



SmartFish
Working Papers

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Fish Handling, Quality and Processing : Training and Community Trainers Manual



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DEFINITIONS

Authorized officer	Someone who has been given the power to carry out duties in controlling hygiene
Chill storage	Storage equipped with insulated walls to maintain fish at a temperature as close to 0°C as possible
Chorkor oven	An improved fish smoking oven which uses less fuel wood and produces good quality products
Codex	International organization that makes good practice guidelines on how to handle food and make safe food
Cold storage	Storage equipped with insulated walls to maintain fish in a frozen condition at a temperature of -18°C or less
Collector boat	Boat equipped with proper holds which, when transporting fish from landing site to gazetted landing site, has ice in them to keep the fish cold
Competent Authority	A person or authority that has legal backing to carry out its food safety inspection duties
COMESA	Common Market for Eastern and Southern Africa consisting of 19 countries
Designated area/place	A place that should only be used for fish handling and processing
Disinfectant	Chemical used to kill bacteria (e.g. Chlorine)
EAC	East African Community made up of Kenya, Tanzania, Uganda, Rwanda and Burundi
Freezer	Blast or Plate freezer which brings fish very quickly to -18°C
Fry	Small, young or baby fish
Fingerling	Small fish which is not adult
GAP	Good Aquaculture Practice
Gazetted landing site	Places for landing and selling fish which have been officially authorized by government
Germ	Bacteria, virus
GHP	Good Hygienic Practices are the things we need to do to make sure fish is handled in a safe way making it good to eat
Grading	Sorting fish according to size or quality
Hazard	A chemical, biological or physical contaminant which causes food to be unsafe to eat
IGAD	Intergovernmental Authority on Development
Insulated box	Box which keeps the fish cold and iced for a long time
PAH	Chemicals called polycyclic aromatic hydrocarbons that are produced when fuel wood or other fuels are burnt. Some are poisonous.
Pelagic	Fish which live near the surface or in the mid water area
Pesticide	Something that is used to kill or repel a pest which can be an insect, animal or plant
Quality	The condition or characteristics of safe fish
SADC	Southern Africa Development Community consisting of 15 countries
Standard	The required way to produce or handle fish and what the final product should be like
Traceability	Collecting information about what happens to fish at every stage of the distribution chain

FOREWORD

Fisheries are one of the most significant renewable resources that Eastern and Southern Africa (ESA) and Indian Ocean (IO) countries have for food security, livelihoods and economic growth. Efforts however, need to be made to ensure that as the population in these countries grows, and demand for food and employment likewise grows, the benefits that fishery resources provide, are protected through sustainable management and value-addition.

The IOC-led Program for the Implementation of a Regional Fisheries Strategy for the ESA-IO region (IRFS) [SMARTFISH] was launched in February 2011 with the aim of contributing to an increased level of social, economic and environmental development and regional integration in the region through the sustainable exploitation of fisheries resources. Underpinning the Program is the harmonization of the region's strategies and the strengthening of regional integration especially in partnership with COMESA, EAC and IGAD. The ultimate beneficiaries are fishermen, coastal communities and wider populations in Burundi, Comoros, Djibouti, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

In terms of trade, the traditional focus on large international trading blocks and fostering trade from Africa to these blocks, has meant less attention has been paid to developing regional trade, which is thought to have great potential and consequently is a key focus of the program. Some of the most pressing issues facing regional fisheries trade relate to trade barriers in both regional and domestic markets. Average import tariffs for example between countries in the region are generally much higher than in developed countries and are thought to have weakened intra-regional trade significantly. Non-tariff barriers include challenges with export licensing, logistics and poor infrastructure throughout the value-chain, all of which reduce competitiveness through increased costs to exporters.

Improving quality and sanitation issues is critical to improving marketing opportunities regionally as quality standards are becoming an important requirement for trading fish across borders. Regionally harmonized quality standards should increase competitive access for traders and help to ensure improved quality of fish for consumers. Capacity building for all those involved in the value-chain is an important part of improving standards and quality. It is SmartFish's aim that this trainers manual be used as a tool by all relevant stakeholders to strengthen handling, hygiene and sanitation practices in line with COMESA and EAC standards for the betterment of regional trade, livelihoods and food security.

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1. INTRODUCTION

The fisheries sector provides both food and employment for millions of people as well as fish for consumers who have a right to eat food which has been caught, handled and treated in a good way. Some consumers worry about what happens to their food before they eat it. They look for quality and they worry about what may have happened to fish before they eat it. In the end they have to trust fishermen, processors and traders to be very careful with the fish they catch and handle. Many countries that import a lot of fish have regulations to protect consumers from eating fishery products which will make them sick. Failing to meet these requirements can mean that fish can be banned from entering that market and a ban can mean that many people will lose business and suffer as a consequence. Everyone, no matter which country, has a right to eat good, safe fish. That's why many countries in Africa and particularly those in COMESA, SADAC and the EAC have standards and regulations to protect consumers and encourage better handling and processing of fish. These standards are based on those promoted by Codex, an international organization that develops worldwide standards.

Fishermen, fish processors and traders in many countries often rely on simple low cost equipment and live and work in remote areas where basic services and facilities are not available. They may also lack knowledge, skills and the ability to invest in new equipment and ideas. This can mean that fish is often handled and processed in unhygienic conditions causing spoilage, contamination with disease causing germs, and a loss of income as fish are sold for a low price. Fishermen, processors and traders may know what they are doing is not the best, but find it difficult to change what they are doing. Especially when faced with a lack of potable water, electricity, good roads, equipment and landing site facilities. Whilst Government should ensure such services are provided and that food safety laws are in place and enforced properly, fishermen, processors and traders need to ensure that they handle fish properly and the required food hygiene and safety standards are met. It is worth remembering that all stakeholders involved in fishery activities have a responsibility to make sure that fish is handled in the best possible way and in the best conditions possible, so that the consumer receives good quality and safe fish to eat.

This manual has been produced to help introduce better practices that can help people make more from the fish they catch, process and sell, as well as help them reduce post-harvest losses. The manual supports the standards related to small-scale fisheries promoted by COMESA and the EAC and is designed to help encourage the adoption of these standards by fishermen, processors, traders, fish farmers and transporters and so improve business and regional trade.

The manual is designed for use by community trainers as well fishermen, processors, fish farmers and traders to use to help them improve their businesses and teach others about good fish handling practices. It can also be used by extension workers and NGO's interested in achieving the same objective.

The manual will help:

- improve knowledge of good fish handling, processing, hygiene and sanitation practices;
- the trainer to be able to train and communicate that knowledge to others;
- identify simple ways to improve fish handling, hygiene and sanitation;
- Make better use of existing and future facilities and services.

The manual contains 13 different chapters. Each chapter includes background information on the topic as well as images that can be used to help get the important messages across to beneficiaries who are not literate. Chapter 1 which focuses on training skills and ideas for trainers to help them be more effective. In addition, each chapter also contains “trainers tips” which can be used by trainers to help deliver training in technical issues. The other 12 chapters deal with technical issues related to good fish handling, hygiene and processing practices related to small-scale fisheries.

There are also two annexes. Annex 1 provides more information on good general cleaning practice and Annex 2 provides checklists that can be use to see if the better practices described in the manual are being used in a particular.

The manual has been used to run training of trainers workshops where a number of community trainers have learnt how to deliver short participatory training sessions at community level using a mixture of handouts, posters and drama.

