International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 46 No. 1 August 2024, pp. 58-64

Application of HACCP in the Processing of Frozen Gindara Fish (Lepidocybium Flavobrunneum) at PT. Tridaya Eramina Bahari

Lidya Dwi Handayani[1], Yempita Efendi[2], Yusra[2]

[1]Student of Fisheries Resources Utilization Study Program, Faculty of Fisheries and Marine Sciences, Universitas Bung Hatta, Padang, West Sumatera, Indonesia-25133

[2]Lecturer of Fisheries Resources Utilization Study Program, Faculty of Fisheries and Marine Sciences, Universitas Bung Hatta, Padang, West Sumatera, Indonesia-25133

Corresponding Author: Yusra; yusra@bunghatta.ac.id

Abstract - One marine fish exporting company, PT. Tridaya Eramina Bahari, describes HACCP as a system for assessing and managing food-related health risks. This investigation aims to examine how PT. Tridaya Eramina Bahari applies Hazard Analysis Critical Control Point (HACCP) to quality control when processing frozen gindara fish (Lepidocybium flavobrunneum). This study employs observations and interviews as part of a survey methodology. The data analysis method used is quantitative-descriptive. This research shows that at all stages of the Gindara Fish (Lepidocybium flavobrunneum) processing at PT. Tridaya Eramina Bahari, three critical control points (CCP) were established: the raw material receiving stage, the packaging and labelling, and the metal detector inspection. Based on data obtained at the time of receipt of raw materials, the samples used meet the requirements and comply with the standards set by PT. Tridaya Eramina Bahari. Packaging and labelling feasibility results were also obtained based on the packing analysis form by the company's QC staff. The metal detector inspection feasibility results were also obtained based on the analysis of the record of checking the metal detector form from the company's HACCP document.

Keywords - HACCP, processing, fish, frozen, Gindara.

I. INTRODUCTION

Based on the 2023 Ministry of Marine Affairs and Fisheries Statistics Data, it is estimated that Indonesia's fisheries export figures will grow by 8.84% with a value of USD 6.22 billion until December 2022, compared to the end of 2021. To continue to increase the value of Indonesian fisheries exports, what needs to be done is to improve the quality of fish and fishery products that will be exported [1].

The first step that can help improve the quality and safety of food is to develop a system that can prevent the possibility of a risk of danger during the processing process [2]. The concept and strategy are considered safer and have been recognised for their effectiveness internationally. They are implementing the HACCP food safety management system. The HACCP approach helps with planning and operations in food production activities that focus on controlling various hazards directly [3].

In Indonesia, the implementation of HACCP is regulated in the Decree of the Fish Quarantine, Quality Control, and Fishery Product Safety Agency Number 75/KEP-BKIPM/2020 concerning Technical Instructions for the Implementation of a Quality System Based on the Concept of an Integrated Quality Management Program/Hazard Analysis and Critical Control Point, where every fish processing unit that will export is required to implement HACCP certification from BKIPM [4].

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 46 No. 1 August 2024, pp. 58-64

PT. Tridaya Eramina Bahari is an industrial company in the field of marine fish exporters that refers to HACCP grade A as a system for analysing and controlling health risks related to food products[5]. Currently, the company focusses its activities 100% on exporting production results with dominant raw materials and products, namely frozen products [6].

Research by [7] stated that in maintaining the safety of frozen tuna loin products, PT. Tridaya Eramina Bahari has implemented the HACCP system. However, there are still stages of the process that need further supervision to prevent the possibility of food safety hazards. These stages include receiving raw materials, packaging and labelling, and checking for heavy metals. the examination or analysis of this hazard must be implemented as the main step in grouping the hazards that may occur if the product is consumed [8]. The implementation of HACCP in UPI will help in terms of guaranteeing consumers that the products produced are processed with good safety assurance. This study aims to analyse the implementation of quality control through the application of HACCP (Hazard Analysis Critical Control Point) in the processing of frozen gindara fish (*Lepidocybium flavobrunneum*) at PT. Tridaya Eramina Bahari.

