STRATEGY FOR HANDLING THE QUALITY OF CAUGHT SKIPJACK TUNA TRAWLER SHIP AT PPS KUTARAJA

STRATEGI PENANGANAN DAN MUTU IKAN CAKALANG HASIL TANGKAPAN KAPAL PUKAT LINGKAR DI PPS KUTARAJA

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ABSTRACT

One of the main commodities landed at the Oceanic Fishing Port (PPS) of Kutaraja is skipjack tuna (*Katsuwonus pelamis*), which has high economic value and strong export potential. However, the quality of skipjack tuna landed at PPS Kutaraja often declines due to poor post-harvest handling, such as uncontrolled storage temperatures and inadequate application of a proper cold chain. This study aims to formulate a quality control strategy model for skipjack tuna caught by purse seine vessels at PPS Kutaraja. The research employed descriptive methods and a SWOT analysis to identify internal and external factors systematically. Data were collected through interviews with 14 purse-seine captains and two experts familiar with the port's conditions. Captains were selected using accidental sampling. The findings indicate significant opportunities to improve the quality of skipjack tuna landed at PPS Kutaraja. The proposed strategies include: (1) improving quality control from capture to fish auction sites (TPI), (2) providing training and education on good fish handling practices for fishers, (3) maintaining fish storage temperatures at 0°C until landing, (4) providing funding for the modernization of refrigerated fishing vessels, (5) facilitating certification for purse seine fishing and proper fish handling, (6) collaborating between port authorities and fishers to establish skipjack quality control standards at TPI, (7) enhancing human resources through certified fish handling training, and (8) cooperating between port authorities and vessel owners to design vessels equipped with freezer systems.

Keywords: fish handling, freezer, PPS Kutaraja, skipjack tuna

ABSTRAK

Salah satu komoditas utama yang didaratkan di Pelabuhan Perikanan Samudra (PPS) Kutaraja adalah ikan cakalang (*Katsuwonus pelamis*), yang memiliki nilai ekonomis tinggi serta potensi ekspor yang besar. Namun, kualitas ikan cakalang yang didaratkan sering menurun akibat penanganan pasca-tangkap yang kurang optimal, seperti suhu penyimpanan yang tidak terkontrol dan minimnya penerapan rantai dingin. Penelitian ini bertujuan merumuskan model strategi pengendalian mutu hasil tangkapan cakalang dari kapal pukat lingkar di PPS Kutaraja. Metode yang digunakan adalah deskriptif dan analisis SWOT dengan mengidentifikasi faktor internal dan eksternal secara sistematis. Data dikumpulkan melalui wawancara terhadap 14 orang nahkoda kapal dan dua orang ahli yang memahami kondisi pelabuhan. Responden nahkoda dipilih menggunakan metode *accidental sampling*. Hasil penelitian menunjukkan adanya peluang besar untuk meningkatkan mutu ikan cakalang di PPS Kutaraja. Strategi yang diusulkan meliputi: (1) perbaikan pengendalian mutu sejak proses penangkapan hingga Tempat Pelelangan Ikan (TPI), (2) penyuluhan dan pelatihan penanganan ikan yang baik kepada nelayan, (3) pengendalian suhu penyimpanan pada 0°C hingga proses pendaratan, (4) pendanaan untuk modernisasi armada penangkapan berpendingin, (5) fasilitasi sertifikasi penangkapan dan penanganan ikan, (6) kerja sama antara pengelola pelabuhan dan nelayan dalam menetapkan standar mutu, (7) peningkatan kapasitas SDM melalui sertifikasi, dan (8) kerja sama desain kapal berpendingin antara pengelola pelabuhan dan pengusaha kapal.

Kata kunci: *freezer*, ikan cakalang, penanganan ikan, PPS Kutaraja

INTRODUCTION

Kutaraja Ocean Fishing Port (PPS) is a center for capture fisheries activities that supplies the largest sea fish in Aceh Province. According to the UPTD PPS Kutaraja (2022), the amount of sea fish production landed in 2022 at PPS Kutaraja reached 23,759 tons. Most of it was skipjack tuna (*Katsuwonus pelamis*), reaching 7,263 tons, which came from the catch of the purse seine (Putri 2022). Mallawa *et al.* (2014) stated that skipjack tuna is a type of fish caught for export. Referring to data from the UPTD PPS Kutaraja (2022), the number of purse seine vessels at PPS Kutaraja reached 269 units, or around 53% of the total number of fishing vessels actively operating.

