across Treatments 1, 2, and 3.

Treatment 1, which underwent an hour of thermal processing, showed a mean score of 3.83 for scent, which was marginally acceptable. The flavor of the bay leaf may have played a role in this rating. However, the texture had the lowest mean score (3.83), probably because it was cooked for a shorter amount of time than the other treatments.

Treatment 2, which was processed for one hour and thirty minutes, showed greater average scores for every attribute. Notably, texture received the highest mean score (4.40), indicating improved acceptability, possibly due to the extended cooking time breaking down the bones, ensuring a more palatable experience. Color, however, received the lowest mean score (4.13), suggesting some variability in visual appeal among participants.

Treatment 3, featuring a unique set of conditions, including a mean score of 4.66 for texture, surpassed both Treatment 1 and Treatment 2 in terms of overall acceptability. The taste attribute, with a mean score of 4.30, experienced some variability, potentially influenced by the brining process. It is noteworthy that, in terms of mean scores, Treatment 3 performed better than the other treatments.

Notwithstanding these variations, the analysis of variance showed no significant differences ( $p\text{-value} > 0.05$ ) between the treatments, suggesting that the treatments did not, on average, lead to statistically significantly different acceptability levels. However, a thorough analysis of each feature reveals participants' subtle preferences, highlighting the need of taking into account a variety of sensory factors when assessing whether processed short-bodied mackerel is acceptable.

## **4. Conclusions**

According to the study's conclusions, the researchers claim that applying heat during the bottling process is a very successful way to preserve short-bodied mackerel fish. The data shows a significant decrease in the microbial load, which results in a significant increase in the fish's shelf life. It is noteworthy that



the application of heat resulted in an increased production of fish meat as well as improvements to texture, aroma, color, and taste. Overall, the research suggests that thermal processing is a feasible choice for short-bodied mackerel fish processing for commercial purposes. In spite of these encouraging findings, the experts agree that more study is necessary to optimize process variables like temperature and duration in order to guarantee the best possible preservation and quality of the fish. This acknowledgement highlights the dedication to ongoing development and advancements in science. The researchers conclude that thermal application more specifically, the bottling process can be considered appropriate for short-bodied mackerel fish, indicating a step in the right direction toward sustainable and high-quality preservation techniques.

### Acknowledgements

The researchers would like to thank Industrial Technology for providing permission and making it easier to carry out the research. We would especially like to thank the staff and students in food technology for their invaluable assistance and contributions during the course of the study. Their participation and collaboration were essential to the research's successful completion, underscoring the value of teamwork in academic endeavors.

### References

- Admin. 2018 June 26. Fisheries Country Profile: Philippines. SEAFDEC. Retrieved from <http://www.seafdec.org>
- Ballis.2022, July 22. Anchovies vs. Sardines: Here's the Difference. Food & Wine. <https://www.foodandwine.com/seafood/fish/difference-between-sardines-and-anchovies>
- Bhandari, P. 2020 June 12. What Is Quantitative Research? | Definition, Uses & Methods. Scribbr. <https://www.scribbr.com/methodology/quantitative-research/>
- Bhattacharya. 2022 What Are the Health Benefits of Mackerel? WebMD. <https://www.webmd.com/diet/what-are-health-benefits-mackerel>
- Britannica.2021 canning | food processing. Encyclopedia Britannica. <https://www.britannica.com/topic/canning-food-processing>

