

Good Manufacturing Practice (GMP) for Small and Medium-sized Fish and Fish Products Pre-Processing Establishments in ASEAN

Edited by: Yeap Soon Eong | Toh Xin Wei



Marine Fisheries Research Department



Southeast Asian Fisheries Development Center

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Southeast Asian Fisheries Development Center,
Marine Fisheries Research Department,
2 Perahu Road, Singapore 718915

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Introduction

Many small and medium-sized fish processing establishments (SME) in ASEAN member countries find it difficult to implement quality assurance systems due to economic and technical constraints. They comprised largely of pre-processing establishments (PPE), which produce semi-processed raw materials for main processing establishments and traditional products processing establishments (TPE). PPE supply semi-processed raw materials such as shrimp, crab, squid, fish and bivalve mollusc to main fish processing establishments. The processes carried out in these establishments may include peeling, de-heading, degutting, de-skinning, cooking, picking, filleting or shucking depending on the raw materials involved. Thus, PPE can play a significant role in determining the quality and safety of raw materials and subsequently of the finished products. In the ASEAN region, traditional fish products represent a significantly large part of total fish utilization and are a major source of animal protein. As a result, traditional fish products are vitally important to food security, especially considering that the marginalized and poorer segments of the population consume most of these products. In view of the importance of these products to

the people's diet in the ASEAN region and the importance of a safe food supply to food security, it is imperative that the TPE apply appropriate GMP programs to assure quality and safety of these products. Therefore, to help the small and medium-sized fish processing establishments (SME) in the ASEAN member countries meet food safety and quality assurance requirement, MFRD proposed a 5-year project (2007-2011) under the Japanese Trust Fund II (JTFII) programme on 'Quality Assurance Systems for Small and Medium-sized Fish Processing Establishments in ASEAN member countries' to develop GMP in PPE and TPE as a first step towards implementation of HACCP-based quality assurance systems.

In 2007, MFRD in collaboration with seven ASEAN member countries, namely, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Thailand and Vietnam, conducted a regional project activity to develop GMP for selected PPE in these countries. The selected PPE were involved in various pre-processing activities such as shrimp pre-processing (de-heading/peeling and or deveining), fish meat/filleting, crab meat picking and shrimp salting.

Table1: List of ASEAN Countries and selected PPE

Country	PPE
Cambodia	Crab meat picking
Indonesia	Fish meat/filleting (for surimi processing)
Malaysia	Fish meat/filleting (for surimi/otoshimi processing), Shrimp pre-processing
Myanmar	Shrimp pre-processing
Philippines	Crab picking, Shrimp salting (for shrimp paste processing)
Thailand	Shrimp pre-processing
Vietnam	Shrimp pre-processing

This publication is the output of the regional project activity and it describes the GMPs developed for the selected PPE as well as outlines of the processing steps involved.

GMP can cover every aspect of food production, employee/personnel hygiene and training, plant and equipment/utensils design and specifications, cleaning and sanitation, and even warehousing and distribution of the finished products. In this publication the emphasis is on GMP for production and process controls, which are specific to the selected PPE. GMP for

the other areas are also covered when they have an impact on the production and processes involved. This publication should be used in conjunction with other important references such as the Codex Alimentarius Commission's Recommended International Code of Practice- General Principles of Food Hygiene (CAC/RCP 1-1969, Rev 4-2003) and US FDA's Code of Federal Regulation Title 21 Part 110 Current GMP in Manufacturing, Packing or Holding Human Food, as well as other relevant national regulations.

Background on Selected PPE

A. Shrimp PPE (De-heading/Peeling and or Deveining) in Malaysia, Myanmar, Thailand and Vietnam

The shrimp industry in Malaysia has been growing tremendously over the years since the early 1980s and is fast becoming a major player in the seafood industry. Most of the shrimp products are exported to other countries, and in 2004, the shrimp products accounted for about 56.6% of total exports of the fisheries commodities. In 2004, the total exports for shrimps (fresh and frozen) amounted at 51,415 tonnes, which valued at RM 1.1 million. The two main sources of shrimp production in Malaysia are from capture and culture activities. Cultured shrimps contribute to the main source of raw material for the processing plants. The main two species cultured in Malaysia are the black Tiger shrimp (*Penaeus monodon*) and the White shrimp (*P. vanammei*).

In Malaysia, shrimps are important fisheries commodities for export markets. It can be exported fresh or frozen or as value-added products (e.g. shrimp tempura). To date, there are over 30 establishments producing a variety of frozen shrimps products in Malaysia. The numbers of establishments will continue to increase as it is in line with the development of new areas for aquaculture where the main target is on shrimp culture of White shrimp (*P. vanammei*).

The increasing numbers of shrimp processing plants in Malaysia has created a greater demand for shrimps as raw materials. There are about 20 shrimp pre-processing establishments (PPE) in Malaysia, which are situated in proximity to shrimp farming areas or are situated along the coastal areas. The scale of operation usually involves about 5 -15 workers, and the various processing steps include sorting, grading, washing, peeling, chilling and transporting for further processing. A typical processing premise of a shrimp PPE will have the following facilities- table (for sorting, grading and peeling), chiller, ice forming machine, washing equipments, insulated fish boxes and styrofoam boxes. The shrimps after peeling, de-heading and or deveining are chilled and packed with ice into insulated boxes before transporting to the shrimp traditional processing plants (TPE) or to retail outlets (e.g. supermarkets, hypermarkets). The shrimps are usually packed in quantities of 10 -30 kg per box and the prices vary, which depend on the sizes of the shrimps (e.g. 30 pieces of shrimp per kg costs about RM 8 -10).

The shrimp PPE in Myanmar utilized shrimp species such as the Black tiger shrimp (*Penaeus monodon*), White shrimp (*Penaeus indicus*) and Pink shrimp (*Metapenaeus affinis*). Some of the shrimp processing plants in Myanmar are owned by foreign investors and for these

businesses with greater market shares, their annual production quantities can range from about 60 to 100 metric tonnes (mt) which amounts to approximately US\$200,000 to US\$300,000 worth of production.

Fishery products are ones of the most important agriculture commodities of Thailand. They help to create jobs and foreign exchanges to the people in the fishery sectors. Aquaculture has become increasingly important, particularly when natural resources are depleting in the country. Marine capture used to be the major source of raw materials to supply to the fish industry. However, with the significant increase in the fuel prices, smaller workforce in fishing industry and limited natural resources, the Thai fish industry is relying more on aquacultured shrimps.

Shrimp aquaculture has played an important role in the fishery sector of Thailand since the early 1980s. The shrimp aquaculture production has dramatically increased and reached 450,000 tons in 2006 with export value at US\$2.4 billion. Major importing countries of Thai shrimp products are USA, Japan, the European Union (EU) and Australia. *Penaeus monodon* (Black tiger shrimp) used to be the major shrimp species cultured but in recent years, the dominant species has changed to *Penaeus vannamei* (White shrimp) due to their better resistance against diseases and providing higher and rapid returns of income upon farming.

Many small and medium-sized fish processing establishments (SME) in Thailand find it difficult to implement quality assurance systems due to economic and technical constraints.

They comprised largely of PPE, which produce semi-processed raw materials for main processing establishments. The processes carried out in these establishments include peeling, de-heading and deveining, depending on the type of raw materials involved, and also upon customers' requests. Thus, PPE can play a significant role in determining the quality and safety of raw materials and subsequently of the finished products.

In Vietnam, the fisheries industry, particularly shrimp processing industry has developed incessantly with yearly growth rate of 7-12% in the recent years. The number of industry scale processing facilities had reached 520 establishments, as compared with 232 establishments in 2000, and the export turnover for 2007 amounted to US\$3.75 billion, as compared with US\$1.4 billion in 2000. Many of the establishments have a continuous chain of materials supplied to the various processing stages, from the aquaculture farms to the PPE and finally, to the exporting processing factories. Due to the high production cost incurred by labour expenses for the pre-processing activities, the shrimp PPE are located in proximity to the aquaculture farms and operate long hours. Currently in Vietnam, there are about 1000 smaller scale establishments of shrimp pre-processing facilities that are surrounded by 127 farming areas, with about 10 to 200 workers.

In order to be registered and approved for shrimp pre-processing activities above by the local competent authority, establishments are required to have good conditions of premises, means of production, processing tools, water and ice. In addition, establishments must have

enough manpower for GMP and HACCP implementation.

However, in comparison with the main processing factories, the quality control in shrimp PPE are not completely satisfactory in terms of meeting the requirements of GMP and HACCP. In order to help the PPE to complement HACCP, Ministry of Fishery (now merged with Ministry of Agriculture and Rural Development – MARD) instructed and chose some model establishments for application of HACCP. The project which ends in 2010, is a large scale project where all the participating establishments will be required to apply HACCP and be inspected by competent authority for approval.

B. Fish Meat/Filleting PPE in Indonesia and Malaysia

In Indonesia, the fish processing industry comprises mainly the domestic-based traditional fish products factories commonly operated by small to medium-scale processors (SME) which cater mostly to the domestic market. The fish processing establishments are spread out in all the provinces in Indonesia particularly in Java Island where almost 60% of the total industries are located.

Some of the PPE lack adequate and proper infrastructure, materials and equipment for higher productivity output. In addition, there is scarce supply of raw materials (fish) for fish meat/filleting as large quality of the fresh raw materials are exported to other countries. Most PPE also lack awareness on the hygiene requirements during the handling and processing stages, which resulted in less superior quality products. Moreover,

the locations of the PPE are spread throughout the country, making it difficult for relevant government agencies to monitor and conduct surveillance work on the performance of the PPE.

Efforts should be made to encourage these PPE to improve their knowledge and skills on processing technology especially on the adoption of Good Manufacturing Practice (GMP) and Standard Sanitation Operating Procedures (SSOP). Adequate knowledge on these aspects of fish processing as well as having sufficient and clean processing facilities will assure the country of fish products that are of high quality and safe for human consumption not only for the domestic market but also for the competitive export market as well.

The processing of fish meat/fillets requires washing of the deboned and trimmed fish with cool clean water and packing the product with ice. The various processing stages are as follow: de-heading, gutting, filleting, skinning, trimming, washing, packing and storage. Fish meat/fillets, upon semi-processed in the pre-processing plants, are delivered to surimi processing plants for surimi manufacturing.

