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GUIDE TO IMPROVED DRIED SHRIMP PRODUCTION

Cover photograph:
Dried and peeled shrimp
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GUIDE TO
IMPROVED DRIED SHRIMP PRODUCTION

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ABOUT THIS GUIDE

Dried shrimp is an important product. It is produced and consumed in many east Asian countries. Dried shrimp quality is affected by processing method, handling and hygiene practices at all stages of production, starting from fishing. Poor quality dried shrimp results in a low price and reduced income for producers. Poor practices can also mean the final product is harmful to consumers. This guide is for dried-shrimp producers, buyers and those involved in extension services. The aim is to describe good processing, handling and hygiene practices that will help producers maximize the value and income from dried shrimp, meet required national standards and access new and high-value markets.

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1. INTRODUCTION

In East Asia, the term dried shrimp refers to boiled, dried and peeled shrimp (Penaeidae, Palaemonidae), which are widely consumed in salads, soups and condiments in: Cambodia; China; China, Hong Kong SAR; Indonesia; Malaysia; Myanmar; the Philippines; Singapore; Thailand; and Viet Nam. Dried shrimp are a good source of protein, vitamin B12 and also selenium, vitamin A, vitamin E, vitamin B6, iron, magnesium, sodium (salt), zinc and copper. Depending on shrimp size and quality, the retail selling price can be up to USD 30/kg. Due to their popularity, they are also sold in specialist food shops in countries outside the East Asia region, and there are also markets for dried shrimp in the Americas, e.g. in Brazil, Mexico and the United States of America.

The quality of dried shrimp is affected by the processing method and the handling and hygiene practices at all stages of production, starting at fishing. Figures 1 and 2 show the difference between good-quality and poor-quality dried shrimp. Poor quality results in a low price and reduced income for producers. Table 1 shows the criteria often used to decide dried shrimp quality.

Figure 1. Poor quality (dark, broken, shell on)

Figure 2. Good quality (red/orange, whole, no shell)

Table 1. Dried shrimp – quality guide

Quality	Colour	Size	Appearance	Smell	Moisture content
Best	Pink/red	Large	No shell No black colour No breakage	Fresh No smell of ammonia	Less than 30%
Good	Pink/red	Medium	No shell No breakage	Fresh No smell of ammonia	On average 30%
Medium	White	Medium	Some shell on Up to 20% breakage	Slight smell of ammonia	More than 30%
Low	Dark colour	Small	A lot of shell on Up to 40% breakage Black colour	Strong smell of ammonia	Much more than 30%

This guide provides information on the production of good-quality dried shrimp, especially:

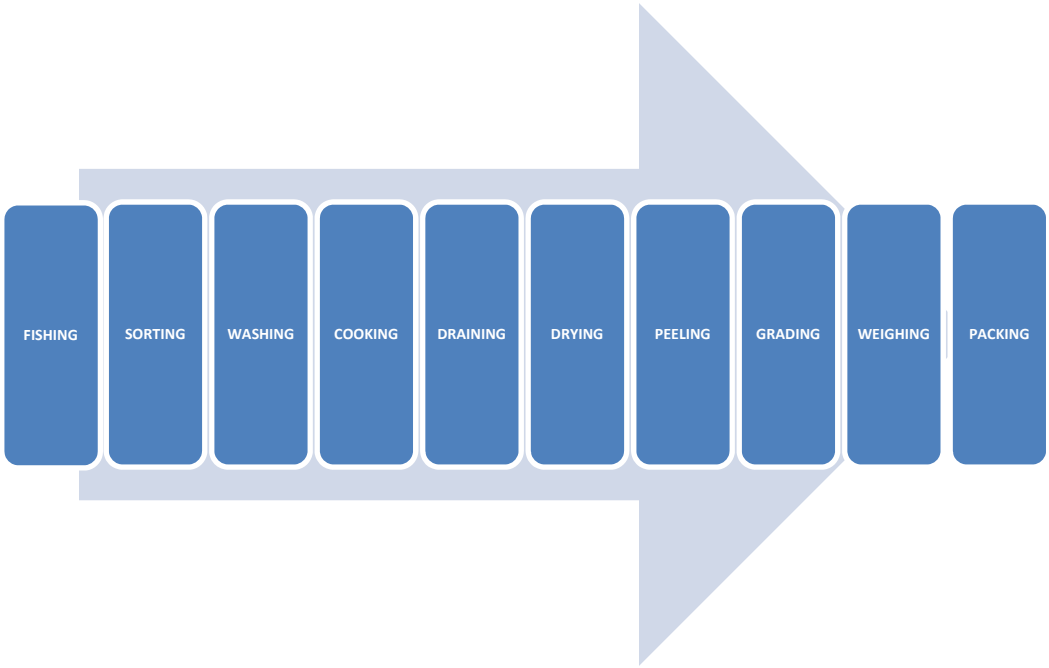
- the processing steps;
- the reasons why quality can change;
- good handling and hygiene practices.

