

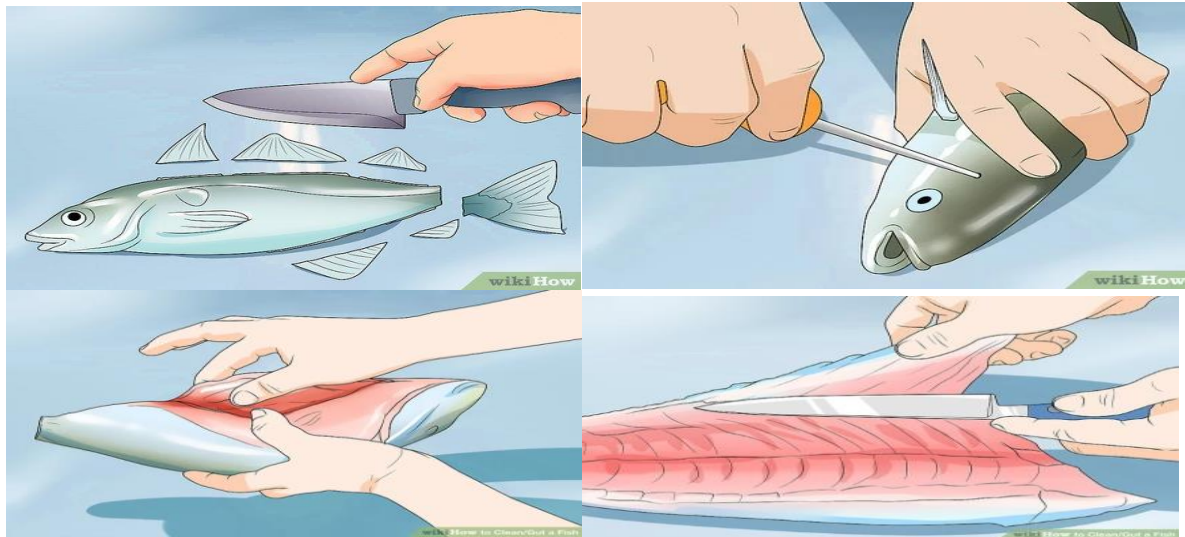


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Ministry of Labor and Skills

FISHERY AND AQUACULTURE

Level – II

**Based on July 2022, Version- I Occupational
Standard**



Module Title: - Performing fish gutting and filleting

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Introduction to the Module

This module covers the knowledge, skills and attitude required to Perform fish gutting and filleting that requires the ability to Prepare work area for gutting and filleting, Perform fish gutting, Perform fish filleting, and Finalize gutting and filleting operation.

LG #21

LO#1- Prepare work area for gutting and filleting

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Tools, materials, equipment and machines
- Occupational health and safety(OHS)
- Signs of defects, spoilage and parasites
- Cleaning work area

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Select, calibrate and check tools, materials, equipment and machines
- Apply Occupational health and safety(OHS)
- Identify Signs of defects, spoilage and parasites
- Clean work area

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet-1

1.1. Tools, materials, equipment and machines for fish gutting and filleting

Definition of Terms

Drawn/Gutted fish: - Drawn fish are whole fish that have been gutted, meaning their viscera (stomach, roe sacks, and other guts) have been removed.

Headed & Gutted (H&G) fish: - Headed & gutted fish have had their viscera (guts) and head removed.

Dressed fish: - have had their viscera, head, tail, and fins removed. They have also been de-scaled.

Bullets: - Whole gutted fish with head and tail removed.

Steaks: - are portions of fish that have been cut across the body rather than along the sides.

Fillets: - Fish fillets are cut along the entire side of the fish, removing the meat from the spine and most of the bones.

Butterflied Fillets: - are two fish fillets that have been cleaned like regular fillets, but left attached to each other.

Fillet Portions: - Fish fillets, especially those from particularly large fish, are often cut into smaller portions to make them more manageable.

Cheeks: Some large fish have portions of meat on their heads, separate from the fillet, that are of sufficient quality to be harvested and sold separately.

Skin On: - The fish skin is left on the portions. Skin on fish fillets & fillet portions are often used in pan seared fish recipes, so the skin crisps up, providing an attractive texture and presentation.






Skinless/Skin Off: - Skin removed prior to sale. Whether to leave round fish skin on is often a question of personal preference, the species being used, and the recipe being used.




Pin Bones Out (PBO): - Many fish fillets have small, thin, flexible bones distributed along the side of the fillet. Generally, these are removed (usually with a pair of tweezers) prior to cooking and serving the fish.





The following lists of equipment and tools are commonly used in fish gutting and filleting.





Table. 1.1 Tools and Equipment's used in fish gutting and filleting

No	Name of items	Image/Figures	Functions
1	Fish cleaning/ gutting machine		<ul style="list-style-type: none"> Used to remove gut accurately and cleanly without damaging the fish gallbladder.
2	Fish filleting machine		<ul style="list-style-type: none"> Designed for Cut the fish with fast speed; The sharp blade cuts the fish with accuracy; Fillet the head-off fish into three pieces (the left piece, the right piece and the pin bone)
3	Band saw		<ul style="list-style-type: none"> Band saws are used to cut large volumes of frozen fish and fish products.
4	Fish scaler		<ul style="list-style-type: none"> This kitchen tool is made to easily remove the scales attached to the skin of a fish that will be prepared and cooked whole.

5	Fish filleting troughs		<ul style="list-style-type: none"> Fish filleting troughs for washing and icing
6	Filleting knives		<ul style="list-style-type: none"> Fillet knives are specifically designed for cutting fish and removing bones.
7	Cleaning/gutting knives		<ul style="list-style-type: none"> Handy blades allow you to easily and delicately prepare fish for removing internal parts.
8	Deboning knives		<ul style="list-style-type: none"> The main purpose of deboning knives is to separate meat from the bone. They make boning easier and save time.
9	Cleaning/gutting and filleting table		<ul style="list-style-type: none"> A Table designed to make the process of filleting and trimming fish more efficient with a central dispenser trough for waste disposal or alternatively graded goods ready for packaging.

10	Fish boxes and tubs		<ul style="list-style-type: none"> Used for storage of catches on board the vessels.
11	Trays		<ul style="list-style-type: none"> Used to protect the fish from contamination and keeps them fresh.
12	Weighing balance		<ul style="list-style-type: none"> Used to determine the weight of fish
13	Deboning machines		<ul style="list-style-type: none"> Used for collecting and extracting the fish flesh with stainless steel rotary drum which is designed with screening holes in it.
14	Fat suction tools and equipment		<ul style="list-style-type: none"> Used to removes excess fat through a suctioning process.

15	Fish tubs and bins		<ul style="list-style-type: none"> Used for storing fish, for the transport of live fish, during maturation of fish products, and as bins for collecting fish waste.
16	Hand-held scale		<ul style="list-style-type: none"> Used to weighing fish and fish products.
17	Scaling knife		<ul style="list-style-type: none"> Used to remove scales. Knives can handle small fish such as sardines and mackerels or fish with only few scales or thin scales, but they can't handle fish with solid scales.
18	Scaling machine		<ul style="list-style-type: none"> Used to remove the fish scale in an automatic and sanitary way.

19	Packaging material		<ul style="list-style-type: none"> Protect fishery products from dehydration, oxidation and contamination.
20	Chiller		<ul style="list-style-type: none"> Reduce the temperature at which the fish is kept lowers the rate of deterioration. During chilling the temperature is reduced to that of melting ice, 0 °C/32 °F.
21	Ice box		<ul style="list-style-type: none"> An icebox is a container which is kept cool so that the fish and fish product inside stays fresh.
22	Ice machine		<ul style="list-style-type: none"> Dedicated to making a large amount of ice in the comfort of your own home. This prevents you from having to stock up on ice.

23	Fish cutting board		<ul style="list-style-type: none"> Used as a protective surface on which to cut or slice fish. Cutting boards are often made of wood, plastic or cork.
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1.2. Occupational health and safety(OHS)

Occupational health and safety is the discipline concerned with preserving and protecting human resources in the workplace. Occupational health is the adaptation of work to man and of each man to his job. It has the following components:

- Promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- Prevention among workers of departures from health caused by their working conditions;
- Protection of workers in their employment from risks resulting from factors adverse to health; and
- Placing and maintenance of a worker in an occupational environment adapted to his physiological and psychological equipment.

<https://www.youtube.com/watch?v=mSKxcVZAXjw> (accesses date January, 23, 2023)

1.2.1. Conducting checks on all tools, materials, equipment and machines

Checking materials, tools and equipment's refers to the process of examining their parts to ensure their normal functioning.

- Checking before use**
 - ✓ To identify the problems (defects, damages) of the Machinery, Tools and Equipment's and take actions to correct or change them before using them.

- ✓ To identify any hazards and risks that can be raised from miss-use of the Machinery, Tools and Equipment's and take minimization action timely.

- **A guideline to conduct pre-operational checks on equipment's and tools**

You should make sure that the equipment's and tools used for work are safe to use. Here is list of actions that should be taken to ensure this is so.

- ✓ Perform a risk assessment to identify the hazards and the control measures you should use
- ✓ Check that the equipment/tool is suitable for work and way in which it is going to be used
- ✓ Check that the equipment/tool is in good condition
- ✓ Make sure that the user knows which personal equipment to use and how to use it
- ✓ Think about who will use the equipment/tool including experienced workers, workers with language difficulties, new starter
- ✓ Speaking with team members or team leaders who has used the equipment before will help you identify any potential issues or problems.

1.2.2. Manual handling techniques for loading and unloading materials

Loading: refers to putting of the load (anything) on to the ship, truck or pack animal

Unloading: removing cargo from carrier or taking the load off a ship, truck, or pack animal

- **A guideline to load and unload equipment's and tools**

- ✓ Load/unload the material in required order taking care to avoid damage
- ✓ Use manual handling techniques of loading /unloading throughout the process to avoid injury or damage
- ✓ Install the material in appropriate work or storage area in accordance with direction
- ✓ Identify any hazardous items and load /unload these in a manner that minimizes health and safety risks.
- ✓ Inspect load prior to transportation to ensure that all items are loaded appropriately and make adjustments as required

- ✓ Secure package against shifting within a vehicle during transportation though tying, blocking and bracing the load
- ✓ Load packages with orientation marks (up arrow) so that the marks remain pointed up
- ✓ Do not allow any smoking or any source of ignition on or near the vehicle when loading flammable
- ✓ Always load materials having high weight at the bottom
- ✓ Always load similar materials in one side during loading of different types of items

1.2.3. Selecting and checking suitable personal protective equipment

Personal protective Equipment's (PPE): -Personal Protective Equipment's are those equipment's that used to protect the body from external hazardous matters or conditions during work activities in the workplace.

1.2.3.1 Choosing the appropriate personal protective equipment

What protective clothing and equipment is necessary? This depends on the duty being undertaken and chemical being used but the work place instruction and manufacturer's directions should be used as a guide. The degree of protection required will be relative to the degree of hazard presented by a particular product or/and work.

