



## 1. INTRODUCTION

Cases of export rejection of frozen fish overseas still occur. Based on RASFF data until 2010, Indonesia ranks 18th in the world in the number of rejection of fishery products, with 10 cases of rejection in the European Union related to food quality and safety issues (Madan *et al.* 2005). The reason for the rejection is that the importing country has its own standards that are stringent than those set by the Codex Alimentarius Commission to protect its people from the danger of contamination. Based on the results of the competitiveness research and the factors that influence the export of Indonesian shortfin scad fish in the European market from 2008 to 2016, it can be concluded that the Indonesian shortfin scad fish commodity is in the average position of "Falling Star" which means that the Indonesian shortfin scad fish commodity has a competitive advantage but weak competitiveness in the European market from 2008 to 2016. To increase the competitiveness of Indonesia's shortfin scad fish commodities, serious handling is needed (Puput *et al.* 2018).

Efforts to minimize the rejection case will have an impact on increasing the competitiveness of Indonesia's frozen shortfin scad fish exports. This effort can be done by implementing the HACCP (Hazard Analysis And Critical Control Point) system. The HACCP system is defined as a management to ensure the safety of food products in the food processing industry by using the concept of a logical (rational), systematic, continuous and comprehensive approach (comprehensive) and aims to identify, monitor and control hazards that are at high risk to quality and safety food products (Bryan 1990).

Packaging is an important indicator in maintaining the quality of fishery products. Damaged packaging, packaging from regions that do not meet export standards, different buyer requests from importing countries, and the existence of technical errors in the use of cold storage cause repacking of the company to be carried out. The purpose product repacking is to maintain the quality of fish in accordance with export standards desired by the buyer. The purpose of this research is to improve food safety through the analysis of the application of the HACCP system in the repacking process of frozen shortfin scad fish products at Satya Trinadi Komira Perkasa Jakarta Ltd. to maintain the quality of fish in accordance with export standards desired by buyers.

The packaging can maintain the quality of the product, but can also make the product contaminated if it is not monitored for its use. Export-scale fishing companies in Jakarta conduct fish freezing directly on miniplants in several regions in Indonesia so that the quality of fish is maintained. Products to be shipped to the importing country must heed the request from the buyer. Technical constraints in storing products in cold storage, damaged packaging, packaging from areas that do not meet export standards, the buyer demand for packaging that varies from the importing country causes the repacking process to be carried out by the company. The rejection of fisheries commodities is generally due to the presence of foreign material content and differences in standards used by importing countries. Efforts to minimize rejection of fishery exports and handling repacking processes in export companies must be done by integrating a quality assurance system with the application of HACCP, a food safety management system, and company policies. The rejection occurred because of the incompatibility of the company's quality management system with the quality standards set by the importing country so that a review of the quality assurance system for food safety is needed. Good quality management of a product will increase the value and trust of importers in the international market.

The proper application of HACCP will produce products with a quality that is maintained and safe for consumption. The process of repacking shortfin scad fish must be done carefully, precisely, maintain a cold chain, and as soon as possible prevent a deterioration in quality and produce frozen fish products with good quality so that they have high competitiveness in the global market.

## 2. MATERIALS AND METHODS

### 2.1 Time and Place

The research was carried out in August 2019 at Komira Ltd's located in Penjaringan North Jakarta.

### 2.2 Material and Tools

The tools used for research are SNI frozen fish (01-4110.3-2014), work area supervision worksheet, GMP and SSOP Satya Trinadi Komira Perkasa Ltd., Hazard analysis worksheet, worksheet identification of critical control point. The raw materials used are frozen fly fish size 41-45 cm, repacking process flow of frozen floating fish products, microbiology laboratory results of frozen floating fish, data on the laboratory results of frozen fly fish chemistry, laboratory organoleptic test results of frozen floating fish, data on water laboratory results

### 2.3 Research Methods

The research method used is a survey method by following the flow of the repackaging process of frozen shortfin scad products starting from the initial stage to the final product. The data obtained in the form of primary data and secondary data. Research conducted includes observing the flow process of frozen shortfin scad fish processing, analyzing potential hazards, and identifying critical control points. The data obtained were analyzed in a comparative descriptive manner. Data obtained from Komira Ltd. covers hazard analysis, CCP, microbiology (ALT), chemistry and organoleptics at the repacking channel stage of frozen shortfin scad fish products. Data were then analyzed descriptively and compared with frozen fish SNI (4110: 2014).