The guide is for dried-shrimp producers, buyers, those involved in extension services as well as anyone interested in becoming involved in the industry. The overall objective is to help producers maximize value, meet required national standards, and access new and high-value markets.

2. MAIN STEPS IN IMPROVED DRIED SHRIMP PROCESSING

Producing good-quality dried shrimp involves certain steps and practices. This section describes these processing steps, which are shown in Figure 3.

Figure 3. Key steps in improved dried shrimp production



Fishing

The fishing process must be done in such a way as to minimize spoilage and damage to the shrimp before landing. Ideally, fishing gear should be lifted frequently and the catch transferred as quickly as possible to the landing site and processed. Chilling the catch is an important way of maintaining quality and preventing rapid spoilage and quality deterioration. It is important to use fresh good-quality raw shrimp. Remember that good quality in means good quality out, and poor quality in will mean poor quality out!

Sorting

After landing, sort the shrimp from the rest of the catch and other debris that may have been caught such as leaves and sticks (Figures 4 and 5). Do this quickly and in a shaded, cool, clean place.

Figure 4. Shrimp catch after landing

Cooking shrimp with other fish and bycatch can affect the taste and colour of the final dried product.

Also, sort the shrimp by size (extra-large, large, medium, small), as larger shrimp should be cooked for longer than small shrimps.

Figure 5. Sorting fresh shrimp

Washing

Wash all shrimp with clean water before cooking (Figure 6). Washing removes dirt and bacteria.

Figure 6. Washing shrimp before cooking

Cooking

Cooking soon after landing helps to give the shrimp the best flavour and colour.

Cooking reduces the water content, kills bacteria and inactivates enzymes, and makes drying quicker (see section Drying).

Use clean seawater or freshwater for cooking, and add salt depending on what the customer wants in terms of taste and saltiness.

Use cooking equipment (Figure 7) and utensils made from non-corrodible materials that can be easily cleaned.

Figure 7. Improved cooking stove

The cooking time must be as short as possible; slow boiling results in poor flavour and texture. Cooking too long will make the texture soft and remove flavour.

Figure 8. Shrimp about to be cooked

Heat the water to 100 °C (212 °F). A thermometer will help you know when the water is hot enough (100 °C). Use a lid on the boiling pan to speed up the heating process and save energy.

Put the shrimp into already boiling (100 °C) water (Figure 8). Batches must be small enough to allow the shrimp to move freely in the water. Densely packed shrimp will not cook uniformly. The ratio should be 3 kg of shrimp to 16 litres of water, and the heat input should be sufficient to cook the shrimp in 6–7 minutes. Use a clock or timer to know when cooking time has been reached (Figure 9). Shrimps are cooked when they turn pink, curl up and feel firm when pressed. If you cut one open, the inside turns from clear to cloudy.

Figure 9. Removing shrimp after cooking

A lidded wire mesh basket can be used for immersing the batches of shrimp, and the basket of shrimp should be agitated gently in the water to ensure uniform cooking. Any scum or froth that appears on the surface of the water should be removed.

The cooking water should be changed as often as possible; dissolved protein and dirt in the water may cause bad smells, taste and discoloration in the dried shrimp.

Draining

After cooking remove the shrimp from the water and let it drain (Figure 10).

Figure 10. Draining after cooking

A centrifuge or spin dryer can be used to remove water quickly. Removing water using a centrifuge will help speed up the drying process.

Drying

Drying removes water from shrimp, and this stops bacteria from making the shrimp go bad. Drying also makes it easier to take the shell off the shrimp.