1.2.3.2 Common PPE items

There are many PPE items however, we will mention some of the ones that you are most likely to come across in most animal care workplaces.

A. Plastic boot: Helps your foot against possible exposure within a contaminated environment.



Figure 1.1 Plastic boot

B. Uniforms, overalls or protective clothing: used as protective clothing when working.



Figure 1.2. Uniforms

C. Aprons: Description usually made of rubber; aprons protect the body and clothing from splashes and spills when handling large quantities of corrosive chemicals. They are also useful to keep you dry when handling fish. Aprons should cover the body from the shoulder to below the tops of boots.



Figure 1.3 Aprons

D. Gloves, mitts or gauntlets, and protective hand and arm covering: help protect you when directly handling potentially infectious materials or contaminated surfaces.



Figure 1.4. Gloves

E. Protective hair, beard and boot covers: help protect only your head from sun rays.



Figure 1.5. Protective hair, beard and boot covers

F. Insulated protective clothing: for freezers or chillers and refrigeration unit.



Figure 1.6. Insulated protective clothing

G. Face mask: Protect against food contamination.



Figure 1.7 . Face mask

1.2.4 Identifying and responding OHS hazards

Hazard: is the term that refers to dangerous conditions that can results risks in the working place. This can be physical, mechanical, chemical, and biological factors which affect or harm the health and safety of all people and animals in the working place.

Every farm is different, but hazards common to most farms include:

- **chemicals** – pesticides and herbicides can cause injuries such as burns, respiratory illness or poisoning
- **confined spaces** – such as silos, water tanks, milk vats and manure pits may contain unsafe atmospheres, which can cause poisoning or suffocation
- **electricity** – dangers include faulty switches, cords, machinery or overhead power lines
- **heights** – falls from ladders, rooftops, silos and windmills are a major cause of injury
- **machinery** – hazards include tractors without roll-over protection structures (ROPS), power take-off (PTO) shafts, chainsaws, augers, motorbikes and machinery with unguarded moving parts
- **noise pollution** – noise from livestock, machinery and guns can affect your hearing
- **vehicles** – crashes or falls from motorbikes, two-wheel and quad bikes, tractors, Utes and horses can result in major injuries
- **Water** – drowning can occur in as little as five centimeters of water. Dams, lakes, ponds, rivers, channels, tanks, drums and creeks are all hazards. Young children are particularly at risk
- **Weather** – hazards include sunburn, heat stroke, dehydration and hypothermia.

Preventive measures

- Wear safety shoes with non-slip soles
- Erect fences and post warning signs round open pits in the farm.
- call a qualified electrician to examine and repair faulty or suspect electric equipment
- Wear protective goggles and respiratory protection during work
- Do not ever enter a confined space when you are alone
- Seek medical attention if skin rashes develop; consult an allergy specialist
- Keep a high level of personal hygiene; change clothes at the beginning and end of shift; do not take work-soiled clothes home
- Learn correct lifting techniques and work postures, to avoid low back pain use mechanical aids for the lifting and transport of heavy loads how to deal with sensitivity to solvents and adhesives.
- Install effective exhaust ventilation to remove hazardous gases and vapors, and eliminate obnoxious odors from the farm.

1.3. Visual inspection of fish

After you have decided what kind of fish you would like to buy, you need to evaluate the quality of the fresh you have chosen. Whole fish, regardless of the variety, have certain characteristics that indicate freshness.

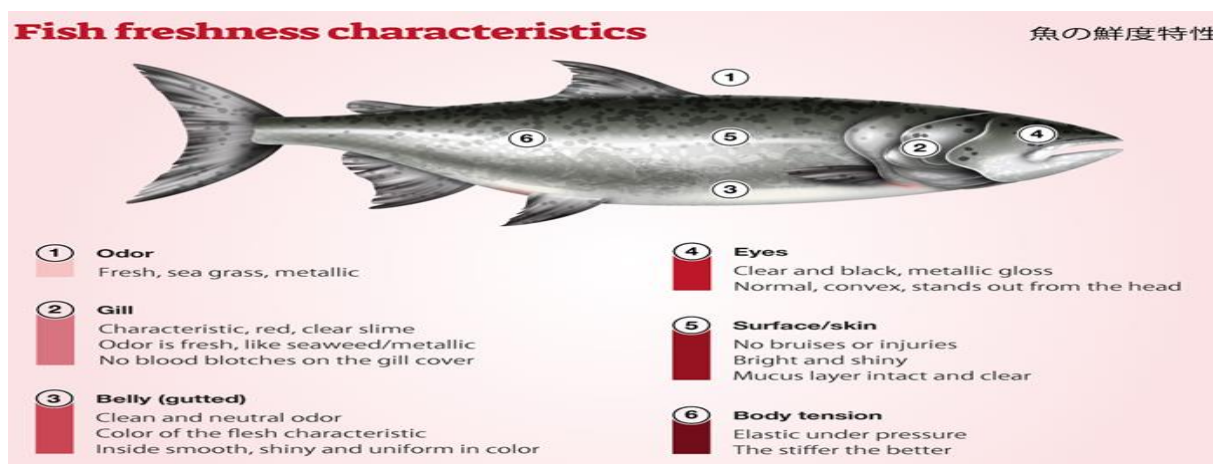


Figure 1.8. Fish freshness indicators



Figure 1.9. Fish freshness indicators

1.3.1 Signs of defects, spoilage and parasites

1.3.1.1 Define Fish Spoilage

What comes into your mind when you hear “spoilage”? Let us try to discuss it and see what it means. In our daily handling of fish, we touch the fish frequently, which may cause the fish to deteriorate. Fish spoilage can be defined as any change in your fish which causes a loss in its quality and commercial value. Note that a spoilt fish cannot be good for human beings to eat, they can only be thrown away or be used to feed animals. Spoilt fish causes loss to your fisheries business when they are thrown away.

1.3.1.2. Factors that cause fish spoilage

The various changes that take place in the handling of fish that cause losses, are influenced by several factors. Some of these factors are:

Time: The time between the death of the fish to its final use or consumption. Delay in the process will cause the fish to spoil. Naturally, quality processed fish also deteriorates over a period of time.

Temperature: It is the degree of hotness or coldness the fish is exposed to. High ambient temperatures, such as 20°C and above, easily create favorable conditions for fish spoilage while temperatures below 5°C help slow down the action of bacteria and the rate of spoilage, thereby helping to reduce losses.

Bad handling practices: Poor handling practices lead to sustained and increased microbial contamination, speeding up the spoilage rate of fish.

Such practices include:

- Using dirty canoes, equipment, fish boxes and baskets
- Not washing fish
- Washing fish in dirty water
- Placing fish on dirty surfaces
- Physically damaging fish by throwing or standing on them
- Throwing away catch fish at sea because fish is too small or not good enough to land for sale.
- Poor processing techniques damages fish
- Animal predation and insect infestation
- Poor packaging and storage practices lead to damage the fish

1.3.1.3 Signs use to determine spoilt fish

There are signs on a fish that can help you determine if the fish is spoilt. These include can:

- Sunken eyes.
- Dark gills
- Presence of flies
- Burst stomach
- Bad smell



Figure 1.10. Sunken eyes fish



Figure 1.11. Good - Bright red gills and Bad- Dark gills



Figure 1.12. Fish with flies



Figure 1.13. Burst stomach

1.4. Cleaning work area

Whatever the work, the working environment should be free of hazards that make problems both on workers and the products getting from the farms. Fish handling area should be free from dry and wet wastes, rusted metals, rusted and damaged equipment, unwanted bushes, wild fire, suspected flood, dangerous reptiles (snakes, crocodiles, etc.) and other enemies of both workers and fishes.

The major waste that makes difficulty in and around fish processing area is the cut of harvested fish and feed remaining. Therefore, fish producers give great concentration for waste management program by thinking over the workers as well as the dwellers surrounding the fish and fish product handling area.

A good workplace housekeeping system will provide for proper inspection, maintenance, upkeep and repair of tools, equipment, machines and processes. Tasks and the equipment required to carry them out should also be set up in a fashion that minimizes the number of times items have to be handled.

Poor workplace housekeeping can often lead to workplace injuries from:

- being hit by falling objects
- tripping over objects on the floor, stairs and platforms
- slipping on wet, greasy, dirty or icy surfaces
- hitting projecting items and stacked materials
- Cutting, puncturing or tearing the skin on projecting nails, wire, etc.

General guidelines in maintaining the work area;

- All dead stock must be removed and buried as soon as possible.
- Fuel must be stored away from other chemicals, food and holding tanks.
- Always tighten the caps and tops of chemical containers after use.
- Mop up all spills immediately.
- Check baits and traps regularly and dispose of any kills properly.
- Waste water is transported to the settling pond.
- Waste must be handled properly; otherwise the environment may be damaged.

Self-check 1

Written test

Name..... ID..... Date.....

Directions: Answer all the questions listed below.

Test I matching

- | A | B |
|--|--------------------|
| _____ 1. Used to open the belly of fish. | A. Fish scaler |
| _____ 2. Used to removing meat from bones. | B. Filleting knife |
| _____ 3. Remove the scales attached to the skin. | C. Fish tubs |
| _____ 4. Used for storing fish. | D. Gutting knife |
| _____ 5. Essential tool that easily breaks down and precisely portions fish. | E. Deboning knife |

Test 1: Give short answer for the following questions.

1. List at list five tools and equipment's used for fish gutting and filleting work?
2. What is spoilt fish?
3. Describe two conditions that can cause your fish to spoil?
4. Name signs you can use to identify spoilt fish?

Operation Sheet -1

- **Visual inspection of fish Conditions**

A. Materials, tool and equipment

- Potable water and ice
- Fish
- PPE
- Pen
- Paper

B. Techniques /procedures

- For your practical exercise, take **I (one)** basket full of fish and separate the spoilt fish from the good ones, use the guidelines bellow to assess the spoilt fish you identified.

Criteria	Fresh fish	Spoiled fish
Odor	Light, desirable, characteristic of the water weeds,	Undesirable, acrid, acid, putrid, ammonia-like,
General aspect	Bright, iridescent pigmentation, no blood spots around the head, along the vertebral column	Dull pigmentation with no shine or reflections
Rigidity of the body	Rigid body. Firm and elastic	Flaccid body. Soft consistency. A slight pressure by the finger leaves a mark
Secretions	Humid fish, transparent mucus, no visible secretions	Presence of sticky secretions
Scales	Bright and firmly attached	Come out easily
Skin	Tight and adhering well	wrinkled, discolored, easy to detach and cu

Eyes	Clear and bright pupil, convex (bulging), occupy all the orbital cavity, transparent cornea	Tern, opaque pupils, concave, glassy, completely sunken
Gill-cover	Adheres firmly with no blood spots	Slightly detached with dark red spots
Gills	Humid, shiny, pink or red	Dry, grayish or opaque
Abdomen	Neither swollen, saggy, tight or cut	Flaccid, deformed, often swollen, with dark blue, green or black spots
Anus	Tightly closed	Open, often prominent
Viscera	Smooth, clean, bright, nacreous, peritoneum sticks tightly to flesh	Sunken, swollen, fragile peritoneum
Vertebrate Column	Sticks firmly to muscles	Does not stick
Flesh	Firm and elastic, smooth surface, nacreous reflections	friable, red colored, especially along the vertebral column

- Prepare all necessary materials
- Wear PPE
- Carefully inspect catch fish
- Separate spoil fish and the good/fresh one.

