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STRATEGIES FOR IMPROVING QUALITY CONTROL AND SAFETY OF FISHERY PRODUCTS AMONG SUPPLIERS IN MEDAN

Strategi Peningkatan Pengendalian Mutu dan Keamanan Hasil Perikanan pada *Supplier* di Kota Medan

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ABSTRACT

The city of Medan, as the main gateway for the export of fishery products from North Sumatra Province via the Belawan International Port, has established itself as the hub for fish processing facilities in North Sumatra Province that are focused on the export of fishery products, with the total volume of fishery exports from North Sumatra in 2024 reaching 102,707.56 metric tons. However, the implementation of quality and safety control for fishery products at fish raw material supplier units is still not fully effective, which will affect the quality of the fish raw materials supplied to fish processing units, potentially leading to rejection by processing companies or export destination countries. This study aims to formulate strategies that can improve quality control and safety of fishery products at supplier units to produce export-quality fish in the city of Medan. This study employs a quantitative and descriptive qualitative approach to obtain a comprehensive overview of the actual level and conditions regarding the implementation of quality control and safety of fishery products at supplier units, thereby enabling the identification of internal and external factors in strategy formulation. Research data were obtained from the status of quality control and safety of fishery products at the Fish Processing Unit (UPI), observations, and interviews. The research sample consisted of 55 respondents, including representatives from fish supplier units, fish processing units, and Fisheries Product Quality Inspectors. In formulating strategies, the IFE and EFE Matrix Analyses, SWOT Analysis, and QSPM Matrix were used. In the IFE-EFE Matrix, weighting is determined based on how important the identified factors are for achieving the goal of improving quality control at suppliers, while ratings are determined based on how effectively current conditions address those factors. The assessments were conducted by the study's respondents. The results of the IFE and EFE Matrix analysis are as follows: Strengths (S) = 1.752; Weaknesses (W) = 0.562; Opportunities (O) = 2.077; Threats (T) = 1.442. Thus, quality control and safety of fishery products at suppliers are progressing positively, with 18 alternative strategies. A QSPM analysis was conducted to identify the highest TAS value, indicating the

most attractive strategy to implement, taking into account all identified strategic factors. Consequently, the priority strategy is to increase routine outreach regarding CPIB and HACCP certifications for suppliers by the Competent Authority to meet the requirements of export destination countries, with the highest TAS value of 4.287.

Keywords: Fish Raw Materials, Fishery Products, QSPM, Quality Control, Suppliers

ABSTRAK

Kota Medan sebagai pintu utama dalam kegiatan eksportir hasil perikanan Provinsi Sumatera Utara melalui Pelabuhan Internasional Belawan mendorong kota ini sebagai sentra keberadaan unit pengolahan ikan di Provinsi Sumatera Utara yang berorientasi pada ekspor hasil perikanan dengan jumlah ekspor hasil perikanan tahun 2024 dari Sumatera Utara mencapai 102.707,56 ton. Namun, pelaksanaan pengendalian mutu dan keamanan hasil perikanan di unit *supplier* bahan baku ikan masih belum sepenuhnya berjalan dengan baik, yang akan berpengaruh pada kualitas bahan baku ikan yang akan dipasok ke Unit Pengolahan Ikan, sehingga berpotensi mengalami penolakan dari perusahaan pengolahan maupun negara tujuan ekspor. Penelitian ini bertujuan merumuskan strategi yang dapat meningkatkan pengendalian mutu dan keamanan hasil perikanan di unit *supplier* untuk menghasilkan ikan bermutu ekspor di Kota Medan. Jenis penelitian ini adalah kuantitatif dan deskriptif kualitatif untuk memperoleh gambaran yang komprehensif terkait tingkat dan kondisi sebenarnya mengenai penerapan pengendalian mutu dan keamanan hasil perikanan di *supplier* sehingga mampu menentukan faktor internal maupun eksternal dalam perumusan strategi. Data penelitian diperoleh dari status pengendalian mutu dan keamanan hasil perikanan di UPI, observasi dan wawancara. Sampel penelitian berjumlah 55 responden yang terdiri dari pihak unit *supplier* ikan, unit pengolahan ikan dan Inspektur Mutu Hasil Perikanan. Dalam merumuskan strategi menggunakan Analisis Matriks IFE dan EFE, Analisis SWOT dan Matriks QSPM. Dalam Matriks IFE-EFE dalam penentuan bobot dilihat dari seberapa penting faktor yang diidentifikasi untuk mencapai tujuan peningkatan pengendalian mutu di *supplier*, sedangkan penentuan rating dilihat dari seberapa efektif kondisi saat ini dalam merespon faktor yang ada. Penilaian dilakukan oleh responden dalam penelitian. Hasil analisis Matriks IFE dan EFE yaitu Strengths (S) = 1.752 ; Weaknesses (W) = 0.562; Opportunities (O) = 2.077; Threats (T) = 1.442, sehingga pengendalian mutu dan keamanan hasil perikanan di *supplier* bersifat progresif dengan 18 alternatif strategi. Analisis QSPM untuk mencari nilai TAS tertinggi yang menunjukkan strategi yang lebih menarik untuk diterapkan dengan pertimbangan semua faktor strategis yang diidentifikasi sehingga strategi prioritas adalah peningkatan sosialisasi secara rutin mengenai sertifikat CPIB dan HACCP *supplier* oleh Otoritas Kompeten guna memenuhi persyaratan negara tujuan ekspor dengan nilai TAS tertinggi sebesar 4,287.

Kata Kunci: Bahan Baku Ikan, Hasil Perikanan, Pengendalian Mutu, QSPM, *Supplier*

INTRODUCTION

Medan City, the capital of North Sumatra Province, occupies a highly strategic position; it borders the Strait of Malacca to the north and houses one of Indonesia's largest ports, Belawan International Port, which serves as the primary gateway for exporting North Sumatra's fishery products (Medan City Government, 2025). The fishery sector in North Sumatra Province holds significant economic potential; in 2024, fishery product exports from the province reached 102,707.56 tons, and its processed fish output—totaling 719,285 tons—ranked fourth highest in Indonesia (Ministry of Marine Affairs and Fisheries, 2025).