Figure 11. Drying on racks

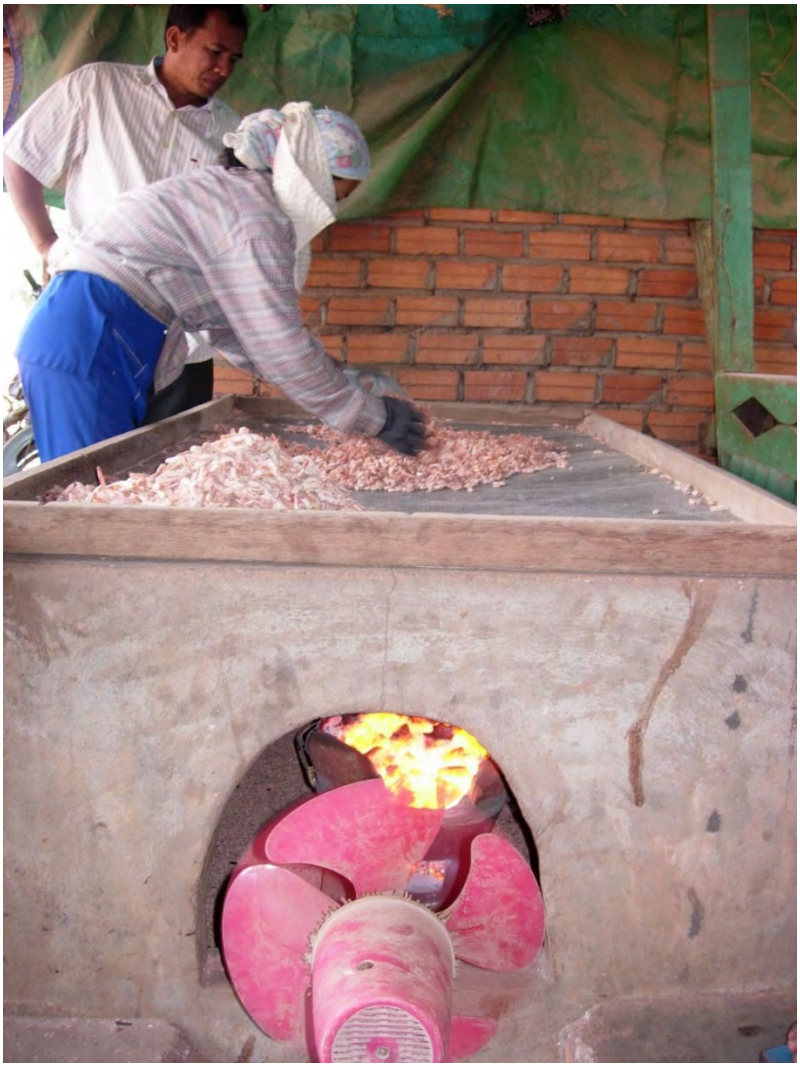
Drying under the sun should be carried out in a clean and protected environment. The drying area should be free from any flies, insects and other pests.

Shrimp should not be dried on the ground. It should be dried on raised drying racks (Figure 11). Drying can also be done on:

- mesh trays that are raised off the ground;
- clean black plastic sheeting, which heats up quickly.

Drying trays and racks must be hygienic. As the air flows under and above the shrimp, the drying process will speed up.

Figure 12. Shrimp dryer



Cooked shrimp can also be dried using dryers (Figure 12). This makes it possible to dry shrimp when weather conditions are not good or at night. There are different dryer designs. In the absence of electricity or bottled gas, charcoal and fuelwood are typically used as the fuel/heat source.

Whether sun drying or using a dryer, turn the shrimp over during drying to ensure an even drying process.

Drying should continue until the dried shrimp have a moisture content of from 20 percent to 30 percent. A practical way to measure moisture content is to use a food moisture content meter (Figure 13). The salt content of dried shrimp should be no more than 7 percent by weight. Salt content can be measured using a salt content meter.

Figure 13. Measuring moisture content

Peeling

Removing the shrimp head and shell must be done carefully to avoid breakage, and it must be done hygienically.

There are different ways to remove the shell:

- by hand;
- using a net;
- by machine.

Figure 14. Removing shell by hand

Peeling by hand is good for large shrimp or if there is only a small quantity to peel (Figure 14). A peeling machine is quick and good for peeling large quantities (Figure 15). These machines are designed for peeling and can be powered by a small engine. Shell can also be removed using a net bag (Figure 16). The shrimp are placed in the bag. The bag is held at each end. The shrimp is moved back and forth, and the rubbing against the net removes shell. This process can be used after machine peeling to clean up the product.