Skipjack tuna (*Katsuwonus pelamis*) is one of the fishery commodities with high economic value, which is classified as a fish that is easily damaged (Litaay and Pelasula 2019). The high histamine content in this fish can cause a significant decrease in quality if not handled properly handling procedures (Febaananto 2023). Histamine is formed through the decarboxylation process of free histidine triggered by the activity of histamine-forming bacteria, especially in storage conditions with uncontrolled temperatures. Therefore, the implementation of a continuous cold chain system, starting from the landing process, handling, processing, storage, to distribution, is very important to inhibit bacterial growth and suppress the activity of the histidine decarboxylase enzyme (Mawaddah *et al.* 2023).

In addition to the histamine issue, recent research results show that the content of heavy metals such as mercury (Hg), lead (Pb), and cadmium (Cd) in the body of skipjack tuna varies depending on the location of capture and water characteristics. Studies conducted in the Bacan waters and the Western Mediterranean Sea indicate that the highest accumulation of heavy metals is found in the liver, while the lowest concentration is found in the meat (Chanto-García *et al.* 2022; Febaananto 2023). These findings underline the importance of monitoring fish quality and heavy metal content to ensure food safety.

Observations at the Kutaraja PPS Fish Auction Place (TPI) show that the quality of skipjack tuna marketed has generally decreased, marked by sunken eye morphology, greyish gill colour, cloudy mucus, soft meat texture, and a sour aroma.

This decline in quality has direct implications for the decline in the selling value of fish on the market, considering that quality is one of the main determinants of the economic value of a fishery product (Nuraini and Putra 2022). Therefore, implementing optimal post-harvest handling, from the catching process to distribution, is crucial in maintaining the quality and competitiveness of skipjack tuna in the market.

The Indonesian government has established some regulations and technical standards related to the post-harvest handling process of fish to ensure the quality and safety of fresh fish food. The Ministry of Marine Affairs and Fisheries (KKP), as the authorized technical agency, has issued Regulation of the Minister of Marine Affairs and Fisheries (PERMEN-KP) Number 7 of 2019, which regulates the requirements and procedures for issuing Certificates of Good Fish Handling Practices (CPIB). In addition, provisions regarding fresh fish quality standards have been formulated in the Indonesian National Standard (SNI) 2729:2021, which contains guidelines for implementing quality assurance and food safety for fresh fish commodities. At the international level, similar references are also included in the 2013 Codex Committee on Fish and Fishery Products compiled by FAO, covering quality standards for fresh fish, frozen fish, and other processed products, including crustaceans and molluscs.

However, neither PERMEN-KP Number 7 of 2019 nor SNI 2729:2021 specifically regulates in detail the procedures for handling skipjack tuna caught using purse-seine fishing gear. This ambiguity indicates the need for more detailed technical guidelines to ensure that the handling of skipjack tuna on board follows applicable principles of quality assurance and food safety.

The problem of declining quality of skipjack tuna at PPS Kutaraja is caused by the absence of a good handling strategy from the time the fish are caught until they are traded at TPI. The results of direct observations show that the handling of skipjack tuna is very poor, both when the fish are lifted onto the ship, stored in the cold room, unloaded from the cold room, and traded. Allowing poor fish handling will harm fishermen and the management at PPS Kutaraja.

Mboto *et al.* (2014) studied the strategy of a good fresh tuna handling system on a fishing vessel at the Donggala

PPI (fish landing base), one of the main recommendations was the procurement of an ice crusher and optimization of tuna utilization in the Makassar Strait waters to improve the quality of the catch. Rossarie *et al.* (2019) studied the handling system of skipjack tuna (*Katsuwonus pelamis*) on a huhate vessel in Sorong City, West Papua, which highlighted the importance of proper handling on board to maintain fish quality, including effective storage and cooling practices. Putri and Manengkey (2024) reviewed the handling process of caught fish and physical damage to the main huhate catch on KM. Inkamina 523, improper handling can cause physical damage to the fish, which has an impact on decreasing quality and selling price. Larasati *et al.* (2024) studied the handling of fish caught on KM Dua Putri 02 at the Kendari Ocean Fishing Port (PPS), Southeast Sulawesi, emphasizing the importance of standard handling procedures and training for crew members to ensure fish quality is maintained from capture to landing. Mustaruddin *et al.* (2022) discussed the sanitation aspect of tuna landings at the Bungus PPS, West Sumatra. Good sanitation at the landing port is very important to prevent contamination and ensure fish quality is maintained before distribution to the market. Overall, these studies confirm that proper post-catch handling, including good storage, cooling, and sanitation, as well as training for crew members, is essential to maintaining the quality of tuna and skipjack tuna.