### 3. RESULTS AND DISCUSSION

#### 3.1 Stages of Frozen Shortfin Scad Products Repackaging Process

##### a. Raw material reception and weighing

The final product produced is influenced by the quality of raw materials so it is important to consider the quality of the fish when receiving raw materials. Checking the temperature of the container when it comes to the factory is done and must be at a minimum temperature of  $-18^{\circ}\text{C}$  to  $-20^{\circ}\text{C}$ . The receipt of raw materials or the activity of unloading frozen shortfin scad products must be refilled by containers and carried out in the morning around 9 o'clock. Precooling is carried out for 2 hours with a minimum temperature of  $-10$  to  $-15^{\circ}\text{C}$  before loading or unloading to keep the container temperature in order to remain below  $-18^{\circ}\text{C}$ .

In the process of receiving raw materials, a maximum sample of 10 MC (Master Carton) of fish is taken per container with a quantity of 17 tons, per teer / 2 tons of samples taken a maximum of 5 MC to see the quality of the fish. If it is found that the sample does not comply with the standard in a small amount, then fish are separated per size, and fish is checked thoroughly, but if it is found that the sample is not in accordance with the standard in large quantities, the fish will be diverted to the domestic / local market. Tolerance of fish temperature during the trip  $\pm 3^{\circ}\text{C}$ . If the temperature of the fish is below  $-15^{\circ}\text{C}$ , it will be re-frozen in Air Blast Freezing (ABF). Measurement of fish temperature use a puncture thermometer. The quality of frozen shortfin scad fish in Komira Ltd. is divided into 2 types, namely A and B, where the quality of B's eyes is quite red, there is blood on the body, skin blisters, broken heads (1 or 2 fish in one MC), flat fish in 1 or 2 fish.

The receiving stage of raw materials has potential hazards, namely biological hazards (microbial growth) due to temperature deviations during transportation and prevented by organoleptic temperature and quality checks upon arrival, chemical hazards namely histamine poison due to product temperature deviations and can be prevented from maintaining fish temperature  $\leq 4^{\circ}\text{C}$  during the reception process, and other chemical hazards of heavy metal contamination (Cd, Hg, Pb) due to fish coming from polluted waters and can be prevented by monitoring heavy metal contamination of the product on a regular basis, physical hazards such as sand and moss caused by environmental contamination at the time of capture and can be controlled with GMP and SSOP. The process after receiving raw materials is weighing. Weighing aims to measure the weight of the fish along with the packaging which must measure 10 kg neither more nor less. Weighing is done using a digital scale. There is a biological hazard at the weighing stage, namely microbiological contamination (TPC, Coliform, E. coli) originating from cross-contamination from humans, equipment, environment and can be controlled with GMP and SSOP.



**Figure 1.** (a) Figure 1. Packaging from Regions Not in Accordance with Export Standards;  
(b) Packaging in Accordance with Export Standards

##### b. Packaging and Labeling

Repackaging of frozen shortfin scad products is carried out using three types of plastic namely inner plastic, master carton, and outer plastic. One fish sample in one MC was affixed with paper that was written in fish size in printed form. Fish labeling attaching regional origin such as SB (Slid Banggai), type of fish for example MI (Malalugis), and the name of the buyer is MA (Melody Asri). The first step is repackaging by removing the product using a pallet. The second stage is tidying the packaging starting with opening the raffia straps that are on the package and tidying the outer plastic, then the package are glued 6 times using white duct tape and done quickly, carefully and cleanly. After the process of tidying the packaging, the next step is to replace the raffia rope that was opened before, then do the rearrangement on the pallet, the use of the raffia rope is adjusted to the buyer's request. The color of the rope that is generally used is black or green. The use of external packaging is adjusted to the request of the buyer can be used outside plastic or sacks. Export preparation takes approximately 1 week to 2 weeks. The packaging and labeling stages can cause biological hazards, namely microbial

contamination caused by cross contamination (human, equipment, and environment) and microbial growth due to temperature deviations, this can be controlled with GMP and SSOP.