II. Research Methodology

The study was conducted from February to March 2024 and took place at PT. Tridaya Eramina Bahari Jl. Muara Baru Ujung Blok K No. 3, Penjaringan District, North Jakarta, 14440. The research used tools such as hairnets, rubber gloves, masks, boots, stationery, and digital cameras for documentation of research activities. The materials used were from the production process of frozen Gindara Fish (*Lepidocybium flavobrunneum*) at PT. Tridaya Eramina Bahari. Data collection in this study used a survey method and was presented descriptively by describing and explaining conceptual theoretical studies based on literature. The research was conducted by directly following the processing process of Gindara fish (*Lepidocybium flavobrunneum*) frozen at PT. Tridaya Eramina Bahari, from receiving raw materials to storing end products. The data obtained are primary data and secondary data, which are then observed using the CCP identification table. The data analysis method in this study uses a quantitative descriptive analysis method, where this analysis is used to analyse data by describing or depicting the collected data according to the problem limitations, which are then reviewed with existing references according to the objectives and problem limitations that have been set.

III. Result and Discussion

Gindara fish (*Lepidocybium flavobrunneum*) is one of the mainstay export commodities at PT. Tridaya Eramina Bahari, with various forms of frozen products. Each product produced must go through a process according to the work steps in sequence to avoid cross-contamination. HACCP in the processing of frozen Gindara Fish (*Lepidocybium flavobrunneum*) at PT. Tridaya Eramina Bahari has been implemented as one of the guarantees of food safety quality for export products. The HACCP system is based on a science-based and systematic approach with the aim of anticipating the possibility of hazards in the production process by establishing critical control points that must be monitored more carefully (Critical Control Point/CCP) [9].

In developing the implementation of an integrated quality system based on the PMMT/HACCP concept, it begins with several stages [10]. In its implementation, HACCP has seven principles that must be met, including: 1) hazard analysis; 2) identification of critical control points; 3) determination of critical limits; 4) monitoring procedures; 5) corrective actions; 6) verification procedures; and 7) recording procedures [11].

1. Hazard Analysis

In its stages, hazard analysis is the first application of the HACCP principle. Hazard analysis in the production process is applied to determine the factors causing hazards and potential hazards that arise, then group the hazards whether they are biological, chemical or physical hazards, then determine the risk or significance of the identified hazards and determine preventive measures [7]. Based on the results of interviews and field observations, the hazard analysis carried out by the HACCP team of PT. Tridaya Eramina Bahari was carried out based on the standards in Tables 1 and 2.

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 46 No. 1 August 2024, pp. 58-64

TABLE 1. Assessment matrix

Assessment Matrix		Severity		
		L (Low)	**M (Medium)**	**H (High)**
	L (Low)	LL	LM	LH
	M (Medium)	ML	MM	MH
	H (High)	HL	HM	HH
Probabilty		Highlighted Cell Shows Potential Hazzard		

TABLE 2. Determination of hazard standards

SETTING STANDARDS OR SEVERITY GUIDELINES			
	H (High)	**M (Medium)**	**L (Low)**
Biological Hazards	*Clostridium* sp	Bacterial growth (*E.coli*, Salmonella, Coliform, Styphlococcus, Vibrio)	None
Physical Hazards	Foreign material: Metal fragment piece of sharp glass brittle/hard plastic	Foreign material: Piece of plastic Piece of wood Sand	Foreign material: piece of paper
Chemical Hazards	Histamin Allergens	Heavy metal (Pb, Cd, Hg) Migration of chemicals	None

In line with research conducted by [6] which stated that the results of the hazard analysis found that there are three types of potential hazards that can occur in frozen products: biological hazards (the presence of bacteria, mould, yeast, and parasites), chemical hazards (the presence of toxins or contamination with chemicals that are not suitable for consumption), and physical hazards (the presence of pieces of gravel, sand, hair, insects, pieces of metal, damage to the texture of fish meat, and so on).

2. Determination of Critical Control Points (CCP)

Based on the CCP Decision Tree used by PT. Tridaya Eramina Bahari in determining CCP in the frozen Gindara Fish (*Lepidocybium flavobrunneum*) processing process, which has the potential to have significant hazards, see Table 3.