2. PRESENTATION AND TRAINING SKILLS

What we will learn about

- Communicating for training;
- What to do during training to make it go well;
- How to prepare for training.

In Chapter 1 we will learn how to run a good training session that shows good preparation and communication skills.

Successful training is all about good communication. Some trainers are ‘naturals’ but anyone can deliver effective training by following some of the simple rules given here and by practice. We will look at how to communicate well, what to do during the training session and things to do to prepare for training.

Training Images

Picture 1. Communicating for training

The key to good training is communicating. We communicate with people in 3 ways:

- o What we say;
- o How we say it;
- o What we look like when we say it.

Body language is very important when we give a spoken message. As trainers it is very important that we understand how to communicate effectively with our bodies and voices, so that we pass on the right messages and help our trainees learn. Now we describe some of the main things to remember and do, so that we can carry out good training.

Posture

When you train try to stand in a relaxed way and present yourself in a relaxed way with free movement of your arms and legs. Don't fold your arms as this is a sign that you are not happy or uncomfortable. Avoid standing with your back turned to your participants also.

Eye contact

Eyes are the most important feature of our faces and the things that people look at when we are talking to them. When training you should try to always make eye contact with your audience/trainees. This draws people into the training process and makes people feel like you are talking to them and interested in them. Remember not to look at the floor or ceiling or keep your eyes closed.

Position

Where you stand or sit when training is also important. Standing close to participants will indicate that you are friendly and this may help them relax and feel at ease. Standing at the centre gives you more control, standing to the side lets the group have more control. When training it can help if you can be a little energetic and move around as much as possible to engage with your group.

Speaking

The way we use our voice when we are training is important for communicating. Some trainers concentrate on what they are going to say and forget to think about how they are going to say it! To use your voice effectively in a training situation you must:

1) **Speak Clearly:** It is very important that people can hear and understand what you are saying. You can achieve this by:

- speaking more loudly than normal but don't shout or you will strain your voice;

- directing your voice to the back of the room so everyone will hear what you say;
 - not speaking with your back to participants;
 - pronouncing words carefully;
 - knowing what you are going to say and not simply reading from your notes or manual.
- 2) Make your voice sound interesting and make sure you sound interested in what you are saying.
 - 3) Speak fast at times to excite and stimulate - but not too fast so people may not be able to understand you!
 - 4) Use your voice to help people to recall information:
 - o repeat key words and phrases;
 - o emphasise key information by speaking slowly.

Attitude

Participant's interest in learning will be influenced by your manner. If you are enthusiastic when you train it will encourage your group to also be interested and enthusiastic about what you're saying.

Your emotions can be expressed through your facial expressions. If you are bored and not enthusiastic then your group will probably be the same and may lose interest in learning.

Make sure you smile and use plenty of words of encouragement for your group. You can use phrases like “well done”, “that's great”, “I like your question”, “that's a good idea”, “that's a good point you make” etc.

Appearance

The way you dress and the clothes you wear will send a message. It is important to look smart, clean and yet wear clothes that make you feel comfortable.

Trainers Tips

Explain that we are going to learn about how to train well so that we can use this training manual and materials well. Explain that we are going to learn about how to communicate well when we train and practice some of these techniques. Then:

Ask the group to look at the picture 1;

Explain each image using the notes above and give a demonstration of good and bad practice;

Divide the participants into groups and ask each group to prepare to demonstrate examples of good and bad practice;

Watch each participants give their demonstrations and give them feedback and of course encouragement;

Explain that we will have more chances to practice good communication skills during the rest of the workshop and as we use the manual.

Recap questions

What are three things we need to remember are important in getting our training message across? (Answer: body language, voice, words)

Ask the group to suggest examples of good and bad communication when training a group. Ask if there are any questions or comments.

PRESENTATION SKILLS 1. COMMUNICATION

**SPEAK CLEARLY, SLOWLY AND
NICE AND LOUD**



**WHAT YOU SAY...KEEP IT
SIMPLE!**



**BE SMART, ENTHUSIASTIC
AND MAKE EYE CONTACT**



Picture 2. What we should do during training

There are some things which we can do to make training better and more interesting and keep our participants interested and learning.

Keep your participants interested

This is important if your group are going to learn easily. It can be achieved by:

- o Using a participatory approach and encourage everyone to say something and join in;
- o Being enthusiastic;
- o Giving plenty of examples;
- o Using pictures to show ideas;
- o Using different ways of communicating and training - asking questions, encouraging discussion, having short breaks, practical work, drama, group work;
- o Keep the training session short and not too long.

Help your participants to understand

Some of what you will talk about and discuss with the group will be new, so it is important not to hurry:

- o Use words and phrases and language that people understand;
- o Give information in small amounts at a time;
- o Present information in the right order;
- o Regularly check the group understand what you are talking about by asking them recap questions.

Help your participants to remember

It is not enough for the participants to understand the information in your training they must also be able to remember it. You can help them to do this if you:

- o Introduce the main things you want your group to remember early in the training;
- o Concentrate on the main points and do not introduce too much extra information that may not be needed;
- o Repeat the main points you want your group to learn during and at the end of training;
- o Provide handouts for participants to take away.

Avoid distractions

Try to keep the participants attention by:

- o Giving handouts at the right time. If people start talking regain their attention by:
- o Asking a question;
- o Starting a new discussion;
- o Go completely silent and look at them. Help participants to think

How they will use the training

After training, those trained should use what they have learnt. As trainers we should help trainees to develop Action Plans that describe how they will use what they have learnt. Action Plans can be developed by individuals or groups and can be shared and discussed these with the overall group.

What is an Action Plan?

An Action Plan describes what will be done by the trainee after the training and how they will use or put into practice, what they have learnt. It will describe:

- What activities will take place;
- Where activities will take place;
- When the activities will carried out;
- Who will be involved;
- How the activities will be carried out;
- Why these activities are necessary/beneficial.

As a trainer your job is to help trainees develop their action plans and help them be as specific as possible about how they will use what they have learnt after the training.

Evaluate the training session

Good training involves getting feedback from your group to understand how they felt about the training and what they thought was good and not so good. This can help you as a trainer to understand how well you have done and how you could do things differently the next time you train.

At the end of the training ask the participants what they thought about the training. If people are able to read and write then you could ask them to fill in a simple questionnaire with questions based on:

What did you learn from the training?

What do you still need to learn more about?

What will you now try and do differently in your business?

What will be difficult for you to apply in your business?

What did you think about the training?

How could the training have been better?

As a trainer it will be good to find out at some stage after the training how participants have used what they learnt e.g. how they have applied their Action Plans. This could mean contacting them weeks or months later and finding out what they have done.

Trainers Tips

Explain that we are going to learn about things which we should do during training to make sure that training goes well.

Use picture 2 and explain each image using the notes above to cover the following:

Keep your participants interested;

Help your participants to understand;

Help your participants to remember;

Avoid distractions;

Help participants to think how they will use the training;

Evaluate training.

Ask the group what they think will be difficult to do and what they think will be easy to do from these things and why.

Explain that practicing these things is important. Ask if there are any questions or comments.

Recap questions

How can we keep participants interested during training? What can help participants understand and remember?
What should we help participants do to encourage them to use what they have learnt? What should we do at the end of training and why?

PRESENTATION SKILLS 2. DURING TRAINING

HANDOUTS ARE GOOD THEY HELP
PEOPLE REMEMBER



BE PARTICIPATORY, ALWAYS
EVALUATE YOUR TRAINING,
ENCOURAGE QUESTIONS



SHOW
ENTHUSIASM



USE DISCUSSION GROUPS

Picture 3. Preparing for training

Good preparation is important if we are to carry out good training. Here are some things to do when planning a training session.