The solution to maintain good fish quality can be done by first formulating a strategy model. This is done by introducing a skipjack tuna quality handling system on a trawl vessel, starting from when the fish are lifted onto the vessel, before being put into the cooling room, during unloading, until being sold at the TPI PPS Kutaraja. This study aims to formulate a strategy model for handling the quality of skipjack tuna caught by a trawl vessel at PPS Kutaraja. This study hypothesizes that the formulation of a strategy for handling the quality of skipjack tuna can improve the quality of fish caught by trawl vessels based on PPS Kutaraja.

METHODS

Field research was conducted on November 6-30, 2023. The research location was carried out at the Kutaraja Ocean Fisheries Port (PPS), Aceh Province. The research location map can be seen in Figure 1.

Data types and data collection

Types and data collection using 2 methods, namely direct observation and interviews. Direct observation is intended to identify the handling system of skipjack tuna on the trawlers since the fish are loaded onto the ship, before being put into the cooling room, unloaded, and traded at the TPI PPS Kutaraja. Interviews were conducted with 14 trawler captains who carried out fishing operations in November. All samples of trawlers used the accidental sampling technique. In addition to interviews with the captains, data collection was also obtained from the Head of PPS Kutaraja and the harbor master, as parties who understand the conditions at the port.

Data analysis

All data were analyzed using two methods, namely the descriptive method and the SWOT approach. A descriptive method was used to analyse the skipjack tuna handling system on purse seine vessels. Meanwhile, SWOT analysis was conducted through Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices to identify and evaluate strengths and weaknesses in formulating a strategy for controlling the quality of skipjack tuna caught by purse-seine vessels at PPS Kutaraja. Determination of IFAS and EFAS factors was carried out through the following steps:

1. Preparation of the IFAS matrix containing strengths and weaknesses, and the EFAS matrix containing opportunities and threats in the first column.
2. Assign weight to each factor in the second column on a scale ranging from 1.0 (very important) to 0.0 (not important).
3. The rating assessment in the third column for each factor uses a scale of 1 to 4, where 1 indicates very weak, 2 is less weak, 3 is quite strong, and 4 is very strong.
4. Calculating the weighted score by multiplying the weight by the rating listed in the fourth column.
5. Adding the weighted subtotal scores to obtain the total weighted score for internal and external factors (see Tables 1 and 2) (Rangkuti 2013).
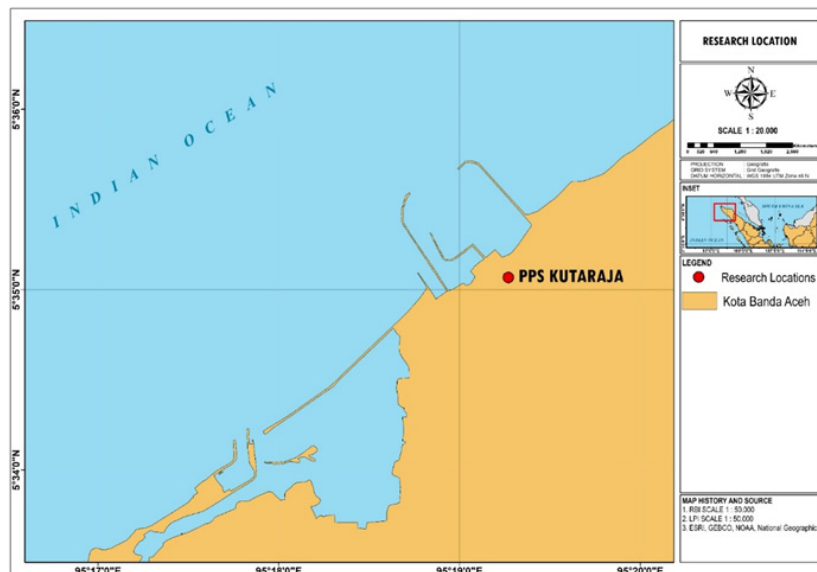
Figure 1. Map of research location at PPS Kutaraja, Banda Aceh City, Aceh Province.

Table 1. Internal factor evaluation matrix (ISFS).

Internal Factors	Weight	Rating	Score
Strengths (S)	….	….	….
Weaknesses (W)	….	….	….
Total	….	….	

Table 2. External factor evaluation matrix (ESFS).