The fish meat/fillets are usually from fish species such as, Yellowtail fusilier (*Caesia erythrogaster*) [local name - Ekor Kuning], Rainbow runner (*Elagatis bipinnulatus*) [local name - Sunglir], Purple-spotted bigeye (*Priacanthus tayenus*) [local name - Tumenggung mata besar], Doublewhip threadfin bream (*Nemipterus nematophorus*) [local name - Kurisi cambak Ganda], Bloched grunt (*Pomadasys maculates*)

[local name - Gerot-gerot] and Banded grunter (*Therapon theraps*) [local name - Kerong-Kerong].

To date in Malaysia, there are 10 fish meat/ filleting PPE located at the fish landing jetties in Kuala Kedah (Kedah); Batu Maung (Pulau Pinang); Hutan Melintang (Perak); Endau (Johor), Kuantan (Pahang), Chendering (Terengganu), Kuala Besut (Terengganu), Tok Bali (Kelantan); Bintawa (Sarawak), and Tuaran (Sabah), which altogether supply fish meat/fillets to 7 surimi and otoshimi processing plants within the country.

A potential demand for fish meat/fillets has helped in creating a more vibrant economy for the fisheries sector in Malaysia. Fish meat/filleting activities had started in the early 1990s and the development was in tandem with the growing demand for surimi and surimi-based products. Most of the processing activities are carried out at the fish landing jetties by small-scale operations with 10 -15 female workers. A usual processing routine, which starts from the morning, will involve sorting, washing, scaling, degutting, de-heading, filleting and packing before transporting into surimi processing plants. The fish meat/fillets are chilled and packed in insulated boxes before transporting into surimi processing plants. There is an estimated daily quantity of 1000 -3000 kg fish meat/fillets that is produced by each PPE. The price of fish meat/fillets ranges from RM 1.50 – 2.00 per kg.

The species of fish used for the fish meat/ filleting are namely *Nemipterus* spp (local name- Ikan kerisi), *Priacanthus* spp, *Parupeneus* spp (Biji nangka), *Sphyaena forteri* (kacang/alu-alu), *Saurida*

micropectoralis (ikan conor), *Chrysochir aureus* (croacker) and *Decapterus maruadsi* (scad).

C. Crab Meat Picking PPE in Philippines and Cambodia

Crab meat picking is a PPE activity carried out in some ASEAN member countries such as Philippines and Cambodia. These PPE are predominantly located along the coastal areas whereby processing can be efficiently carried out without much delay due to the close proximity to the source of raw materials.

The crab meat picking industry in the Philippines is concentrated along coastal towns of Quezon, Palawan, Masbate, Bicol, Negros Occidental, Iloilo, Bohol, Cebu, Samar, Leyte, Zamboanga del Norte and Surigao. The plants where the pre-processing (picking) is conducted, employ from about 100 to 160 crab meat pickers working in shifts, depending on the availability of the raw material, and /or market demand. Most plants are separated from the main processing plant where the meat are processed (canned) and packaged for export. The species generally used is the Blue Crab (*Portunus pelagicus*), in local context known as "alimasag" or "kasag".

The crab meat pre-processing (picking) plants are generally small-scale, supplying main processing establishments that produce pasteurized/ canned crab meat, the export of which is presently limited to non-European Union (EU) countries, mainly the United States and Australia. Presently there are 61 active crab meat picking pre-processing plants located in various regions of the country, which are as follows:

Table 1.
Number of Crab meat picking PPE in various regions of Philippines

Regions	Number of PPE
Mainly in Palawan towns Quezon, Roxas, Abu-abu, Aborlan, New Quilon	5
Sorsogon, Masbate, Pina Island, Bulan, Camaligan	8
Negros Occidental and Panay	27
Cebu and Bohol	6
Leyte and Samar	8
Zamboanga del Norte and Zamboanga del Sur	3
Surigao and Butuan	3
Tawi-Tawi	1
Total	61

During the peak season in August, crab catch can vary from 500 kg to 1 ton per day, about 25 % of which become picked crab meat. The cooked crab meat are picked and classified into categories depending on which part of the crab the meat were picked from, placed in individual plastic canisters,

packed in polyethylene / plastic bags and arranged alternatively with ice in styrofoam / insulated boxes for transport to the main processing plant. These picked crab meat can be differentiated into 6 main categories namely, Collosal, Jumbo, Lump, Special, Flower or Backfin and Claw.

Table 2. Classification of picked crab meat

Category	Description
Collosal	White lump of meat, average of 11 grams/piece, largest part of meat from the body portion adjacent to the backfin, most expensive
Jumbo	White lump of meat , average of 4 to 10 grams/piece from the body portion adjacent to the backfin, expensive
Lump	Broken pieces of Jumbo meat
Special	Flakes of white body meat other than the Lump meat
Flower or Backfin	White body meat left out after removing the Jumbo meat, smaller and can consist of Lumps and Flakes
Claw	Meat from the claws

In Cambodia, crab meat processing is one of the important activities that contribute to the country's economy, mainly due to export demands of crab meat. Along the coastal province of Cambodia, there are

24 crab meat picking processing plants - 6 are in Kampot province, 2 are in Kep city, 8 are in Sihanouk ville, and 8 are in Koh Kong province. Fisheries statistics showed that crab meat processing has increased

since 1994, from 61 tonnes per year to 332 tonnes in 2000. However, the continued growth to this industry is limited due to the depleting resources. The number of workers that run the operation in the crab picking processing establishments ranged from managing by individual households to medium-scaled production, with a capacity of few hundred workers.

The six species of crab that are being processed in Cambodia are Blue swimming crab (*Portunus pelagicus*); [local name- Kdam Ses] Bloodspotted crab (*Portunus sanguinolentus*) [local name- Kdam Ses Phkay], Crucifix crab (*Charybdis feriatus*) [local name- Kdam Khla], Two-spine arm swimming crab (*Charybdis anisodon*) [local name- Kdam Nhe or Kdam Dangkeb Sor], Sentinel crab (*Podophthalmus vigil*) [local name- Kdam Prolet or Kdam Pnek Veng] and Spotted belly rock crab (*Ozius guttatus*); [local name- Kdam Phkolorn]

The semi-processed product after the crab meat picking –chilled crab meat are usually further processed (e.g. canning) to value-added products. The production capacity of these crab meat picking PPE can range from about 300 – 400 kg of fresh crabs (100 – 140 kg of crab meat) with price of crab meat ranged from US\$15-25/kg.

D. Shrimp Salting PPE in Philippines

Shrimp salting is an important process in making shrimp paste. In Philippines, shrimp paste is one of the important condiments in the Filipino diet. Besides, the shrimp salting industry plays an important role in the economic structure of the country as it also generates employment opportunities for the fishermen involved in shrimp harvesting.

Upon packing the salted shrimps into containers, the semi-processed product will be sent to shrimp paste processing establishments for further while some of the salted shrimps are also sold to vendors, middlemen or distributors for resale to the consumers after bottling.

Shrimp paste is made from the fermentation of salted shrimps, from the species known as *Acetes indicus* or *Acetes sp.*. The local name for shrimp paste is known as *bagoong alamang*, *ginamos* or *bagoong aramang*. This product is commonly used as a cooking ingredient, aside from using it as a food condiment. The quality of the shrimp paste varies in appearance and flavor, depending on customer's requirement. For instance, pink and salty *bagoong alamang* is marketed as 'fresh' and this particular quality is achieved by fermenting the shrimp-salt mixture for 2 days prior distribution. The price of fresh *bagoong alamang* ranges from US\$1-2/kg.

There are several manufacturers of shrimp paste engaging in smaller scale production and the process varies from one processor to another. In Philippines, there are 30 small shrimp paste (local name - *bagoong alamang*) processors in Bataan particularly in Balanga City; 5 backyard processors in Navotas City. There are also quite a number of salted shrimp processors in Bulacan, Pangasinan, Quezon and in the Bicol provinces. According to Bataan fisheries statistics, 100 small processors have an average production of 100 to 500 kg a day and the product is intended for local consumption only. There are only 3 *bagoong alamang* processors that can be considered as medium-sized establishments in Balanga City that produce *bagoong alamang* for further processing.

GMP for selected PPE

Shrimp Pre-Processing

Process Flow Diagram

Outline of Processing Steps

Good Manufacturing Practice (GMP)

Shrimp Pre-Processing (De-heading/Peeling and or Deveining)

Countries: *Malaysia, Myanmar, Thailand and Vietnam*

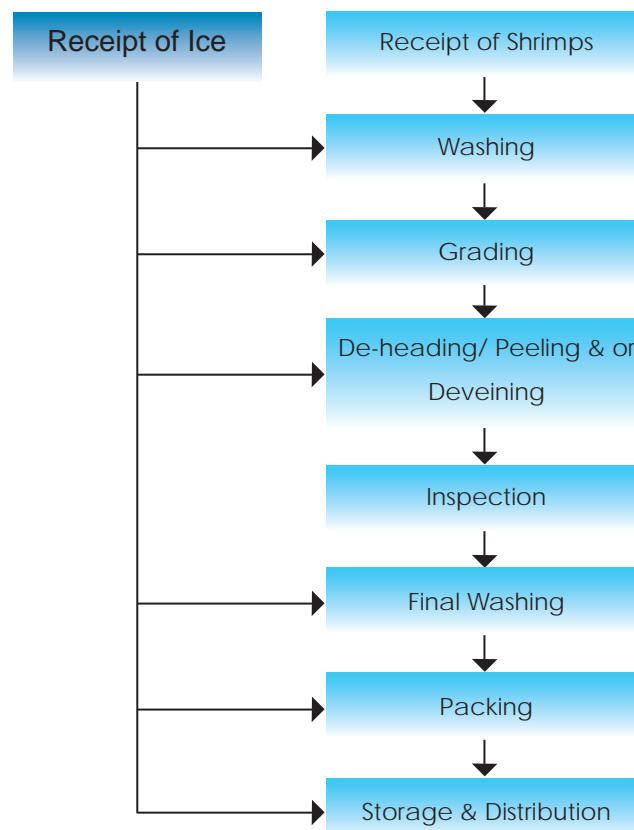
Product Name: *Shrimps (de-headed/peeled and or deveined)*

Product Description

Shrimps are de-headed, washed and graded accordingly before packing into boxes and stored at optimum chilled temperature. Upon customers' request, the de-headed shrimps may also be peeled and or deveined. These semi-processed shrimps

(de-headed/ peeled and or deveined) are sent to other processing establishments for further processing into value-added products such as block frozen or IQF (individually quick frozen) shrimps, cooked shrimps, battered and breaded shrimps etc.