Figure 15. Peeling machine

Shrimp peeling should be done in an area where contamination can be prevented. The peeling area should be free from pests such as cockroaches, flies and other insects, as well as rodents and animals such as dogs and cats. All these things can add bacteria and dirt to the dried shrimp and make the shrimp harmful to consumers.

Figure 16. Using a net bag to clean off remaining shell

Grading

Grading is done by hand (Figure 17), using basket sieves or with the aid of a machine. Grading into different sizes (Table 2) and separating out broken pieces and dust helps improves the overall quality and consistency of the final product. Grading also helps to set the selling price.

Grading helps remove any unwanted shell, stones, leaves and other material. However, if you find these things in the shrimp, then you need to change the way you process shrimp because something has gone wrong earlier in the process.

Table 2. Guide to shrimp sizes

Sizes	Number per 100 g
Extra large	Not more than 50
Large	51 to 250
Medium	241 to 500
Small	More than 501

Figure 17. Grading and removing shell

Weighing

Weighing the different sizes of dried shrimp will help you to understand the potential value of the final product and how much money should be received from the sale process.

Packing and labelling

Packaging materials are designed to preserve the quality of the product and to protect the product against mechanical damage, dust, dirt, other extraneous foreign materials, insects and microbial contamination. Plastic bags will stop the shrimp from absorbing moisture from the air.

Dried shrimp should be packed as quickly as possible into large or small clean, food-grade plastic (polyethylene) bags or suitable plastic containers (Figures 18–20) in a hygienic manner and according to what the buyer wants. Ideally, the packaging used should be biodegradable or easily recyclable so as not to cause any potential harmful effects to the environment.

The careful control of hygiene and the environment in the packing area is necessary to prevent contamination and quality deterioration of the product.

Good-quality shrimp can fetch a high price. It can be packed and labelled. Packing and labelling can increase the selling price, but incur additional costs associated with packaging materials, equipment and extra labour.

Figure 18. Packing dried shrimp in polyethylene bags

© Cambodian Fisheries Administration

Figure 19. Boxes lined with polyethylene

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Figure 20. Packing in plastic jars

Transparent packaging allows the consumer to see what they are buying and creates confidence about the product (Figure 21). Packaging can be used to convey messages about the taste, flavour, colours and natural production conditions of the product. The packaging identifies the product contained in the package. Labelling will also convey essential knowledge of the benefits and attributes of the product as well as convey a brand. Labelling requirements are set by national authorities, but typical requirements include:

- name of the food, e.g. dried shrimp;
- list of ingredients;
- quantitative ingredients declaration (where indicated);
- net contents and drained weights, e.g. weight of dried shrimp in package;
- name and address of producer;
- country of origin;
- lot identification (code to identify when and where product was produced);
- date marking and storage instructions;
- instructions for use and any special storage requirements;
- nutrition information, e.g. protein content, minerals.

Packaging and labelling are good if there are buyers who will pay more for better quality. Packed and labelled dried shrimp is popular in supermarkets. Small packs sell for a high price. Supermarkets need to know that the dried shrimp has been produced in a good clean way and that it will not cause any problems for their consumers. Many supermarkets have their own standards and requirements for processors.

Plastic bags are available and labels can be printed on the bags. Plastic bags are typically sealed using a sealing machine.

Figure 21. Value-added products

3. SHRIMP QUALITY AND SAFETY

This section provides more information on shrimp quality and why the quality can change. After shrimp is caught and dies, its colour changes. It starts to smell bad and go soft. If these changes go on for a long time, shrimp colour darkens and can become black and spoiled and can become harmful to the consumer.

The time it takes shrimp to spoil depends on: the fishing method, handling after catching, the storage temperature of the fresh shrimp, and the time before it is cooked.

Good quality means:

- high selling price;
- long storage life;
- low breakage;
- can be sold on the international market;
- the consumer is happy!

Poor quality means:

- shorter storage life;
- breakage;
- black colour;
- difficult to negotiate a good price;
- cannot be sold on the international market;
- a low selling price;
- consumers might fall sick due to contamination with bacteria, chemicals, foreign bodies.

Spoilage of fresh shrimp

Raw shrimp meat contains 75–80 percent water, 18–20 percent protein and about 1 percent fat, while cooked meat contains 65–70 percent water, 25–30 percent protein and about 1 percent fat. The calorific value of cooked shrimp meat is about 4.5 kJ/g. Vitamins A and D are present in small quantities. Dried shrimp will have higher levels of protein and other nutrients.