Location and training environment

Choose a good place to do the training. It should be cool, have plenty of light and be somewhere quiet. This way the participants will feel comfortable and be able to concentrate.

Participants

Think about who will benefit most from the training. Some training maybe best for fishermen and boat owners, whereas other training might be good for processors and traders. Make sure you don't invite too many people for training. Maybe no more than 15 to 20 people is good as everyone will need to be able to clearly see any pictures you use and have a chance to be involved in discussions. If you need to train more people, then you can do more training sessions.

Duration of session and timing

Try to find a good time to carry out the training by asking the participants beforehand when it would be a good time good for them. For example suggesting doing training for fishermen when they are still fishing obviously would not work. When you agree a start time and date also include an end time so that participants know how long the training will be.

Invite the participants to the training and at the agreed time. Make sure you give enough advance notice of when the training will take place so people can prepare themselves and their households in their absence.

Sitting arrangement

To help you deliver good training and to make sure the participants are comfortable and to help you communicate well with them it is good if the participants can sit in a semi-circle or "u" shape arrangement. With a maximum of 15 to 20 people this is easy to arrange. In this arrangement you can easily see everyone and everyone can see you as well as any pictures used. This sitting arrangement helps interaction between trainer and participants and group discussions.

Practice

You will be able to train well if you prepare well. Once you have arranged your training activity and have

decided on what the training will focus on, then do three things:

1. Practice !
2. Practice !
3. Practice !

Everyone feels a bit nervous when they first start training, but it is important that you keep your nervousness under control. You can do this by:

- o Make notes on what you are going to say and do and refer to these if you need to;
- o Practice what you are going to say and do;
- o Plan the first few minutes carefully;
- o Take a few minutes to relax before you start;
- o Rehearse what you will say and do when using any pictures.

Trainers Tips

The trainer should follow these steps to help explain the main issues and help the group
Explain that it is good to prepare well and practice before the training takes place.

Describe each image in the picture using the notes above and explain the following points:

- Location and training environment;
- Participants;
- Duration of session and timing;
- Sitting arrangement;
- Practice.

Ask if there are any questions.

Recap questions

What are the features of a good training location?

How many participants should we train in a group and why?

How long should a training session be?

What sort of sitting arrangement is best?

What should we do plenty of before we do our training?

PRESENTATION SKILLS 3. PREPARING FOR TRAINING

CHOOSE A LOCATION WHICH IS QUIET, COOL AND LIGHT. U SHAPED SEATING IS GOOD



MAKE SURE TIMING AND DURATION IS GOOD



PRACTICE MAKES PERFECT!

3. FISH SPOILAGE & QUALITY ASSESSMENT

What we will learn about

- What is fish spoilage?
- What causes fish spoilage?
- Why is freshness important?
- How to prevent spoilage and maintain quality

Fishermen, gear and boat owners, processors and all fisheries stakeholders will be able to explain the importance of fish as food and as a source of income and know what can make fish go bad or spoil and harm the consumer. They will also learn what makes fish go bad quickly and how to prevent this and make sure that fish is as fresh as possible and safe to eat. They will also know how to recognize when fish has gone bad and what a good quality fish is.

Training images

Picture 1 Produce good quality safe fish and Picture 2 Bad fish is not good for us.

Why is it important to look after fish well? Because by looking after fish well we can get some good benefits:

- We can get a better price for a fish;
- Consumers will be happy and healthy;
- Buyers are more likely to keep buying from you because they know your fish is good;
- Your fish will stay longer in good condition.

Pictures 1 and 2 help explain the benefits of producing and selling good quality fish and the problems caused by bad quality fish.

Trainers Tips

Picture 1 “Produce good quality safe fish” shows the benefits of handling fish well in a good clean environment. It shows healthy consumers eating happily, cash signifying that if we handle fish well we will get more income, a healthy and strong person because they have eaten good quality fish. The picture shows good things as a result of looking after fish well.

Ask participants what they can see in the “produce good quality safe fish” picture.

Make sure all the benefits have been mentioned. To help you can point to a particular image and ask the group what it means.

Ask if there are any questions before moving on.

Now turn to Picture 2 “Bad fish is not good for us”. This shows that if we don’t look after fish well and we don’t keep our equipment and environment clean then we are losing out as our fish will become low quality very quickly. If our fish is low quality then it will:

get a low price;

not keep for very long and we will have to sell it quickly and therefore we won’t be in a good bargaining position;

might become contaminated and consumers might become sick.

Explain that we are going to talk about how we can avoid our fish going bad and causing problems for consumers.

Explain that if we don’t treat our fish well then we are losing out. Ask the group how they might lose out.

Ask what people can see in the “bad fish is not good for us” picture?

Go through each of the images on the slide and explain the problems that they show. From the top left clockwise:

Bad fish mean we don’t get a lot of money...our profit is low;

Bad fish can give us diarrhea and make us vomit;

If we are not careful we can make people very sick e.g. pass on serious diseases such as cholera.

Ask the group if they have any questions.

FISH SPOILAGE 1. PRODUCE GOOD QUALITY SAFE FISH

TASTY AND MAKES YOU HAPPY



MAKE MORE MONEY



MAKES YOU STRONG AND HEALTHY



SELL IN DIFFERENT MARKETS

FISH SPOILAGE 2. BAD FISH IS NOT GOOD FOR US



PUTS CONSUMER OFF AND DOESN'T SELL WELL



CAN MAKE YOU VERY ILL!



MAKES YOU ILL

Picture 3. How do we know fish are bad?

After fish die, changes take place which cause the fish to change colour, change its taste, produce smells and go soft. These things are used to judge the quality of fish and its influence on price. If these changes are allowed to go on for long enough then the fish will become completely spoiled and useless. There are two reasons why fish spoil or go bad. These are bacteria (germs) which are on the outside of the fish and in its stomach and enzymes, which are chemicals that act like acid. Enzymes are mainly found in the stomach of the fish. It is very important to know that these are the real causes of fish to go bad. Whereas other things like high temperatures, rough handling and time delays just give the bacteria and enzyme the conditions they need to eat or digest the fish and make it go bad. Therefore to avoid spoilage it is important to keep fish chilled at low temperatures (0°C), chill the fish as quickly as possible or process it and sell it as soon as possible. The other thing to remember to do is handle fish with care. So no throwing, dropping, standing on, or mishandling them.

Tips for trainers

The trainer should use the following picture and questions to help explain the main issues and make sure they mention the main points in the technical background.

Before asking the group to look at Picture 3 “How do we know fish are bad”, ask the group the following question:

What happens to fish if we leave fish out in the sun for a while? How does it change?

Now show the picture and ask the group what it shows and describe the key changes which occur in fish:

The answers to look for are: Smell

Texture Taste Colour

Eye

Gills

Now ask the question: Why do we think these changes are occurring or what is causing these changes?

It is likely that the answers will include:

Because the fish stays too long in the net;

Delays in getting to the landing site;

No ice;

Delays in selling the fish.

However, these are the things which make fish go bad quickly as they help bacteria and enzymes to grow and be active.

Picture 4. Bacteria and enzymes make fish go bad

There are 2 things which really cause fish to spoil or go bad: bacteria and enzymes. If there were no bacteria or enzymes on fish then it would not go bad!