LAP Test-1

Performance Test

Name.....

ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

Task 1: Perform visual inspection of fish Conditions

LG #22	LO#2- Perform fish gutting
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Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Methods of Fish gutting
- Cleaning /Gutting Fish
- Removing scales
- Removing Gills and guts
- Placing Fish parts

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Methods of Fish gutting
- Cleaning /Gutting Fish
- Removing scales
- Removing Gills and guts
- Placing Fish parts

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 2

2.1. Methods of Fish gutting

Fish gutting can be done by hand manually or by machine depending on the availability of the material and production level of the industry.

2.1.1 Machine Fish gutting

Gutting freshly caught plaice is a labour-intensive job. On average an experienced fisherman can gut 10 to 15 fish per minute. The automatic fish gutting machine is mainly used to split the fresh live fish or dead fish and remove the fish viscera quickly. This commercial fish offals remover machine is commonly used in various fish shops, restaurants, and fish processing plants. When this fish gutting machine removes fish offals, it will not cause damage to the fish head, tail, and flesh of the fish, it can replace the work of artificial fish-killing, and the processing efficiency is very high. The fish deep-processing equipment in our factory mainly has the functions of removing the fish viscera and splitting the fish automatically.

In case of machine gutting system a specialized gutting work station allows to safely cut fish down the belly (used mainly during processing of trout), remove the guts by vacuum suction and quickly wash and rinse the body cavity with a rotational brush and a water spray, including kidney tissue removal. Simple systems consisting of rotating brushes and water sprays are widely used. They facilitate the work and increase the product quality. Protective gloves, periodically disinfected and replaced, should be worn during gutting, especially when mechanized devices are used.

- Machine gutting techniques includes:
 - ✓ Setting up your work area and gutting machine.
 - ✓ Make ready the machine for gutting activities
 - ✓ Manually put the fish on the worktable into the feed port orderly, the rolling shaft in the machine automatically conveys the fish forward

- ✓ During the conveying process, the knife underneath open the fish and remove viscera.
- ✓ The fish are conveyed through the conveyor belt.

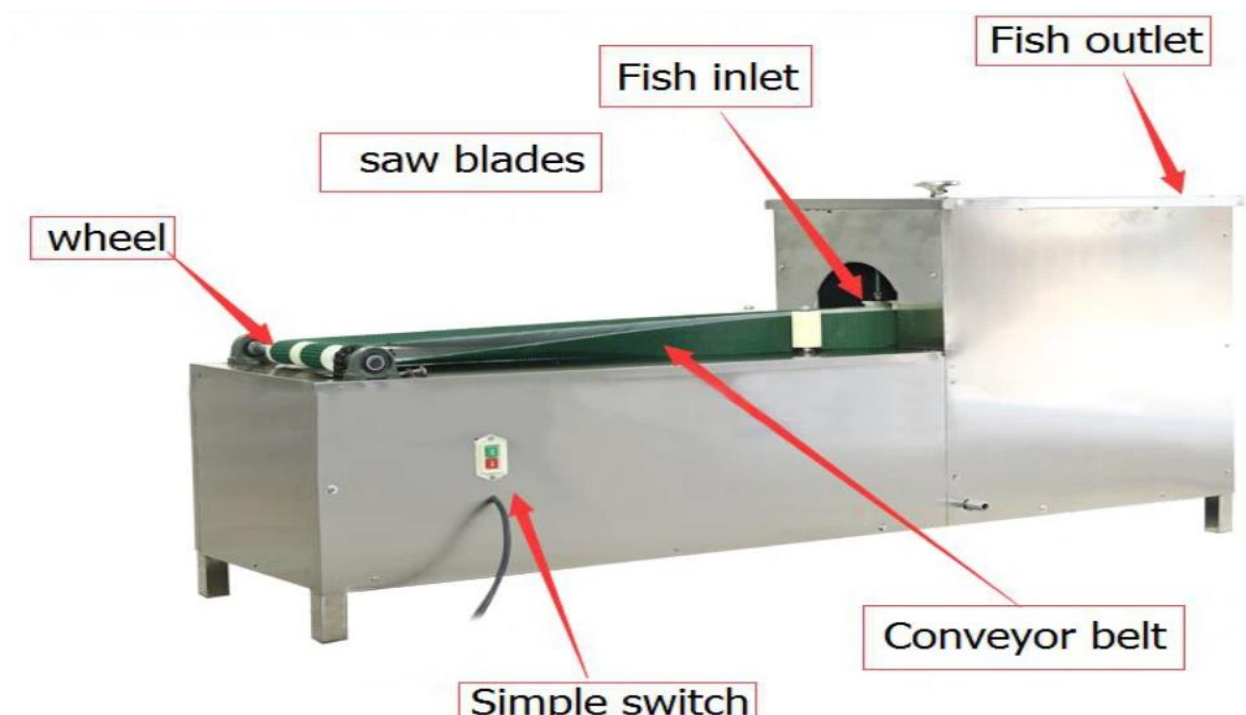


Figure 2.1. Machine gutting techniques

<https://www.gelgoog.com/product/other/fish-processing-machine.html> (accesses date January, 23, 2023)

2.1.2 Manual fish gutting

Gutting consists of cutting down the belly (fish may be deheaded or not), removal of internal organs, and, optionally, cleaning the body cavity of the peritoneum, kidney tissue and blood. Fish is cut longitudinally up to the anal opening, and special care is taken to avoid cutting the gall bladder hence manually removing the organs from the abdominal part of fish by using knife is known as manual fish gutting.

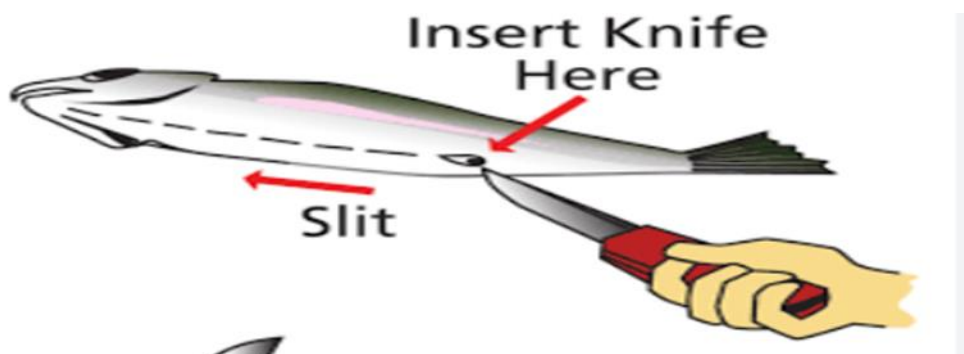


Figure 2.2. Manual fish gutting techniques

2.2. Gutting Fish

The purpose of gutting is to remove those fish body parts most likely to reduce product quality, as well as to remove gonads and sometimes the swim bladder. Evisceration of freshwater fish is labor-intensive and usually performed by hand. Gutting consists of cutting down the belly (fish may be de headed or not), removal of internal organs, and, optionally, cleaning the body cavity of the peritoneum, kidney tissue and blood. Fish is cut longitudinally up to the anal opening, and special care is taken to avoid cutting the gall bladder. This procedure is performed on a table made of special material which is hard, easy to wash and does not absorb fluids. The table surface should be frequently rinsed and periodically disinfected.

Table 2.1. Fish gutting

I. Spread the stomach open and remove the guts and entrails. Without ripping your cut, carefully spread the two sides of the fish open 2–6 inches (5.1–15.2 cm) at the vent. Reach near the head of the fish and pinch the organs where they connect to the head between your thumb and index finger. Gently pull them out at the root. Reach towards the tail of the fish and slowly pull out the guts and entrails.



- Inspect the body cavity for any remaining organs and remove them by hand.
- Discard the organs in an appropriate trash bin. At a cleaning station, drop them in the grinder to get rid of them.

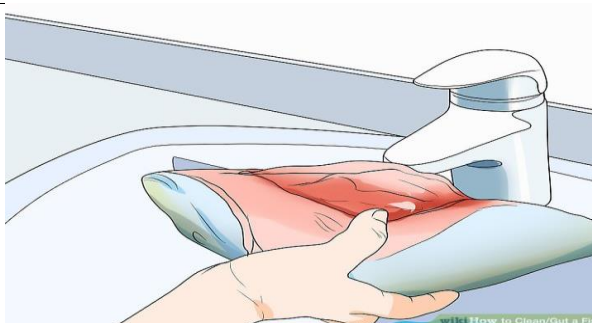
Tip: Physically pulling out the guts, gills, and entrails should be relatively easy. There shouldn't be much resistance and you shouldn't need to cut anything with your knife.

II. Scoop out the fish's kidney by the spine if it has one.
Some fish have a small kidney on the inside of their spine near their midsection. Look along the interior side of the spine for a small bean-shaped organ. If your fish has a kidney, scoop it out with a spoon.



III. Rinse your fish under cold water and clean the abdominal cavity.

In a large sink or cleaning area, hold your fish vent-side up. Turn on a steady stream of cold water and spread the stomach open. Let the water run through your fish's abdominal cavity while you use your hands or a spoon to rub the interior walls of your fish's body. This will remove any remaining residue from the organs and clean the flesh.



- Wash your fish for at least 1 minute to ensure that every part of the fish's abdominal cavity gets rinsed.



IV. Rinsed well cleaned gutted fish



https://www.youtube.com/watch?v=YeXqdZYtF_A (accesses date January, 20, 2023)F

2.3. Removing scales

Scale the fish by scraping the side with the back of your knife. Place the fish in a large sink or cleaning area. Hold the tail in your non-dominant hand and raise it up so that the fish's body rests at a 45-degree angle. Hold your knife firmly in your dominant hand and scrape the scales with the blunt side of your knife in long, hard swipes. Start at the tail and scrape your way towards the head. Flip the fish over and repeat the process to scale the other side. For tough-skinned species, you can use the sharp edge of your knife. Just be careful and make sure that the blade scrapes along the top of the scales and not into the flesh of the fish.

- Rinse your fish after scaling it to keep any loosened scales from getting into your fish's abdominal cavity.
- You can scale the fish after you've gutted it if you prefer.



Figure 2.3 Methods of descaling fish

2.4. Removing Gills and guts

While it isn't mandatory, you can make the cleaning process easier by removing the fins. Hold the tip of a fin up in the air with your non-dominant hand. Place a fillet knife at the base of the fin and slide your knife through it. Remove any large fins that you think will get in the way during the cleaning process.

- Depending on the species, the dorsal fins may be particularly long and hard to remove. Cut lengthwise through them in small sections to make the process easier.
- You can really use any sharp knife to clean and gut a fish, but a flexible fillet knife is preferable because the thin blade will keep you from shredding the flesh.