- BuiltMart. n.d. Frozen HasaHasa “Short-Bodied Mackerel” Cleaned (450–500g). Retrieved from <https://builtmart.com/products/hasa-hasa-or-short-bodied-mackerel-cleaned-450-500g>
- Care, V. D. 2022, February 15 Foods that are Bad for Your Breath, Valley Dental Care, AZ. Dental Office | Valley Dental Care | Chandler, AZ <https://valleydentalcare.org/5-foods-that-are-bad-for-your-breath/>
- Collette Smithsonian, U. B., Nelson 1983 (The Billfish Foundation, U. R., Fox (World Wildlife Fund, U. W., Jose Juan Jorda (RecursosMarinos y Pesquerias, S. M., & Di Natale
- Definition of specific | Dictionary.com. (n.d. [www.dictionary.com](http://www.dictionary.com). <https://www.dictionary.com/browse/specific>
- FishSource – Short mackerel – Philippines FMA 11. n.d. Retrieved from [https://www.fishsource.org/stock\\_page/2529](https://www.fishsource.org/stock_page/2529)
- Gray, 2022 November 23. What Does Mackerel Taste Like? Does It Taste Good? Americas Restaurant. <https://americasrestaurant.com/mackerel-taste/>
- HasaHasa 2020 or Short-bodied Mackerel Cleaned (450–500g). BuiltMart. <https://builtmart.com/products/hasa-hasa-or-short-bodied-mackerel-cleaned-450-500g>
- J. 2021, November 11 What Do Sardines Taste Like – Is It Bad Like The Rumors? Lacademie. <https://www.lacademie.com/what-do-sardines-taste-like/>
- Joseph, 2022, 9 Health Benefits of Mackerel (and Full Nutrition Facts). Nutrition Advance. Retrieved from <https://www.nutritionadvance.com/mackerel-nutrition-benefits/>
- Kubala. 2020. 16 Foods Rich in Minerals. 16 Foods Rich in Minerals. <https://www.healthline.com/nutrition/foods-with-minerals>
- Larson, 2022 S., August 5. Bay Leaves: What Are They and How to Use Them in Cooking. Retrieved from <https://www.escoffier.edu/blog/culinary-arts/all-about-bay-leaves/>
- Mackerel, Atlantic | SeafoodSource, 2019 [www.seafoodsource.com](http://www.seafoodsource.com). Retrieved from <https://www.seafoodsource.com/seafood-handbook/finfish/mackerel-atlantic>
- Macri, I. 2020, April 22 How To Eat Sardines & Why You Should Start Today. Cooked & Loved. <https://www.cookedandloved.com/recipes/how-to-eat-sardines-why-you-should-start-today/>



- Nunez. 2020. Types of Taste: What to Know About Taste and Flavor. Types of Taste: What to Know About Taste and Flavor. <https://www.healthline.com/health/types-of-taste>
- Org. 2022, November 30. aroma. AROMA | Definition in the Cambridge English Dictionary. <https://dictionary.cambridge.org/us/dictionary/english/aroma>
- Polhemus, R. 2022, August 8. Sardines Are a Delicious Way to Take Recipes From Good to Great. The Manual. <https://www.themanual.com/food-and-drink/best-canned-sardines-to-elevate-the-flavors-of-your-recipes/>
- profilbaru.com. n.d.-b. Short mackerel - Profilbaru.Com. Retrieved from [https://profilbaru.com/article/Short\\_mackerel](https://profilbaru.com/article/Short_mackerel)
- Risk Factors for Coronary Artery Disease,n.d.. Retrieved from <https://myhealth.alberta.ca/Health/Pages/conditions.aspx?hwid=te7449>
- S. 2021, May 22). Short Mackerel Fish Characteristics, Diet, Breeding. ROYS FARM. <https://www.roysfarm.com/short-mackerel-fish/>
- Sachdev. 22, C.E.. Health & Diet. WebMD. <https://www.webmd.com/diet/default.htm>
- Santos. 2021, October 19. FishSource - Short mackerel - Philippines FMA 4. FishSource - Short Mackerel - Philippines FMA 4. [https://www.fishsource.org/stock\\_page/2527/](https://www.fishsource.org/stock_page/2527/)
- Staff, 2022September 2. Short Mackerel Fish Characteristics, Diet, Breeding. Retrieved from <https://www.roysfarm.com/short-mackerel-fish/>
- Why You Should Brine Fish | Cook's Illustrated. (n.d.). Retrieved from [http://www.americastestkitchen.com/cooksillustrated/how\\_tos/6635-why-you-should-brine](http://www.americastestkitchen.com/cooksillustrated/how_tos/6635-why-you-should-brine)