Bacteria are everywhere and they are also known as germs. We can't see them, unless we have a microscope. There are many types of bacteria. They can be described as being like very small insects and some of them eat fish after it is dead. Bacteria are found on the fishes skin, in the slime, in the gills and in the stomach. They come from the water where the fish live.

One of the causes of the bad smell of fish is due to bacteria as they eat the fish and produce smelly waste products.

Enzymes are chemicals in the fish. They are like acid and make the fish go soft. Enzymes are used by the fish when it is alive to digest its own food in its stomach. Enzymes are also found in the muscle or meat of the fish.

After the fish dies...bacteria and enzymes continue working and digesting the fish...unless we do something to stop them! A simple thing to do to reduce the number of bacteria on fish is to wash it in clean water. Another simple thing to get rid of many enzymes and bacteria as well is to remove the fishes stomach. This must be done in a clean environment.

As well as bacteria being found on fish, they are also found in lots of other places. Especially dirty and wet places! If fish comes into contact with anything in these environments then more bacteria will be added to the fish which will increase the risk of the fish going bad or spoiling and also increases the risk of food poisoning for the consumer. If we physically damage the fish we allow on one hand inner bacteria and enzymes to penetrate other parts of the fish thus causing further spoilage and on the other hand other bacteria from the surrounding environment can penetrate the fish enhancing also spoilage. Such a damaged fish is unattractive to the buyer and hence, its selling price will be low

For fish there are two types of bacteria we need to be worried about. Those that cause fish to spoil and those which cause food poisoning and make the consumer sick. Bacteria which cause the spoilage don't necessarily make people sick and those that make people sick by food poisoning don't usually contribute much to fish spoilage.

Bacteria like certain things in order to be able to survive and grow. They generally like wet or moist places. They need food e.g. fish or waste food. And they like warm temperatures. All these things will make bacteria happy and strong. So keeping our fish in warm, wet and dirty places is the worst place we can keep them as it creates an ideal environment for bacteria.

There are certain things which bacteria don't like and which will slow down their growth or even kill them. Bacteria generally don't like hot or cold temperatures. Hot temperatures (above 50°C) will kill most bacteria. Whereas cold temperatures (below 5°C) will generally slow down their activity. Another thing which bacteria don't like and which kills them is dry conditions. That's why dried smoked fish keep a long time as the bacteria have been killed by heat from the fire and there is very little water left in the fish for bacteria to use.

Trainers Tips

It is important that the group know that bacteria and enzymes are the major cause of fish spoilage and quality deterioration. If they can understand this then, they will know why it is important to practice good handling and good hygienic practices.

Picture 4. "Bacteria and enzymes make fish go bad" shows bacteria and that they are nasty things (generally) and enzymes or chemicals (like acid!)

To help the group understand what bacteria and enzymes do then it is useful to ask "what happens to the food in our stomachs after we have eaten"?

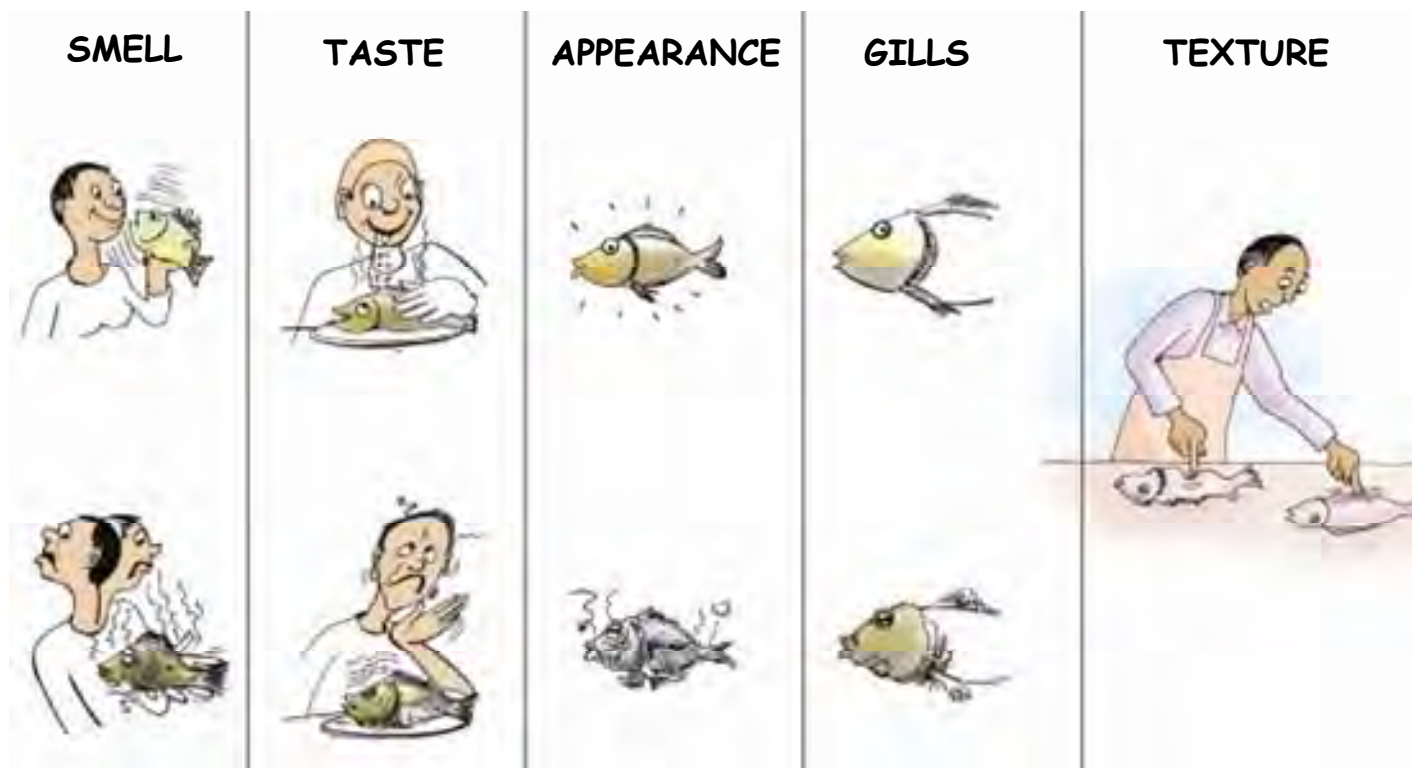
Steer the discussion to the fact that food breaks down or rots in our stomachs and this happens because of bacteria and certain chemicals known as enzymes.

Ask if anyone can describe bacteria or knows of any examples?

Explain what bacteria and enzymes continue after the fish is dead to eat it.

Conclude by repeating that these are the 2 main reasons why fish and food in general spoils.

FISH SPOILAGE 3. HOW DO WE KNOW FISH IS GOOD OR BAD



FISH SPOILAGE 4. WHAT MAKES FISH SPOIL?

BACTERIA



ENZYMES



Picture 5. Bacteria and enzymes are already on fish but where?

This picture shows where we can find bacteria already on the fish after it is caught and enzymes in its stomach.

Trainers Tips

Ask people to look at the picture and say where they think bacteria and enzymes are found. The trainer should explain that fish when they are caught already have bacteria and enzymes and that bacteria's are found in the natural environment.

Enzymes and bacteria can cause "belly burst" which is when the stomach wall and flesh of the fish gets eaten away....ask if anyone has seen this and then explain that this is due to bacteria and enzymes.