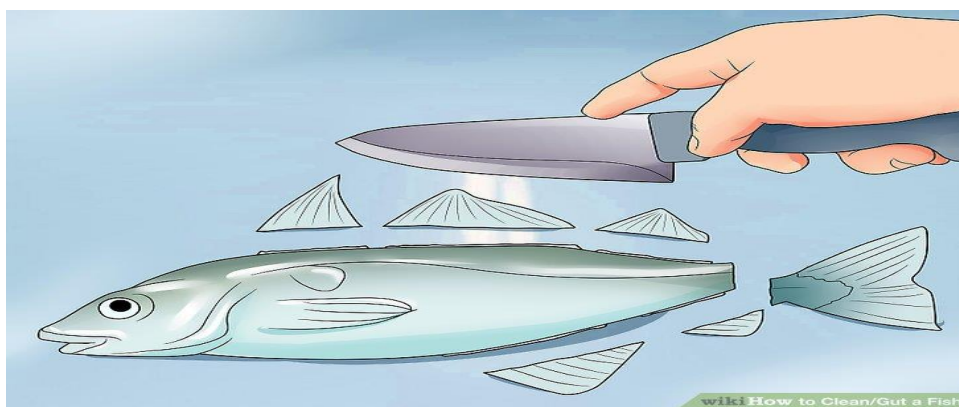


Figure 2.4. Removing Gills

2.5. Placing Fish parts

After cleaning/gutting a Fish parts should be placed into correct container for further processing or disposal (gutted fish and offal's should be putted in the right place.)



Figure 2.5 a. Gutted fish



Figure 2.5 b. Fish abdominal parts/offal's

Self-check 2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below.

I. Fill the blank space

1. _____ is the act of removing internal organs of fish.
2. _____ is removing the scales of fish

II. Give short answer

1. Write two methods of fish gutting?
2. How can we remove gills of a fish?
3. Write down the major steps to be followed in fish gutting?
4. Why we gutting fish?

Operation Sheet -2

2.1. Techniques of manual fish gutting work

A. Materials, Tools and equipment required for fish gutting work

- Potable water and ice
- Gutting knives
- Gutting table
- Fish boxes and tubs
- Trays
- Weighing balance
- Fish tubs and bins
- Packaging material
- Fish scaler
- Scaling knife
- Chiller
- Ice box
- Ice machine

B. Procedures

How To Clean A Fish

Step 1

Rinse fish. Lay it on a flat surface. Make a shallow cut from anus to head.



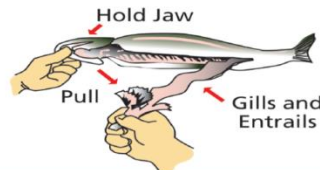
Step 2

Make a cut at the throat to separate the gills from the head.



Step 3

Remove the gills and the entrails.



Step 4

Scrape out the kidney, located near the backbone.



Step 5

Remove the head, if desired, and cut off the dorsal fin. Rinse fish in cold, clean water.



Step 6

Dispose of fish waste in open waters, at a fish cleaning station, or in your own compost.



2.2. Techniques of machine fish gutting work

A. Materials, Tools and equipment required for fish gutting work

- Potable water and ice
- Gutting machine
- Fish boxes and tubs
- Trays
- Weighing balance
- Fish tubs and bins
- Packaging material
- Chiller
- Ice box
- Ice machine

B. Procedures

- ✓ Wear appropriate PPE
- ✓ Setting up your work area and gutting machine.
- ✓ Make ready the machine for gutting activities
- ✓ Manually put the fish on the worktable into the feed port orderly, the rolling shaft in the machine automatically conveys the fish forward
- ✓ During the conveying process, the knife underneath open the fish and remove viscera.
- ✓ The fish are conveyed through the conveyor belt.

LAP Test-2

Performance Test

Name.....

ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1/2 hours. The project is expected from each student to do it.

Task 1: Perform manual fish gutting work

Task 2: Perform Machine fish gutting work

LG #23

LO# 3- Perform fish filleting

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Methods Fish Filleting
- Filleting equipment
- Inspecting aside fillets.
- Trimming fillets and removing bones.
- Removing and placing skin tissue
- Cutting portions
- Trimming steaks and cutlets.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Carryout fish Filleting
- Use filleting equipment safely
- Inspect aside fillets.
- Trim fillets and removing bones.
- Remove and placing skin tissue
- Cut portions to size, weight and shape
- Trim steaks and cutlets.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 3

3.1 Methods Fish Filleting

Filleting can be done by hand or by using a filleting machine. One important limitation of a fish filleting machine is non- capability of the machine to fillet all varieties and sizes of fish. Although filleting machine is preferable for use in a factory, filleting by hand is also economical and can be followed by the industry. Fillets may be with or without skin. The belly flaps are usually separated from the fillets as the belly flap tissue may dis-colour during frozen stage.

The most common way to process your fish is to fillet it. Filleting a fish means to remove two large pieces of boneless meat from each side of the fish. This is the ideal method for beginners learning how to clean a fish.

Steps of filleting fish

- Lay the fish on the cutting board and make a cut behind the gills and the pectoral fin until you reach the backbone.
- Turn your knife toward the tail so it lays flat against the backbone.
- Cut along the backbone through the ribs and belly until you are roughly 1/4" from the tail.
- Flip the slab over so that the skin side of the fillet is laying on the cutting board.
- Slant your knife to a 45° angle near the base of the tail, drawing your knife back and forth until you are underneath the meat
- Lay your knife flat and work it back and forth against the grain of the skin to separate the skin from the fillet
- To easily remove the rib bones, cut out the semi-circle outline by the belly of the fish.
- Rinse your fillets with cold water.



How To Filet a Fish *Tailored Tackle*



Figure 3.1 Filleting fish

<https://www.youtube.com/watch?v=sTqhSdHBBPE> (accesses date January, 19, 2023)

What does a fish fillet look like?

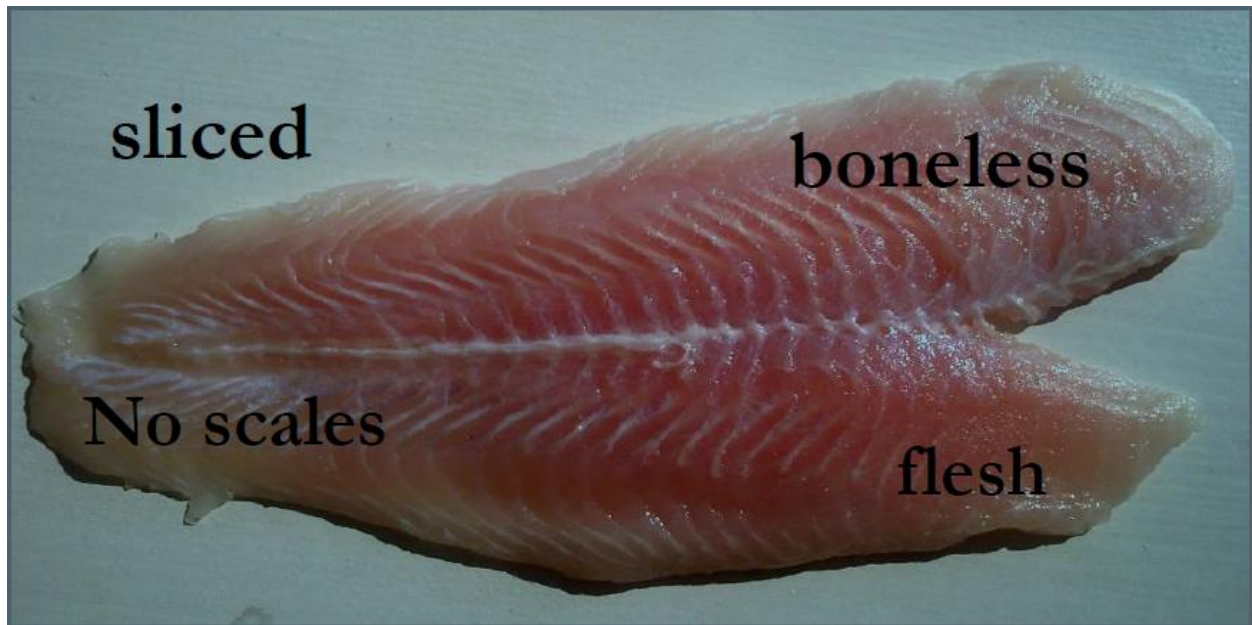


Figure 3.2 Fillets

A fish fillet, from the French word filet meaning a thread or strip, is the flesh of a fish which has been cut or sliced away from the bone by cutting lengthwise along one side of the fish parallel to the backbone.

- **Fillet vs. Filleting**
 - ✓ Fillet is the cut flesh of the fish
 - ✓ Filleting is the act of cutting the flesh from the backbones of the fish with skin on or without.

3.2 Safe use of filleting equipment

Filleting a fish needs to be done carefully. Apart from a sharp knife you have sharp gill plates and sharp spines to contend with. On top of that the fish is slippery so there are many factors contributing to making the process potentially dangerous.

- Never, ever cut towards yourself! It seems like this one should go without saying but people still do it.

- Wear non-slip rubber boots and an apron so you can stand comfortably close to your filleting bench without worrying about getting water or guts on your clothes.
- Wear a glove on your non-knife hand. This hand should do all the handling of the fish. The type of glove isn't too important but it should give you good grip while allowing you to still 'feel' the fish. If it's waterproof too that's a bonus.
- Keep your knife hand and the handle of your knife clean at all times (and preferably dry). Avoid using your knife hand to handle the fish. If you do handle the fish with your knife hand, rinse and dry your hand before proceeding.
- Fillet the fish on a cutting board that will help prevent the fish sliding away. Keep the board clean and wipe away blood and guts from previously cut fish before starting on a new fish.
- Make the first cut down the dorsal spines from head to tail. You will sometimes see people start at the tail and cut upwards to the head. This method as it encourages you to cut towards your own hand and you are cutting on top of the scale which makes it easy to slip.
- Remember the spines and gill plates! People are often very careful not to cut themselves with the knife but don't pay enough attention to other dangers like the sharp gill plates and the spines. In our experience cutting fish at factories we have actually seen more people injured with nasty puncture wounds from spines than cuts from a knife.
- Finally, take your time and focus on doing a neat job and getting good recovery, never rush or try to go too fast.