TABLE 3. Identification of Critical Control Points at PT. Tridaya Eramina Bahari

Process step	**Signification Hazard**	**SSOP & GMP**	**Q1**	**Q2**	**Q3**	**Q4**	**CCP**
		Y/N	**Y/N**	**Y/N**	**Y/N**	**Y/N**	
Receiving Raw Material	Histamin	N	Y	N	Y	N	CCP
Packing	Allergen	N	Y	Y	-	-	CCP
Metal Detecting	Metal Fragment	N	Y	Y	-	-	CCP

a. Receiving raw materials

When receiving raw materials, they are received by QC staff and supervised by the Head of Production. After being received and quality checked, sorting is then carried out based on the size and total weight of the fish. Damage during the receipt of raw

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 46 No. 1 August 2024, pp. 58-64

materials can cause biological, chemical, or physical hazards. The real danger that occurs due to chemical damage is the formation of histamine. The formation of histamine is caused by an increase in fish temperature and the content of heavy metals accumulated in the body of the fish that comes from the waters where the fish were caught. Therefore, at each receipt of raw materials, organoleptic tests and histamine content in the fish are carried out. Chemical hazards at the stage of receiving raw materials are included in the CCP. According to [12] the formation of histamine is caused by the presence of exogenous decarboxylase enzymes produced by microbes in the fish's body.

b. Packaging

Activities are designated as CCP based on company guidelines, and preventive and control measures are needed by checking the components in the packaging. In line with [6] statement that at this stage, it is only necessary to make process improvements in the form of how to store packaging materials and adjust them to GMP, as well as adjusting the label to the label requirement standards.

c. Metal checking

The next critical control point is metal checking. Metal checking aims to prevent and detect metal content contamination in the product. According to [6], the metal content in the product will cause problems for consumers if swallowed and consumed continuously. This stage is designated as CCP because special supervision is needed to avoid real dangers from the metal content in the product.

3. Determination of Critical Limits

The critical limits of each CCP are determined based on technical references and standards as well as monitoring in the production unit. Critical limits help detect the suitability between suitable and non-suitable products, so that each CCP is easily identified and can be guarded by employees in the production process. Critical limit monitoring at PT. Tridaya Eramina Bahari at the raw material acceptance stage, namely the maximum limit of histamine content in frozen fish, Monitoring is carried out by conducting histamine tests in the company's internal laboratory. The maximum limit of histamine content at raw material acceptance is >50 ppm. The critical limits of each CCP at PT. Tridaya Eramina Bahari have been set according to field conditions, as shown in Table 4.

TABLE 4. Critical limits of CCP at PT. Tridaya Eramina Bahari

CCP	Real danger	Critical limit
Receipt of raw materials	Histamine formation	Histamine content > 50 ppm
Packaging and labeling	Allergen	Allergen information & type of fish are listed
Metal inspection	Metal flakes	- Fe > 3.0 mm - Sus > 3,5 mm - No Fe >3,5 mm

4. Critical Control Point (CCP) Monitoring

Activities at the monitoring stage are monitoring and checking the stages of receiving raw materials (receiving), packaging and labelling (packaging), and checking metal (metal detector). The monitoring procedure at the stage of receiving raw materials is carried out by checking the body temperature of the fish and conducting a histamine level test on the incoming raw materials by Quality Control staff, then requesting information on the results of laboratory analysis in the form of a letter from the supplier stating that the incoming raw materials are free from pathogenic bacteria and heavy metals [13].

International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

https://ijpsat.org/
Vol. 46 No. 1 August 2024, pp. 58-64

The requirements for receiving frozen fish raw materials at PT Tridaya Eramina Bahari are: a minimum temperature of -18 ^{0}C; having an organoleptic test score of at least 7; and not containing more than 50 ppm of histamine. Based on the raw material receipt monitoring document obtained, the raw materials received by PT. Tridya Eramina Bahari have met the requirements set by the company by referring to SNI 4110 of 2020 [14]. The average fish temperature was -18.6 ^{0}C, the average organoleptic test score was 7.75, and the histamine content in the fish samples used was 13.6 ppm. Organoleptic test data on the Gindara Fish (*Lepidocybium flavobrunneum*) samples can be seen in Figure 1.

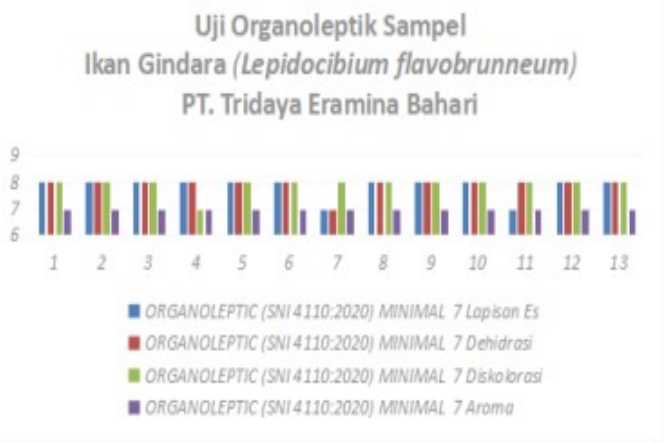

FIGURE 1. Organoleptic test graph of gindara fish (*Lepidocybium flavobrunneum*) samples.