Process Flow Diagram



Outline of Processing Steps

1. Receipt of Raw materials

a. Receipt of Ice

Ice functions as a cooling agent during the washing steps of the raw shrimps by reducing the temperature to an optimum level not exceeding 5°C. Ice is transported to the pre-processing establishments in clean and well-designed containers, which are made of non-corrodible materials and are handled in a sanitary manner so as to prevent any contamination from occurring.

b. Receipt of Shrimps

Every lot of shrimps should be recorded and evaluated for its chemical and organoleptic parameters to ensure that they are safe and suitable for processing. A common additive which should be tested for is sodium bisulphite, which is added to inhibit the blackening of the shell of the shrimps, due to the enzymatic formation of the black pigment melanin. However, in excess of the regulatory limit, this food additive can pose as a health threat.

Reducing the temperature of the shrimps as soon as possible after capture can retard spoilage, which begins immediately thereafter. Shrimp are normally stored at low temperature not exceeding 5°C until processing.



Figure 1. Shrimps (raw material) stored in non-corrodible containers.

2. De-icing and Washing

The shrimps are washed in clean and potable chilled or iced water. This can be done in batches using clean and suitable barrels and plastic containers. The shrimp are gently stirred in water to remove any extraneous foreign materials. Ice is added frequently during the washing of shrimps or when a new raw material lot is introduced into the production chain to maintain chilled temperatures.



Figure 2. Shrimps are de-iced and washed using potable iced water.

3. Grading

The raw shrimps are graded according to defined species, sex, length, weight, size or freshness. Grading may be carried out by visual inspection or weighing using a weighing scale. The graded shrimps are then placed in separate labelled containers accordingly.



Figure 3. Size grading of shrimps.



Figure 4. Grading of shrimps.

4. De-heading/Peeling and or Deveining

During this step, the head (cephalothorax) is gently removed from the shrimp. Next, the tail is held while the shell around the shrimp is gently peeled off. The tail can then be removed completely if necessary. The 'vein' (digestive tract) can be removed by making a lengthwise, shallow cut at the outer curve of the shrimp's body using a suitable sharp pointed utensil.



Figure 5. De-heading and peeling of shrimps.

5. Inspection

This step is conducted mainly through monitoring by observation to ensure that only shrimps of acceptable quality are selected.



Figure 6. Inspection carried out using ice to keep the shrimps chilled.

6. Final Washing and or Chemical Bath/Dip

The shrimps are washed in iced water at temperatures not exceeding 5°C. Each batch of washing should not exceed a certain quantity of shrimp to ensure that the washing step is carried out effectively. The washing procedure is gently carried out to avoid damaging the shrimps. The water is changed as frequently as possible during washing or when a new lot is introduced into the production chain.

A chemical bath/dip for the semi-processed shrimps is sometimes used as a final washing step to reduce the microorganisms found on the surface of the shrimps. The chemicals used are usually chlorine-based (e.g. sodium hypochlorite) and these chemicals are added to water in concentrations that can destroy harmful microbes that are associated with the raw shrimps.



Figure 7. Washing of shrimp in batches.

7. Packing

The semi-processed shrimps are packed into clean and suitable packaging materials or containers.

8. Storage and Distribution

The semi-processed shrimps are stored well iced and or in chiller room before distribution. During distribution, the shrimps are also kept well iced. Ideally, transportation should be by refrigerated vehicles.



Figure 8. Ice is used to prevent quality deterioration during storage and distribution.

GMP For Shrimp Pre-Processing

Section 1 Receipt of Raw Materials

GMP 1A.1 Receipt of Ice

Ice received for use in the pre-processing establishment should be contained and transported in clean and well-designed containers.

Reason

Ice contained and transported in dirty and unsanitary containers will become a source of contamination.

Compliance

1. Ice containers must be made of non-corrodible materials, which are durable and easily cleaned.
2. Ice containers must have tight fitting covers and must not be damaged with cracks and crevices.
3. Shipments of ice delivered to the PPE in unsanitary containers are refused and returned to the supplier.

GMP 1A.2 Manufacture of Ice

Ice must be manufactured using approved, potable water supply.

Reason

Ice that comes in contact with product during processing must be produced in such a manner as to reduce the possibility of contaminating the product with bacteria or with toxic substances.

Compliance

1. Ice for use must be manufactured using approved, potable water supply.
2. Shipments of ice not using approved, potable water supply are refused and returned to the supplier.

GMP 1B.1 Receipt of Shrimps

Every incoming shipment of raw shrimps should be evaluated for condition and quality. The condition of the shrimps should be noted on receipt. Documentation records on the quality should be maintained and be properly kept.

Reason

The incoming shipment of raw shrimps should be evaluated to ensure that no tainted, decomposed, or unwholesome shrimp are utilised for processing. Records are documented in order to identify lots that may not meet specifications.

Compliance

1. The following details are recorded and maintained:
 - a. Species name
 - b. Date of receipt of shipment
 - c. Name and address of supplier
 - d. Name of delivery vessel or transport company
 - e. Date of harvest
 - f. Average temperatures of the shrimps upon receipt
 - g. Quality in the shipment
2. The following parameters should be tested:
 - a. Chemical parameters for the presence of antibiotics residues and prohibited food additives such as sodium bisulphite.
 - b. Organoleptic parameters of the raw shrimp
3. The requirements for organoleptic quality of shrimps are as follows:
 - a. Freshness
 - b. Absence of any black spot on the shrimp
 - c. Intact whole shrimp, together with the head and the shell
 - d. Natural smell, with no off-odours

GMP 1B.2 Handling of shrimps

Raw shrimps are to be stored in suitable containers at temperatures not exceeding 5°C.

Reason

Storage of raw shrimps at low temperatures reduces bacterial growth rate and also slows down many of the enzymatic reactions involved in spoilage.

Compliance

1. Shrimps are stored at low temperatures by refrigeration or cooling with ice.
2. Shrimps shall be kept at a temperature not exceeding 5°C at all times.
3. If ice is used, the ice should be added and melting ice water should be allowed to drain off to achieve the required temperature.

SECTION 2 De-icing and Washing

GMP 2.1 De-icing and Washing

The raw shrimps should be de-iced and washed using chilled or iced water from approved, potable water supply.

Reason

The purpose of de-icing and washing is to minimise the possibility of contamination by removing any extraneous foreign materials. The use of approved potable water will prevent contamination to the product. At low temperatures, bacterial growth is reduced.

Compliance

1. The water used must be from an approved potable source.
2. The temperature of the water is maintained below 5°C by refrigeration or the addition of ice.
3. Washing containers or tanks should be made of non-corrodible materials and well-designed to provide a constant change of water with good circulation, and to have provisions for drainage and to be easily cleaned.

SECTION 3 Grading

GMP 3.1 Grading

Shrimps should be graded mechanically or manually immediately after de-icing and washing. This should be carried out in a sanitary area separated from the receiving area. There should also be adequate manpower to handle the quantity of shrimp being graded. Shrimps should be kept at low temperatures at all times.

Reason

Grading is important due to market demands and it facilitates the de-heading, peeling or deveining when these steps are performed mechanically.

An adequate supply of manpower will ensure that there is no occurrence of backlogging. Processing at low temperatures is essential, as it will greatly reduce microbial growth and spoilage.

Compliance

1. The grading should start immediately after de-icing and washing.
2. The personal hygiene of workers is well maintained and monitored accordingly. All workers handling the shrimps during the process should comply with personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.

SECTION 4 De-heading/ Peeling and or Deveining

GMP 4.1 De-heading/ Peeling and or Deveining

Shrimp de-heading/ peeling and or deveining should be carried out hygienically and as quickly as possible in a sanitary area.

Reason

As the heading/peeling and or deveining process expose the shrimp meat to possible contamination, it must be carried out hygienically and quickly to prevent contamination and reduce microbial growth.

Compliance

1. The equipment and or tools used should be well-designed and made of non-corrodible materials, easy to clean and sanitize.
2. The room or area where the de-heading, peeling and deveining take place is properly maintained.
3. The personal hygiene of workers is well-maintained and monitored accordingly. All workers handling the shrimps during the process should comply with good personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.
4. The temperature of the shrimps should not exceed 5°C at all times.

SECTION 5 Inspection

GMP 5.1 Inspection

Inspection of the shrimps prior to packing should be done as quickly as possible, keeping the product temperatures low at all times.

Reason

Inspection is necessary to remove any remaining extraneous foreign materials as well as shrimps that are perceived as defective and unsuitable for use. This includes but is not limited to broken shrimp, pieces of shell, unpeeled or undeveined shrimp, blackspot on shrimp and crushed shrimp material. Inspection must be done as quickly as possible at low temperatures to minimise contamination and microbial growth to the product.

Compliance

1. The inspection process is completed in as short a time as possible.
2. The shrimp temperatures should not exceed 5°C at all times.
3. All defective or unusable products should be properly segregated and removed.

SECTION 6 Final Washing and/or Chemical Bath/Dip

GMP 6.1 Washing

The inspected shrimp should be washed with iced or chilled water from an approved, potable water supply.

Reason

The semi-processed shrimps should be washed again to reduce the microbial load in the product.

Compliance

1. Washing is carried out using iced or chilled water, to ensure that the product temperatures do not exceed 5°C.
2. The water is changed as frequently as possible, and at the beginning of a new washing lot.
3. Care in washing is undertaken to avoid any damage to the shrimps.

GMP 6.2 Chemical Bath/Dip

If the shrimps are treated in a chemical bath/dip, the bath/dip should be prepared using approved chemicals and potable water supply.

Reason

Chemicals that are unapproved for use pose a health hazard to the consumers.

Compliance

1. Only approved chemicals should be used and prepared according to the manufacturer's instructions.
2. The final residual concentration of the chemical in the shrimps should not exceed the maximum allowable level permitted by the relevant authorities for the chemical.

SECTION 7 Packing

GMP 7.1 Packing

The shrimps should be packed as quickly as possible in a hygienic manner, into clean and suitable packaging materials or containers with the temperature of the shrimps not exceeding 5°C at all times.

Reason

Packaging materials is designed to preserve the quality of the product and protect the product against mechanical damage, dust, dirt and other extraneous foreign materials, insects and microbial contamination.

Packing is done as quickly as possible to minimize contamination to the product and microbial growth.

Compliance

1. The packaging materials used must be food grade and clean.
2. The containers used should be clean and made of non-corrodible materials. Wood and materials that is capable of absorbing moisture should not be used.
3. The personal hygiene of workers is well maintained and monitored accordingly. All workers handling the shrimps during the process should comply with good personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.