Filleting equipment Listed as follows:

✓ Filleting machine	✓ Filleting knives	✓ Fish boxes and tubs
✓ Potable water & ice	✓ Deboning knives	✓ Trays
✓ Filleting troughs	✓ Filleting table	✓ Weighing balance

- ✓ Deboning machines
- ✓ Fish tubs and bins
- ✓ Hand-held scale
- ✓ Scaling machine
- ✓ Packaging material
- ✓ Chiller
- ✓ Ice box
- Ice machine

3.3 Visual inspection of fillets.

Unlike whole fish, it is much more difficult to tell how "fresh" fillets are because the number of indicators is significantly reduced. Fillets that have been filleted by hand, if processed properly, are preferable to those from automated and industrial processing. When removing the fish bones by machine, cracks or indentation may be added to the meat. The damage is not only unsightly, but also provides a potential breeding ground for bacteria. Condensation can collect in the cracks, which can promote the growth of bacteria. If filleted pieces are pale and dry or covered with some sort of slimy layer, refrain from using them. Pre-packaged fillets should not contain excessive liquid, which can be an indication of temperature abuse or excessive storage. In addition, the liquid promotes faster spoilage of the fillets. Features/benefits of fish file inspection system include:

- Precise and robust detection of any remaining fish bones
- Can be used with a wide range of different fish types
- Capacity up to 3 fillets/s

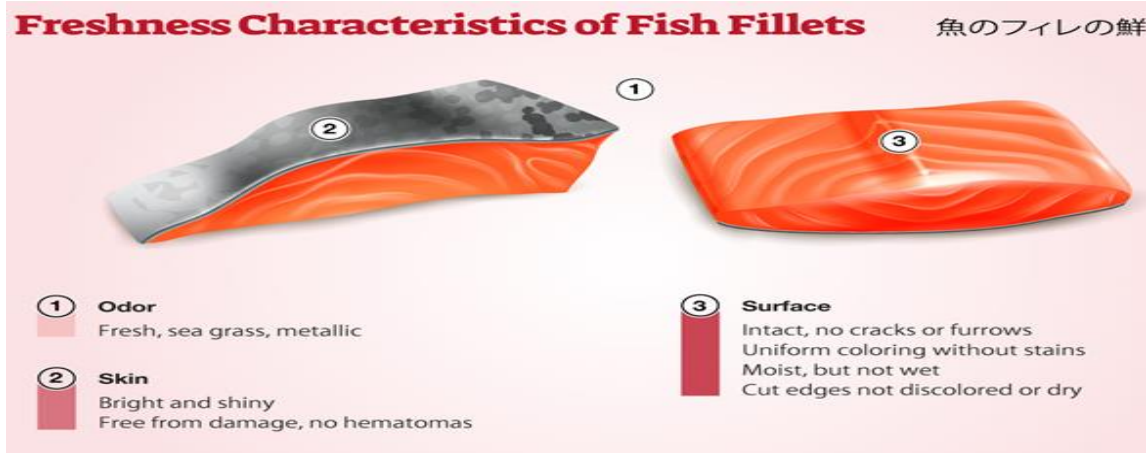


Figure 3.3 freshness characteristics fish fillets

3.4 Trimming fillets and removing bones.

3.4.1 Trimming fillets

Trim any excess fatty skin from the belly side, but keep the fillets as natural a shape as possible. Run the tip of your finger along the middle of the fillet and you will feel the bones running close through the thickest part of the fillet. It is imperative that these are removed before further preparation or cooking.



Figure 3.4. Trimming fillet

<https://www.youtube.com/watch?v=HqjgsefXYp4> (Access date January, 20, 2023)

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			January, 2023

3.4.2 Removing bones.

If you are cutting your fish into fillets, as with larger types of fish, and in particular, flat fish, the fish is cut in a way in which the flesh is easily removed from the bones and you are left with several boneless portions of fish. To debone your small fish you will need a clean board or surface to work on, a sturdy and sharp knife with a flat edge to cut through the fish and a small pair of tweezers to remove stray bones.

There are several ways in which you can debone your fish and below we will describe the two most common and easiest methods.

A. Deboning fish through the belly

- This method is used if you want to stuff or butterfly the fish with the head and tail removed.
- For small round fish, the insides must first be removed. This is done by making a slit along the belly and removing the guts.
- Once the fish has been cleaned and rinsed, take the fish, place it on a clean board and cut off the head. Do this by slicing the head just behind the gills and cut in a big and swift stroke.
- Do the same at the tail end and remove the tail. Also remove the fins at the same time.
- Next, open the fish out like a book, and place it flat down with the skin facing upwards. With your fingers, press down along the backbone, in order to loosen it.
- Turn the fish over, so that the skin is touching the board and then try to lift the whole of the backbone and rib cage out in one piece with one hand, whilst gently freeing the bones with a thin, sharp knife with the other. Hold the knife parallel to the board, sliding the knife underneath the bones.
- Once the backbone and rib cage have been removed, check for any stray bones and remove them with a pair of tweezers.

- Rinse the fish under cold running water and then dry with some kitchen towels. The fish may then be folded back into its original shape and filled with stuffing or left open and cooked under the grill.
- If you are not going to cook the fish immediately, return it to the refrigerator, where it will stay fresh.
- However, smaller types of round fish may be deboned whilst still whole, so that the fish is then ready to be stuffed or butterflied prior to cooking.

B. Deboning through the back

- Use this method if you want to keep the head and tail intact.
- It may be slightly trickier than the previous method, yet for presentation purposes this way of preparing the fish may be more suitable.
- Rinse the whole fish and place it with the belly on a clean board.
- Take a very sharp knife and make a slit all the way along one side of the backbone, from one end of the fish to the other.
- Gently slide the knife down the side of the rib cage, detaching the flesh from the bone as you go along.
- Carry out the same procedure on the other side of the backbone.
- Take a pair of scissors and cut the backbone free at both ends of the fish and carefully lift out the backbone with the rib cage, stomach contents and the gills.
- Rinse the fish inside and out thoroughly under running water.
- Your fish is now ready to stuff and cook.



Figure 3.5. Removing bones

<https://www.youtube.com/watch?v=N0AuP1A9F2U> (accesses date January 22, 2023)

3.5 Removing and placing skin tissue

Fish are often skinned after they are filleted. In a few instances such as Dover Sole, the fish can be skinned whole before filleting. On some fish species the skin is left on and crisped when cooked for added texture. Just follow the instructions below remove the skin:

- Place the fish skin-side down on a cutting board, close to the edge of the counter, and with the tail (or a corner, if you've already cut the fish into fillets) closest to the edge.
- Take a long, thin knife with a sharp edge, and slide it between the skin and the meat, starting at the tail end (or corner) by the edge of the counter.
- Once you've separated about an inch of skin, grip the skin firmly between your finger and thumb, using a paper towel to stop your fingers from slipping. Keep your hand over the end of the counter to avoid scraping your knuckles.
- Pull gently but firmly on the freed skin, and move the knife in the opposite direction. If the skin is a little stubborn, you can make a slight sawing motion with the knife.
- Turn the fillet over and check that all the skin is removed. If there are any scraps still remaining, trim them off.

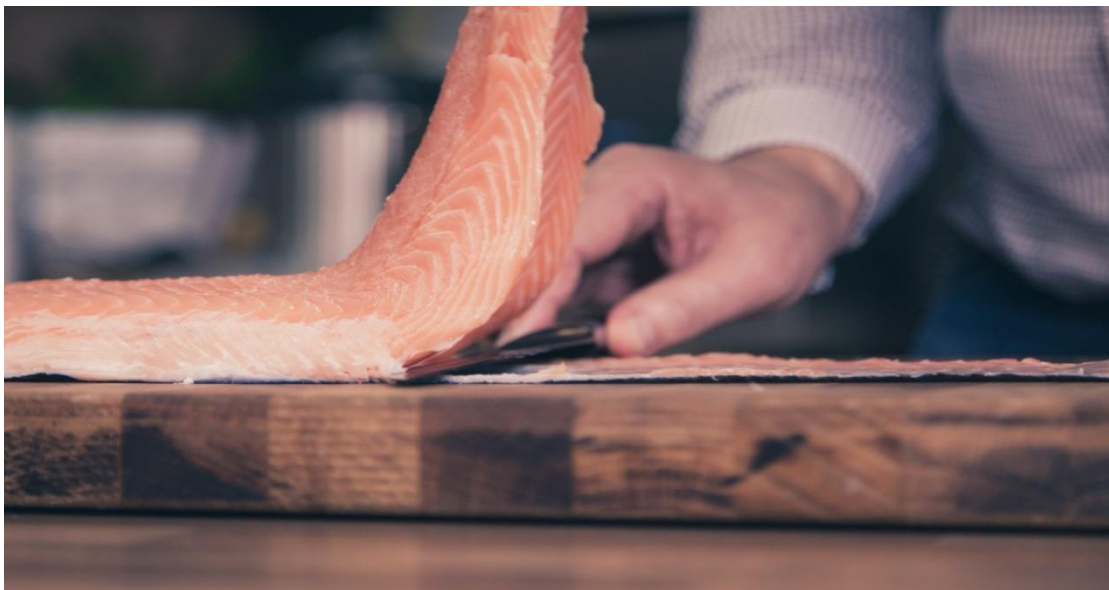


Figure 3.6. Removing skin

<https://www.youtube.com/watch?v=rVJx90DeafQ> (accesses date January 21, 2023)

3.6. Cutting portions

Once filleted, fish can be cut into desired sizes and shapes including escalopes, darnes or tranche (slices), or goujon/goujonette (fingers).

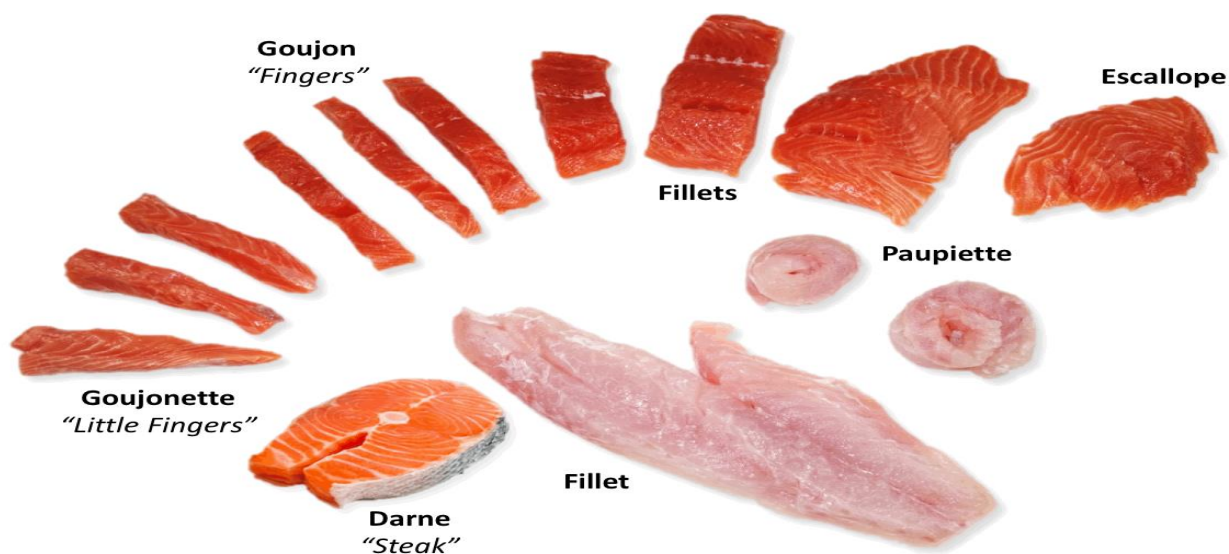


Figure 3.7 fish cut portions

3.6 Trimming steaks and cutlets.

A **fish steak**, alternatively known as a **fish cutlet**, is a cut of fish which is cut perpendicular to the spine and can either include the bones or be boneless. Fish steaks can be contrasted with fish fillets, which are cut parallel to either side of the spine and do not include the larger bones. In contrast to other vertebrate animals, over 85% of the fish body is made up of consumable muscle.