Ask the group how we can remove bacteria and enzymes from fresh fish. The answers should include washing the fish in clean water and removing the guts from the fish.

Picture 6. Bacteria are found in dirty places

This picture shows places different places where there are usually lots of bacteria. It highlights that bacteria are found in many places and they generally like dirty wet places.

Trainers Tips

Ask the group to look at the picture and say where they think bacteria can be found. The answers should include (clockwise from top left):

Unclean toilet;

In the air;

Dirty water around the landing site;

Insects such as flies and cockroaches carry bacteria on their feet, bodies and mouth;

Dirty equipment, containers and utensils;

Dirty hands;

Dirty clothes;

Open defecation – faeces contain a lot of bacteria and attract flies which pick these up;

Animals carry bacteria on their fur, feathers, feet, mouths and beaks;

Rubbish and poor environmental conditions;

Dirty ice and dirty salt.

Make sure the group understands that if we want to stop adding bacteria to our fish then we need to control these things and make sure that fish does not come into contact with these things or is prepared in these places.

Therefore ask how can we prevent fish getting contaminated? The answers given should be related to keeping things clean, not putting the fish in dirty places or water and careful handling.

Picture 7. Two types of bacteria

This picture shows that there are 2 types of bacteria: those that cause food poisoning or consumers to get sick and those that cause fish to spoil.

Trainers Tips

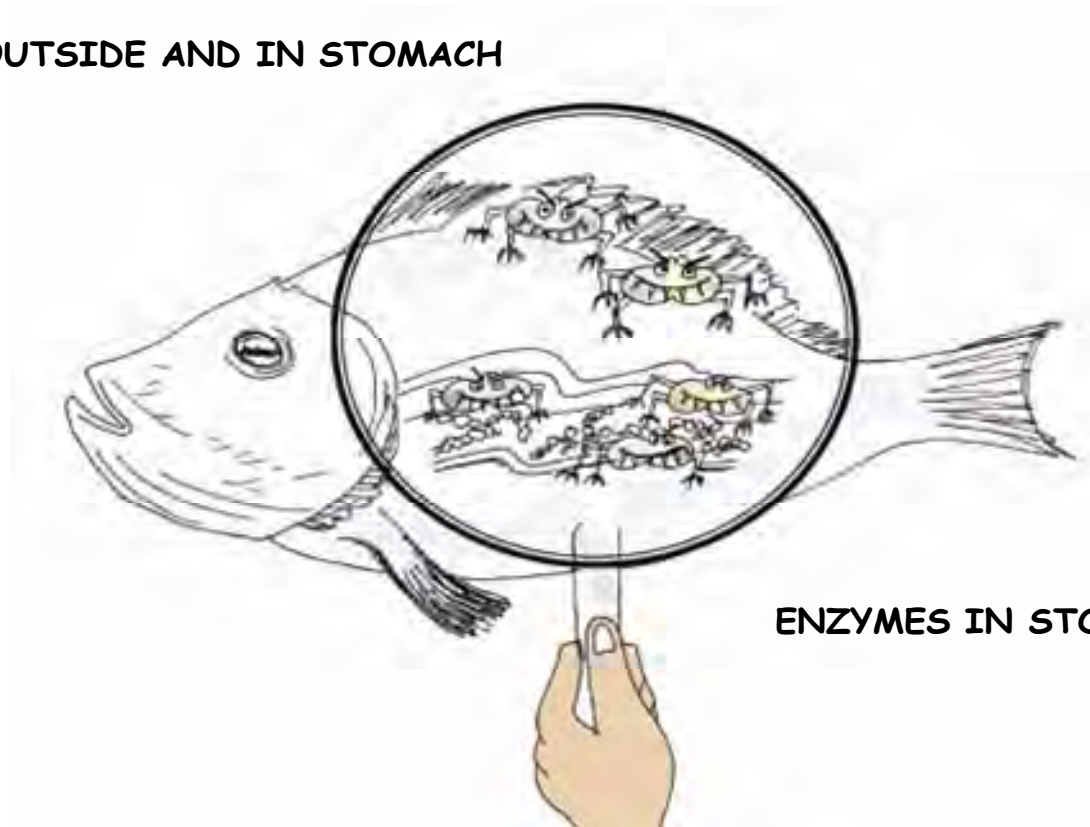
Make the point that if we are not careful and we don't handle fish well then we can add bacteria to fish that make people sick or that spoil fish.

Ask if anyone knows any diseases which make people sick that are caused by bacteria e.g. Typhoid, cholera.

Ask if anyone knows how bacteria can be added to the fish? This will recap on the means of contamination mentioned earlier in picture 6 "bacteria are found in dirty places".