External Factors	Weight	Rating	Score
Opportunities (O)	….	….	….
Threats (T)	….	….	….
Total	….	….	
External Factors			

Table 3. SWOT matrix used to map internal and external factors owned by PPS Kutaraja.

IFAS / EFAS	Strength (S)	Weaknesses (W)
Opportunity (O)	S-O Strategy The strategy that uses strengths to create opportunities	W-O Strategy The strategy that maximizes weaknesses to take advantage of opportunities
Threat (T)	S-T Strategy The strategy that uses strengths to overcome threats	W-T Strategy The strategy that minimizes weaknesses to avoid threats

Next, the creation of the SWOT matrix includes four strategy quadrants, namely SO, WO, ST, and WT (Table 3). Determination of the recommended strategy is done by reducing the subtotal of internal factors, Strengths (S) and Weaknesses (W), which produces a value (a), and reducing the subtotal of external factors, Opportunities (O) and Threats (T), which produces a value (b). The value (a) is then used as the X-axis coordinate, while the value (b) becomes the Y-axis coordinate.

RESULTS AND DISCUSSION

Fishing area

The PPS Kutaraja purse seine fishing area (DPI) is generally located in the Indian Ocean. Its waters have abundant potential for skipjack tuna fish resources. The purse seine fishing operation system is divided into 2 types, namely purse seine with a one-day fishing system and a more than one-day fishing system. Pursuit seine fishing (one-day fishing) is usually carried out fishing activities around the waters of Sabang and Pulau Weh, Aceh. The distance of the route is around 12 miles and takes 1.5-2 hours of travel. Multi-day fishing carries out fishing activities in the Indian Ocean. The duration of the trip (from the fishing base to the fishing ground) depends on the size of the purse seine, usually around 2-4 hours.

Determination of skipjack tuna fishing areas usually uses fishing aids in the form of Global Position System (GPS) and an echo sounder. However, fishermen sometimes only rely on natural signs, such as foaming water and flocks of birds. The duration of fishing operations lasts throughout the year, with daily and weekly trip patterns. Daily trips are carried out in one day, either at night or in the morning, while weekly trips last for more than a week at sea. Determination of fishing locations by fishermen at PPS Kutaraja is based on experiences at sea that have been passed down from generation to generation.

Capture operating system

The departure time of the trawlers at PPS Kutaraja to the fishing area is divided into two types, namely departures in the morning and evening. Small vessels generally depart in the morning, namely between 05.00 and 05.30 WIB, from the fishing base to the fishing ground. Meanwhile, departures at night, which take place between 20.00 and 21.00 WIB, are only carried out by large vessels. The duration of the trip from the fishing base to the fishing ground varies depending on the size of the trawlers. Figures 2 and 3 show the flowchart of the skipjack tuna fishing operation system with a travel duration of 5-20 days and 1-2 days at PPS Kutaraja.

Analysis of internal and external factors of the handling system for skipjack tuna caught by trawlers at the Kutaraja PPS

SWOT analysis was applied to formulate a strategy model for handling the quality of skipjack tuna caught by trawlers at PPS Kutaraja. The analysis process began with the identification of internal factors, namely strengths and weaknesses, which were obtained through direct observation and interviews with fishermen. Grouping these factors was also carried out through confirmation and discussion with the fishing port authorities, who understood the conditions at the research location. Details of the strength factors consist of:

1. The purse seine fishing gear does not damage the quality of skipjack tuna.
2. The age of fishermen at PPS Kutaraja is still of a productive age.
3. The number of crew members of purse seine vessels at PPS Kutarja is large, and each has their duties.
4. The capacity of fish landing facilities and infrastructure at the port is quite large, and
5. The availability of private ice factories around the port.

There are several factors of weakness, including:

1. Handling of fish is thrown and slammed.
2. The handling of fish from catching to landing does not implement a good cold chain.
3. The trawlers at PPS Kutaraja are not yet equipped with a fishery freezer cooling machine.
4. The temperature of the fish storage room is not controlled, and
5. Skills in handling skipjack tuna are still lacking.

Furthermore, external factors include opportunities and threats. Several opportunity factors identified are:

1. The potential for skipjack tuna is quite abundant in WPP 572.
2. The existence of SNI 2729:2013 concerning the standard requirements for the quality of fresh fish food safety.
3. Purlin fishermen have fishing aids in the form of FADs.
4. The existence of PERMEN-KP No. 7 of 2019 concerning Good Fish Handling Methods (CPIB), and

5. Skipjack tuna is one of the export commodities.

Meanwhile, the threats include:
1. Fish are left to flounder after being caught until they die in the sun;
2. The education level of trawl fishermen is still very low;
3. The decline in the purchase price of skipjack tuna;
4. There are no experts at the Kutaraja PPS who have the competence in controlling the quality of skipjack tuna, and
5. There is no special training in controlling the quality of skipjack tuna from the time it is caught until it is sold at the TPI.