Fish steaks can be made with the skin on or off, and are generally made from fish larger than 4.5 kilograms (10 lb). Fish steaks from particularly large fish can be sectioned so they are boneless. It takes less time to make a fish steak than a fillet, because steaks are often bone in and skin on. Cutting through the backbone with a knife can be difficult, so it is preferable to use a butchers saw to make fish steaks. Larger fish, such as tuna, swordfish, salmon, cod and mahi are often cut into steaks.

Fish steaks can be grilled, pan-fried, broiled or baked. While beef steak takes time to cook and can be tough, fish cooks rapidly, is tender, and tends to fall apart. Fish steaks are less likely to fall apart than fish fillets. Unlike beef steak, fish steaks are often baked in a sauce.

Cut through the fish's spine to create fish steaks and cutlets. With the head removed, take a steak knife and rest the blade across the fish's body so that your blade is perpendicular to the spine. Place your knife 2–3 inches (5.1–7.6 cm) from the opening at the neck and slide the knife back and forth along the same line until you've cut all the way through the fish's body to create a steak.

- Repeat this process leaving 1 inch (2.5 cm) of flesh between each cut to steak an entire fish.
- The difference between a steak and a filet is whether or not the bone was cut through. A steak is a cut through the bone, while a filet is cut around the bone.



Figure 3.8 Trimming steaks and cutlets.



Self-check 3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below.

1. Define fish filleting?
2. Define the term fillet?
3. Write the major steps of fish filleting?


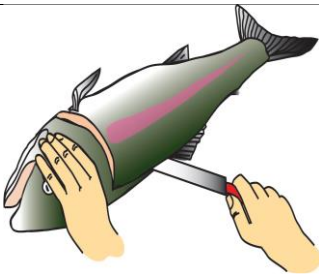
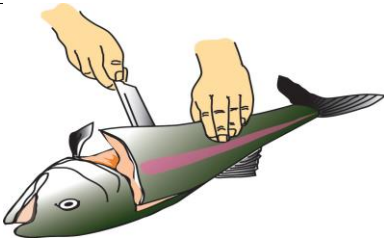
Operation Sheet -3

3.1. Techniques of manual fish filleting work

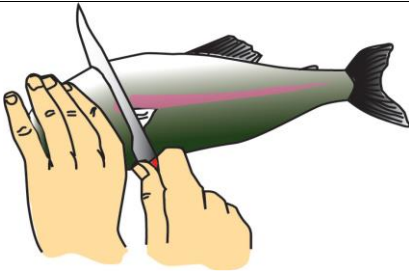
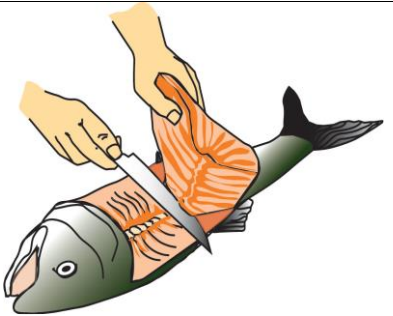
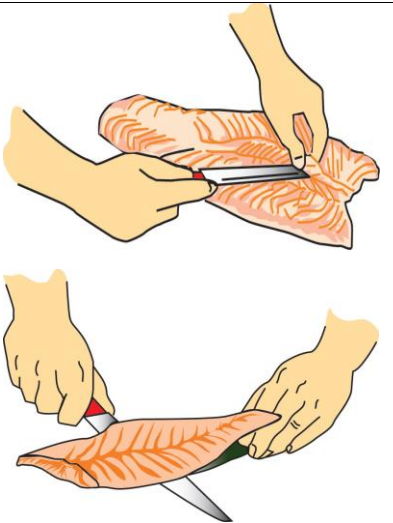
A. Materials, tool and equipment PPE

- Potable water and ice
- Fish boxes and tubs
- Packaging material
- Chiller
- Fish filleting troughs
- Trays
- Ice box
- Filleting knives
- Fish tubs and bins
- Ice machine
- Deboning knives
- Hand-held scale
- Filleting table
- Scaling machine

B. Procedures

<ul style="list-style-type: none"> Setting Up Your Work Area 	
<ul style="list-style-type: none"> Lay the fish on its side on a flat surface. Cut the fish behind its gills and pectoral fin down to, but not through, the backbone 	
<ul style="list-style-type: none"> Without removing the knife, turn the blade and cut through the ribs toward the tail. Use the fish's backbone to guide you. Turn fish around and finish cutting fillet away from the backbone. 	



<ul style="list-style-type: none"> • Turn the fish over and repeat on the other side. 	
<ul style="list-style-type: none"> • Remove rib cage after the fillet is cut. 	
<ul style="list-style-type: none"> • To skin the fish place it skin side down on a flat surface, insert the knife blade about a 1/2 inch from the tail. • Grip the tail firmly and run the knife blade at an angle between the skin and the meat. 	

3.2. Techniques of manual fish filleting work

A. Materials, tool and equipment PPE

- Fish filleting machine
- Potable water and ice
- Fish filleting troughs
- Deboning knives
- Filleting table
- Fish boxes and tubs
- Trays
- Deboning machines
- Fish tubs and bins
- Hand-held scale
- Scaling machine
- Packaging material
- Chiller
- Ice box
- Ice machine

B. Procedures

- ✓ Wear appropriate PPE
- ✓ Setting up your work area and filleting machine.
- ✓ Make ready the machine for filleting activities
- ✓ Manually put the fish on the worktable into the feed port orderly, the rolling shaft in the machine automatically filled the fish

LAP Test-3

Performance Test

Name.....

ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

Task 1: Perform manual fish filleting work

Task 2: Perform machine fish filleting work

LG #24	LO#4-Finalize gutting and filleting operation
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Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Gutted and filleted fish Storage instruction
- Labeling of gutted and filleted fish
- Rinsing and chilling fillets.
- Handling and disposing Wastes.
- Cleaning and storing tools, materials and equipment
- Food safety and hygiene regulations and procedure
- Record keeping and reporting

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Store or display Gutted and filleted fish
- Label gutted and filleted fish
- Rinse and chill fillets.
- Handle and dispose Wastes.
- Clean and store tools, materials and equipment
- Follow food safety and hygiene regulations and procedure
- Record keeping and reporting

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 4

4.1. Gutted and filleted fish storage instruction

The fish is iced and arranged in layers in insulated tubs with tube ice for storing. The tubs are stacked in the hold and are easy to lift by crane when landing. A label is attached to each tub for traceability at further stages of the process.

Properly preparing fresh fish for storage will allow it to be stored for a longer period of time and maintain its quality. Fresh caught fish should be gutted and cleaned as soon as possible and then stored at the proper temperature until ready to cook. For the best flavor and quality, fish should be prepared for eating within 24 hours of catching but if stored properly it is safe to keep refrigerated for 2 to 3 days.

Fresh caught or market fresh fish should be stored at a temperature 40°F or below and cooked fish should be kept at a temperature 140°F or higher to keep it outside of the temperature zone in which bacteria, that causes food borne illness, grows quickly. The danger temperature zone is a range between 40°F and 140°F. Raw fish can be stored in a refrigerator for 2 to 3 days. Leftover cooked fish can be stored for up to 3 or 4 days. If raw or cooked fish is not going to be used within the recommended time, it should be frozen to prevent it from perishing.

Refrigerating

Raw fish can be stored safely in a refrigerator at 40°F or lower for 2 to 3 days. Oily fish will store longer than lean fish and whole fish will store better than steaks and fillets. There are several factors listed below that will have an affect on how well the fish will store.

- The amount of time that market fresh fish can be refrigerated will depend on:
 - ✓ If it was stored properly after it was caught, before it got to the market.
 - ✓ How fresh the fish was when purchased.
 - ✓ Whether or not the fish was stored properly on ice at the market.
 - ✓ The temperatures it is exposed to in transporting from the store to home refrigeration.

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			January, 2023

- ✓ The type of packaging used.
- The amount of time that fresh caught fish can be refrigerated will depend on:
 - ✓ How the fish was handled after being caught.
 - ✓ How long it was kept alive.
 - ✓ Whether or not it was bruised from flopping around on the bottom of the boat or on the dock.
 - ✓ If there was any damage done to its skin.
 - ✓ How soon it was cleaned and if it was cleaned properly.

Follow the instructions below to store fresh fish in the refrigerator properly.

- Remove the fish from the wrapper. Thoroughly rinse the fish in cold water.
- Pat it dry with a paper towel.
- Line a plate or pan with a double layer of paper towels and place the fish on the towels.
- Cover them tightly with plastic wrap or aluminum foil and place in the coldest part of the refrigerator, the top shelf in the back.
- Be sure the fish is tightly wrapped so that if there are any juices from the raw fish, they will not come in contact with any other food.

4.2.Labeling of gutted and filleted fish

Regulations on labeling are clear. There might, however, be slight differences between the labeling of unprocessed and processed fish and seafood, and between the labeling of wild and cultivated fish. In general, the following information needs to be labeled on products, with pre-packed products having some additional information needs that products which have not been pre-packed do not need to include.

- **All products:**
 - ✓ The name of the product, including the commercial and scientific names;
 - ✓ List of ingredients (including all relevant which are the identifying numbers given to the substances), to be added to the outer carton label;

- ✓ Production method – it must be mentioned whether it is a cultured product or wild catch;
 - ✓ Origin (reference the country where they are produced);
 - ✓ Net weight (the net weight must be mentioned on pre-packed products);
 - ✓ Date of minimum durability, consisting of the day, month and year, in that order and preceded by the words “best before” or “best before end” or the “use by” date;
 - ✓ The name or business name and address of the manufacturer, packer or seller;
 - ✓ The packaging must contain a approval number;
 - ✓ The packaging must also contain a “lot number”, which is a number that is given to products belonging to the same batch from the same exporter;
 - ✓ Nutrition (ingredients and nutritional value must be mentioned).
- **Additional information for pre-packed products:**
 - ✓ List of ingredients (including all relevant numbers, which are the identifying numbers given to the substances), to be added to the consumer packaging label;
 - ✓ Quantity of ingredients (as a % of the total net weight);
 - ✓ Net weight;
 - ✓ Name or business name and address;
 - ✓ Country of origin or place of provenance;
 - ✓ Instructions for use (only if needed);
 - ✓ Nutrition declaration;
 - ✓ Packed in a protective atmosphere;
 - ✓ Date of first freezing (the right date of freezing needs to be agreed on with the buyer. Some buyers prefer the first date that raw materials are frozen; for example, when a fish is caught and frozen on board, even if it is not yet in its final form. Other buyers may want the date of freezing to be the first time that the product is frozen in its final form; for example, fish fillets rather than the whole fish frozen on board);
 - ✓ Added proteins of different origins;
 - ✓ If a product is processed, this information needs to be mentioned;

✓ Identification mark;

Water should always be mentioned on the ingredient list in the order of its share of the product's total weight compared with other ingredients. For example, if 8% water is added, the label should read 92% fish, 8% water, followed by any other ingredients. In the case of processed fish, if less than 5% water is added the order in which water is mentioned on the ingredient list is not important. However, suppose more than 5% water is added. In that case, water should not only be mentioned in the ingredient list, it also has to be stated explicitly in the name of the product, which should read “shrimp with added water”.