In the context of fish processing, raw fish and fish products require rapid, hygienic, and careful handling while maintaining the cold chain to ensure the quality of the raw material

(Handoko & Yuniarti, 2023). Fish and fish products must be handled according to four key principles: cleanliness, careful handling, cold chain maintenance, and rapid processing (Pratama et al., 2024). Fishery products move through an extensive process chain, involving a supply chain that transports raw fish to processing units before distribution to consumers via local markets or export channels. Effective management of this process chain—in terms of both value and cost—enables the fish processing industry to achieve a strong competitive advantage (Irawati et al., 2019).

A Fish Processing Unit (UPI) is a facility designated for fish handling and/or processing activities. Medan serves as a hub for Fish Processing Units (UPI), playing a vital role in the national fish raw material supply chain and offering significant potential for a fish processing industry capable of producing high-quality fishery products for export markets. CPIB (Good Fish Handling Practices) constitutes a set of procedures designed to meet quality assurance and safety requirements for fishery products. Suppliers can obtain CPIB certification by implementing Sanitation Standard Operating Procedures (SSOP) and Good Manufacturing Practices (GMP) (Minister of Marine Affairs and Fisheries Regulation No. 52 of 2018).

Consumers in developed nations are increasingly attentive to the quality and safety of the products they purchase, highlighting the critical importance of these aspects in fishery products (Irawati et al., 2019). Laboratory test results—covering raw fish supplied to UPIs, finished products, and the water and ice used in sanitation processes—have revealed instances of non-compliance with applicable standards. Issues include microbiological parameters and chemical factors such as heavy metals and antibiotics; such non-compliance hinders fishery product exports and creates a risk of rejection by destination countries.

Strict quality and safety controls across the entire supply chain—from upstream to downstream—are essential to ensure fishery products meet the requirements of export destination countries (Sasono et al., 2025). UPIs and suppliers often face challenges regarding CPIB or HACCP certification, including costs, infrastructure limitations, and a lack of awareness regarding the importance of certification for ensuring fishery product safety, particularly in the upstream sector. Raw material suppliers often assume that they can continue supplying fish to UPIs or selling to local markets without such certification. Conversely, UPIs are often reluctant to pressure suppliers to obtain quality control certification, fearing that doing so might disrupt the supply of raw fish.

Issues regarding the implementation of quality and safety controls for fishery products in the upstream sector—compounded by discrepancies between laboratory test results and established quality standards—impact both suppliers and fish processing units (FPUs). Suppliers face the risk of having their raw materials rejected by FPUs, while FPUs may produce finished goods that fail to meet the requirements of export destination countries. This study aims to analyze the raw fish supplied to FPUs, assess the level of quality and safety control for raw fish within these units, and develop strategies to enhance quality and safety controls at the supplier level, thereby ensuring the production of export-quality fish.

RESEARCH METHODS

The research was conducted involving raw material suppliers, HACCP-certified Fish Processing Units (UPI) in Medan City, and Fishery Product Quality Inspectors from the Medan City BPPMHKP. The study spanned three months, from November 2025 to January 2026. Samples were selected using purposive sampling—a technique for selecting data sources based on specific criteria (Sugiyono, 2023). These criteria targeted individuals possessing knowledge of fishery product quality and safety control, or those directly involved in such activities: specifically, raw fish material suppliers, fish processing business operators (who act as recipients of raw fish materials), and Fishery Product Quality Inspectors responsible for supervising the implementation of quality and safety controls at both supplier and processing

unit levels. The study population comprised raw fish material suppliers registered with Fish Processing Units (UPI) in Medan City, the Fish Processing Units themselves, and Fishery Product Quality Inspectors in Medan City. The sample consisted of 32 fish raw material suppliers, 10 Fish Processing Units (UPI), and 13 Fishery Product Quality Inspectors.

This study employs a mixed-methods approach, combining quantitative and qualitative methods. Quantitative research involves studying a specific population or sample using research instruments, with data analysis conducted through quantitative or statistical means (Sugiyono, 2023). Qualitative research is descriptive in nature, aiming to provide an accurate and systematic depiction of phenomena, facts, or events regarding the characteristics of a specific population or region (Hardani et al., 2020). Research data were obtained by examining the quality and safety control status of fishery products at UPIs, conducting direct observations at supplier units and UPIs, and interviewing Fishery Product Quality Inspectors.

To formulate strategies for enhancing quality and safety control of fishery products among raw material suppliers in Medan City, Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) analyses were used to identify the organization's internal and external environmental factors (David, 2011). Subsequently, a SWOT (Strengths–Weaknesses–Opportunities–Threats) analysis was conducted to generate strategic alternatives. Finally, these alternatives were analyzed using the Quantitative Strategic Planning Matrix (QSPM) to identify the best strategy—and the organization's priority—among the options.

RESULT

1. Quality Analysis of Fish Raw Materials Supplied to Fish Processing Units (UPI) in Medan City

Data on raw fish material testing were obtained from official control and internal testing conducted by fish processing units (UPI) between 2025 and the first quarter of 2026 at the SPPMHKP Medan II laboratory and private laboratories accredited by the National Accreditation Committee (KAN). The raw fish and cephalopod samples tested in this study originated from suppliers—both those certified under CPIB/HACCP standards and those without such certification. The test results are presented in the table below:

Table 1. Test Data for Raw Fish Materials from CPIB/HACCP-Certified Suppliers

Parameter	Sample Size	Non-compliant Sample	% failing to meet SNI requirements	Sample Range Invalid	SNI Product Standard	
					Cephalopods	Fish
Microbiology						
ALT (kol/g)	63	1	1.6	1,4x10^5	10^5	10^5
E.Coli (APM/g)	63	0	0		1	1
Salmonella (per 25g)	63	0	0		Negatif	Negatif
Vibrio parahaemolyticus (APM/g)	6	0	0		3	-
Chemistry						
Histamin (mg/kg)	3	0	0			<100
Hg (mg/kg)	9	0	0		0,5	1
Cd (mg/kg)	9	2	22.2	1,28-1,88	1	0,3
Pb (mg/kg)	9	0	0		1	0,4