Shrimp are usually good to eat and of good quality when first caught. However, once the shrimp dies, changes occur and it starts to spoil. Several things cause fresh shrimp to spoil or “go bad”; these are:

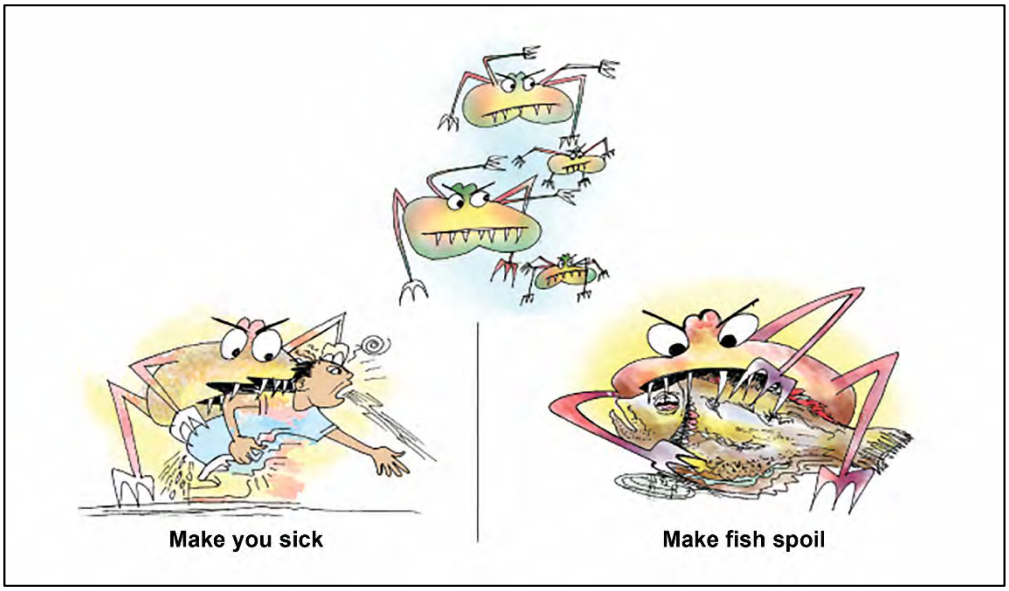
- bacteria;
- enzymes;
- rough handling.

Bacteria

Bacteria are everywhere. They are in the sea and on land. We cannot see them unless we have a microscope.

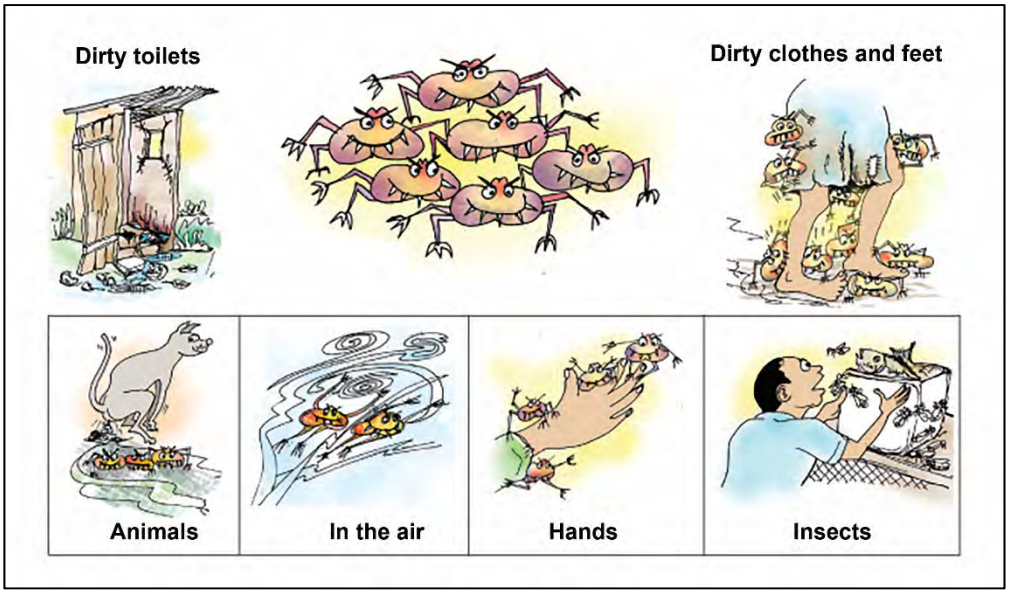
Some bacteria will attack and eat shrimp after it is dead and cause it to smell and go soft. Other bacteria cause food poisoning and make people sick (Figures 22–25). These bacteria cause diseases like typhoid and cholera. Bacteria like warm temperatures.