4.3. Rinsing and chilling fillets.

Rinse the fillet then immediate Chilling is an effective way of reducing spoilage in fish if it is done quickly and if the fish are kept chilled and handled carefully and hygienically. Immediate chilling of fish ensures high quality products. For every 10⁰C reduction in temperature, the rate of deterioration decreases by a factor of 2-3. The objective of chilling is to cool the fish as quickly as possible to as low a temperature as possible without freezing. Chilling cannot prevent the spoilage together but in general, the colder the fish, the greater the reduction in bacterial and enzyme activity.

The important chilling methods of fish and fish products at non-freezing temperature are:

- Iced storage.
- Chilled seawater (CSW) storage.
- Chilled freshwater (CFW) storage.
- Mechanically Refrigerated seawater (RSW) storage.
- Cold air storage.

The most common means of chilling is by the use of ice. Although ice can preserve fish for some time, it is still a relatively short-term means of preservation when compared to freezing, canning,

salting or drying, for instance. When used properly it can keep fish fresh so that it is attractive in the market place.

Ice is available in several forms such as blocks, plates, tubes, shells, soft and flakes. Of these, flake ice is the most popular form for industrial use because of its cooling efficiency. It is also relatively dry and will not stick together to form clumps when stored. Cooling capacity is more for flake ice due to a large surface area for heat exchange. It also causes minimum damage to the flesh. To ensure maximum contact of ice with the fish, proper selection of the size of ice particles and good stowage practices are needed. The rate of chilling is governed by:

- The size, shape and thickness of fish;
- The method of stowage;
- Adequate mixing of ice, water and fish (in ice slurries);
- Adequate contact of ice with the fish;
- The size of the ice particles.

Icing is widely employed for chilled storage of freshwater fish in the country. The dressed and cleaned fish is kept in a chill store in insulated boxes with proper icing prior to preprocessing. The major advantage of using ice for chilling the fish is that it has a high latent heat of fusion so that it is capable of removing large amount of heat as it melts without changing the temperature at 0°C. During transition from ice to water 1 kg of ice absorbs 80 k calorie of heat and this will be sufficient to cool about 3 kg of fish from 30 °C to 0°C.

4.4. Handling and disposing Wastes.

There are different waste materials or product which will be produced in work place but the main waste material which will produced in fish gutting and filleting are the following:

- Head and guts, bone and meat scraps/derbies and blood and whole rejected fish as well as cleaning sewerage.
- Fish wastes will be either disposed according to industry work procedures or recycled or re-

used or returned to manufacturer.

- Utilize to fish meal and other purposes

These waste materials which are produced in fish gutting and filleting work have to be removed from the site on regular manner properly. Disposal of this waste is, in many cases similar to regular waste disposal methods. As in, solid materials are often sent to landfills or incinerators. However, this can obviously have a negative effect on the planet something which those who work within agriculture are likely to be particularly passionate about. In fact, the future of farming relies on taking care of the planet. Fortunately, there are other methods of agricultural waste disposal, such as composting and recycling which can be implemented to help protect the environment.

Disposable materials properly buried in deep enough trench and should be covered with quicklime and then with soil or use Burning. But burning is the most difficult because the Fumes and smoke may be a problem to the surrounding environment. Mud holes should be frequently filled or exclude the animals away from it quickly. On the other hand Fish wastes available from your farm such as trash fish, spoiled fish and fish offal can be used efficiently in several simple ways.

- You may add wastes to your compost plies as an additional source of nitrogen
- You may chop the wastes into small pieces and feed them raw to your animals, especially poultry.
- You may produce highly nutritional cooking oil together with excellent feed for your fish (especially juveniles) and other animals. Simply proceed as follows:
 - ✓ Half fill a metal drum with water;
 - ✓ Start a fire under it and bring the water to a boil;
 - ✓ Finely chop fresh fish wastes and throw them into the boiling water until the drum is three-quarters full;
 - ✓ Boil for about 20 minutes;
 - ✓ Take the drum off the fire;

- ✓ As the fish oil rises to the surface, skim it off and keep it in a clean container for later use; keep this container tightly closed;
- ✓ When the water has cooled down, drain it from the drum and collect the fish waste residue from the bottom; it is an excellent ingredient for mixing in animal feeds; you may also dry waste residue, for example in a solar dryer to make a simple fishmeal.

4.5. Cleaning and storing tools, materials and equipment

Cleaning refers to removal of dirt, filth or unwanted substances matter from the materials, tools and equipment. Work site have to be clean and safe for efficient work of employee. So, any farmer or employee in livestock farm has to keep sanitation of his work site; which mean that he has to clean his work area after completing his task by doing these he can keep healthy himself and his staff members.

After completion of the work all materials, tools and equipment they has to be cleaned, sanitized, disinfected, maintained, and stored properly.

The materials tools and equipment should be Stored in a safe, dry place/ ventilated and away from animals reach, and placed on wooden racks or shelve in order to prevent direct contact with soil.

4.6. Food safety and hygiene regulations and procedure

Hygiene means conditions and measures necessary in the processing to ensure safety and fitness of the products for human consumption. The Guidance on Good Hygienic Practices for Pre-processing of Fishery Products is intended to provide recommendations for the implementation of good hygienic practices during raw material preparation such as de-heading, gutting, de-shelling, and filleting in order to produce safe products fit for human consumption. Guidance on Good Hygienic Practices includes:

4.6.1. Establishment

A. Location

- Establishment shall not be located in an area that poses environmental risk of contamination to the products such as a polluted industrial area, flooded area, and heavily air-polluted area. If it is unavoidably located in an area likely to cause contamination, appropriate control measure shall be in place.
- Surrounding area of the establishment shall be clear, clean, free from rubbish and surplus materials and tall grass which could be the harbouring places of rodents, insects and other disease carrier animals.

B. Design

- Layout and processing line shall enhance good hygienic practices
 - ✓ Sufficient space in processing room shall be provided for placement of equipment and tools in order to enable easy cleaning. Processing areas shall be properly designed according to the process flow so as to prevent contaminations from microorganisms, chemicals, and foreign matters.
 - ✓ Unclean areas such as raw material receiving and pre-processing such as de-shelling, de-skinning, de-heading, gutting, etc. shall be separated from the clean areas. If different products are processed in the same area such as shrimp, cephalopods, fish, each production shall be clearly separated. In the production step, such cleaned products should be segregated from the unclean products.
 - ✓ In production of cooked product, the layout shall be properly designed by clearly separating post-cooking area from pre-cooking area in order to prevent microbiological cross contamination from raw to cooked products.
 - ✓ Establishment shall be located separately from housing areas without direct connection, except when there are appropriate measures to prevent product contamination in place.

- Floors of the processing area shall be made of durable materials, easy to maintain, smooth surface, non-slippery, non-absorbent, without crack and in good condition. Floors shall be slightly sloped to allow adequate draining.
- Ceiling and walls of the processing area (including tools and plumbing system installed in the area) shall be made of easy-to-clean material, smooth, non-absorbent, light coloured and in good condition in order to prevent mould. Ceiling in the processing area shall be able to prevent foreign matters such as spider webs, dusts, rust from overhead metal fixtures and plumbing, falling into the products. Plumbing system such as water and steam pipes should be designed to hide above the ceiling. If these systems are installed underneath the ceiling, pipes shall be clean without steam condensation.
- Drains in the processing area, in particular where excessive use of water is required, should be adequate in number and size with appropriate slope, good drainage, without causing water standing or overflow. Due to the significant amount of water used in the pre- processing of fishery products, appropriate design of the drainage system will accelerate water removing.
- Processing area should have good ventilation to exhaust odour, smoke, steam and heat which are resulted from processing activities. Poor ventilation will cause water condensation from steam which may contaminate the product. Steam generated from product cooking, once condensed will be a good source for microbial growth.
- Lighting should be adequate in the processing areas such as shrimp de-shelling and deveining, cephalopod skin cleaning, raw material washing, etc. to reduce the amount of defected product and ensure that the physical contamination is visible, particularly during washing or sorting out filth or foreign matters in raw materials.
 - ✓ General working areas should have a minimum light intensity of 220 lx, and at least 540 lx at sorting areas.
 - ✓ Light bulbs suspended over the working areas shall be covered and the covers shall be maintained their cleanliness. In case of light bulb dropping or breakage during work, the covers will prevent the broken glass from falling into the products and facilitate cleaning.

- Clothes changing facilities where work wear and personal belongings are stored shall be separated from the processing areas. The facilities should be kept clean and of good ventilation. Personal clothes should not be comingled with work wear.

C. Supplies, equipment and tools

- All supplies, equipment and tools used in the processing area directly or indirectly in contact with the product shall fit for purposes, easy to maintain with smooth surface, no cracking, non-absorbent and free of rust.
- Cleaned containers and tools shall be stored in an appropriate and clean place and not cause contamination such as good ventilation. Containers and tools shall be kept with enough space from the floor. Such containers and tools used inside the processing areas should not be stored outside that may cause contamination.

4.6.2. Control of operation

A. Raw materials

- Raw material shall be clearly identified by lots. Lot identification shall be recorded and traceable to the source where necessary.
- Temperature of raw materials shall be monitored and recorded upon each receiving. The raw material temperature during transportation should be maintained close to 0oC (except for live aquatic animal such as bivalve molluscs) in order to inhibit microbial growth. If the temperature of raw material upon receipt is high, sensory evaluation on the raw material quality shall be conducted. If the quality is acceptable, the temperature shall be quickly reduced to around 0oC by adding ice and then further processing the raw materials immediately.
- Each lot of raw material received shall be subjected to physical examination and recorded. Defective and early-stage decomposed raw materials shall be culled off prior to further process.

B. Food additives

- Food additives shall be registered or permitted for use by the Thai Food and Drug Administration. For exported product, processors should take into account requirements of the importing countries.
- For storage and use, the food additive shall be clearly labelled on both original container and small re-packed containers to avoid mistaken use.
- Food additives shall be grouped and appropriately stored in a designated area which is clean, of good ventilation and able to prevent disease carrier animals and dusts from contaminating the product. Food additive use shall be properly controlled such as distribution and quantity used.