Table 2. Test data for raw fish materials from suppliers not certified under CPIB/HACCP

Parameter	Sample Size	Non-compliant Sample	% failing to meet SNI requirements	Sample Range Invalid	SNI Product Standard	
					Cephalopods	Fish
Mikrobiologi						
ALT (kol/g)	89	20	22.5	1,2X10^5 - >2,5X10^6	10^5	10^5
E.Coli (APM/g)	89	4	4.5	10-21	1	1
Salmonella (per 25g)	89	0	0		Negatif	Negatif
Vibrio parahaemolyticus (APM/g)	0	0	0		3	-
Kimia						
Histamin (mg/kg)	6	3	50	141-143		<100
Hg (mg/kg)	6	0	0		0,5	1
Cd (mg/kg)	6	4	67	1,01-6,41	1	0,3
Pb (mg/kg)	6	0	0		1	0,4

2. Level of Quality and Safety Control for Raw Fishery Materials at Fish Processing Units (FPUs) in Medan City

Quality control encompasses all activities—including inspection, verification, surveillance, auditing, and sampling—aimed at ensuring the quality and safety of fishery products (Government Regulation No. 57 of 2015). Data regarding the level of implementation of quality and safety controls for fishery products at supplier units and fish processing units are presented in the table below:

Table 3. Level of Implementation of Quality and Safety Controls for Fishery Products at Supplier Units

No	Question	Criteria	Supplier K	Supplier A	Supplier M	Supplier D	% Implementation Rate
			CPIB-certified	Not yet CPIB-certified	Not yet CPIB-certified	Not yet CPIB-certified	
1	Implementation of Handling and Processing	Implementation	1	1	1	1	100
		Documentation	0	0	0	0	0
2	Packaging and Labeling	Implementation	1	1	1	1	100
		Documentation	0	0	0	0	0
3	Storage	Implementation	1	1	1	1	100
		Documentation	1	1	1	1	100
4	Distribution and Transportation	Implementation	1	1	1	1	100
		Documentation	1	1	1	1	100
5	Employee training	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
6	Water and ice safety	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
7		Implementation	0	0	0	0	0

	Surfaces in direct contact with the product	Documentation	0	0	0	0	0
8	Prevention of cross-contamination	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
9	Employee sanitation and disinfection facilities	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
10	Protection of products, packaging, or equipment from contaminants	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
11	Labelling, Storage and Use of Hazardous Chemicals	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
12	Employee health and hygiene	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0
13	Pest control	Implementation	0	0	0	0	0
		Documentation	0	0	0	0	0

Description:
Value 1: Suitable
Score 0: Not Suitable

Table 4. Level of Implementation of Quality Control and Safety of Fishery Products at UPI

No	Question	Criteria	UPI A Grade B	UPI B Grade A	UPI C Grade B	% Implementation Rate
1	Supplier control	Implementation	1	1	1	100
		Documentation	1	1	1	100
2	Implementation of traceability	Implementation	0	1	0	33
		Documentation	1	1	1	100
3	Implementation of Handling and Processing	Implementation	0	0	1	33
		Documentation	1	1	0	67
4	Packaging and Labeling	Implementation	1	1	1	100
		Documentation	1	1	1	100
5	Storage	Implementation	0	1	0	33
		Documentation	1	1	1	100
6	Distribution and Transportation	Implementation	1	1	1	100
		Documentation	1	1	1	100
7	Employee training	Implementation	1	1	1	100
		Documentation	1	1	1	100
8	Water and ice safety	Implementation	1	1	0	67
		Documentation	1	1	1	100
9	Surfaces in direct contact with the product	Implementation	1	1	1	100
		Documentation	1	1	1	100

10	Prevention of cross-contamination	Implementation	0	0	0	0
		Documentation	1	1	1	100
11	Employee sanitation and disinfection facilities	Implementation	0	1	0	33
		Documentation	1	1	1	100
12	Protection of products, packaging, or equipment from contaminants.	Implementation	1	1	1	100
		Documentation	1	1	1	100
13	Labelling, Storage and Use of Hazardous Chemicals	Implementation	1	1	1	100
		Documentation	1	0	1	67
14	Employee health and hygiene	Implementation	1	1	1	100
		Documentation	1	1	1	100
15	Pest control	Implementation	0	1	0	33
		Documentation	1	1	1	100
16	Implementation of HACCP	Implementation	1	1	1	100
		Documentation	1	1	1	100

Description:
Score 1: Suitable
Score 0: Not Suitable

3. Identification of Internal and External Factors

Data regarding the evaluation of internal and external factors were obtained through data collection and interviews with respondents involved in fish quality control at the supplier level—specifically raw material supplier units, fish processing units (UPI), and the competent authority (Fishery Product Quality Inspectors in Medan City). The results of the internal and external factor evaluations are presented in the table below:

Table 5. IFE Matrix for Quality Control at Fish Suppliers in Medan City

	Internal Factors	Weight	Rating	Score
Strength				
1	The presence of the Quality Agency's Technical Implementation Unit (UPT) in Medan City, which is tasked with controlling the quality and safety of fishery products from upstream to downstream.	0.064	4	0.256
2	The presence of competent Fishery Product Quality Inspectors responsible for the CPIB and HACCP certification of suppliers.	0.064	4	0.256
3	The willingness of Fish Processing Units (FPUs) to assist suppliers in implementing quality and safety controls for fishery products.	0.061	4	0.244
4	Quality control and quality assurance of fishery products at supplier units serve as key performance indicators for the Quality Agency's technical implementation unit in Medan City.	0.062	4	0.248
5	There is an accredited laboratory for testing the quality of fish raw materials.	0.064	4	0.256
6	No-cost processing for CPIB and HACCP supplier certification.	0.061	4	0.244
7	There are clear regulations regarding CPIB and HACCP supplier certification procedures.	0.062	4	0.248
	Subtotal	**0.438**		**1.752**
Weakness				