FISH SPOILAGE 5. WHERE ARE BACTERIA AND ENZYMES

BACTERIA ON OUTSIDE AND IN STOMACH



ENZYMES IN STOMACH

FISH SPOILAGE 6. BACTERIA ARE FOUND IN DIRTY PLACES

DIRTY TOILETS



DIRTY CLOTHES AND FEET



ANIMALS



IN THE AIR

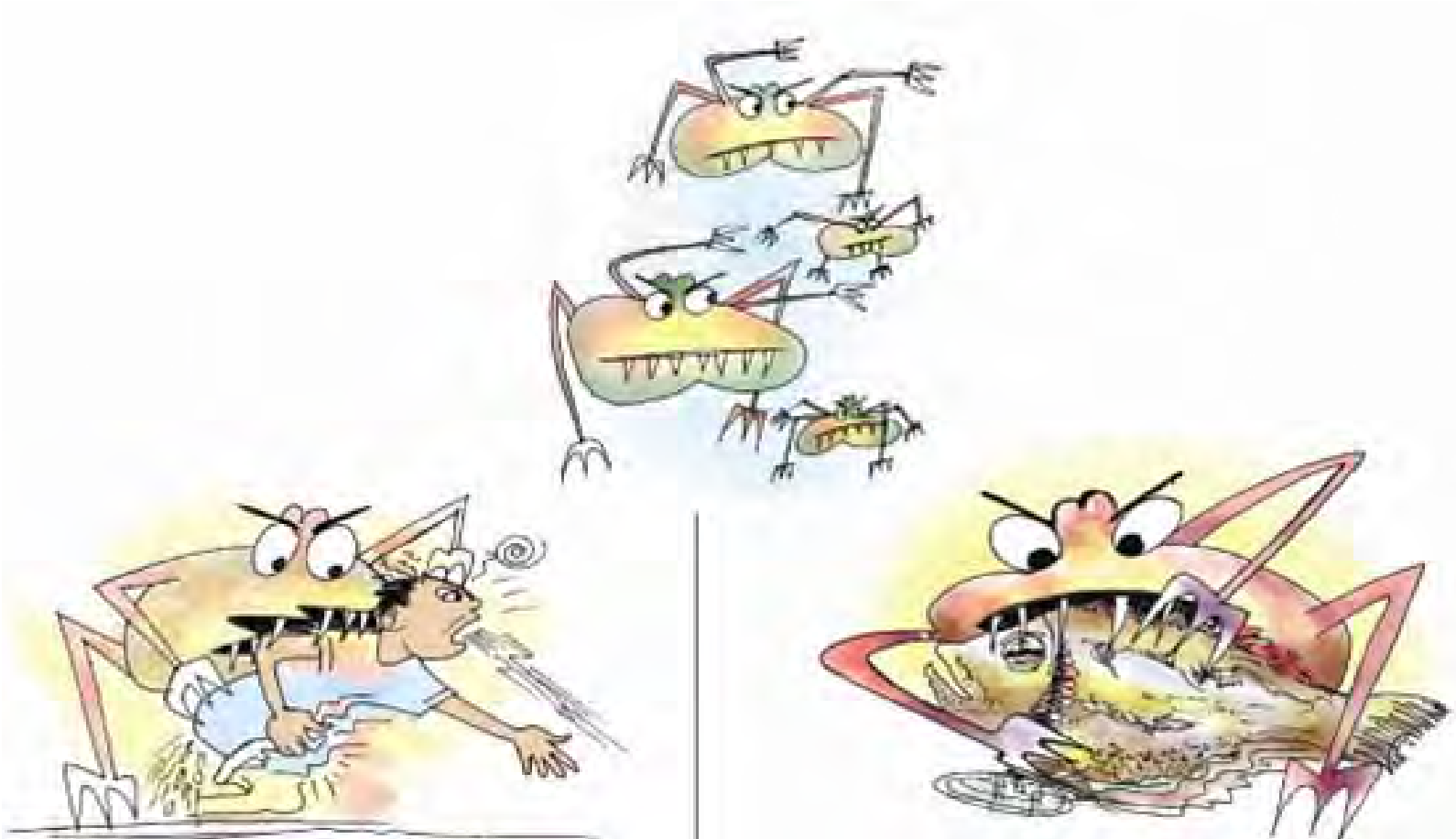


HANDS



INSECTS

FISH SPOILAGE 7. TWO TYPES OF BACTERIA



MAKE YOU SICK

MAKE FISH SPOIL

Picture 8. What do bacteria like?

This picture shows the things that bacteria like and which makes them grow quickly: water, food and nice warm temperatures.

Trainers Tips

Explain that if we leave fish out in the sun or in warm temperatures then bacteria will be very happy.

Ask how we can stop bacteria being happy and growing or how we can kill bacteria?

The answers will lead into the next picture “What bacteria don’t like” e.g. lowering or increasing temperature and removing water.

Picture 9. What bacteria don’t like

This picture shows some of the things that bacteria don’t like and will kill them or make them very slow or not active such as cold temperatures, dry conditions and very hot temperatures. To stop bacteria growing on and spoiling fish it is important to reduce the temperature to 0°C or below (freezing) as soon as possible or process the fish quickly. Frozen or smoked fish can keep a long time as long as they are stored properly. Also, fresh chilled fish should be sold as soon as possible as ice or chilling will not prevent spoilage completely.

Trainers Tips

Ask what the group can see in this picture and what they think bacteria don’t like.

Ask if anyone can give examples of these.

The answers should include:

Drying of fish which gets rid of water and bacteria don’t like that;

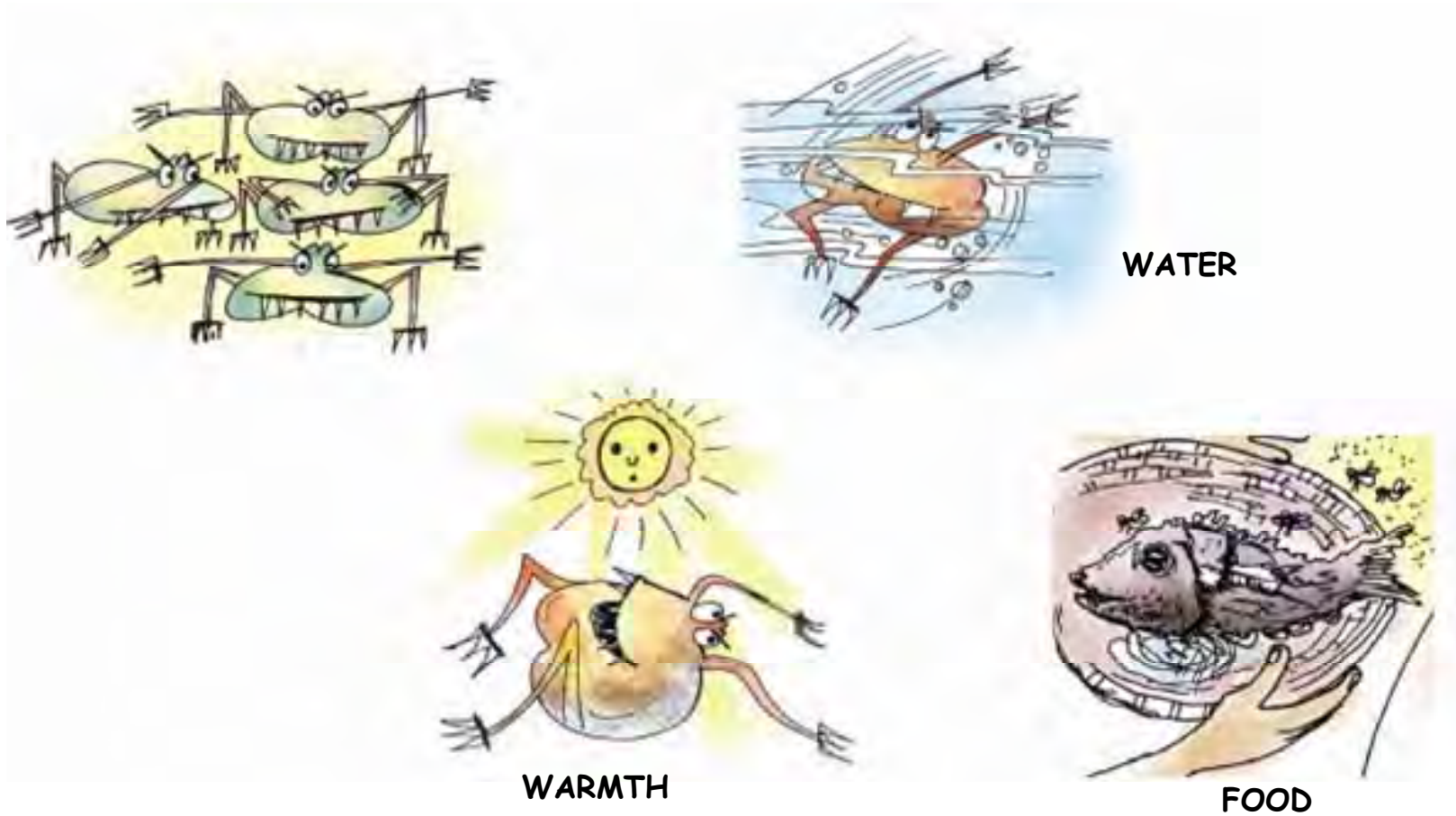
Hot smoking kills bacteria and drives out water from the fish, making it dry;

Ice and freezing lowers the temperature, slowing down or stopping the activity of bacteria;

Cooking fish kills bacteria contained on and in the fish.

Explain what bacteria don’t like and then as how some of our activities help control bacteria or kill them.

FISH SPOILAGE 8. WHAT DO BACTERIA LIKE



FISH SPOILAGE 9. WHAT BACTERIA DON'T LIKE



DRY CONDITIONS



VERY HOT TEMPERATURES



COLD

Picture 10. Bad handling causes spoilage and poor quality

This picture shows some of the things that increase spoilage and cause damage and lead to poor quality fish and low prices. Damaging fish by standing on it, throwing it or dropping helps spread bacteria and enzymes through the fish flesh and also causes contamination with bacteria and dirt, oil etc. Bruised or damaged fish do not look nice and people avoid buying them if they can.