Compliance

1. The packed shrimps should be stored iced or in a chiller room such that the product temperatures do not exceed 5°C at all times.
2. Each pack or container should be adequately labelled with correct information, which include:
 - a. Species name
 - b. Batch/lot number
 - c. Date of production
 - d. Name and address of processor
3. The packed shrimps should be kept well iced during distribution such that the product temperatures do not exceed 5°C at all times. Ideally, distribution should be carried out using refrigerated vehicles.

SECTION 8 Storage and Distribution

GMP 8.1 Storage and distribution

The packed shrimps should be stored properly labelled and distributed in such a manner as to minimize temperature abuse.

Reason

Labelling of the product is important for identification and traceability. Storing at low temperatures is to prevent undesirable product deterioration and minimize microbial growth.

Fish Meat/Filleting

Process Flow Diagram

Outline of Processing Steps

Good Manufacturing Practice (GMP)

Fish Meat/Filleting

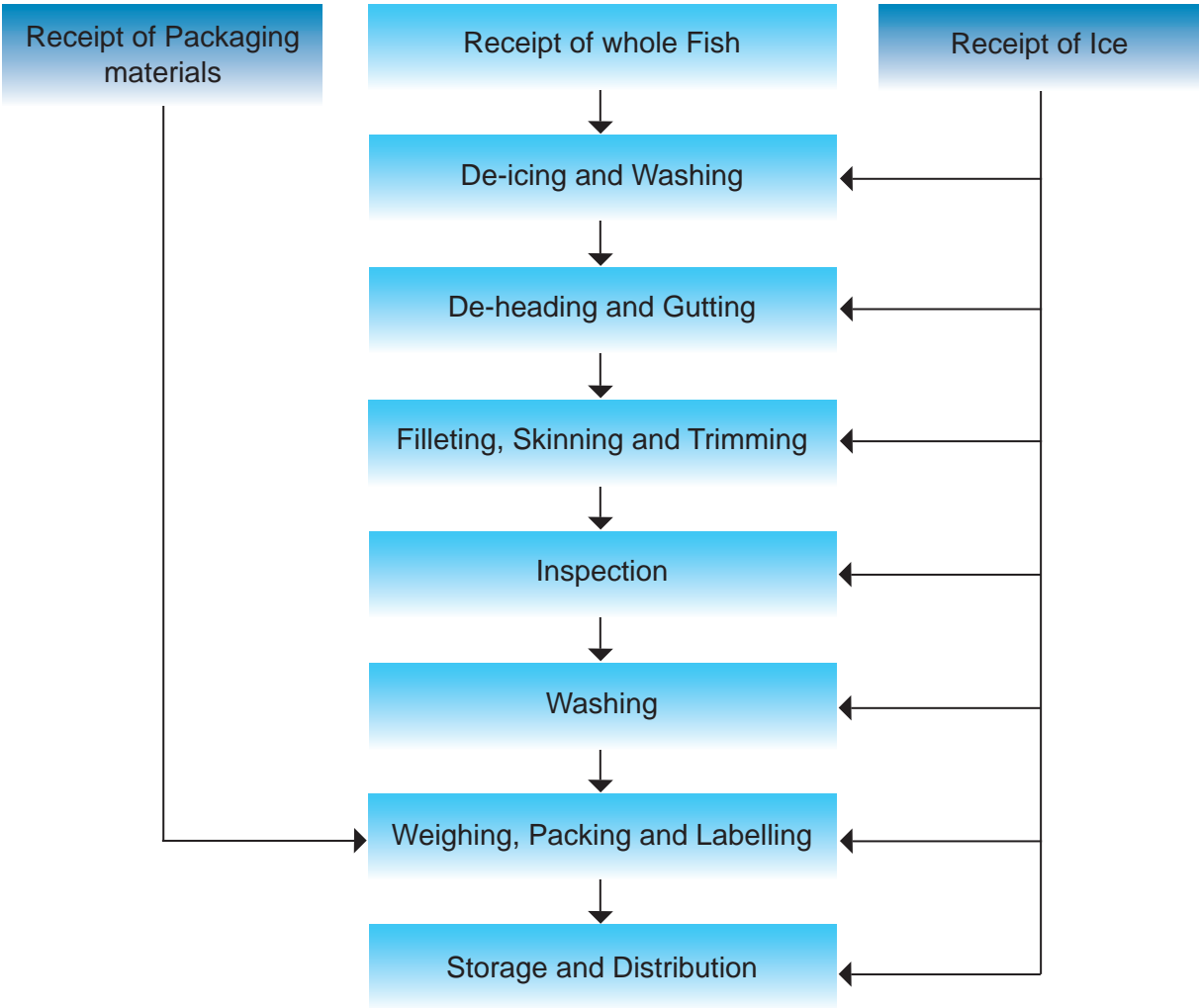
Countries: Indonesia and Malaysia

Product Name: Fish Meat/ Fillets (for surimi otoshimi processing)

Product Description

Fresh whole fish are gutted and filleted to obtain boneless pieces of fish meat. These fish meat/ fillets are packed into food grade plastic bags and stored in properly labelled boxes before it is distributed to surimi processing plants for processing into surimi.

Process Flow Diagram



Outline of Processing Steps

1. Receipt of Raw materials

a. Receipt of Ice

Ice functions as a cooling agent during the washing steps of the raw whole fish by reducing the temperature to an optimum level not exceeding 5°C. Ice is transported to the pre-processing establishments in clean, hygienic and well-designed containers, which are made of non-corrodible materials and are handled in a sanitary manner so as to prevent any contamination from occurring.

b. Receipt of Packaging materials

Packaging materials such as food grade plastic (polyethylene) bags are used to pack the fish meat/fillets before transporting to the surimi processing plants.

c. Receipt of whole Fish

Every shipment of raw whole fish should be recorded and evaluated for its organoleptic parameters to ensure that they are safe and suitable for processing. Fish are preserved at low temperatures not exceeding 5°C by using ice.



Figure 1. Receipt of whole fish.

2. Washing

The fish are washed in clean and potable iced water before they are further processed. This can be done in batches and ice is added to lower temperature of the water.



Figure 2. Washing the fish with clean and potable water.

3. De-heading and Gutting

This step will remove the head and all the contents of the gut cavity or belly cavity of the fish. After the head is cut off, fish is slit open from throat to vent and all the guts and organs are removed. This step is usually performed manually.



Figure 3. De-heading of whole fish.



Figure 4. Gutting of fish.

4. Filleting, Skinning and Trimming

This step involves cutting, either manually or by machine, roughly parallel with the backbone, a strip or slice of largely boneless flesh from along the length of a fish to produce from one side of the fish a fillet. Filleting machines are available for many species but hand filleting is still widely used, and may be preferred because the yield of fillet is better by manual cutting. The fish skin is removed from the fillet which is then trimmed.



Figure 5. Fish filleting, skinning and trimming steps.

5. Inspection

The fish meat/ fillets are visually inspected for remaining bones which are then trimmed off.



Figure 6. Inspecting the fish meat/fillets.

6. Washing

The fish meat/fillets are given a final wash or rinse before weighing, packing and labelling.



Figure 7. Washing of fish meat/fillets.



Figure 8. Washing of fish meat/fillets.

7. Weighing, Packing and Labelling

The fish meat/fillets are weighed and packed into food grade plastic bags, which are then labelled for identification and traceability.



Figure 9. Weighing of fish meat/fillets.



Figure 10. Fish meat/fillets packed in food grade plastic bags.

8. Storage and Distribution

The fish meat/ fillets in plastic bags are stored in proper labelled containers with ice and distributed to surimi processing plants with minimal temperature abuse.

GMP For Fish Meat/Filleting

Section 1 Receipt of Raw Materials

GMP 1A.1 Receipt of Ice

Ice received for use in the pre-processing establishment should be contained and transported in clean and well-designed containers.

Reason

Ice contained and transported in dirty and unsanitary containers will become a source of contamination.

Compliance

1. Ice containers must be made of non-corrodible materials, which are durable and easily cleaned.
2. Ice containers must have tight fitting covers and must not be damaged with cracks and crevices.
3. Shipments of ice delivered to the PPE in unsanitary containers are refused and returned to the supplier.

GMP 1A.2 Manufacture of Ice

Ice must be manufactured using approved, potable water supply.

Reason

Ice that comes in contact with product during processing must be produced in such a manner as to reduce the possibility of contaminating the product with bacteria or with toxic substances.

Compliance

1. Ice for use must be manufactured using approved, potable water supply.
2. Shipments of ice not using approved, potable water supply are refused and returned to the supplier.

GMP 1B.1 Receipt of Packaging Materials

Packaging materials (e.g. polyethylene bags) that are damaged and dirty should be rejected/refused.

Reason

Damaged and dirty packaging materials will not provide the necessary protection to the food against contamination and may become a source of contamination to the products.

Compliance

1. Damaged or dirty packaging materials should be rejected and refused entry into the plant so as to present no risk of contamination to other packaging materials.

GMP 1B.2 Storage of Packaging Materials

Packaging materials (e.g. cardboardes, polyethylene (PE) and polypropylene (PP) bags and polystyrene (PS) trays) that are used to contain the finished products shall be safe for their intended use and be stored under proper conditions.

Reason

Packaging has an important function in protecting the finished products from contamination. Damaged packaging materials will not provide the desired protection and dirty packaging materials may contaminate the product.

Compliance

1. Packaging materials used shall be non-toxic and of food grade quality to ensure that they are safe for containing the finished products.
2. Packaging materials used shall be in clean and hygienic conditions.
3. A clean and dry room that is insect-free shall be provided for the storage of packaging materials. The storage room should be designed and constructed to a) permit adequate maintenance and cleaning, b) avoid pest access and harborage; and c) enable minimal likelihood from contamination by locating the storage room for packaging materials away from areas where raw or food products are handled.
4. Proper shelving racks shall be in place for storing of the packaging materials, away from the ground.
5. Packaging materials shall be used on a First-In-First-Out (FIFO) basis or according to the factory's rotation/inventory control schedule and should not be used beyond their recommended shelf life period.

GMP 1C.1 Receipt of whole Fish

Every incoming shipment of unprocessed whole fish should be evaluated for condition and quality. The condition of fish should be noted on receipt. Documentation records on the quality received should be maintained and be properly kept.

Reason

The incoming shipment of raw materials should be evaluated to ensure that no tainted, decomposed, or unwholesome fish are utilised for further processing. Records are documented in order to identify lots that may not meet specifications.