Figure 22. Types of bacteria



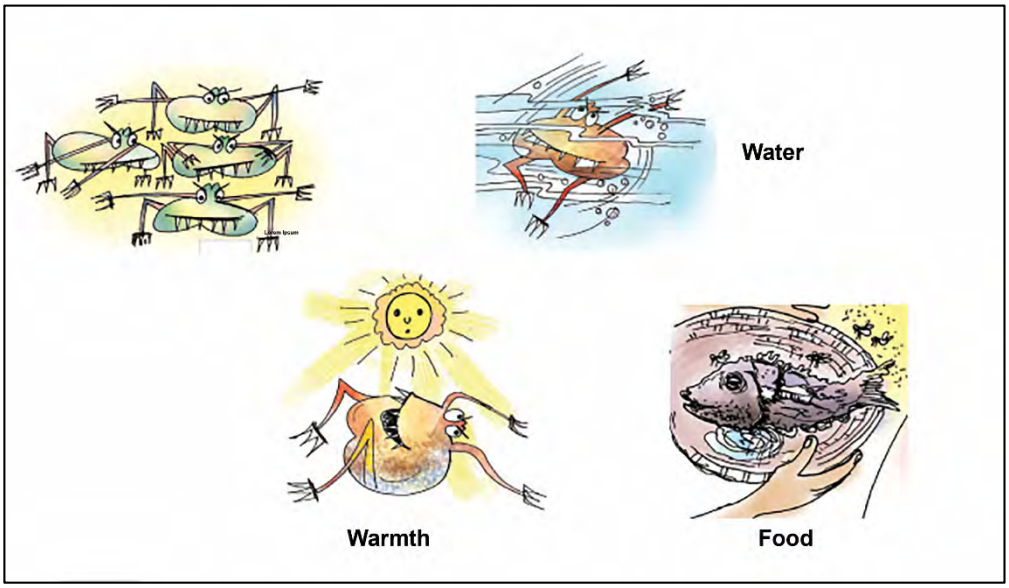
Source: Ward and Beyens, 2012.

Figure 23. Where bacteria are found



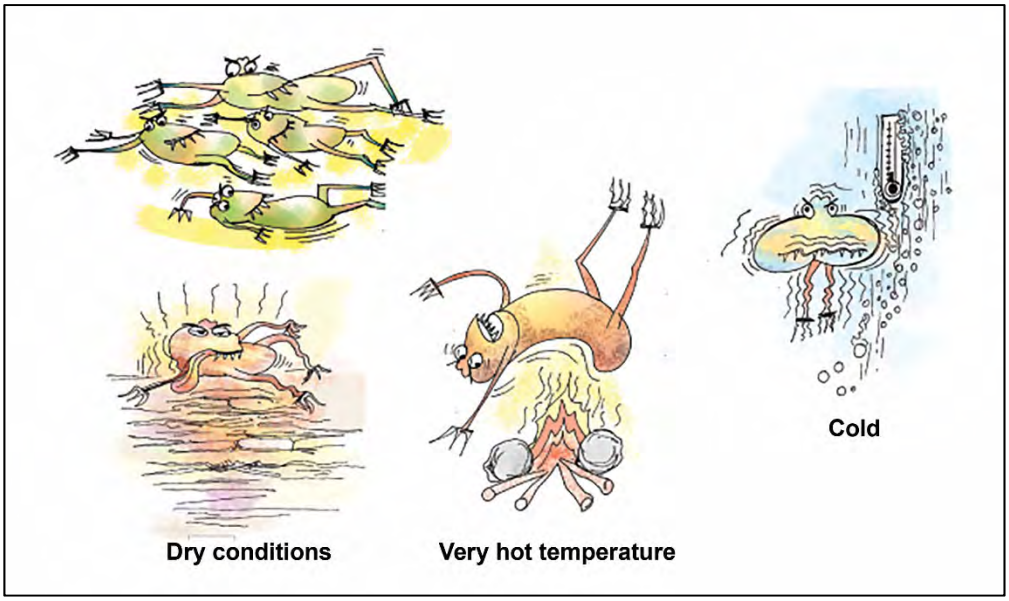
Source: Ward and Beyens, 2012.