Trainers Tips

Ask what the group can see in this picture and what they think will happen to the fish. Answers should include:

Fish gets crushed and bruised;

Further contamination by bacteria, from the surrounding environment: means more bacteria are added to the fish;

Crushing spreads bacteria and enzymes through the flesh speeding up spoilage; Poor quality fish will get thrown away or have a low price.

Recap or test questions

The trainer should now use the following questions to recap and emphasise the main issues: What are the benefits of making sure fish is good quality?

How do we know if fish is good quality or bad quality?

Ask the group "why do fish spoil?" to ensure that people are getting the message. The answer should be bacteria and enzymes, anything else just makes these things more active!

Ask where bacteria and enzymes are found. The answer should include on and in the fish as well as in various dirty and wet places.

Ask how we can remove or prevent bacteria and enzymes from making fish go bad. The answer should include washing in clean water, removing guts, cooling the fish, heating it to high temperatures, drying it as well as careful handling and avoiding contamination.

Finally, ask the group if they have any questions or comments.

FISH SPOILAGE 10. BAD HANDLING CAUSES SPOILAGE

DON'T STAND ON FISH OR DROP IT



DON'T THROW FISH



BADLY HANDLED FISH IS NOT GOOD FOR US

NOT THAT FISH...NO THANKS!

3. PERSONAL HYGIENE

- Good personal hygiene for fishermen, processors and traders;
- How poor personal hygiene can result in contamination of fish;
- What health conditions are bad to handle fish in.

Germ or bacteria are everywhere and like dirty environments. They are in our stomachs and when we go to the toilet we can spread them to our hands and the environment. If we don't wash our hands and the fish come into contact with our hands or a dirty environment then they can pick up these bacteria also. So it is important to keep ourselves clean and wash our hands, particularly after going to the toilet. Also make sure any wounds are covered up so that blood and other fluids do not come into contact with the fish. Likewise, keeping wounds covered also helps us prevent spreading bacterial infections. Fish handlers are a common cause of contamination and therefore attention to good personal hygiene is very effective in reducing the risk of disease causing germs being passed from the handler to fish. All those involved in catching, handling, processing and selling fish should make sure they also know what the local food safety and quality regulations are.

Fish handlers (fishermen, landing site workers, transport workers, processors and traders) will understand the link between poor personal hygiene and contamination of fish with disease causing germs. They will also know the personal hygiene steps they can take to prevent fish from becoming contaminated.

Common failings in personal hygiene that can result in germs being passed onto fish are:

- Failure to wear clean, protective clothing;
- Failure to cover wounds;
- Failure to wash hands after going to the toilet;
- Failure to wash hands before handling fish;
- Spitting;
- Coughing / sneezing;
- Allowing finger nails to grow long;
- Smoking;
- Eating / drinking when handling fish;
- Handling fish when you are sick (diarrhoea, vomiting, skin infections);
- Wearing jewellery (watch, rings, bracelets, necklaces, ear-rings).

It is important to realise that good personal hygiene is our own responsibility.

Training images

Picture 1. Examples of Good Personal Hygiene

By keeping clean we can help prevent bacteria and dirt getting onto our fish and contaminating it. It is important to wash hands after going to the toilet and before handling fish. It is important to keep the environment clean as this helps to keep us clean also. To cover up any wounds or cuts is also important. If we don't wash our hands properly and use clean water the fish we handle can get bacteria on its skin. Whoever then eats the fish may get sick.

Picture 1 shows the basic issues about personal hygiene. And the importance of clean clothing, use of clean water, personal cleanliness, use of proper toilet facilities and hand washing.

Tips for trainers

Ask the trainees to comment on how good personal hygiene reduces contamination of fish. Answers should include:

Uncovered cuts can become infected increasing the risk of contamination with germs;

Dirty clothing carries germs which may contaminate the fish;

Wearing protective clothing that is easy to clean reduces risk of contamination.

Not wearing jewellery reduces both the risk of contamination with metal objects and the risk of germs happily growing under jewellery;

Discuss each example with the trainees and ask how we can implement it? What are the constraints and how can these be overcome? Ask the question: when do you think it is a good time to wash our hands and why?

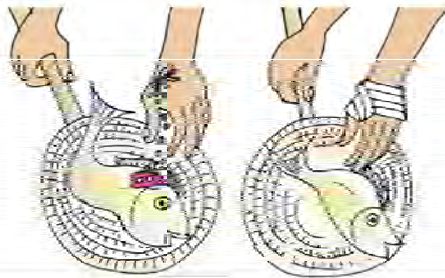
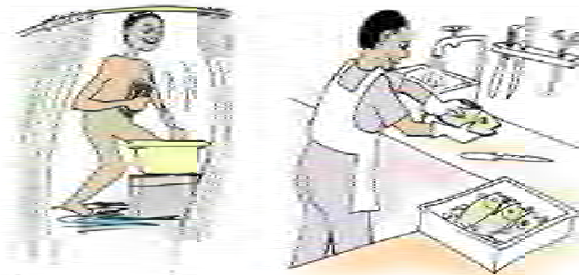
Answer should include: before we handle fish, after we handle fish and after we have gone to the toilet. Bacteria are on our hands.

PERSONAL HYGIENE 1. GOOD PRACTICES

WASH HANDS BEFORE WORKING
AND AFTER TOILET



GOOD PERSONAL HYGIENE STOPS US
PASSING BACTERIA AND DIRT ONTO THE
FISH



COVER WOUNDS OR CUTS



NO SMOKING OR SPITTING!

Picture 2. Toilet hygiene on boats

This picture shows good on-board toilet practice. Soap (preferably liquid soap) should be taken on fishing trips. Before handling fish and after going to the toilet the fishermen should carefully wash their hands with soap and clean water, rinsing with clean water afterwards. This will reduce the risk of germs present in human waste contaminating fish during on-board handling.

Tips for trainers

Ask the trainees to discuss the problems of personal hygiene on fishing trips and what steps can be taken to reduce them.

Picture 3. Sickness

Fish handlers (fishermen, landing site workers, fish processors, traders) should not be allowed to come into contact with fish when they are ill, especially when they suffer from diarrhoea and/or vomiting. They should seek medical help if necessary and only return to work when fully recovered. Medical checkups and medical certificates may be required for handlers working in export supply chains.

Picture 4. Examples of poor personal hygiene

This picture displays some examples of poor personal hygiene. Eating, drinking, smoking and spitting etc. should not be allowed in areas where fish is handled. At landing, processing and selling sites, notices prohibiting such activities should be displayed.

Tips for trainers

Finish by recapping the topics covered and asking the trainees to list the 5 most important things they have learned.

Recap or test questions

The trainer should now use the following questions to recap and emphasise the main issues: How can we pass bacteria on to the fish?

What should we do to make sure we don't pass germs onto the fish when we handle it when fishing and onshore?

Finally, ask the group if they have any questions or comments.

PERSONAL HYGIENE 2. WASH HANDS AFTER TOILET

CARRY WATER AND SOAP



WASH HANDS TO PREVENT
BACTERIA AND DIRT GETTING ON
FISH

PERSONAL HYGIENE 3. WHAT TO DO IF YOU ARE SICK

IF YOU ARE SICK YOU MIGHT
HAVE SOMETHING WHICH CAN
MAKE THE FISH DANGEROUS TO
EAT



REST UNTIL YOU ARE BETTER



GO TO THE DOCTOR



WHEN YOU ARE BETTER GO
BACK TO WORK

PERSONAL HYGIENE 4. BAD HABITS TO AVOID



BAD HABITS CONTAMINATE FISH WITH BACTERIA AND DIRT

4. USE OF ICE

How to use ice properly to maintain the quality of fish during fishing, on landing sites and during transportation.