Compliance

1. The following details are recorded and maintained:
 - a. Species name
 - b. Date of receipt of shipment
 - c. Name and address of supplier
 - d. Name of delivery vessel or transport company
 - e. Date of harvest
 - f. Average temperatures of the fish upon receipt
 - g. Quality in the shipment
2. The following quality parameters should be evaluated:
 - a. Odour – Presence of stale odour associated with taint or decomposition.
 - b. Belly cavity – Presence of burns through to skins or breakdown of belly wall.
 - c. Physical damage – Presence of splitting or mutilation of the fish.
 - d. Texture – Presence of soft and mushy texture.
 - e. Eyes – Presence of sunken, dull white or red eye or centre of eye liquefied.
 - f. Gills – Presence of uncharacteristic and stale odours associated with taint or decomposition. Presence of dark brown to yellow brown or white-yellow colour and slimy appearance of gills.

Lots with the presence of these observations should be rejected.

GMP 1C.2 Handling of whole fish

Whole fish are to be stored in suitable containers at temperatures not exceeding 5°C.

Reason

Storage of whole fish at low temperatures reduces bacterial growth rate and also slows down many of the enzymatic reactions involved in spoilage.

Compliance

1. Whole fish are stored at low temperatures by refrigeration or cooling with ice.
2. Whole fish shall be kept at a temperature not exceeding 5°C at all times.
3. The ice should be added and melting ice water should be allowed to drain off to achieve the required temperature.

SECTION 2 De-icing and Washing

GMP 2.1 De-icing and Washing

The whole fish should be de-iced and washed using chilled or iced water from approved, potable water supply.

Reason

The purpose of de-icing and washing is to minimise the possibility of contamination by removing any foreign materials. The use of approved potable water will prevent contamination to the product. At low temperatures, bacterial growth is reduced.

Compliance

1. The water used must be from an approved potable source.
2. The temperature of the water is maintained below 5°C by refrigeration or the addition of ice.
3. Washing containers or tanks should be made of non-corrodible materials and well-designed to provide a constant

change of water with good circulation, and to have provisions for drainage and to be easily cleaned.

SECTION 3 De-heading and Gutting

GMP 3.1 De-heading and Gutting

Fish are de-headed and gutted to remove the head and gut contents, washed in approved, portable water supply to remove all remnants guts, blood and organs from the belly cavity.

Reason

Remaining guts, blood and organs in the belly cavity can be a source of contamination to the fish meat/fillets. The use of approved potable water supply will prevent contamination to the product. Proper disposal of waste is important to prevent cross-contamination.

Compliance

1. The equipment and utensils used should be made of non-corrodible materials that are easy to clean and sanitize.
2. Waste should be collected in covered pedal-operated bins, which are removed and emptied regularly.

SECTION 4 Filleting, Skinning and Trimming

GMP 4.1 Filleting, Skinning and Trimming

Filleting, skinning and trimming processes should be done as quickly as possible in a sanitary area and the fish should be sufficiently iced to maintain low temperatures.

Properly designed equipment and tools should be used. Wooden cutting surfaces

should not be used. All workers must comply with good personal hygiene practices.

Reason

As filleting, skinning and trimming expose the fish meat/fillets to possible contamination, it must be carried out in a clean and sanitary area. Processing at low temperatures is essential, as it will reduce microbial growth and spoilage.

Properly designed equipment and tools are essential for facilitating the filleting, skinning and trimming processes so that they can be carried out quickly. Wooden cutting surfaces are porous and quickly become waterlogged and are practically impossible to be cleaned thoroughly.

Humans can be a source of contamination, thus there should be strong emphasis on good personal hygiene practices.

Compliance

1. The fish meat/fillets are maintained at 5°C or below at all times during processing by icing.
2. The equipment and tools used are made of non-corrodible materials that are easy to clean and sanitize. If in the absence of other materials, wood has to be used, a single board of a well-finished and smooth surface is recommended. Once the surface becomes badly worn or pitted then the board should be reconditioned or discarded.
3. The room or area where filleting, skinning and filleting take place is properly maintained in a hygienic and sanitary condition.
4. The personal hygiene of workers is well maintained and monitored accordingly. All workers should comply with good personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.

SECTION 5 Inspection

GMP 5.1 Inspection

Inspection of the fish meat/ fillets should be conducted as quickly as possible after filleting, skinning and trimming steps and the fish meat/ fillets should be sufficiently iced to maintain low temperatures at all times.

Reason

Inspection of the fish meat/fillets should be carried out as quickly as possible under low temperatures to minimise microbial growth and spoilage as well as contamination to the product.

Compliance

1. The inspection process is completed in as short a time as possible.
2. The fish meat/fillets temperatures should not exceed 5°C at all times.
3. All defective or unusable products should be properly segregated and removed.

SECTION 6 Washing

GMP 6.1 Washing

The fish meat/ fillets should be washed with iced or chilled water from approved, potable water supply prior to packing. Excess water on the fish meat/ fillets should be drained off.

Reason

The fish meat/fillets should be washed again to minimize the possibility of contamination and also to reduce the microbial load in the product.

Compliance

1. Washing is carried out using iced or chilled water, to ensure that the product temperatures do not exceed 5°C.
2. The water is changed as frequently as possible, and at the beginning of a new washing lot.
3. Care in washing is undertaken to avoid any damage to the fish meat/fillets.

SECTION 7 Weighing, Packing and Labelling

GMP 7.1 Weighing

Weighing should be carried out in a hygienic and sanitary manner and as quickly as possible.

Reason

It is necessary to carry out weighing as quickly as possible to ensure that the fish meat/ fillets are maintained at low temperatures to reduce the microbial growth and spoilage. Weighing should be carried out in a hygienic and sanitary manner to prevent cross contamination to the products.

Compliance

1. Weighing is carried out in an area or room that is clean and properly maintained.
2. The fish meat/ fillets are maintained at 5°C or below at all times.

GMP 7.2 Packing

The fish meat/fillets should be packed as quickly as possible in a hygienic manner, into clean and suitable packaging materials or containers with the temperature of the fish meat/fillets not exceeding 5°C at all times.

Reason

Packaging materials is designed to preserve the quality of the food and protect the food against mechanical damage, dust, dirt and other extraneous foreign materials, insects and microbial contamination.

Packing is done as quickly as possible to minimize contamination to the product and bacterial growth.

Compliance

1. The packaging materials used must be of food grade and clean.
2. The containers used should be clean and made of non-corrodible materials. Wood and materials that is capable of absorbing moisture should not be used.
3. The personal hygiene of workers is well maintained and monitored accordingly. All workers handling the shrimps during the process should comply with personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.

GMP 7.3 Labelling

Each pack should be properly and adequately labelled.

Reason

Labelling of products is important for identification and traceability.

Compliance

1. Each pack should be labelled with correct information, which include:
 - a. Species name
 - b. Batch/lot number
 - c. Date of production
 - d. Name and address of processor

SECTION 8 Storage and Distribution

GMP 8.1 Storage and Distribution

The packs of fish meat/ fillets should be stored in properly labelled containers or cartons and distributed as quickly as possible in such a manner as to minimize temperature abuse.

Reason

Efficient distribution of the products at low temperatures is to minimize quality deterioration of the product due to time and temperature abuse.

Compliance

1. The packs of fish meat/fillets should be adequately chilled or iced so that product temperature does not exceed 5°C at all times.
2. Each container/carton of product should be labelled with correct information, which include:
 - a. Species name
 - b. Batch/lot number
 - c. Date of production
 - d. Name and address of processor
3. Distribution vehicles should be maintained in clean and sanitary condition.

Crab Meat Picking

Process Flow Diagram

Outline of Processing Steps

Good Manufacturing Practice (GMP)

Crab Meat Picking

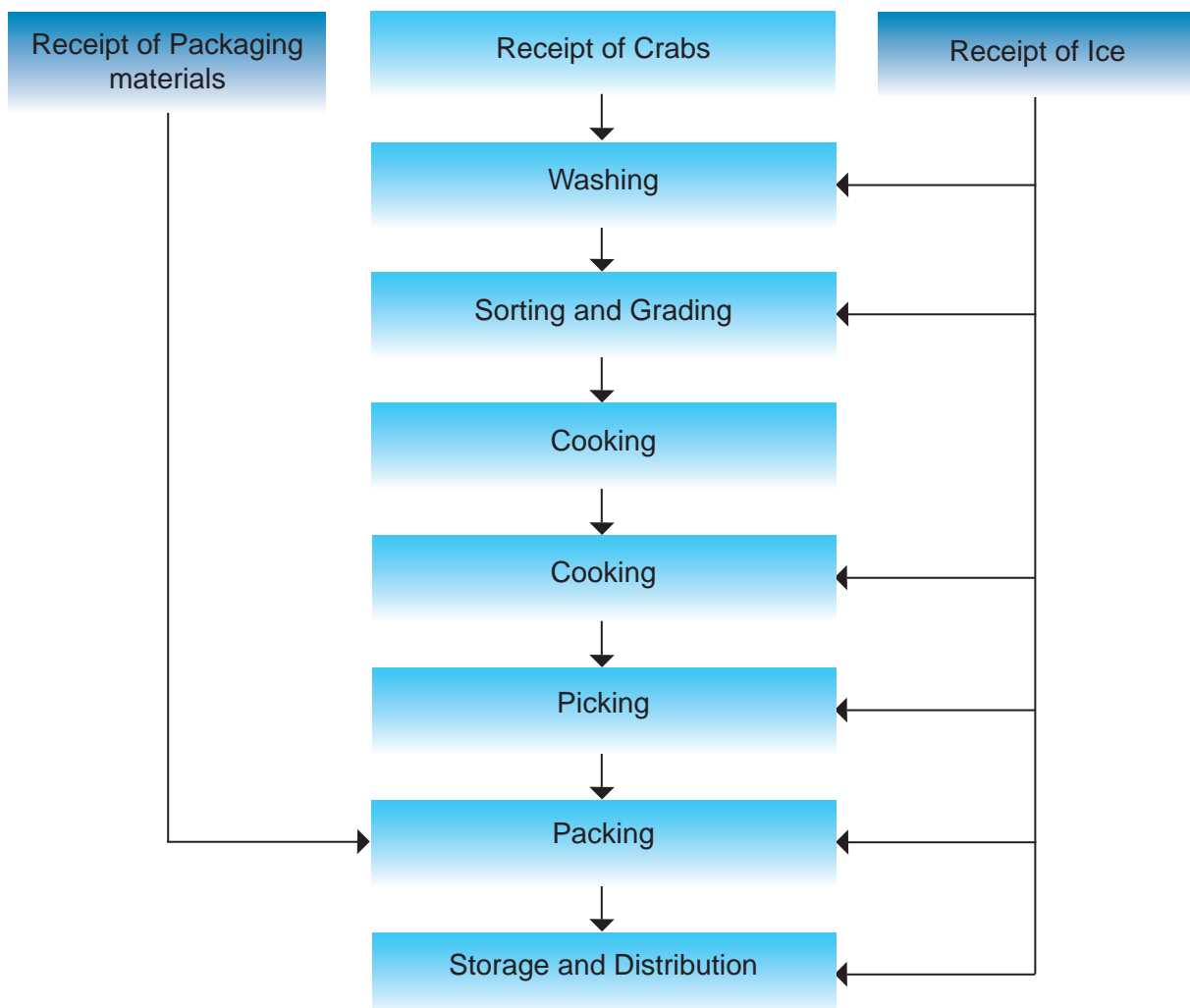
Countries: Cambodia and Philippines

Product Name: Chilled Crab meat

Product Description

Whole crabs are cooked by boiling or steaming before picking to obtain the crab meat. The chilled, picked crab meat is packaged for distribution to the main processing establishments for freezing or further processing into value-added products.