1	Lack of understanding among employees in the supplier unit regarding CPIB or supplier HACCP.	0.062	1	0.062
2	Lack of willingness from supplier unit owners to implement CPIB or supplier HACCP.	0.061	1	0.061
3	Budgetary constraints of the Competent Authority (Quality Assurance Unit) in Medan City regarding the supervision and certification of CPIB and HACCP for suppliers.	0.062	1	0.062
4	Supplier units still face a lack of capital or financing for implementing quality and safety controls for fishery products.	0.062	1	0.062
5	Inadequate facilities and infrastructure at supplier units for implementing quality and safety controls for fishery products.	0.063	1	0.063
6	The implementation of a traceability system for fish raw materials cannot be fully guaranteed at supplier units.	0.062	1	0.062
7	Suppliers still consider the licensing process for CPIB and HACCP certification to be very difficult.	0.062	1	0.062
8	Limited number of Fishery Product Quality Inspectors assigned to the certification and oversight of CPIB and supplier HACCP implementation.	0.063	1	0.063
9	Limited data on fish suppliers and difficulties for the Competent Authority in directly accessing supplier units.	0.063	1	0.063
	Subtotal	**0.562**		**0.562**
	TOTAL NUMBER	**1.000**		**2.314**

Table 6. EFE Matrix for Quality Control at Fish Suppliers in Medan City

	External Factors	**Weight**	**Rating**	**Score**
Opportunities				
1	Opening markets for fishery products to various export destinations.	0.076	4	0.304
2	Increasing buyer confidence, thereby enhancing the competitiveness of fishery products in export destination countries.	0.077	4	0.306
3	Utilization of technology for the implementation of a fish raw material traceability system.	0.077	4	0.309
4	Meeting the requirements of European export destination countries to reopen access for new UPI registration.	0.068	4	0.272
5	Increasing the income of raw fish suppliers	0.077	4	0.306
6	Medan as the hub for UPI's operations.	0.077	4	0.309
7	Improving the quality of fish in the domestic market	0.068	4	0.272
	Subtotal	**0.519**		**2.077**
Threats				
1	Fluctuations in raw fish prices	0.067	3	0.201
2	Quality of raw materials not meeting fish quality requirements	0.077	3	0.232
3	Meeting the requirements for CPIB or HACCP supplier certification entails significant costs.	0.068	3	0.204
4	Rejection of fish raw material supplies from suppliers by the fish processing unit (UPI)	0.067	3	0.201
5	Laboratory test results for raw materials that do not meet standards	0.067	3	0.200

6	Rejection by destination countries due to fishery products failing to meet quality and safety requirements.	0.068	3	0.204
7	Limited supply of raw fish to supplier units.	0.067	3	0.201
	Subtotal	**0.481**		**1.442**
	TOTAL NUMBER	**1.000**		**3.519**

4. SWOT analysis (Strengths – Weaknesses – Opportunities – Threats)

SWOT quadrant positioning was determined based on the total scores from the IFE and EFE matrices, with the aim of enhancing quality and safety control for fishery products among suppliers in Medan City. The values obtained for the internal and external factors were: Strengths (S) = 1.752, Weaknesses (W) = 0.562, Opportunities (O) = 2.077, and Threats (T) = 1.442. These values are represented on a SWOT diagram at coordinates (x, y) = (1.19, 0.635), indicating the positioning of quality and safety control for fishery products among suppliers in Medan City, as shown in the figure below:

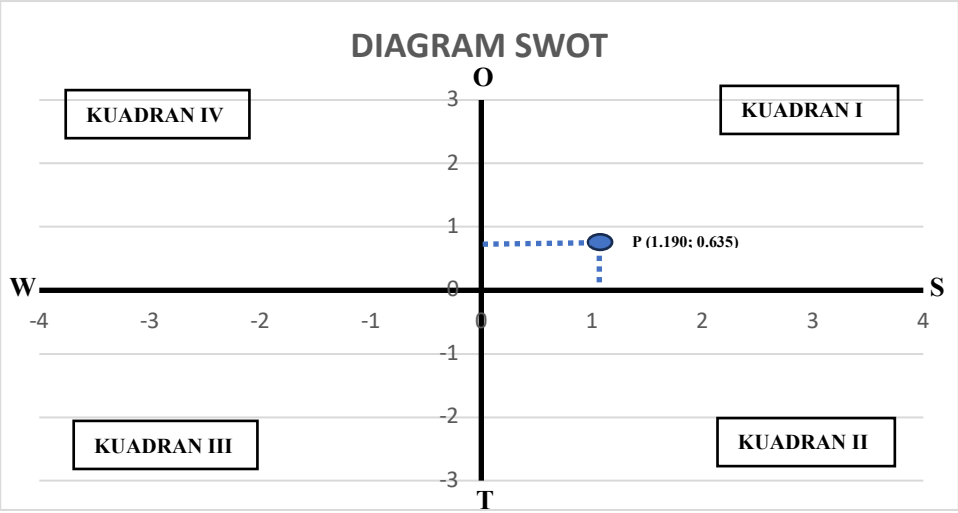

Figure 1. SWOT diagram of quality control at suppliers in the city

The diagram above shows that the position of quality and safety control for fishery products among suppliers in Medan City falls within Quadrant I.
The SWOT matrix analysis is presented in the table below:

Table 7. SWOT Matrix for Quality Control among Fish Suppliers in Medan City

	STRENGTHS (S)	**WEAKNES (W)**
	1. The presence of the Quality Agency's Technical Implementation Unit (UPT) in Medan City, which is tasked with controlling the quality and safety of fishery products from upstream to downstream. 2. The presence of competent Fishery Product Quality Inspectors responsible for the CPIB and HACCP certification of suppliers. 3. The willingness of Fish Processing Units (FPUs) to assist suppliers in implementing quality and safety controls for fishery products.	1. Lack of understanding among employees in the supplier unit regarding CPIB or supplier HACCP. 2. Lack of willingness on the part of supplier unit owners to implement CPIB or HACCP. 3. Budgetary constraints of the Competent Authority (Quality Assurance Unit) in Medan City regarding the supervision and certification of CPIB and HACCP for suppliers. 4. Supplier units still face a lack of capital or financing for

	4. Quality control and quality assurance of fishery products at supplier units serve as key performance indicators for the Quality Agency's technical implementation unit in Medan City. 5. There is an accredited laboratory for testing the quality of fish raw materials. 6. No-cost processing for CPIB and HACCP supplier certification. 7. The existence of clear regulations regarding CPIB and HACCP certification procedures for suppliers.	implementing quality and safety controls for fishery products. 5. Inadequate facilities and infrastructure at supplier units for implementing quality and safety controls for fishery products. 6. The implementation of a traceability system for fish raw materials cannot be fully guaranteed at supplier units. 7. Suppliers still consider the licensing process for CPIB and HACCP certification to be very difficult. 8. Limited number of Fishery Product Quality Inspectors assigned to the certification and oversight of CPIB and supplier HACCP implementation. 9. Limited data on fish suppliers and difficulties for the Competent Authority in directly accessing supplier units.
OPPORTUNITIES (O) 1. Opening markets for fishery products to various export destinations. 2. Increasing buyer confidence, thereby enhancing the competitiveness of fishery products in export destination countries. 3. Utilization of technology for the implementation of a fish raw material traceability system. 4. Meeting the requirements of European export destination countries to reopen access for new UPI registration. 5. Increasing the income of raw fish suppliers. 6. Medan as the hub for UPI's operations. 7. Improving fish quality in the domestic market.	**S-O Strategy** 1. The Competent Authority regularly conducts outreach to fish raw material supplier units regarding the importance of CPIB and HACCP Supplier certification, especially in meeting the requirements of export destination countries (S1, S2, S4, S7, O1, O2, O4). 2. Providing convenience in fishery product quality certification services for UPIs that have successfully encouraged supplier units in CPIB and HACCP Supplier certification (S1, S2, S3, S4, S5, S6, S7, O1, O2, O4, O5, O6, O7). 3. Developing an integrated application system between CPIB certification management, laboratory testing and a fish raw material traceability system that can be used up to the supplier unit (S1, S2, S4, S5, S6, S7, O1, O2, O3, O4, O6, O7). 4. Create a monitoring program through routine surveillance by the Fishery Product Quality Inspector to the raw material supplier units (S1, S2, S3, S4, S5, S6, S7, O1, O2, O3, O4, O6, O7). 5. Requires all UPIs to supply raw fish materials from certified suppliers (S1, S2, S3, S4, S5, S6, S7, O1, O2, O3, O4, O6, O7).	**W-O Strategy** 1. Conducting training by the Competent Authority or involving UPI to supplier units related to CPIB or HACCP Supplier (W1, W2, W6, W7, O1, O2, O3, O4, O5, O6, O7). 2. Proposing an increase in the Competent Authority budget and additional personnel for Fishery Product Quality Inspectors in Medan City (W3, W8, O1, O2, O3, O4, O5, O6, O7). 3. Opening access to business financing for small-scale supplier units (W4, W5, O1, O2, O3, O4, O5, O6, O7). 4. Building a supplier data system that is integrated with UPI data that can be accessed by Competent Authorities (W6, W9, O1, O2, O3, O4, O6, O7). 5. Providing a Helpdesk to supplier and UPI business actors regarding Supplier CPIB and HACCP information (W2, W7, O1, O2, O3, O4, O6).
THREATHS (T) 1. Fluctuations in raw fish prices. 2. Quality of raw materials not meeting fish quality requirements. 3. Meeting the requirements for CPIB or HACCP supplier certification entails significant costs. 4. Rejection of fish raw material supplies from suppliers by the fish processing unit (UPI).	**S-T Strategy** 1. Optimizing the supervision of the implementation of CPIB or HACCP Supplier by Fishery Product Quality Inspectors (S1, S2, S4, S7, T2, T4, T5, T6) 2. Strengthening Quality Inspector supervision to UPI regarding the consistency of receiving fish raw materials from CPIB or HACCP Supplier certified suppliers (S1, S2, S4, S7, T2, T4, T5, T6)	**W-T Strategy** 1. 2. Increase cooperation with UPI to assist supplier units in CPIB or HACCP Supplier certification (W1, W2, W3, W4, W7, W8, T2, T3, T4, T5, T6) 3. Strengthening the role of laboratories at UPT and UPI to verify the quality of raw fish materials to final products (W3, W8, T2, T4, T5, T6)

5. Laboratory test results for raw materials that do not meet standards. 6. Rejection by destination countries due to fishery products failing to meet quality and safety requirements. 7. Limited supply of raw fish to supplier units.	3. Strengthening the role of the laboratory as the initial gateway that guarantees the quality of fish raw materials (S1, S2, S3, S4, S5, S7, T2, T4, T5, T6) 4. Socialization regarding the processing of CPIB and HACCP Supplier certification is free of charge (S1, S2, S6, T3) 5. Encourage UPI to provide competitive price certainty for fish raw materials originating from suppliers who have been certified by CPIB or HACCP Supplier (S1, T1, T7)	4. Adding critical points as findings of non-conformity in the implementation of quality control at suppliers in every quality control activity at UPI by the Competent Authority (W3, W8, W6, W8, W9, T4, T5, T6)