**Figure 2.** (a) Plastic Outer Packaging; (b) Outer Sack Packaging

### c. Frozen storage

Storage of export shortfin scad products at Komira Ltd. uses the ABF cooling system where frozen products are placed in a room that is blown cold air at high speed through the cooling pipes to the surface of the product. Fish can be frozen in ABF with only about 3 hours because the product has been frozen. The use of temperature at ABF is maximum of  $-45^{\circ}\text{C}$ . ABF room at Komira Ltd. has a capacity of 5 tons. The pallets are arranged in an orderly manner but there are no specific stipulations in certain places. The preparation of the pallet contains one supplier of the same size and type of fish. The pallets are arranged in ABF where one pallet contains 1 ton of frozen shortfin scad product and one package contains 10 kg. Frozen storage phase can cause chemical hazards, namely enzymatic reactions caused by temperature deviations in the frozen storage room and can be prevented by maintaining cold storage temperatures of  $-20^{\circ}\text{C}$  to  $-25^{\circ}\text{C}$ .



**Figure 3.** Preparation Products In One Palette; Frozen Storage at ABF

### d. Loading

Loading is carried out on containers with a capacity of 17 tons (20 feet) and 27 tons (40 feet). The precooling process must be carried out for 2 hours with a minimum temperature of  $-10^{\circ}\text{C}$  to  $-15^{\circ}\text{C}$ . Fish obtained from miniplants are tested twice when receiving raw materials, if the levels of histamine exceed the standard in large quantities, the fish are returned to miniplants and internal communication is carried out. After loading 25 tons of frozen shortfin scad products, recharging must be carried out until the temperature reaches  $-18^{\circ}\text{C}$  to  $-20^{\circ}\text{C}$ . Temperature rise tolerance is  $\pm 3^{\circ}\text{C}$ . The temperature rise only takes place after 2 hours of loading without starting the engine. The loading stage has biological hazards, namely microbial contamination caused by cross contamination from humans, equipment and the environment and is controlled using GMP and SSOP, physical hazards ie cartons damaged due to poor handling and can be prevented by

worker training and carton replacement.

### 3.2 Products Description

**Table 1.** Product Description Frozen Shortfin Scad at Komira Ltd. Jakarta

No	Index	Information
1	Product name	Frozen fish
2	Species name	Frozen muroaji / frozen shortfin scad ( <i>Decapterus macrosoma</i> )
3	Origin of raw material	WPP-RI 712: Java Sea waters WPP-RI 713: Makassar Strait, Gulf of Bone, Flores Sea & the Sea of Bali
4	Acceptance of Raw Materials	Fish kite purchased from suppliers in fish landing sites and transported from the landing with Thermoking. shortfin scad fish received in freezing conditions and the temperature is maintained <-18°C and checked with Digital Thermometer
5	The final product	<i>Frozen Pelagic Fish</i>
6	stages of Production	Raw material receiving, weighing, repackaging and labeling, cold storage, and transportation
7	Packaging type	Packing in plastic bags the size of 42 cm x 25 cm, outer packaging master carton size of 380 mm x 280 mm x 150.5 mm, and a plastic outer packaging.
8	Storage Requirements	Frozen products maintained at a temperature of -25 ° C or lower
9	Sustainable power	18 months if the product is stored at a temperature -18 ° C or below
10	Label / Specifications	Company Name, weight, size, product name, production codes
11	Use of Products	Crude product: cooked before consumption
12	Customers / Buyers	Not for babies, limited durability, allergies
13	Market	ASEAN, ASIA

Source: Komira Ltd. (2016)