Process Flow Diagram



Outline of Processing Steps

1. Receipt of Raw materials

a. Receipt of Ice

Ice functions as a cooling agent during the washing steps of the whole crabs by reducing the temperature to an optimum level not exceeding 5°C. Ice is transported to the pre-processing establishments in clean and well-designed containers, which are made of non-corrodible materials and are handled in a sanitary manner so as to prevent any contamination from occurring.

b. Receipt of Packaging materials

Packaging materials such as polyethylene bags are used to pack the chilled crab meat.

c. Receipt of Crabs

Local fishermen supply fresh live crabs to the pre-processing establishments (PPE). The crabs upon receipt are examined and evaluated for its organoleptic parameters to ensure that they are alive and suitable for processing. Crabs are then iced awaiting further processing.



Figure 1. Live crabs after harvesting.



Figure 2. Crabs received in pre-processing plant.



Figure 3. Crabs iced in containers prior to further processing.

2. Washing

The crabs are washed in clean and potable water before they are further processed. This can be conducted in batches by using clean and suitable containers such as plastic baskets.



Figure 4. Washing of crabs in plastic baskets.

3. *Sorting and Grading*

The crabs are sorted and graded according to species, sex, size/weight and or quality characteristics such as freshness. Sorting and grading is for the purpose of pricing when they are sold to the processing plants.

Sorting and grading may be carried out by visual inspection, by smelling or by weighing using a weighing scale. It may also be carried out mechanically for size by means of inclined roller graders of various designs, or by automatic weighing system. The sorted and graded crabs are then placed in different labelled containers accordingly.



Figure 5. *Washed crabs at the grading stage.*

4. *Cooking*

The graded crabs are cooked by steaming or boiling in water for a sufficient period of time, depending on their sizes. During steaming, the crabs are first layered in stainless wire mesh baskets. Water is then heated to boiling in steamers before the baskets are placed inside. Steam cooking may vary according to crab size and could be anywhere from 25 to 30 minutes.



Figure 6. *Crab cooking area.*



Figure 7. *Cooking of crabs in metal containers*

5. *Cooling*

The cooked crabs are then rapidly cooled using potable running water, or placing the cooked crabs on slotted trays and covered with nets and cooling with cold circulated air.

Cooled crabs if not used immediately are kept in clean PE bags and stored in ice in styrofoam boxes which are then stored in a chiller room until needed.



Figure 8. *Cooked crabs covered with net during cooling stage.*



Figure 9. *Cooled crabs in PE bags stored in ice in styrofoam box*

6. Picking

Picking is carried out manually. At the picking tables, carapace, claws and legs are methodically removed. The crab meat from the different parts of the crab (body, claws and legs) are then picked and stored separately in coded containers which are then placed in a bed of ice to keep the crab meat at chilled temperatures.



Figure 10. Hand gloves worn during picking.



Figure 11. Crab meat picking.



Figure 12. Picking of crab meat into coded containers placed in a bed of ice.

7. Packing

The crab meat is packed into clean and food grade PE bags before storing in styrofoam boxes filled with ice. Weighing may be involved in this step to ensure that there is consistent amount of crab meat in each package.

8. Storage and Distribution

The packed crab meat in styrofoam boxes are transferred to a clean sanitary area, away from any unprocessed raw materials before they are distributed to the processing plants for further processing, with minimal temperature abuse. For longer storage, the packed crab meat is stored in a chiller room.

GMP For Crab Meat Picking

Section 1 Receipt of Raw Materials

GMP 1A.1 Receipt of Ice

Ice received for use in the pre-processing establishment should be contained and transported in clean and well-designed containers.

Reason

Ice contained and transported in dirty and unsanitary containers will become a source of contamination.

Compliance

1. Ice containers must be made of non-corrodible materials, which are durable and easily cleaned.
2. Ice containers must have tight fitting covers and must not be damaged with cracks and crevices.

3. Shipments of ice delivered to the PPE in unsanitary containers are refused and returned to the supplier.

GMP 1A.2 Manufacture of Ice

Ice must be manufactured using approved, potable water supply.

Reason

Ice that comes in contact with product during processing must be produced in such a manner as to reduce the possibility of contaminating the product with bacteria or with toxic substances.

Compliance

1. Ice for use must be manufactured using approved, potable water supply.
2. Shipments of ice not using approved, potable water supply are refused and returned to the supplier.

GMP 1B.1 Receipt of Packaging Materials

Packaging materials (e.g. polyethylene bags) that are damaged and dirty should be rejected/refused.

Reason

Damaged and dirty packaging materials will not provide the necessary protection to the food against contamination and may become a source of contamination to the products.

Compliance

1. Damaged or dirty packaging materials should be rejected and refused entry into the plant so as to present no risk of contamination to other packaging materials.

GMP 1B.2 Storage of Packaging Materials

Packaging materials (e.g. cardboardes, polyethylene (PE) and polypropylene (PP) bags and polystyrene (PS) trays) that are used to contain the finished products shall be safe for their intended use and be stored under proper conditions.

Reason

Packaging has an important function in protecting the finished products from contamination. Damaged packaging materials will not provide the desired protection and dirty packaging materials may contaminate the product.

Compliance

1. Packaging materials used shall be non-toxic and of food grade quality to ensure that they are safe for containing the finished products.
2. Packaging materials used shall be in clean and hygienic conditions.
3. A clean and dry room that is insect-free shall be provided for the storage of packaging materials. The storage room should be designed and constructed to a) permit adequate maintenance and cleaning, b) avoid pest access and harborage; and c) enable minimal likelihood from contamination by locating the storage room for packaging materials away from areas where raw or food products are handled.
4. Proper shelving racks shall be in place for storing of the packaging materials, away from the ground.
5. Packaging materials shall be used on a First-In-First-Out (FIFO) basis or according to the factory's rotation/inventory control schedule and should not be used beyond their recommended shelf life period.

GMP 1C.1 Receipt of Crabs

The incoming shipment should be inspected upon receipt to ensure that only live crabs are selected for processing. The crabs should also be evaluated for condition and quality. Every incoming shipment should be contained in clean and appropriate containers upon receipt and there is adequate hygiene control in place. Documentation records on the quality should be maintained and be properly kept.

Reason

The incoming shipment of raw materials should be evaluated to ensure that no tainted, diseased or dead crabs are utilised for further processing. Records are documented in order to identify lots that may not meet specifications.

Compliance

1. Only live and healthy crabs are accepted for processing.
2. The following details are recorded and maintained:
 - a. Species name
 - b. Date of receipt of shipment
 - c. Name and address of supplier
 - d. Name of delivery vessel or transport company
 - e. Date of harvest
 - f. Quality in the shipment
3. Clean and sanitized containers are used in transporting the live crabs. These containers must be washed properly before and after use, and kept dry and properly stored when not in use.
4. Tainted, diseased or dead crabs should be removed from the processing premises as quickly as possible.

SECTION 2 Washing

GMP 2.1 Washing

The crabs should be washed in running water from approved, potable water supply. Where necessary, scrubbing is needed to remove the gross dirt and mud on the crabs. Ice may be added to lower the temperature of the water. Suitable containers are used for washing the crabs.

Reason

The purpose of washing is to remove the gross dirt and mud on the crabs. The use of approved water source will prevent contamination to the product. The use of suitable and clean containers and tools will also minimise contamination.

Compliance

1. The water used should be from an approved potable source.
2. Washing containers or tanks should be made of non-corrodible and are well-designed to provide a constant change of water with good circulation, and to have provisions for drainage and to be easily cleaned.

SECTION 3 Sorting and Grading

GMP 3.1 Sorting and Grading

This step will require visual inspection whereby only good quality crabs are chosen for processing. There should also be adequate manpower to handle the quantity of crabs being processed. Suitable containers should be used to store the crabs

Reason

The selection of good quality crabs for processing is essential for ensuring the quality of the finished products. The use of suitable and clean containers will ensure that these containers do not become a source of contamination.

Compliance

1. Crabs are properly handled to ensure they are not killed or damaged during the process.
2. Containers should be made of non-corrodible materials, which excludes wood and materials that is capable of absorbing moisture and should have smooth surfaces that are free from cracks and crevices.

SECTION 4 Cooking

GMP 4.1 Cooking

The live crabs should be cooked by steaming or boiling in water for a sufficient period of time to ensure they are fully cooked. Cooking should be carried out in a clean and sanitary area or room.

Reason

A clean and sanitary cooking area and the use of clean and potable water will ensure that there is minimal contamination to the crabs during the cooking step.

Compliance

1. The cooking equipment and tools are made of non-corrodible materials, which exclude wood and materials that is capable of absorbing moisture.

2. Cooking equipment and tools, as well as the cooking area should be cleaned and sanitised on a regular basis.
3. Water used for cooking the crabs should be regularly changed.
4. All workers handling the crabs during the operation should comply with good personal hygiene practices.

SECTION 5 Cooling

GMP 5.1 Cooling

Cooling of the cooked crabs should be carried out efficiently and as quickly as possible by using cold circulated air in an enclosed room prior to picking. Alternatively, cold potable running water can also be used for cooling.

Reason

An enclosed area for cooling will prevent cross contamination to the cooked crabs.

Compliance

1. The cooling area should be kept clean and sanitized prior to air-cooling.
2. The cooling area should be properly enclosed to prevent entry of dirt, dust and pests such as flies.
3. Cooled crabs are not used immediately for picking should be kept at low temperatures (not exceeding 5°C) by packing the crabs in clean polyethylene bags and stored in ice in styrofoam boxes which are then stored in a chiller room until needed.