C. Water supply

- Water in contact with raw materials and product shall be complied with the potable water standard notified by the Ministry of Public Health on the provision of: “containing Coliform bacteria less than 2.2 in 100 ml water as determined by MPN (Most Probable Number) method, absent from *E. coli* and pathogenic bacteria”. Chemical properties shall be in compliance with the Notification issued by the Ministry of Public Health.
- Water supply shall be adequate for processing and cleaning equipment, tools and processing areas. Water treatment shall be hygienic. Water tanks shall be made of easy-to-clean materials, well covered and able to prevent microbial contamination in the water system due to changes of water pressure in the pipes causing a back flow. Pipe ends or water hose tips should not be immersed in water containers during work. A safety valve should be installed at each tap to prevent back flow.
- Water samples shall be examined at least quarterly for microbiological quality on a regular basis and annually for chemical properties.
- If chlorine is applied in the water system, residual chlorine shall be monitored at least twice daily (morning and afternoon). If disinfectants other than chlorine are used, their

residues should be monitored as well. If the water quality does not meet the potable water standards, an investigation and corrective actions to improve water supply system shall be conducted.

D. Ice

- Ice used for processing shall meet the potable water standard. If the ice is purchased from an ice making plant, the ice shall be complied with the Notification of the Ministry of Public Health entitled Ice Quality.
- Storage room including containers and tools used in contact with ice shall be in good condition, clean and hygienic as follows:
 - ✓ Transfer of ice from ice making plant to the pre-processing establishment and from storage room to an ice crusher shall not cause contamination.
 - ✓ If ice blocks are used, they shall not be placed directly on the floor.
 - ✓ If crushed ice is used, it shall be transferred from ice making plant in covered containers to prevent contamination.
- Ice is subject to microbiological quality analysis on a regular basis, at least quarterly.

E. Control of initial operation

- Raw material temperature shall be maintained between 0 oC and 10oC during processing by using ice or cold water. If it is not possible to control as such, production time shall be controlled instead.
- If raw material is subject to heat, time and temperature shall be appropriate for the purpose and in compliance with relevant laws and regulations.
- Temperature and time shall be recorded in accordance with the established frequency.
- Upon completion of cooking process, product shall be immediately cooled down to avoid accumulation of heat which will adversely affect product quality and to prevent thermophilic bacterial growth.

4.6.3. Maintenance and sanitation

A. Maintenance

Establishment, equipment and tools shall be maintained in good condition and operational according to their purposes, facilitating good hygienic practices and effectively preventing **product contamination**.

B. Cleaning and disinfection

- Cleaning program including method and frequency for equipment, tools and establishment should be in place for both before and after work. Disinfection shall be applied after cleaning of the processing area, equipment and tools in direct contact with food. Such equipment and tools shall not cause product contamination. Thus washing, cleaning and disinfections should be conducted at appropriate frequency such as during lunch break or after work.
- Cleaning tools such as brushes, water wipers shall be non-absorbent, in good condition, not cause contaminations to other tools. They shall be adequate, and stored in an allocated and hygienic storage. As these tools are used for such purposes as cleaning processing equipment including floors and walls, therefore, they should be clean and not cause microbial contamination to the surfaces being cleaned.
- Detergent and disinfectant properties shall be appropriate for use in food processing plant and appropriate for the purposes. For example, household detergents should not be used to remove fat remaining in containers. Appropriate kind and quantity of detergent should be applied according to the instruction on the label. A.3.2.4 Detergents, disinfectants and toxic chemicals shall be stored separately from food ingredients and clearly labelled.
- Effective cleaning shall be monitored on a regular basis and recorded.

C. Pest control

- Rodents, insects, and disease carrier animals shall not be present in the processing area. They are carriers of dangerous diseases which are contagious to humans through the product. Identifications of filth such as hair, insect parts indicated poor sanitary control.
- Building shall be maintained in good conditions. There is no access for insects and disease carrier animals such as bottom clearance of the door connecting to the processing area, ventilation outlets or drainage system opening to outside of the building. All openings should be appropriately covered to prevent rodents and insects.
- Regular control and eradication program for rodents, insects, and disease carrier animals shall be in place. If chemicals are used, they shall be approved by a recognized agency. Dosages used shall be properly controlled. Operators shall have knowledge on the application and shall prevent contamination to product or food contact surfaces.
- Evidence or track of disease carrier animal and openings in the processing area shall be monitored on a daily basis.

D. Waste and waste water management

- Waste such as heads, offal, skins, bones, shells should be regularly removed from the processing area in an appropriate frequency. The transfer should be conducted in a hygienic manner and not cause contamination to product. These waste materials and rubbish are source of microorganism accumulation. If these waste materials are not handled hygienically, they are likely to contaminate the product.
- Waste containers shall be made of easy-to-clean materials, strictly used only for waste materials and kept clean. The designated container is aimed at avoiding cross contamination with the product as microorganisms are significantly accumulated in waste materials. If waste containers are used for containing products, contamination will occur.

- The area for waste and trash shall be separated, closed and hygienic. If the waste area is located outside the building, covers shall be used to prevent odour and rodents, insects, and other animal harbourage and infestations.
- Waste water shall be appropriately discharged without contamination to the product.

E. Toilets

- Adequate number of toilets shall be provided and located separately from processing area. Toilet doors shall not open directly to the processing area.
- Toilet areas shall be in good condition, clean and hygienic as toilets may be a spreading source of the microorganisms causing gastroenteritis to human. If there is unhygienic practice, these microorganisms may contaminate the product and be harmful to consumer health. Toilets should be equipped with non-hand operated taps, liquid soaps, hand drying materials such as paper towels and rubbish bins with cover.
- Waste shall be hygienically disposed off and clearly separated from waste water treatment.

F. Hand wash basin and foot bath

- Hand wash basin shall be maintained in a good condition, clean and equipped with non-hand operated taps, liquid soaps, hand drying materials such as paper towels or disposable hand towels. The hand operated taps shall be avoided because microorganisms can spread from one person to another using the same taps. Replacing bar by liquid soap will help preventing microbial accumulations on the bar. Repeatedly use of hand towels will not only cause microbial accumulations but also cause microbial transmission to those who have cleaned hands.
- The number of hand wash basin shall be adequate and located at the every entrance and inside the processing area at the practical points.
- Basins containing disinfectants for hand and glove dips shall be available at each entrance to processing area. The disinfectant concentration should be appropriate and

monitored. For examples, if chlorinated water is use for disinfection, residual chlorine shall be regularly examined in order to maintain the effectiveness.

- Foot bath shall be installed at each entrance to processing area containing adequate and appropriate concentration of disinfectants. If chlorine is used, the chlorinated water should contain at least 100 ml/L of residual chlorine. The chlorinated water level in the foot bath should be at least maintained to cover the back of the feet.

4.6.4. Personal hygiene

A. Personnel

- Operators in the processing area shall not suffer from serious contagious diseases such as tuberculosis, a carrier of gastrointestinal diseases such as choleras, typhoid, and diarrhoea. They shall undergo medical examination including serious contagious and gastrointestinal diseases before being admitted to work and at least annually in the following years. The medical examination record shall be maintained.
- Operators working in the processing area shall not have open or infected wound or lesions that could contaminate the product except there is appropriate protection such as covering the wound with plaster before putting on gloves. Ill operators with the symptoms such as fever, sore throat, dysentery, vomiting, infected skin, shall immediately report to supervisor for transfer to another section not involving food or taking a sick leave until full recovery.

B. Personal practices

- Operators shall work in a hygienic manner.
- Operators working in processing area or in contact with raw materials shall always maintain good personal hygiene. They shall wash their hands and dip in disinfectant solutions both before and during work as appropriate, for example, after contacting dirty materials or upon each return to processing area and after using the toilet. Hand washing

upon entering the processing area is necessary since the operators may cause contamination after leaving the processing area.

- Clothes and workwear shall be clean and hygienic. Workwear should not be worn from home as microorganisms or dirt from outside may contaminate. Clothes changing or wearing workwear arranged by the pre-processing establishment at the production site will help minimize and control the contamination of dust from clothes. During processing, hair shall be covered and jewelry shall not be worn. Aprons used shall be waterproof with proper length that is not too long and contact the floor. Boots and gloves shall be clean.

4.6.5. Product storage

A. Storage practices

- Storage area shall be located separately from the processing area. Storage shall not cause contamination to the product. The area shall be clean with good ventilation.
- Temperature of product, if not at frozen stage, shall be maintained at close to 0oC at all times.
- Products shall be stored orderly and the area shall be regularly cleaned.

B. Product identification

- Origins of the fishery products during storage shall be identified for traceability purposes.

4.6.6. Document and record keeping

A. Record on sanitary control shall be available and containing the followings:

- Name and address of the pre-processing establishment
- Structure, materials, equipment and tools
- Maintenance and cleaning program
- Personnel
- Water and ice

- Rodent, insect and disease carrier animal control program
- Quality control for raw material and processing
- Other controls including chemical control and waste management

B. Sanitary control shall be recorded as specified and maintained at least 1 year for further inspection.

4.6.7. Training

Operators in contact with food and quality controllers shall have knowledge or experiences or be trained to understand food safety standard, good hygienic practices for pre-processing establishment and quality control. Training will help operators fully understand the nature of work and food safety at every point of the operation and be able to perform appropriate task.

4.7. Record keeping and reporting

4.7.1. Record keeping

To keep records is simply to collect relevant information that can help you to take good decisions and to keep track of activities.

Records can be about:

- Both weight and length measurements measurement before the fish is gutted and frozen.
- Date of the fish and the location where it was caught.
- Both weight and length measurements after gutted and iced, filleted or otherwise cut up.
- Provide side-view photograph

It is important to keep record keeping simple, and to keep records systematic. If records should be of use for the consumer to trace back about the fish, than they must be complete (none missing), they should be true (collected carefully). When record can't be trusted because they are not complete or true, time should not be spent on it at all.

The records can:

- Be used in determining profitability of various techniques used at the farm
- Be used to keep your memory on what you did and/or what happened
- Be used in decision making, especially on a strategic level

4.7.2. Reporting work outcomes

An important point in every work including livestock work is recording data, analyzing and reporting, all the steps from the initial to the final product of the work. One of the ways of communicating to the employer or the customer is reporting work outcome. This report includes information regarding

- Raw materials
- Problem encountered
- Length of work
- Hazards and safety
- Techniques and system of work
- Cost expended
- Material availability
- Sustainability of work
- Labor required
- Facilities in work

Self-check 4	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below.

1. Mention types of records in fish gutting and filleting work.
2. Write at least 2 importance of record.
3. What information should be included in work out come report?
4. List down three waste materials produced in fish gutting and filleting activity.

Operation Sheet -4

Report work outcome

A. Materials

- Pen
- Paper
- Chair
- Table
- Ruler
- Computer
- Printer
- Note book

B. procedures

- Prepare recording file
- Record all the data and steps in work
- Arrange the data
- Select the relevant data to the work
- Interpret according to your work
- Compile the data properly
- Report the total outcomes of the work to the concerned body

LAP Test-4

Performance Test

Name.....

ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

Task 1: Report work outcome

Reference Materials

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