### 3.3 Hazard Analysis of Shortfin scad On Frozen Fish Repackaging

**Table 2.** Hazard Analysis On Repackaging Frozen Shortfin Scad Fish

Process stages	Potential Hazards	Cause Danger	Preventive measure	GMP / SSOP	
				GMP	SSOP
Receipt of raw materials	Growth of bacteria (indication: their organoleptic changes are decomposed)	Temperature deviations during transport	Temperature probe and organoleptic quality of the raw materials upon arrival, the raw material was rejected when showing signs of decomposition	✓	✓
	Chemical contamination: Histamine poison	Product temperature deviations	Keeping the temperature of ≤ 4 °C fish during the admissions process	✓	-
	Contamination of heavy metals (Cd, Hg, Pb)	The fish come from polluted waters	Monitoring of heavy metal contamination on the product regularly	✓	✓
	Physical: sand, moss, etc.	Environmental contamination at the time of arrest	Controlled with GMP and SSOP	✓	✓
Weighing	Contamination mikrobiologi (TPC, Coliform, <i>E. coli</i> )	Cross-contamination	Controlled with GMP and SSOP	✓	✓
Repackaging and Labeling	Contamination mikrobiologi Microbial growth	Cross-contamination Temperature deviations	Controlled with GMP and SSOP	✓	✓

Frozen Storage	Chemical contamination: Enzymatic	Temperature deviations in frozen storage space	Maintaining the cold storage temperature of -20 °C to -25 °C degrees	✓	-
Process stages	Potential Hazards	Cause Danger	Preventive measure	GMP / SSOP	
				GMP	SSOP
Loading	Microbiological contamination (TPC, Coliform, <i>E. coli</i> )	Cross-contamination	Controlled with GMP and SSOP	✓	✓
	Broken carton	Poor handling	Worker training and replacement carton	✓	-

Source: Komira Ltd. (2016)

### 3.4 Identification of Critical Control Point / Critical Control Point

**Table 3.** Identification of CCPs On Raw Material Acceptance Komira Ltd.

Process stages	Significant Hazards	Identification of the CCP				
		Q1	Q2	Q3	Q4	CCP
Receipt of raw materials	Growth of bacteria (indication: the change in the organoleptic commonly known as dekompos)	Yes	No.	Yes	No.	CCP
	Chemical contamination: Histamine poison	Yes	No.	Yes	No.	CCP

Source: Komira Ltd. (2016)

Critical control points that have been identified at the stage of repacking of shortfin scad fish are carried out a precautionary measure by special monitoring / evaluation and evaluation of the process. The process of receiving raw materials there is a significant danger identified by CCP in biological parameters, namely bacterial growth (indication: organoleptic changes, ie dekompos) and hazard control is done by checking the temperature and quality of raw materials organoleptically upon arrival, the raw material is rejected if it shows symptoms of dekompos, at chemical parameters namely Histamine poison and heavy metal contamination (Cd, Hg, Pb) which are handled by maintaining fish temperature  $\leq 4$  °C during the process of receiving and monitoring heavy metal contamination on the product periodically, whereas on physical parameters the presence of sand and moss so that the handling is done by controlling GMP and SSOP.

### 3.5 Microbiology Test Results

Microbiological tests aims to determine the amount of bacteria in the product. The types of bacteria that emerge come from various sources, namely contamination of water, equipment, and workers so that these types of bacteria are commonly tested. Microbiological testing is done every 6 months and samples are taken randomly. The number of bacterial colonies is needed to be able to assess the quality of food, suspect shelf life, as well as indicators of food hygiene and safety.

#### 3.5.1 Microbiology Test Data Frozen Shortfin Scad Products

Microbiological tests on frozen shortfin scad products required as a condition of export to the importing country in ensuring product safety frozen shortfin scad. Microbiological testing parameters are *Escherichia coli*, *Salmonella* sp., *V. cholerae* and *S. aureus* and Total Plate Colony (TPC). Data from the final product microbiological testing shortfin scades freeze (Table 4).