SECTION 6 Picking

GMP 6.1 Picking

Picking of the crabs should be done as quickly as possible in a clean and sanitary area. The cooked crabs before picking and the picked crab meat should be kept at low temperatures, not exceeding 5°C at all times.

Properly designed tools and utensils for picking should be used and there should be proper disposal of waste materials (e.g. crab shells, viscera, gills and other foreign materials).

All workers involved in picking must comply with good personal hygiene practices and should not handle any raw or uncooked crabs.

Reason

As the picking step will expose the crab meat to possible contamination, it must be carried out efficiently and in a clean and sanitary area. Processing at low temperatures is essential, as it will reduce microbial growth and spoilage.

Properly designed tools and utensils are essential for facilitating the processing of raw materials.

Proper disposal of waste is important to prevent cross contamination.

Humans can be a source of contamination and as such, there should be strong emphasis on proper personal hygiene. The chances of cross contamination are higher when staff personnel are handling both raw and cooked materials.

Compliance

1. The tools and utensils used should be made of non-corrodible materials that are easy to clean and sanitize.

2. Waste should be collected in covered pedal-operated bins, which are emptied regularly.
3. The room or area where the picking takes place is properly maintained. It should be well-illuminated and properly cleaned and sanitized before and after operation.

SECTION 7 Packing

GMP 7.1 Packing

Picked crab meat should be packed as quickly as possible into suitable packaging materials such as PE bags.

Reason

Prolonged exposure to ambient temperatures will promote microbial growth in the crab meat.

Compliance

1. The packaging materials used must be clean and of food grade quality. It should be intact and undamaged in any way.
2. The crab meat should be kept at low temperatures not exceeding 5°C at all times.

GMP 7.2 Chilling

Crab meat packed in polyethylene bags should be kept chilled by placing them into containers filled with crushed ice.

Reason

Low temperatures will reduce microbial growth and quality deterioration.

Compliance

1. The packs of crab meat are placed into suitable containers and iced immediately.
2. The containers of packed crab meat should be stored in a chiller room for longer storage.

SECTION 8 Storage and Distribution

GMP 8.1 Storage and distribution

The packed crab meat properly labelled should be transferred to a clean sanitary area away from unprocessed raw materials and distributed as quickly as possible in such a manner as to minimize temperature abuse. If not distributed immediately, the product should be stored in a chiller room.

Reason

The packed crab meat which is a cooked product must be stored separately from raw materials to prevent cross-contamination. Labelling is important for identification purpose and traceability. Efficient transportation and storage of the crab meat at low temperatures is to minimize quality deterioration of the product due to time and temperature abuse.

Compliance

1. The packed crab meat should be adequately chilled or iced so that product temperatures do not exceed 5°C at all times.
2. Each pack of crab meat should be labelled with correct information, which include:
 - a. Species name
 - b. Weight
 - c. Date of production
 - d. Batch/lot number
 - e. Name and address of processor
3. The chiller room should be able to maintain the product temperatures at 5°C or below. It should not be used to store any raw or uncooked materials.
4. The packed crab meat should be kept well-iced during distribution such that the product temperature does not exceed 5°C at all times. Ideally, distribution should be carried out using refrigerated vehicles.

Shrimp Salting

Process Flow Diagram

Outline of Processing Steps

Good Manufacturing Practice (GMP)

Shrimp Salting

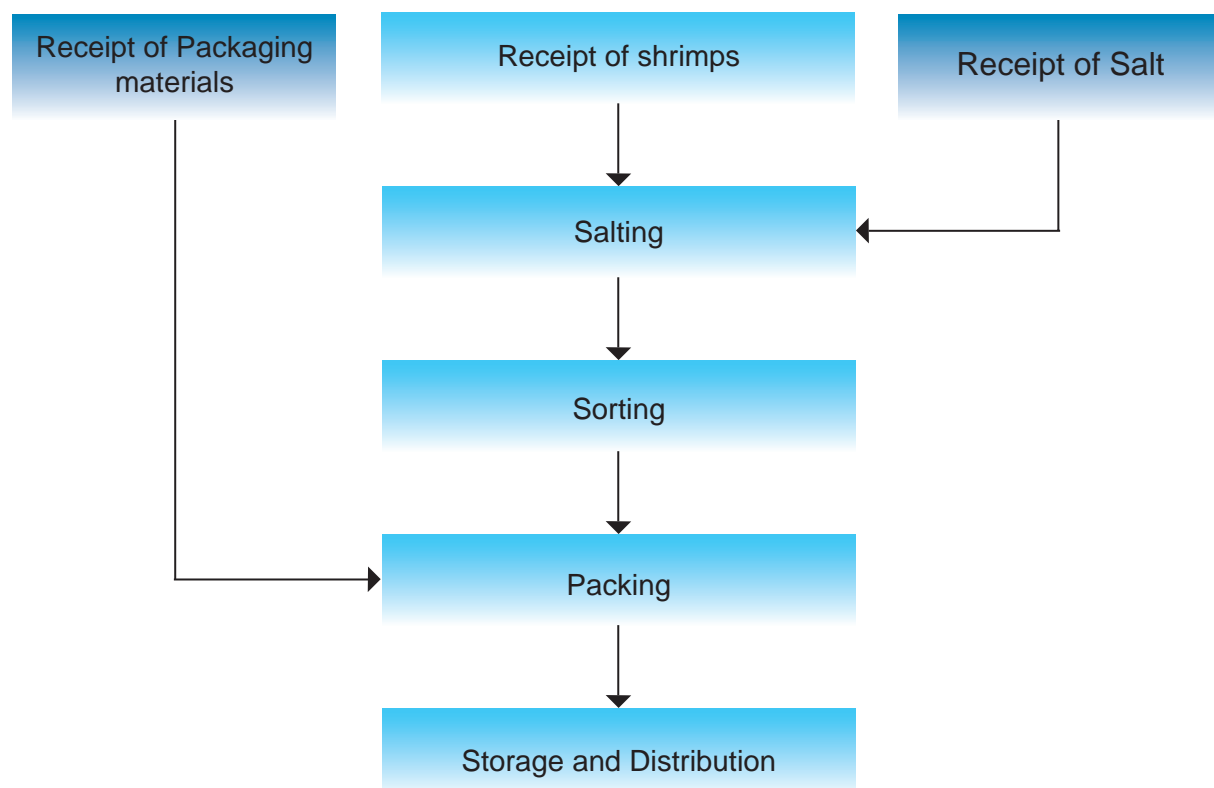
Country: Philippines

Product Name: Salted shrimp (for shrimp paste processing)

Product Description

Fresh shrimps are salted and packed into polyethylene bags before storing in appropriate containers for distribution to the shrimp paste processing plants for making shrimp paste.

Process Flow Diagram



Outline of Processing Steps

1. Receipt of Raw materials

a. Receipt of packaging materials

Packaging materials such as food grade polyethylene bags are used to pack the salted shrimps before transporting to the fish paste processing plants.

b. Receipt of shrimps

Every shipment of shrimps should be recorded and evaluated to ensure that they are safe and suitable for processing. Shrimps are iced to preserve them at low temperatures not exceeding 5°C.

c. Receipt of salt

Food grade salt (sodium chloride) as an ingredient is used for salting the shrimps.



Figure 1. Live, chilled shrimps upon receipt.



Figure 2. Stacking of salt in orderly manner.

2. Salting

In salting, salt is added at the ratio 1 part salt to 5 parts shrimps and using a paddle to mix thoroughly. The aim is to increase the concentration of solutes in the flesh, remove water and lower the water activity of the shrimps. Salting may be dry salting in which shrimp are stacked or covered in solid salt and the brine formed is allowed to flow away, or wet salting by immersion in strong brine. Immersion in an airtight fermentation vat restricts the presence of oxygen, retards oxidation reactions and development of rancidity, although some rancidity is essential to the development of the characteristic flavour of the product.



Figure 3. Salting of shrimps in piles.

3. Sorting

The salted shrimps are sorted out by discarding those unacceptable shrimps based on certain quality aspect such as weight, the degree of spoilage, colour and damage.



Figure 4. Sorting of shrimps.

4. Packing

The salted shrimps are packed in food grade polyethylene bags before storing into tin containers. This will allow the salted shrimps to ferment for 2 days before they are sent for distribution to the shrimp paste processing plants.



Figure 5. Salted shrimps stored in proper packaging.

5. Distribution

The labelled containers are sent for delivery to the shrimp paste processing plants at ambient temperatures.

GMP For Shrimp Salting

Section 1 Receipt of Raw Materials

GMP 1A.1 Receipt of Salt

A certification from the salt supplier should be provided for every shipment of salt to indicate that the salt has conformed to the safety and quality requirements (i.e. microbial limits, free from any physical contaminants) before the salt is accepted for use in the processing plant. Salt as an ingredient needs to be of food grade.

Every shipment of salt should also have their packaging intact and undamaged upon receipt and with proper labels.

Reason

Contaminated salt can affect the quality of the finished product. Salt produced from marine sources may contain halophilic bacteria, which continue to live in the salt and salted shrimps. In order to minimise such microbial contamination to salted fish, used and/or contaminated salt should be removed from the plant.

Damaged packaging will not provide the desired protection and may lead to contamination by extraneous materials such as microorganisms, insects, chemicals and foreign materials (dust, dirt, sand etc). Clear labelling would help in their identification thus ensuring that the correct ingredient is used.

Compliance

1. Only salt shipments with the appropriate certification should be accepted for use in the plant.
2. Salt in badly damaged packaging without proper labelling should not be accepted for use in processing.

3. Packaging labels should contain the following information:

- a. Name of ingredient
- b. Name of manufacturer or importer
- c. Country of origin
- d. Expiry date/ Use-by date

GMP 1A.2 Storage of Salt

Bags of salt should be stored above the floor in a neat and tidy manner in a specifically assigned clean and dry room.

Reason

Storage of salt in an open area in a haphazard manner will result in contamination by extraneous materials such as microorganisms, insects, chemicals and foreign materials (e.g. dust, dirt, sand etc) as well as deterioration in the quality of the salt.

Compliance

1. A clean and dry room that is insect-free must be provided for the storage of salt, which should be designed and constructed to a) permit adequate maintenance and cleaning, b) avoid pest access and harborage; and c) enable minimal likelihood from contamination.
2. Proper non-wooden shelving racks should be in place for storing of the salt away from the floor.
3. Salt that have been removed from their packaging should be stored in clean, dry containers with proper covers and labels.
4. Salt must be used on a First-In-First-Out (FIFO) basis or according to the factory's rotation/inventory control schedule. Salt should not be used beyond their expiry/ use-by date.