Figure 24. What bacteria like



Source: Ward and Beyens, 2012.

Figure 25. What bacteria do not like



Source: Ward and Beyens, 2012.

Enzymes

Enzymes are chemicals. They are inside all animals such as shrimp, fish, lobsters and crab. They help to keep the animal alive.

After the shrimp dies, the enzymes start to digest or eat it. They eat into the stomach and flesh of the shrimp. This makes the shrimp go soft and changes its taste.

Enzymes work faster when the shrimp is warm.

Enzymes cause the shrimp to go black or turn a dark colour. This colour change happens quickly after the shrimp die. The colour can affect the quality and discourage buyers.

Keeping shrimp cool or chilled on ice and cooking it at a high temperature as soon as possible will help stop this colour change happening.

Rough handling

Shrimp are very easily damaged. They must be handled with care at all times.

Throwing, dropping, stepping on shrimp will damage them, causing bruising, softening of the flesh and poor eating texture. More bacteria will also move on to the shrimp.

When a shrimp is damaged, bacteria and enzymes can move easily into the flesh.

Rough handling will also make the shrimp break and look bad, which will mean a low price for your product.

4. GOOD HANDLING AND HYGIENE PRACTICE FOR DRIED SHRIMP PRODUCTION

This chapter describes good handling and hygiene practices that should be used generally when producing dried shrimp. These are some important things to remember and apply that will help to make sure dried shrimp are of good quality and safe to eat:

- Be quick;
- Keep shrimp cool;
- Keep shrimp clean;
- Keep equipment clean;
- Keep yourself clean;
- Handle shrimp with care.

Be quick

The longer the shrimp are left in the net during fishing, before they are landed and processed, the more time they have to spoil and turn black. The sooner the net is hauled after fishing and the shrimp are landed and then cooked, the better the quality of the dried shrimp will be. The time between hauling the gear and cooking should not be more than five hours, if no ice is used.

Keep shrimp cool

Warm temperatures help bacteria and enzymes spoil the shrimp. After landing and before cooking, the shrimp must be protected from the sun and heat and be chilled using ice (Figure 26).

For every 1 kg of shrimp, use at least 1 kg of ice. Ice melts, so keep adding more ice when needed.

Figure 26. Iced shrimp

Ice should be:

- made from drinking-quality water;
- stored in clean boxes or bags;
- from a government-approved ice producer;
- if water is mixed with ice, make sure only clean water is used.

If you do not have ice, then cover the shrimp with a clean wet cloth/blanket. Keep the cloth wet. The evaporation of water from the cloth helps to keep the shrimp cool.

Keep shrimp clean

It is good practice to:

- keep shrimp in a clean place or box (Figure 27);
- keep shrimp away from any chemicals;
- use clean equipment;
- wash shrimp in clean water to remove bacteria and any dirt;
- avoid using nearshore water for washing;
- keep cooking and drying areas clean and free from animals.

Figure 27. Keep shrimp away from sources of contamination

Keeping the processing area clean and making sure that pests and animals such as flies, birds, rats, cats and dogs do not enter is important. The processing area should be made from materials that are smooth and easy to clean. Animals should not be allowed in places where the shrimp are handled and processed or stored. Pests and animals can be excluded by enclosing the processing area and by keeping the surrounding area clean and free of places that attract pests.

Keep equipment clean

It is good practice to:

- use clean fishing gear;
- clean all equipment (basins, baskets, cooking pan, drying area or racks) before processing;
- use only clean piped or well water or clean seawater found offshore for cleaning;
- inspect equipment regularly for damage and keep it in good condition, e.g. cooking equipment (Figures 28 and 29).

Figure 28. Pan that has corroded and needs replacing

© ILO/A. Ward

Figure 29. Equipment coming into contact with shrimp should be cleaned

© BTSF/A. Ward

Good cleaning practice

Here are some tips on how to clean your equipment:

Step 1

Rinse with clean water to remove large pieces of loose waste materials and dirt.

Step 2

Wash with soap or detergent (that are safe for food) and water to remove waste materials, dirt and grease.