No	Procedure	Test results			Standard	Method
		1	2	3		
1	Total Plate Colony (colony/g)	400	400	400	500,000	SNI 01-2332.3-2015
2	<i>E. coli</i> (MPN/g)	<1.8	<1.8	<1.8	<1.8	SNI 01-2332.1-2015
3	Salmonella (per 25g)	negative	negative	negative	negative	SNI 01-2332.2-2006
4	<i>V. cholerae</i> (per 25g)	negative	negative	negative	negative	SNI 01-2332.4-2006
5	<i>S. aureus</i> (colony/g)	<10	<10	<10	1,000	SNI 01-2332.9: 2015

Table  
4.

Microbiology Test Results Shortfin Scad Frozen Products

Source: Komira Ltd. (2019)



Based on data from the microbiological test results on the frozen shortfin scad product, it can be concluded that the product is safe for consumption. Where TPC test results, *Escherichia coli* and *S. aureus* under standard (maximum requirement) in frozen shortfin scad product, it is supported by the results of microbial test *Salmonella* sp. and *V. cholerae* were not identified. Shortfin scad frozen product testing results meet the requirements of ISO 4110: 2014 on quality and safety requirements so that the frozen fish product is safe for consumption.

### 3.5.2 Data Testing Microbiological Water Quality

Water security is guaranteed by microbiological testing laboratory that is certified laboratories in the province of Inspection and Certification Production Center of Fishery Province once every 6 months. Water testing is done as a condition of export documents in the importing country to ensure the safety of the water that the water is safe for consumption. The water microbiology test results of Komira Ltd. (Table 4).

**Table 5.** Results of Testing Microbiological Water Komira Ltd.

No.	Parameter	Result	Standard	Limit of Detection
1	<i>E. coli</i> (colony/ 100mL)	0	0	-

Source: Komira Ltd. tested by PT. Saraswati Indo Genentech (2019)

Based on test data on water microbiology from Komira Ltd., the bacterium *Escherichia coli* are not identified with the result of 0 and under the standard (maximum requirement) in water, it meets the requirements of ISO 3554: 2015 on how to test the water and it can be concluded that the water is safe for consumption.

### 3.6 Chemical Test Results

Chemical testing aims to determine the chemicals contained in the products tested. Tests conducted at the Center for Chemical Production Inspection and Certification of Fisheries Province and carried out every 6 months and samples were taken randomly. Complete testing on water adjuvants done in PT. Genentech Saraswati Bogor annually.

#### 3.6.1 Chemical Test Data Shortfin scad Frozen Products

Data SNI test results are compared to frozen fish. The parameters tested in chemical testing shortfin scad frozen products include histamine, mercury, lead, and cadmium. Chemical test result data of frozen shortfin scad products (Table 5).

**Table 6.** Chemical Test Results Shortfin Scad Frozen Products

No	Procedure	Test results			Standard	Method
		1	2	3		
1	Histamine (mg/ kg)	2:43	2.60	2.75	50	SNI 2354.10: 2016
2	Mercury (Mg / kg)	0031	-	-	0:50	SNI 01-2354.6-2016
3	Lead (mg / kg)	0	-	-	0:20	ISO 2354.5: 2011
4	Cadmium (colony/g)	0006	-	-	0:05	ISO 2354.5: 2011

Source: Komira Ltd. (2019)

Based on data from the chemical test results on the product frozen shortfin scad can be concluded that the product is safe for consumption because the test results of histamine, mercury, and cadmium standard under the shortfin scad product is frozen, it is supported by a lead test results that are not identified. Shortfin scad frozen product testing results meet the requirements of ISO 4110: 2014 on quality requirements and safety of frozen fish.



### 3.6.2 Chemical Water Quality Test Data

Water security is guaranteed by a certified testing laboratory chemicals. Water testing is done as a condition of export documents to ensure the safety of shortfin scad products that the adjuvant used water are safe for consumption. The results of chemical tests on water Komira Ltd. (Table 7).