5. QSPM Matrix (Quantitative Strategic Planning Matrix)

The QSPM matrix calculations yield a ranking of alternative strategies that can be adopted, based on the highest Total Attractiveness Score (TAS). The higher the TAS, the more attractive the strategy is for prioritization. The ranking of alternative strategies based on TAS values is presented in the table below:

Table 8 Quality Control Strategies for Fish Suppliers in Medan City

RANGKING	STRATEGY	TAS
1	The Competent Authority regularly conducts outreach to fish raw material suppliers regarding the importance of CPIB and HACCP Supplier certification, particularly for meeting the requirements of export destination countries.	4.287
2	Requires all Fish Processing Units (UPI) to source raw fish materials from certified suppliers.	4.180
3	Proposing a budget increase for the Competent Authority and an increase in the number of Fishery Product Quality Inspectors in Medan City.	4.077
4	Strengthen Quality Inspector oversight of Fish Processing Units (UPI) regarding the consistency of raw fish intake from suppliers certified under CPIB or HACCP standards.	3.860
5	Strengthening the role of laboratories at both UPTs and UPIs in verifying the quality of raw fish materials through to the final product.	3.799
6	Strengthening the role of the laboratory as the initial checkpoint ensuring the quality of raw fish materials.	3.798
7	Developing an integrated application system covering CPIB certification management, laboratory testing, and a fish raw material traceability system that extends to the supplier level.	3.725
8	Conducting training by the Competent Authority or involving Fish Processing Units (UPI) with their suppliers regarding CPIB (Good Handling Practices) or HACCP for suppliers.	3.418
9	Optimizing the supervision of CPIB or Supplier HACCP implementation by Fishery Product Quality Inspectors.	3.220
10	Adding critical points as non-conformity findings regarding the implementation of quality control at the supplier during every quality oversight activity conducted by the Competent Authority at the Fish Processing Unit (UPI).	3.064
11	Establishing a routine surveillance and oversight program to be conducted by Fishery Product Quality Inspectors at raw material supplier units.	2.627
12	Enhancing cooperation with UPI to assist supplier units in obtaining CPIB or HACCP certification.	2.608
13	Providing a helpdesk for suppliers and Fish Processing Units (UPI) regarding information on CPIB and HACCP.	2.568
14	Opening access to business financing for small-scale supplier units.	2.290
15	Building a supplier data system that is integrated into UPI data that can be accessed by the Competent Authority	2.180

16	There is no charge for the information session regarding the processing of CPIB and HACCP supplier certifications.	2.130
17	Encouraging fish processing units (UPI) to provide guaranteed competitive prices for raw fish sourced from suppliers certified under CPIB or HACCP standards.	1.649
18	Facilitating quality certification services for fishery products for Fish Processing Units (UPI) that successfully encourage their supplier units to obtain CPIB and HACCP Supplier certifications.	1.624

DISCUSSION

Quality Analysis of Fish Raw Materials Supplied to Fish Processing Units (UPI) in Medan City

Most fish raw materials supplied by CPIB/HACCP-certified suppliers met the quality requirements of the Indonesian National Standard (SNI); only one sample failed to meet SNI standards regarding the microbiological parameter of Total Plate Count (TPC), and two samples failed regarding Cadmium (Cd) levels (National Standardization Agency, 2023). In contrast, a higher number of fish raw materials from non-certified suppliers failed to meet SNI standards across several parameters: 20 samples failed the TPC test, 4 failed for *Escherichia coli*, 3 failed for histamine, and 4 failed for Cadmium (Cd) (National Standardization Agency, 2020).

Quality refers to product characteristics that are significant for consumer acceptance (FAO, 2015). Laboratory test results serve as a quality assurance measure for fishery products, ensuring they are safe for consumption and meet product specifications. The high number of raw fish samples from non-certified suppliers showing elevated TPC levels indicates improper handling at the supplier level, particularly regarding hygiene and cold chain maintenance. Bacterial growth accelerates rapidly if immediate cooling is not implemented (Gram & Huss, 1996).

The detection of Escherichia coli in raw fish samples also indicates deficiencies in the application of proper sanitation during handling at the supplier level (Sudaryatma et al., 2025). Escherichia coli contamination can originate from human sources, contaminated water used for washing raw materials, or poor sanitation practices during handling.

Histamine testing is conducted only on samples from the Scombridae, Clupeidae, Scombresocidae, Pomatomidae, and Coryphaenidae families (National Standardization Agency, 2020). High histamine concentrations in fish indicate temperature deviations and improper handling, leading to contamination by histamine-producing bacteria and temperature increases (Hungerford, 2021). Scombrotoxin (histamine poisoning) remains a risk associated with the consumption of pelagic fish, with poor handling being a primary contributing factor. Cadmium contamination in certain fish raw material samples indicates the presence of heavy metals in the waters where the fish were caught. As a heavy metal, cadmium does not dissipate from fish once they are contaminated. Cadmium enters the fish's body through the surrounding water, sediment, and ingested food. Sources of cadmium contamination in aquatic environments include diesel fuel spills from vessels, household waste, engine lubricants from transportation activities, and residues from ship paint (Siregar et al., 2020). The most effective way to prevent contamination of fish raw materials is to implement monitoring of water bodies for heavy metals and to monitor suppliers operating in fishing grounds identified as having heavy metal contamination.

Food safety refers to the conditions or measures implemented to prevent food from potential biological, chemical, or physical hazards that could impair, harm, or endanger human health (Pratama et al., 2025). As a food product, fishery products must be handled according to proper handling principles to ensure they are of high quality and safe for consumption.

In general, a comparison between raw fish suppliers holding CPIB/HACCP certification and those without it reveals that the quality of raw materials supplied by certified vendors is superior. Suppliers can obtain CPIB certification by implementing Sanitation Standard Operating Procedures (SSOP) and Good Manufacturing Practices (GMP) (Ministry of Marine Affairs and Fisheries Regulation No. 52 of 2018). This demonstrates that CPIB certification and the consistent application of quality control measures by suppliers positively impact the quality of the raw materials they provide.