Step 3

Rinse with clean water to remove all waste and dirt, and detergent or soap.

Step 4

Use disinfectant mixed with clean water to rinse the surfaces and kill bacteria.

Step 5

Rinse again with clean water to remove all disinfectant and wash water.

Keep yourself clean

If we are not clean, then we can pass dirt and bacteria onto the shrimp.

During all activities, it is good practice to:

- wash hands with soap and clean water before handling or processing;
- use hand-washing soap (liquid soap) and clean water;
- keep clothes clean;
- wear protective clothing that is easy to clean (Figure 30);
- be in good health, if not a sickness can be passed to the consumer;
- cover any wounds so that blood and other fluids do not come into contact with the shrimp;
- avoid wearing jewellery, which can carry bacteria;
- avoid spitting, coughing or sneezing over the shrimp;
- keep fingernails short;
- avoid smoking, eating or drinking when handling or near shrimp.

Figure 30. Workers need to wear clean protective clothing

Handle shrimp with care

It is necessary to handle shrimp with care to avoid damage and bacterial contamination, which make it spoil faster and go black.

Do:

- Use clean plastic boxes or baskets to carry shrimp (Figure 31);
- Process shrimp quickly and carefully;
- Keep shrimp cool.

Do not:

- Throw shrimp around or leave them on the ground;
- Put too much shrimp in a box or basket;
- Drop or step on shrimp.

Figure 31. Baskets make handling easier and reduce the risk of damage

5. LOOKING AFTER WORKERS

Many businesses involved in dried shrimp production, e.g. fishing, processing or trading, employ workers. These are the people who will carry out the day-to-day tasks. Men are usually engaged in shrimp fishing. Women are often involved in processing. The work for both women and men is often seasonal, with most activities being carried out at specific times of year.

Workers have an important role in ensuring that catching, handling and processing practices are carried out in the best way, which is crucial to achieving good-quality final products that can sell for good prices. If workers carry out their duties wrongly, the opposite will happen. Thus, it is important to motivate and train workers well in order to ensure that they carry out their work in the best possible way. Some ways to do this include:

- Pay workers a good wage;
- Pay workers on time;
- Consider incentives, such as paying a bonus if they achieve a certain standard or production target;
- Feed workers well and ensure they have good sleeping areas;
- Allow adequate rest time;
- Be respectful to workers;
- Ask them about what is happening in the business and listen to what they say. They may be aware of problems you cannot see;
- Make sure they are safe. Do not ask them to do tasks that put them at risk or in danger;
- Provide them with safe working environment.

Some things to bear in mind are:

- Workers deserve to be paid fair wages for the work they do;
- If workers think they are not paid enough, they may do less work and care less about doing their work well. This can mean that bad practices are carried out, which will mean poor-quality products;
- Workers will quit more often, which will mean that new workers have to be trained. It will take them a long time to learn good practices, which may mean that bad practices are used;
- Employing children should be avoided, because:
    - If children work, they often miss school. This will affect their mental development and the level of education they achieve when they leave school. This could have a big effect on their job opportunities later in life and mean that they can only ever find low-paid jobs;
    - It can affect children’s social development.

6. FINDING NEW MARKETS

The practices recommended in this guide will help ensure the production of good-quality dried shrimp. Good quality should be rewarded with a good price. Obtaining a good price may mean that you need to find new buyers or markets willing to pay a higher price. This can mean talking to buyers and consumers, and showing them samples of your product. You could do this yourself or you could ask someone with experience in doing this to do it for you.

Buyers that might pay a high price include supermarkets, mini-marts, home shops, souvenir shops, hotels, restaurants, exporters and food distributors. Leaving samples of dried shrimp with a potential buyer to try and sell can be a good way of testing the market and making a buyer interested in the product.

Some questions to ask when looking for a new market include:

- What do consumers look for when they buy dried shrimp?
- What do buyers or consumers like/dislike about dried shrimp?
- How could the product be improved?
- Does the buyer want the shrimp to be processed in a particular way?
- How could different packaging, labelling and branding be used?
- Does the buyer require the product to be certified and meet a particular standard?
- What is a fair price for the final product?
- How much dried shrimp would a buyer want and how often?

Talking with consumers can also give an idea of quality requirements and acceptable prices.

Producing good-quality dried shrimp should be done knowing that there is a market that will pay for better quality.

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