**Table 7.** Test Results Water Chemistry at Komira Ltd.

No.	Parameter	Result	Standard	Limit of Detection
1	Nitrites (mg / L)	0:03	Max. 3	-
2	Sulfate (mg / L)	21:41	Max. 250	-
3	Selenium (mg / L)	not detected	Max. 0:01	0.0003
4	Copper (mg / L)	not detected	Max. 2	0.00046
5	Zinc (mg / L)	not detected	Max. 3	0:07
6	Cd (mg / L)	not detected	Max. 0003	0.00011
7	Manganese (mg / L)	not detected	Max. 0.4	0.00011
8	Aluminum (mg / L)	not detected	Max. 0.2	0.0023
9	Chromium (mg / L)	not detected	Max. 0:05	0.0012
10	Iron (mg / L)	not detected	Max. 0.3	0.0008
11	pH	7.97	6.5-8.5	-
12	Cl (mg / L)	15:53	Max. 250	-

Source: Komira Ltd. tested by PT. Saraswati Indo Genentech (2019)

Based on data from the results of the test chemical in the adjuvant water can be concluded that the water is safe to use because of the results of the chemical test in the form of nitrite, nitrate, sulfate, selenium, copper, zinc, cadmium, manganese, aluminum, chromium, iron, pH, chloride, ammonium, nitrate and florida is below standard. Results of water testing meets the requirements of ISO 3554: 2015 on how to test the water and it can be concluded that the water is safe to use.

### 3.7 Appearance Test Results

Organoleptic testing aims to determine the quality of the test product. Organoleptic testing at elevated frozen products made in the Production Center of Fisheries Inspection and Certification province once every 6 months, and complete testing of water quality is done once a year at the PT. Saraswati Genentech. Daily testing of raw materials only upon receipt of organoleptic tests performed by the QC. Full organoleptic testing performed every 6 months and samples were taken randomly

#### 3.7.1 Test Data Appearance Shortfin scad Frozen Products

Data test results compared with frozen fish is SNI SNI 4110: 2014. Organoleptic parameters on the shortfin scad frozen products only in the form of *score sheet*, Chemical test results shortfin scad frozen products (Table 7).

**Table 8.** Test Results Appearance Frozen Shortfin Scad Fish at Komira Ltd.

No.	Procedure	Test results			Standard	Method
		1	2	3		
1.	<i>Score sheet</i>	7	-	-	7	ISO 2346: 2015

Source: Komira Ltd. (2019)

Based on organoleptic test data of shortfin scad product, it can be concluded that the product is safe for consumption because of the results of organoleptic tests under standard (at least 7) and meets the requirements of ISO frozen fish that is ISO 4110: 2014 on how to test the water and it can be concluded that the frozen shortfin scad product is safe for consumption.

#### 3.7.2 Water Quality Test Data Appearance

Water testing is done as a condition of export documents in the importing country to ensure the safety of frozen shortfin scad that the adjuvant used water are safe for consumption. Results of water organoleptic test of Komira Ltd. (Table 8).

**Table 9.** Test Results Appearance Water Komira Ltd.

No.	Parameter	Result	Standard	Limit of Detection
1	Flavor	-	Tasteless	Tasteless (tasteless)
3	Smell	Odorless	Odorless (odorless)	-
4	Color (Pt-Co units)	Not detected	Max. 15	0025

Source: Komira Ltd. tested by PT. Saraswati Indo Genentech (2019)

Based on adjuvants water organoleptic test data, it can be concluded that the water is safe for consumption because the organoleptic test results in the form of taste, odor, and color under standard which is odorless, tasteless and the water color is not detected. Results of water testing meets the requirements of ISO 3554: 2015 on how to test the water and it can be concluded that the water is safe for consumption

## Conclusion

Based on the research that has been done on repackaging frozen shortfin scad product Satya Trinadi Komira Perkasa Jakarta Ltd. can be concluded that:

- The application of HACCP in PT. Satya Trinadi Jakarta Komira Perkasa is good based on SNI 01-4851-1998 about System and Hazard Analysis Critical Control Point (HACCP) and Guidelines for Implementation.
- Hazards identified in the form of biological hazards include the growth of bacteria, and chemical hazards include histamine toxic.
- Critical control points on a frozen shortfin scad Repackaging product contained in the raw material stage of the admissions process.

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