GMP 1B.1 Receipt of Packaging Materials

Packaging materials (e.g. polyethylene bags) that are damaged and dirty should be rejected/refused.

Reason

Damaged and dirty packaging materials will not provide the necessary protection to the food against contamination and may become a source of contamination to the products.

Compliance

1. Damaged or dirty packaging materials should be rejected and refused entry into the plant so as to present no risk of contamination to other packaging materials.

GMP 1B.2 Storage of Packaging Materials

Packaging materials (e.g. cardboardes, polyethylene (PE) and polypropylene (PP) bags and polystyrene (PS) trays) that are used to contain the finished products shall be safe for their intended use and be stored under proper conditions.

Reason

Packaging has an important function in protecting the finished products from contamination. Damaged packaging materials will not provide the desired protection and dirty packaging materials may contaminate the product.

Compliance

1. Packaging materials used shall be non-toxic and of food grade quality to ensure that they are safe for containing the finished products.
2. Packaging materials used shall be in clean and hygienic conditions.

3. A clean and dry room that is insect-free shall be provided for the storage of packaging materials. The storage room should be designed and constructed to a) permit adequate maintenance and cleaning, b) avoid pest access and harborage; and c) enable minimal likelihood from contamination by locating the storage room for packaging materials away from areas where raw or food products are handled.
4. Proper shelving racks shall be in place for storing of the packaging materials, away from the ground.
5. Packaging materials shall be used on a First-In-First-Out (FIFO) basis or according to the factory's rotation/inventory control schedule and should not be used beyond their recommended shelf life period.

GMP 1C.1 Receipt of Shrimps

Every incoming shipment of raw shrimps should be evaluated for condition and quality. The condition of shrimps should be noted on receipt. Documentation records on the quality received should be maintained and be properly kept.

Reason

The incoming shipment of raw materials should be evaluated to ensure that no tainted, decomposed, or unwholesome shrimps are utilised for processing. Records are documented in order to identify lots that may not meet specifications.

Compliance

1. The following details are recorded and maintained:
 - a. Species name
 - b. Date of receipt of shipment
 - c. Name and address of supplier
 - d. Name of delivery vessel or transport company

- e. Date of harvest
- f. Average temperatures of the shrimps upon receipt
- g. Quality in the shipment

2. The following organoleptic parameters should be tested:

- a. Freshness
- b. Absence of any black spot on the shrimp
- c. Intact whole shrimp, together with the head and the shell
- d. Natural smell, with no off-odours

GMP 1C.2 Handling of Shrimps

Raw shrimps are to be stored in suitable containers at temperatures not exceeding 5°C if the lots are not processed immediately.

Reason

Storage of raw shrimps at low temperatures reduces bacterial growth rate and also slows down many of the enzymatic reactions involved in spoilage.

Compliance

1. Shrimp are stored at low temperatures by refrigeration or with ice.
2. The containers used to store the shrimps should be made of materials which does not transmit toxic substances, odours or tastes, is non-absorbent, is resistant to corrosion and is capable of withstanding repeated cleaning and sanitization. Surfaces should also be smooth and free from pits and crevices.
3. Shrimps shall be kept at a temperature not exceeding 5°C at all times.
4. The ice should be added and melting ice water should be allowed to drain off to achieve the required temperatures.

Section 2 Salting

GMP 2.1 Salting conditions

The amount of salt, the time and temperature should be carefully controlled to attain the desired product. Salting of shrimps should be carried out in a cool and clean room with a temperature below 10°C. Shrimps should not be placed directly on the floor or in direct contact with the walls.

Reason

Salting at low temperatures will help to control the growth of microorganisms such as halophylic bacteria and moulds.

Compliance

1. Salting must be done in a clean and properly sanitized area and not be placed directly on the floor or in direct contact with the wall.
2. Utensils (e.g. paddle) used during salting must be properly cleaned and sanitized before and after use.

Utensils (e.g. paddle) used must be constructed from food grade materials and free from corrosion.

GMP 2.2 Ensuring uniform salting

Shrimps that are salted in piles should be re-stacked periodically with the top of the pile going to the bottom using paddle made of suitable materials.

Reason

Regular re-stacking will ensure uniform curing conditions and pressing.

Compliance

1. Every pile of shrimp during the re-stacking operation should be carefully salted

using additional fresh salt to ensure that sufficient salt will be present to complete the cure.

2. The paddle used should be made of non-corrodible materials, which excludes wood and materials that is capable of absorbing moisture.
3. All equipment and tools should be cleaned and sanitized on a regular basis.

SECTION 3 Sorting

GMP 3.1 Sorting

Sorting should be carried out as quickly as possible in a clean and sanitary area. Salted shrimps should be sorted into species, sizes and other trade quality categories for the relevant market.

Utensils and tools used for sorting should be made of materials which does not transmit toxic substances, odours or tastes, is non-absorbent, is resistant to corrosion and is capable of withstanding repeated cleaning and sanitization.

All workers must comply with good personal hygiene practices.

Reason

Any contamination to the shrimps and unnecessary delays during sorting may result in an inferior product with shorter shelf life.

Compliance

1. Utensils and tools used during sorting must be properly cleaned and sanitized before and after use.
2. Utensils and tools used must be constructed from food grade materials and free from corrosion, which excludes

wood and materials that is capable of absorbing moisture.

3. All workers handling the shrimps during the process should comply with good personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.
4. Sorting must be carried out without unnecessary delays.

SECTION 4 Packing

GMP 4.1 Packing

The salted shrimps should be packed as quickly as possible into clean, food grade polyethylene bags and into suitable containers.

Reason

Packaging materials is designed to preserve the quality of the food and can protect the product against mechanical damage, dust, dirt, other extraneous foreign materials, insects and microbial contamination.

Compliance

1. Polyethylene bags used in packing should be food grade, clean and intact (not damaged or torn).
2. The containers used should be clean and constructed from non-corrodible materials. Wood and materials that are capable of absorbing moisture should not be used.
3. The personal hygiene of workers is well maintained and monitored accordingly. All workers handling the shrimps during the process should comply with good personal hygiene practices such as wearing proper and suitable footwear, coveralls, smocks or coats and effective hair restraints.

SECTION 5 Storage and Distribution

GMP 5.1 Storage and Distribution

Containers used for distribution of salted shrimps should be clean and made of non-corrodible, excluding wood and materials capable of absorbing water, and should have smooth surfaces free from cracks and crevices.

Appropriate date marking and corresponding instructions on storage conditions should appear on the package labels and or containers.

The salted shrimps should be stored at ambient temperatures away from direct sunlight prior to delivery to the shrimp paste processing plants.

Reason

The use of containers that are constructed from appropriate materials will ensure that they do not become a source of contamination and affect the quality of the salted shrimps.

Labelling is important for identification purposes and traceability.

Compliance

1. Containers used should be made of food grade plastic or stainless steel that are smooth and free from cracks and crevices.
2. Each container or pack should be adequately labelled with correct information, which include:
 - a. Species name
 - b. Batch/lot number
 - c. Date of production
 - d. Name and address of processor

Appendix

Appendix

Appendix 1 - List of Contributors

Cambodia

Sem Viryak
Director
Quality and Processing Division, Fisheries Administration,
Cambodia
Tel: 855-11-948088
Fax: 855-23-224871
Email: viryak@gmail.com

Indonesia

Simson Masengi
Deputy Director for Small-Medium Processing Enterprise
Directorat of Fisheries Product Processing
Ditjen P2HP, Gd. Mina Bahari II
Departemen Kelautan dan Perikanan
Jl. Merdeka Timur, 16
Jakarta-Pusat, Indonesia
Email: simsonmasengi@hotmail.com

Suhartika Idawati
Head of Section of Large Scale Product Development
Directorate Fisheries Product Processing
Directorate General of Fisheries Product Processing and Marketing,
Ministry of Marine Affairs and Fisheries
JI Medan Merdeka Timur No. 16
Jakarta Pusat
Tel: 62-21-3500149
Fax: 62-21-3500149
Email: idawati_s@yahoo.co.id

Appendix 1 - List of Contributors

Malaysia

Bah Piyon Tan
Head of Fish Processing and Fish Handling Section
Division of Fisheries Extension and Fish Quality Control
Department of Fisheries, Malaysia, 3rd Floor, Podium 1, 4G2, Wisma Tani, Precinct 4,
62628, Putrajaya
Tel: 6-3-8870 4416
Fax: 6-3-8889 1055
Email: pyian_tan@yahoo.com

Myanmar

Hla Hla Kyu
Assistant Director
Department of Fisheries
Sinmin Road, Ahlone Township Yangon
Tel: 95-1-222182/2220597
Fax: 95-1-228258
Email: dof@mptmail.net.mm

Philippines

Lilia L. Pelayo
Senior Aquaculturist and Officer-in-charge
Post-Harvest Fisheries Research & Development Division (PHFRDD)
National Fisheries Research & Development Institute
Kayumangi Bldg, 940 Quezon Ave
Quezon City, 1103, Philippines
Tel: 632-374-6490/ 929-5847
Fax: 632-374-6490/ 929-8074
Email: llpelayo@edsamail.com.ph

Norma C. Borja
Chief
Aquatic Product Utilization Section
Post-harvest Technology Division
Bureau of Fisheries and Aquatic Resources
PCA Building, Elliptical Road, Diliman
Quezon City 1101, Philippines
Tel: 632-920-9578/ 632-929-3965
Fax: 632-920-9578/ 632-929-3965
Email: normaborja065@yahoo.com

Appendix 1 - List of Contributors

Thailand

Niracha Wongchinda
Director
Fishery Technological Development Division
Department of Fisheries
Plodprasop Building, Kaset-Klang
Chatuckak, Bangkok 10900
Tel: 662-9406130
Fax: 662-9406200
Email: nirachaw@gmail.com

Varatip Somboonyarithi
Senior Food Technologist
Head of Fish Packaging Development Unit
Fishery Technological Development Division
Department of Fisheries
Plodprasop Building, Kaset-Klang
Chatuckak, Bangkok 10900
Tel: 662-5611400/902
Email: varatip47@yahoo.com

Vietnam

Nguyen Dinh Thu
Head
Fisheries Quality Assurance Division
NAFIQAVED, 10 Nguyen Cong Hoan,
Ba Dinh, Hanoi, Vietnam
Tel: 84-4-8310983
Email: dinhthu.nafi@mofi.gov.vn

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