Information on skipjack tuna handling was obtained from interviews and direct observations in the field.

The Internal Factor Analysis Summary (IFAS) matrix for handling the quality of skipjack tuna caught by trawlers at the Kutaraja PPS is presented in Table 4. Its use is to see the strengths and weaknesses of skipjack tuna handling based on weight, rating, and score. Weighting is done by asking for opinions from fishermen, who are then discussed again with the fishing port manager as an expert who understands field conditions.

Based on the IFAS matrix, the total strength is 2.61 and the total weakness is 0.47, so the total IFAS value is 3.08. The internal strength factor shows a higher value compared to the total internal weakness. The results of the analysis explain that the internal condition of the quality control strength of skipjack tuna caught by trawlers at PPS Kutaraja can overcome weaknesses by utilizing strengths. The external factor analysis (EFAS) matrix is used to see the strength of skipjack tuna handling based on weight, rating, and score. Table 5 presents the External Matrix.
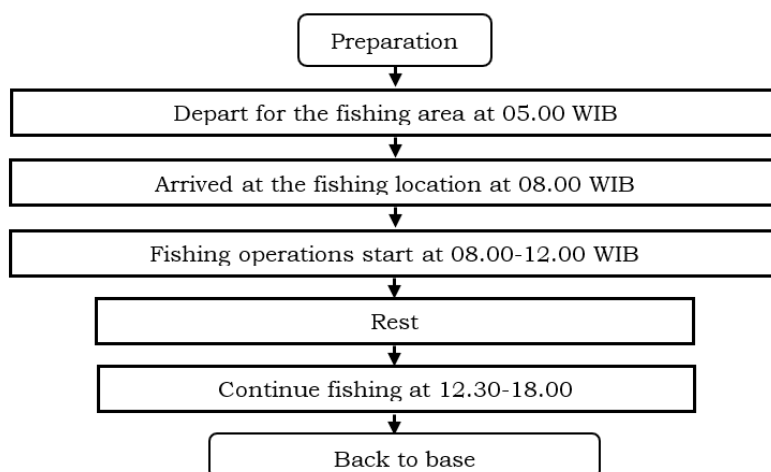

Figure 2. Flowchart of the operating system for catching skipjack tuna using a 5-20 day trawl vessel at PPS Kutaraja.
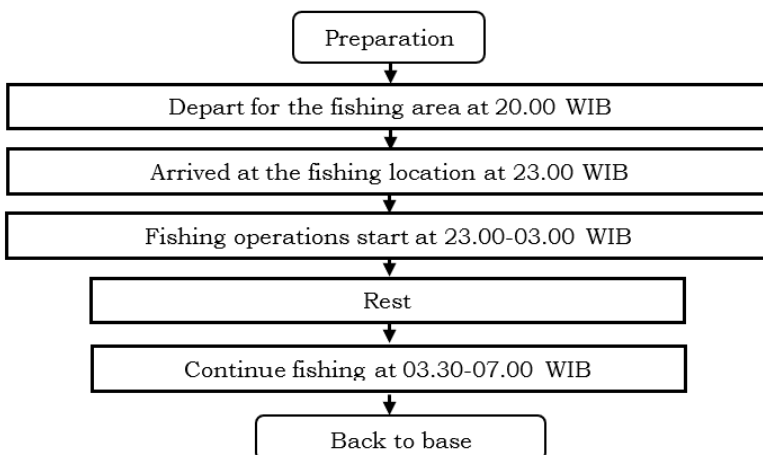

Figure 3. Flowchart of the operating system for catching skipjack tuna using a 1-2 day trawl vessel at PPS Kutaraja.

Table 4. ISFS matrix of skipjack tuna handling system at PPS Kutaraja.