Level of Quality and Safety Control for Raw Fishery Materials at Fish Processing Units (FPUs) in Medan City

Assessments of quality control and safety implementation levels at supplier units generally reveal shortcomings regarding both the application and documentation of these controls. Common weaknesses identified among supplier units include inadequate facilities, insufficient employee training, substandard sanitation of equipment and personnel, and a lack of control over the safety of water and ice used during processing, as well as pest control and employee health management. Supplier units—predominantly operated by small-scale fishery businesses—also face challenges regarding a lack of working capital, which limits their ability to implement quality control and safety systems for fishery products. The relatively low level of implementation increases the likelihood of non-compliance regarding the quality of raw materials supplied to fish processing units. This aligns with laboratory analysis results for raw fish supplied by units in Medan City, which frequently show non-compliance with raw material standards regarding microbiological and chemical parameters.

In contrast, the level of quality control and safety implementation at Fish Processing Units (UPI) generally meets requirements corresponding to their HACCP ratings, particularly regarding HACCP application. Critical control points in the processing stages are subject to routine monitoring and verification by Quality Control (QC) personnel. HACCP controls at the UPI are managed by employees who have completed Basic HACCP training. Integration with prerequisite programs—specifically Good Manufacturing Practices (GMP) and Standard Sanitation Operating Procedures (SSOP)—provides a robust foundation for HACCP implementation (Mamuaja, 2016).

The primary focus of quality control and safety measures at the UPI that directly relates to the supplier sector involves supplier control points and the implementation of traceability. The ability to track the origin and movement of fishery products throughout the supply chain is crucial for ensuring the safety and authenticity of the products reaching consumers (Pembayun et al., 2024). UPI's supplier control level stands at 100%, indicating that the company routinely conducts supplier audits and approvals to ensure that supplied raw materials meet quality requirements.

Analysis of quality and safety controls for fishery products supplied to UPI reveals weaknesses in quality control implementation within the upstream sector, creating a potential risk of raw materials failing to meet fish quality standards. Supplier control through routine audits is a crucial measure employed by UPI to guarantee that raw materials supplied by vendors meet the required quality specifications..

Identification of Internal and External Factors

An assessment of the internal conditions regarding quality and safety control of fishery products among suppliers in Medan City yielded a strength factor score of 1.752 and a weakness factor score of 0.562, resulting in a total weighted score of 2.314. This figure falls below the average of 2.50, indicating that efforts to improve quality and safety control within these supplier units have not yet succeeded in leveraging existing strengths or overcoming current weaknesses.

Regarding the assessment of external conditions, the quality and safety control of fishery products among suppliers in Medan City yielded an opportunity factor score of 2.077 and a threat factor score of 1.442, resulting in a total weighted score of 3.519. This figure exceeds the average of 2.50, indicating that in their efforts to enhance quality and safety control, supplier units in Medan City are capable of capitalizing on available opportunities and are reasonably adept at avoiding the threats they face.

SWOT Analysis

The position regarding quality and safety control of fishery products among suppliers in Medan City falls within Quadrant I. This indicates a strong position with significant opportunities for improvement, thereby warranting a progressive strategic recommendation. This positioning also implies that the organizations and stakeholders involved in quality and safety control are advantageously situated, enabling them to leverage internal strengths to capitalize on external opportunities in pursuit of their objectives.

QSPM Prioritization Strategy

The QSPM (Quantitative Strategic Planning Matrix) provides an objective analysis to identify the best or most suitable strategic alternative for a company or organization, utilizing inputs from the Stage 1 analysis (IFE and EFE matrices) and matching results from Stage 2 (such as the SWOT matrix). The QSPM calculation yields a ranking of strategic alternatives based on their Total Attractiveness Score (TAS); the higher the TAS, the more attractive the strategy is for prioritization.

Three strategic alternatives achieved the highest TAS values—exceeding 4.00. The strategy involving the Competent Authority routinely conducting outreach to fish raw material suppliers regarding the importance of CPIB and HACCP certification achieved a TAS of 4.287. As the authorized body responsible for ensuring the quality and safety of fishery products, the Competent Authority plays a pivotal role in enhancing quality and safety controls through outreach to suppliers. The objective is to foster an understanding of the benefits of CPIB and HACCP certification for raw material quality, as well as their role in regulatory compliance and meeting quality requirements—particularly those of export destination countries. This initiative is expected to encourage suppliers to pursue CPIB or HACCP certification.

The strategy requiring all Fish Processing Units (UPI) to source raw materials exclusively from certified suppliers achieved a TAS of 4.180. As primary partners to suppliers, UPIs can be a key driving force in encouraging their suppliers to obtain certification. Through the Competent Authority's routine oversight of UPIs—aimed at guaranteeing the quality of marine and fishery products—raw material traceability emerges as a critical inspection point that influences quality control in the upstream sector. This oversight encourages UPIs to mandate that their raw material supplies come from certified sources.

The strategy involves proposing a budget increase for the Competent Authority and the recruitment of additional Fishery Product Quality Inspectors in Medan City, with a TAS value of 4.077. The Competent Authority’s execution of duties—encompassing guidance, outreach, certification, and oversight to control the quality and safety of fishery products in the upstream sector—naturally requires an adequate budget. Sufficient funding will drive an increase in certification and oversight activities regarding the quality and safety of fishery products at raw material supplier sites.