At the packaging and labelling stage, the monitoring procedure is carried out by checking the packaging materials and labels using the analysis form provided by the company. Based on documents obtained from the company, the packaging of gindara fish products, also called oilfish, is carried out using vacuum wrapping, then strapped and stored in cold storage. Each package is labelled according to the product identification, and the master carton is marked according to the buyer's instructions based on the guidelines in the traceability document.

The next monitoring procedure is carried out at the third critical control point, namely the metal detector. In this process, monitoring is carried out by conducting a sensitivity test on the metal detector machine, namely by seeing the amount of content and whether it is still included in the check standard, namely iron (Fe) (3.0), stainless steel (Sus) (3.6), and non-iron (non-Fe) (3.5). Then a sensitivity test is carried out on the product with the Pass or Fail indicator. Monitoring of the metal detector process is done by conducting a sensitivity test on the metal detector machine every time production is carried out and 30 minutes before use by QC staff. The CCP that has been set by PT. Tridaya Eramina Bahari can be seen in Figure 2.

(a) (b) (c)

FIGURE 2. CCP Location at PT. Tridaya Eramina Bahari, (a) Receipt of raw materials; (b) Packaging and labeling; (c) Metal detector

5. Determination of Corrective Actions

Determination of corrective actions based on CCP observation results: when passing the predetermined critical limits, corrective actions are required. Correcting and eliminating sources of deviations, reorganising process control, identifying products produced during the process that deviate, and determining corrective actions are the objectives of determining corrective actions [9].

Based on the results of an interview with the head of the HACCP team at PT. Tridaya Eramina Bahari, it can be concluded that the corrective actions taken against deviations that occur in the company on raw materials are returns to suppliers. The packaging and labelling stage of the corrective actions taken is carried out by carrying out a careful re-check and by listing allergens and types of fish on the packaging label. The metal check on products detected as containing metal flakes is separated and dismantled. On the metal detector, calibration or repairs are carried out on the device by checking the sensitivity of the device. In line with [6] stated that if the metal detector fails to detect metal content in the product, calibration or repairs will be carried out on the device by testing the sensitivity of the device and re-checking so that metal flakes passing through the device can be detected properly.

6. Determination of Verification

The method of conducting verification is by checking HACCP records and documents such as process monitoring records, CCP monitoring, and other records. Verification is carried out by conducting planned internal audits, market analysis, and tracing back the results of finished products, raw materials, and semi-finished products in an accredited external laboratory [9]. The verification procedure for the stages included in the CCP carried out at PT. Tridaya Eramina Bahari is as follows:

a) Receipt of raw materials

The verification procedure applied at PT. Tridaya Eramina Bahari is that when receiving raw materials, a check is carried out on the records of the quantity and origin of the raw materials, as well as the results of organoleptic tests and their chemical and biological content.

b) Packaging and labelling verification

The packaging and labelling stage is carried out by checking the packing form to check the traceability of products produced over a period of time.

c) Metal checking

Verification is carried out at the metal checking stage by checking the heavy metal monitoring sheet every day, and the company carries out calibration and validation of the equipment once a year. Based on [6], at the raw material receiving stage, a check is carried out on the records of the quantity, origin of the raw materials, and results of laboratory tests of the raw materials; at the packaging stage, a check is carried out on the material holding form to check the packaging material; and at the metal detector stage, a check is carried out on the heavy metal monitoring sheet every day, and the company carries out calibration and validation of the equipment once a year.

7. Recording

Based on the survey results, the records at PT. Tridaya Eramina Bahari include HACCP team documentation, product descriptions, process diagrams, monitoring records of all stages of the process from receiving raw materials to storing final products, corrective action records, verification action records, records of each stage monitored according to a certain period, verification data and results of improvements at each CCP or any deviations that occur, etc.