Internal Strategy Factors (IFAS)			
Strengths	**Weight**	**Rating**	**Score**
The purse seine fishing gear does not damage the quality of skipjack tuna	0.14	4	**0.51**
The age of fishermen at PPS Kutaraja is still productive	0.14	4	**0.49**
The number of crew members of purse seine vessels at PPS Kutarja is large, and each has their duties	0.14	4	**0.49**
The capacity of fish landing facilities and infrastructure at the port is quite large	0.14	4	**0.51**
The availability of private ice factories around the port	0,.5	4	**0.60**
Total Strength			**2.61**
Weaknesses	**Weight**	**Rating**	**Score**
Handling of fish thrown and slammed	0.04	1	**0.04**
The handling of fish from catching to landing does not implement a good cold chain	0.06	2	**0.09**
The trawlers at PPS Kutaraja are not yet equipped with a fisheries freezer cooling machine	0.04	1	**0.05**
The temperature of the fish storage room is not controlled	0.09	2	**0.19**
Skills in handling skipjack tuna are still lacking.	0.06	2	**0.10**
Total Weaknesses			**0.47**
Total IFAS			**3.08**

Table 5. ESFS matrix of the skipjack tuna handling system at PPS Kutaraja.

External Strategy Factors (EFAS)			
Opportunities	**Weight**	**Rating**	**Score**
External Strategy Factors (EFAS)	0.14	4	**0.51**
The age of fishermen at PPS Kutaraja is still productive	0.14	4	**0.49**
The number of crew members of purse seine vessels at PPS Kutarja is large, and each has their duties	0.14	4	**0.49**
The capacity of fish landing facilities and infrastructure at the port is quite large	0.14	4	**0.51**
The availability of private ice factories around the port	0,.5	4	**0.60**
Total Opportunities			**2.78**
Threats	**Weight**	**Rating**	**Score**
Fish are left to flounder after being caught until they die in the sun	0.06	2	**0.08**
The education level of the trawl fishermen is still very low	0.07	2	**0.14**
The purchase price of skipjack tuna has fallen	0.06	2	**0.08**
There are no experts at the Kutaraja PPS who have the competence in controlling the quality of skipjack tuna	0.04	1	**0.04**
There is no special training in controlling the quality of skipjack tuna from the time it is caught until it is sold at the TPI.	0.05	1	**0.08**
Total Threats			**0.42**
Total EFAS			**3.20**

Based on the EFAS matrix, the total opportunity value is 2.78, and the threat is 0.42, so the total IFAS value is 3.20. This means that the quality control of skipjack tuna caught by circular trawlers at PPS Kutaraja can solve external problems in the form of threats by utilizing opportunities.

The results of the analysis of internal (SW) and external (OT) factors produce a combination of matrices (IE) to formulate a strategy model that addresses the problems faced by PPS Kutaraja. The results of the Matrix (IE) analysis are presented in Figure 4.

Based on the IFAS matrix, the overall score is 2.61, and the overall EFAS score is 3.08. This means that the matrix analysis matrix (IE) shows that it is in quadrant I (aggressive strategy). Figure 4, the (IE) matrix illustrates the strengths and opportunities that can overcome the weaknesses and threats of controlling the quality of skipjack tuna caught by the PPS Kutaraja trawler. Tarigan *et al.* (2019) and Husen *et al.* (2022) state that avoiding existing weaknesses and threats will prioritize strengths and opportunities in the future.

Based on the total score on the internal and external matrices, internal and external factors are obtained to formulate a strategy model that is in accordance with the problem. The results of the SWOT analysis matrix are presented in Table 6.

Based on Table 6, the integration between internal factors (Strengths–Weaknesses) and external factors (Opportunities–Threats) produces several alternative strategies for controlling the quality of skipjack tuna caught by trawlers at PPS Kutaraja. The combination of strengths and opportunities (S-O) produces the S-O strategy, namely:

1. Improving the quality control of skipjack tuna from the catching stage until it arrives at the TPI

High-quality fish are needed to increase the selling value of skipjack tuna. The handling of fish from catching to being sold at the TPI greatly affects the quality of the fish. The role of the Kutaraja PPS management in collaboration with fishermen must be able to maintain the quality of skipjack tuna so that it can compete in the export market. Referring to Yusuf *et al.* (2018), competitiveness is needed to make the existence of the economy more market-based. In addition, skipjack tuna is a fishery resource that is utilized for both domestic consumption and export, so it has significant economic value (Tumonda *et al.* 2017).