CONCLUSION

Based on research regarding alternative strategies for quality and safety control of fishery products at suppliers in Medan City, the following conclusions can be drawn:

1. A comparison of raw material quality reveals that materials supplied by vendors holding CPIB/HACCP certification are superior to those from non-certified suppliers. This indicates that supplier certification (CPIB/HACCP) and the consistent implementation of quality control measures have a positive impact on the quality of the raw materials provided.
2. The quality and safety control levels for fish raw materials at three Fish Processing Units (UPIs) meet the requirements corresponding to their respective HACCP grades. In contrast, the quality and safety control levels for fish raw materials among four raw material suppliers are generally low. Low levels of quality and safety control within the supplier sector increase the likelihood of non-compliance regarding the quality of raw materials supplied to the UPIs.
3. Based on the IFE and EFE matrix analysis—yielding values of Strengths (S) = 1.752, Weaknesses (W) = 0.562, Opportunities (O) = 2.077, and Threats (T) = 1.442—the quality and safety control of fishery products at the supplier level falls into Quadrant I (progressive), presenting 18 strategic alternatives. The QSPM analysis identifies the priority strategy as the Competent Authority increasing routine dissemination of information regarding CPIB and HACCP certification to suppliers in order to meet the requirements of export destination countries, with a TAS value of 4.287.

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REFERENCES

Badan Standardisasi Nasional. (2020). *Ikan Beku*.

Badan Standardisasi Nasional. (2023). *Sefalopoda Beku*.

David, F. R. (2011). *Strategic Management, Concepts and Cases. 13th ed*. Pearson Education, Inc, 13, 235–240.

FAO. (2015). *Post-Harvest Issues in Fisheries and Aquaculture Junior Farmer Field and Life School-Facilitator's guide*.

Gram, L., & Huss, H. H. (1996). Microbiological Spoilage of Fish and Fish Products. *International Journal of Food Microbiology*, *33*(1), 121–137. https://doi.org/10.1016/0168-1605(96)01134-8

Handoko, Y. P., & Yuniarti, T. (2023). Penanganan Ikan Hasil Tangkapan di Atas Kapal dan di Pendaratan: Penerapan, Dampak, dan Upaya Perbaikannya. *Jurnal Kelautan dan Perikanan Terapan (JKPT)*, *1*, 123. https://doi.org/10.15578/jkpt.v1i0.12155

Hardani, Ustiawaty, J., Andriani, H., istiqomah, ria, Sukmana, D., Fardani, R., Auliya, N., & Utami, E. (2020). *Buku Metode Penelitian Kualitatif & Kuantitatif*. CV. Pustaka Ilmu.

Hungerford, J. M. (2021). Histamine and Scombrotoxins. *Toxicon*, *201*, 115–126. https://doi.org/10.1016/j.toxicon.2021.08.013

Irawati, H., Kusnandar, F., & D Kusumaningrum, H. (2019). Analisis Penyebab Penolakan Produk Perikanan Indonesia oleh Uni Eropa Periode 2007 – 2017 dengan Pendekatan Root Cause Analysis. *Jurnal Standardisasi*, *21*(2), 149. https://doi.org/10.31153/js.v21i2.757

KKP. (2025). *Data dan Statistik Kementerian Kelautan dan Perikanan Republik Indonesia*. Portaldata.Kkp.Go.Id.

(KKP) Kementerian Kelautan dan Perikanan. (2018). Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 52/PERMEN-KP/2018 Tentang Persyaratan dan Tata Cara Penerbitan Sertifikat Cara Penanganan Ikan Yang Baik di *Supplier*. KKP : Jakarta

Mamuaja, C. F. (2016). *Pengawasan Mutu dan Keamanan Pangan*. Unsrat Press.

Pembayun, L. S., Widodo, K. H., Hajad, M., & Manikharda. (2024). The Development of Traceability Technology in The Fisheries Industry Supply Chain: A Systematic Literature Review. *E3S Web of Conferences*, *589*, 01003. https://doi.org/10.1051/e3sconf/202458901003

Pemko Medan. (2025). *Kondisi Geografis Kota Medan*. Arsip.Medan.Go.Id.

Peraturan Pemerintah No. 57 tahun 2015 tentang Sistem Jaminan Mutu dan Keamanan Hasil Perikanan Serta Peningkatan Nilai Tambah Produk Hasil Perikanan, Jakarta.

Pratama, A., Mayasari, E., Lantu, I. S., Lubis, A. P., Muharman, S. M., Siregar, S. P. S., Resmi, R., Setiavani, A. N. I., & Gusti, H. Y. P. (2024). *Keamanan Pangan Produk Perikanan* (Abdul Karim, Ed.; 1st ed.). Penerbit Yayasan Kita Menulis.

Pratama, A., Prayudi, A., Nurlaela, E., Pradilia, A. D., Alsere, M., Sahaba, B., Nadirah, S., Masengi, S., Mardiah, R. S., Sigalingging, C., Heny, , Purnamasari, B., Yayasan, P., & Menulis, K. (2025). *Pengendalian Mutu dan Kualitas Produk Perikanan* (Iko Mart Nadeak, Ed.). Penerbit Yayasan Kita Menulis.

Sasono, A., Junita, I., & Author, C. (2025). Strategi Pengendalian Mutu dan Keamanan Hasil Perikanan Bahan Baku Udang Vannamei (*Litopenaeus vannamei*) Unit Pengolahan Udang Ekspor di Provinsi Jawa Timur. *R2J*, *7*(2). https://doi.org/10.38035/rrj.v7i2

Siregar, A. S., Sulistyo, I., & Prayogo, N. A. (2020). Heavy Metal Contamination in Water, Sediments and Planiliza Subviridis Tissue in the Donan River, Indonesia. *Journal of Water and Land Development*, *45*, 157–164. https://doi.org/10.24425/jwld.2020.133057

Sudaryatma, P. E., Wiradana, P. A., Razaq, I., Sunarsih, N. L., Jatmiko, A., Permatasari, A. A. A. P., Sari, N. K. Y., Widhiantara, I. G., Sandhika, I. M. G. S., Rosiana, I. W., & Kusala, M. K. J. (2025). Prevalence of Bacterial Contamination on Seafoods Products Collected from Traditional Fish Market in Bali Province During 2023. *Jurnal Pengolahan Hasil Perikanan Indonesia*, *28*(3), 297–309. https://doi.org/10.17844/jphpi.v28i3.61627

Sugiono. (2023). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (Sutopo, Ed.; 2nd ed., Vol. 5). Alfabeta. www.cvalfabeta.com