Recording is the main point of accurate and efficient proof in the implementation of HACCP in a company. Recording can be in the form of documents or recordings. The types of documents that must be stored as a complete HACCP system are quality manuals (HACCP plans) and supporting documents, CCP monitoring records, corrective action records, verification records, sanitation records, and amendments [9].

IV. CONCLUSION

Overall, in the processing of frozen Gindara Fish (*Lepidocybium flavobrunneum*) products at PT Tridaya Eramina Bahari, good HACCP has been implemented and is in accordance with the concept of the Decree of the Fish Quarantine Agency, Quality Control, and Fishery Product Safety Number 75/KEP-BKIPM/2020. Of the 16 stages of the product processing process, 3 points are designated as critical control points, namely the stage of receiving raw materials, the packaging and labelling stage, and the metal inspection stage (metal detector).

REFERENCES

[1] B. Vatria. "Manual HACCP-based intagrated quality management program of raw frozen shrimp at PT. Pulaumas Khatulistiwa. PT. PMK. Pontianak". 2020.

[2] S. Deni, A, Talib, I.W. Laitupa. "HACCP implementation study on freezing of yellowfin tuna (*Thunnus albacares*) case study at PT. Harta Samudra in Morotai island regency". Journal of Science, Social and Humanities. vol. 3. 2023, pp. 74-88.

[3] A.D. Prayitno, M.B. Sigit. Implementation of 12 stages of hazard analysis critical control point (HACCP) as a food safety system for shrimp products (panko ebi). Journal of Agricultural Technology & Industry. vol, 24. 2019, pp. 100-11.

[4] Fish Quarantine Agency Controls the Quality and Safety of Fishery Products. Decree No. 75/Kep/Bkipm/2020 About Technical Instructions for Implementing a Quality System Based on the Integrated Quality Management Propram Concept /Hazard Analysis Critical Control Point. In BKIPM. Ministry of Maritime Affairs and Fisheries. 2020. pp. 1-24.

[5] I.S. Kumara, A. Kusumawati, A. "Production process information system of PT Tridaya Eramina Bahari". Journal of Science and Technology, vol. 7. 2020, pp. 70-78

[6] A. Rohaini. "Implementation HACCP (Hazard Analysis Critical Control Point) Tuna (*Thunnus* sp.) frozen loin at PT. Tridaya Eramina Bahari. Marine and Fisheries Polytechnic". Departement of Marine Product Processing. Dumai. 2020.

[7] N.E. Hasibuan, A. Azka, A. Rohaini. "Implementation Hazard Analysis Critical Control Point (HACCP) tuna (*Thunnus* sp.) frozen loin in PT. Tridaya Eramina Bahari". Aurelia Journal. vol. 2. 2020, pp. 53-62.

[8] Bahar, Nurmaladewi, F.M. Lisnawaty, F. M. "Hazard identification and determination of critical control points in the tuna smoking process in Malalanda village, Kulisusu district, North Buton regency". Koloni: Multidisciplinary Journal of Science, vol. 1. 2022, pp. 514-525.

[9] B. Vatria. "Review : Implementation of the system Hazard Analysis And Critical Control Point (HACCP) as a guarantee of the quality and safety of fishery food products". Manfish Journal. vol. 2. 2022, pp. 104-113.

[10] T. Chiba. "Management of food hygiene and safety by hazard analysis and critical control point (HACCP)". Yakugaku Zasshi. vol. 142. 2022, pp. 27-31.

[11] S.S. Daulay. "Hazard Analysis Critical Control Point (HACCP) and its implementation in the food industry".123dok. Available at HACCP dan Implementasinya Dalam Industri (123dok.com) [3 Februari 2024]. 2018.

[12] L. Lasmi, N. Nuraenah, A. Nofreeana. "Potential of edible gelatin coating with added quercetin on histamine formation in tuna meat during storage". Manfish Journal.vol. 1. 2021, pp. 152-160.

[13] B.P. Larysa, A. Antonenko, T. Galina, K. Myroslav, B. Tetiana, K. Myroslav & G. Artem. "Accredi bal-prylypko larysatation and prospects of HACCP system implementation in food production". International Scientific-Technical Journal, vol. 1. 2024, pp. 111-116.

[14] Kementerian Kelautan dan Perikanan. "Tuna, skipjack and mackerel fisheries management plan". Directorate of Fish Resources Directorate General of Capture Fisheries. KKP. Jakarta. 2023.