2. Organizing counseling and training on proper fish handling for skipjack tuna fishermen at PPS Kutaraja

Fishermen at PPS Kutaraja need training on handling skipjack tuna. The results of interviews in the field with several fishermen and fishing port managers showed that socialization on handling fishermen's fish was only carried out once a year. The training objectives were also not on target because they only involved
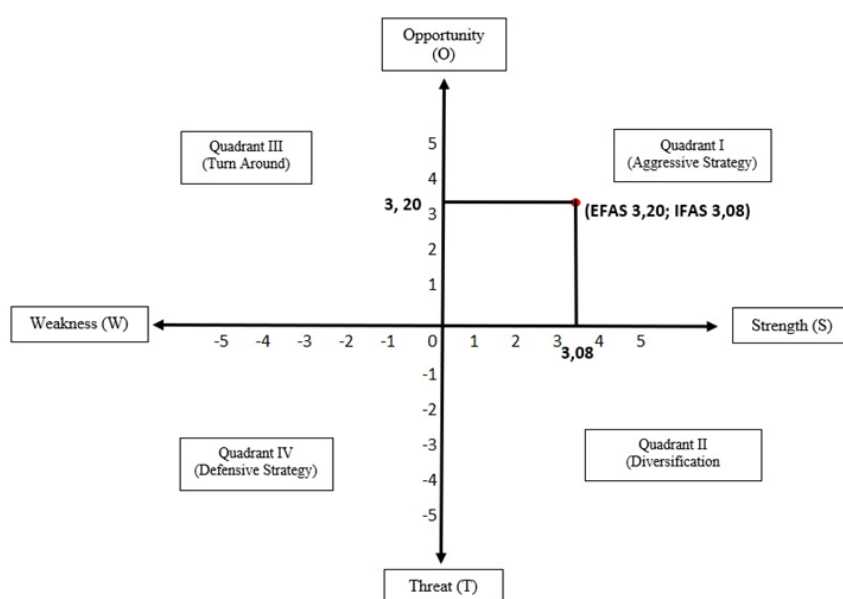

Figure 4. Matrix (IE) of strategies for handling the quality of skipjack tuna caught by trawlers at the Kutaraja PPS.

boat owners and not fishermen. Fish processing skills certification training (SKPI) is one of the steps in implementing quality assurance and traceability of fish products (Harahap *et al.* 2021).

The combination of W-O that utilizes weaknesses and opportunities produces a W-O strategy in the form of:

1. Ensure that the temperature of the fish storage room is maintained at 0°C until it reaches the landing location.
Maintaining the cold chain is very important to maintain the quality of the fish from the time the fish are caught until they arrive at the TPI. According to DJPT (2014), fishing vessels that store catches for more than 24 hours must have a clean and temperature-controlled hold. The storage temperature must not exceed 0°C after 16 hours. Cold chain facilities require equipment used for continuous fish care, starting from fishing operations, processing, and distribution to consumers (Andriani *et al.* 2021).

2. Provide funding support for trawl fishermen to repair and modernize the fishing fleet equipped with a cooling system
Provide funding for the repair and modernization of the refrigerated fishing fleet for trawl fishermen. Cooperation between the Kutaraja PPS management and ship entrepreneurs to carry out renovations and repairs with financial support, and examples of ships that use freezers.

3. Facilitate the certification process for fishermen related to the use of purse seine fishing gear and the implementation of standard fish handling
Cakalang fish handling skills certification training will make it easier for fishermen to handle fish properly on board. Skipjack tuna processing must be carried out by skilled fishermen so that the quality remains good when it arrives at the Kutaraja PPS TPI. Rough handling of fish that causes physical damage should be avoided (Astawan 2019).

Meanwhile, the S-T combination that utilizes strengths and threats will obtain the S-T strategy, namely:

1. Collaborating with fishermen to create quality control standards for skipjack tuna from catching to being sold at TPI
Quality control standards for skipjack tuna catches sold at TPI need to be established. The aim is to help fishermen better understand how to handle fish properly. Good fish handling standards can maintain the quality of fish so that they remain fresh when they arrive at TPI. Rossarie *et al.* (2020) explain the importance of good fisheries management standards, namely the use of guidelines or references to implement good working methods according to their operations. Based on Sulistiani's statement (2016), the purpose of standard operating procedures (SOPs) is to create commitment to work. Skipjack tuna processing standards must be in line with the cold chain approach. Quality control standards are set by the fishing port manager, and fishermen as users (KKP 2014). Fishermen and distribution operators need references in handling fish to minimize errors that affect fish quality.

The combination of weaknesses and threats that utilize weaknesses with threats will produce a W-T strategy, namely:

1. Improving human resources through certification of quality skipjack tuna handling.
Training for certification of skipjack tuna handling is an important step in efforts to increase human resource capacity. This optimization can be achieved through improving the quality of human resources, such as training for fishermen on good fish handling procedures and in accordance with Good Fish Handling Methods (CPIB) standards, to maintain the quality and freshness of fish. The results of the training can change the mindset of fishermen to be more advanced. Srihastuti *et al.* (2019) emphasized that socialization activities are useful in making people aware of the quality of the use of fishery products. Education will be attached to job placement, which is a place where someone takes classes to improve their skills (Zuana *et al.* 2014).

2. Cooperating with the management of PPS Kutaraja and ship entrepreneurs in designing ships equipped with freezers.
Support for the addition of cooling machines to ships to maintain the temperature of the fish hold must be carried out. The recommended strategy is to equip the ring trawl with a cooling machine. Prasetyo *et al.* (2016) concluded that the cooling machine can operate effectively and efficiently to cool the hold. Fish frozen in a refrigerated hold will produce better and more durable fish compared to fish cooled by ice. Small-sized trawl fishing vessels with

short operating times can be equipped with adequate cooling machines or ice to maintain the cold chain. Meanwhile, larger trawl vessels with trip times of more than one day need to be equipped with a freezer to maintain the quality of skipjack tuna.

Table 6. SWOT matrix for handling the quality of skipjack tuna caught by the PPS Kutaraja circular trawl vessel.

IFAS / EFAS	Strength	Weakness
IFAS **EFAS**	1. The purse seine fishing gear does not damage the quality of skipjack tuna. 2. The age of fishermen at PPS Kutaraja is still of a productive age. 3. The number of ABK on each purse seine boat at PPS Kutaraja is large, and each has its duties. 4. The capacity of fish landing facilities and infrastructure at the port is quite large. 5. The availability of private ice factories is available around the port.	1. Handling of fish is thrown and slammed. 2. Handling of fish from catching to landing does not implement a good cold chain. 3. The trawlers at PPS Kutaraja are not equipped with fishery freezer facilities. 4. The temperature of the fish storage room is not controlled. 5. Skills in handling skipjack tuna are still lacking.
Opportunity 1. The potential for skipjack tuna is quite abundant in WPP 572. 2. The existence of SNI 2729:2021 concerning the standard requirements for the quality of fresh fish food safety. 3. Purlin fishermen have fishing aids in the form of (FADs). 4. The existence of Permen-KP No. 7 of 2019 concerning good fish handling methods (CPIB). 5. Skipjack tuna is one of the export commodities.	**Strategy (S-O)** 1. Improving the quality control of skipjack tuna from the catching stage until it arrives at the TPI (S4, S5, O2, O4). 2. Organizing counseling and training on proper fish handling for skipjack tuna fishermen at the Kutaraja PPS (S2, S3, O2, O4).	**Strategy (W-O)** 1. Ensure the temperature of the fish storage room is maintained at 0°C until it reaches the landing location (W2, W3, W4, O4). 2. Provide financial support for purse seine fishermen for the repair and modernization of the fishing fleet equipped with a cooling system (W1, W3, W4, S3, S5). 3. Facilitate the certification process for fishermen related to the use of purse seine fishing gear and the implementation of standard fish handling (W2, W3, W5, O2, O4).
Threats 1. Fish are left to flounder after being caught until they die in the sun. 2. The education level of the trawl fishermen is still very low. 3. The purchase price of skipjack tuna has fallen. 4. There are no experts at the Kutaraja PPS who have the competence in controlling the quality of skipjack tuna. 5. There is no special training in controlling the quality of skipjack tuna from the time it is caught until it is sold at the TPI.	**Strategy (S-T)** 1. Collaborate with fishermen to create quality control standards for skipjack tuna from the time it is caught until it is sold at TPI (S2, S3, S4, T1, T5).	**Strategy (W-T)** 1. Human resource development through certification of good-quality handling of skipjack tuna (W1, W5, T1 T2, T4, T5). 2. Kutaraja PPS management collaborates with ship owners in designing ship designs equipped with freezers for fish storage (W3, W4, T3).

CONCLUSION

The conclusion of this study shows that the SWOT analysis identifies great opportunities to improve the quality of skipjack tuna landed at PPS Kutaraja. Quality improvement strategies can be carried out through improving quality control from catching to auction, training fishermen on good fish handling, and maintaining storage temperatures at 0°C for vessels with trip times of more than one day. In addition, modernization of the refrigerated purse seine fleet, facilitation of fishermen certification, implementation of quality control standards, improving the quality of human resources through certification, and cooperation with PPS Kutaraja managers and ship entrepreneurs in designing refrigerated vessels are also recommended strategic steps.

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