Boat owners, crew, processors, fresh and processed fish traders, vehicle owners, casual labourers at landing sites will learn how to use ice properly to keep fish chilled and maintain its quality.

Training Images

Picture 1. Bad use of ice

Ice is very important in small-scale fisheries. It is a very effective and cheap way of maintaining fish quality while fishing, after landing and during transport and selling. Ice lowers the temperature of the fish and this slows down the growth and activity of bacteria. Remember that good ice must be made from clean water. It should be kept clean and away from the dirt, inside a clean insulated-box, which prevents melting.

Tips for Trainers

This picture is designed to show poor icing practice.

Ask participants what can we see that is not good in this picture?

The answers should include:

Insufficient ice is used;

Fish exposed to the sun;

Large chunks of ice damage fish and don't chill it well;

Ice made from dirty water and contaminated;

Ice contaminated with dirt and bacteria.

Ask what can be done to improve practices?

USE OF ICE 1. BAD ICING PRACTICE

NOT ENOUGH ICE



LARGE PIECES DAMAGE AND DONT CHILL WELL



DIRTY WATER MAKES DIRTY ICE



HEAT WASTES ICE AND MONEY!



DIRTY ICE ADDS BACTERIA AND DIRT



OLD ICE HAS BACTERIA AND DIRT..DONT USE IT!

Picture 2. Good icing practice

Ice has to be used properly for it to be effective. If it is in block-ice, it must be crushed into small pieces in a clean environment so that it can chill the fish quickly and avoid contaminating the fish. Some ice is made as small pieces such as flake-ice. This ice cools the fish quickly because the small pieces have better contact with the fish surface. Enough ice should be used and usually the ratio is

1kg of ice to 1 kg of fish. Ice melts so as time goes on more ice needs to be added to keep the fish well chilled and maintain the 1:1 ratio. Ice should be made from clean water and should not be contaminated after it is made. Ice lasts longer and chills fish better if it is used with a clean insulated box. Use the right amount of ice and don't overfill boxes as this will lead to crushing of the fish. When icing place a layer of ice on the bottom of the box and then a layer of fish. Then another layer of ice and so on.

If ice is not available then evaporative cooling can be used. This involves placing a wet cloth or sheet of material over the fish. The material should be kept wet. The evaporation of water from the cloth draws heat energy from the surroundings and causing a cooling effect.

Tips for Trainers

This picture shows some good icing practices. Ask what the picture shows.

Discuss with the group how these practices can or can't be implemented and how we can overcome any current bad practices.

Use the following questions to continue the discussion about participants current situation: Is ice made of clean water and if not why not?

How can we make sure ice is made from clean water? (treat the water to kill bacteria, filter it or only use water from a drinking water supply) Where is the nearest supply of ice?

If it is not at the landing site, how it is transported and is it transported well? If it is block-ice, how is it crushed and is this done in a hygienic way?

USE OF ICE 2. GOOD ICING PRACTICE

COVER FISH WELL



KEEP ICE IN PROPER STORE TO KEEP IT CLEAN AND STOP MELTING



IF NO ICE TRY EVAPORATIVE COOLING



LAYER OF ICE LAYER OF FISH



ICE FROM AN ICE PLANT IS BEST

Picture 3. Using insulated boxes at sea and on-shore

Clean in well-made insulated boxes will prevent ice from melting quickly and will enable fish to be kept chilled for longer. Insulated boxes can be used during fishing and on-shore for storing and transporting fresh fish. If fish is iced immediately after capture and kept properly iced in insulated boxes it will stay in good condition for many days and the seller can have more control over the selling price of fish. Insulated boxes should be made of materials which are easily cleaned and should have a drain plug so that water can be drained out. Very large boxes can also be used for storing ice at landing sites. They can keep ice for several days and do not require electricity.

Tips for Trainers

This picture shows some more good practices to discuss with the group. Ask the group what they can see here. Discuss the use of insulated boxes. Are they used already? If so, what sort of boxes is used?

Recap or test questions

The trainer should ask the following questions to recap and emphasize the main points: How does ice work on the fish?

Describe some bad ways of using ice. Describe some icing practices.

What are the benefits of using insulated boxes and what should they be made of?

USE OF ICE 3. INSULATED BOXES

KEEPS FISH
COOL FOR
LONGER



PROTECTS FISH

USED ON BOAT AND
LAND



HELPS MARKETING AND PRICING

5. HYGIENIC REQUIREMENTS AND PRACTICES DURING FISHING

What causes fish spoilage during fishing and fish to be harmful to consumers?

What are the main sources of contamination by spoilage and disease causing bacteria?

What actions can fishers take to reduce spoilage and contamination?

Fishermen and boat owners will understand what can lead to fish becoming unsafe to eat and how those hazards can be prevented. They will also be able to explain what can lead to fish spoilage and what they can do to stop spoilage and keep fish quality good during fishing.

There are a number of things that make fish unsafe to eat during fishing:

Contamination of fish with physical hazards such as pieces of wood or metal;

Contamination of fish with chemical hazards such as fuel or oil;

Contamination of fish with disease causing germs present in the lake water or sea-water;

Contamination of fish with disease causing germs found on the boat and other surfaces;

Contamination of fish with disease causing germs found on the fishermen's hands and clothing;

Contamination of fish with disease causing germs found in dirty ice or dirty salt.

The main causes of fish spoilage during fishing are related to:

Fishing method;

Poor handling contaminating the fish with germs;

Not placing the fish in ice or protecting it from the sun;

Poor handling by dropping, throwing and standing on the fish.

Training images

Picture 1. Physical hazards

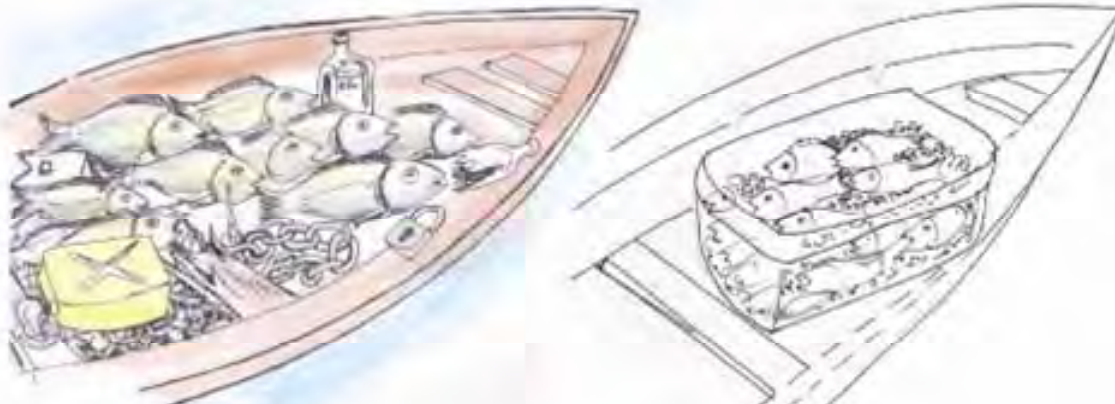
A physical hazard is something in the fish that can harm the person that eats the fish e.g. choking, cuts to mouth, internal bleeding. A physical hazard is a solid object which, if present in the fish, can cause injury when eaten. As shown in Picture 1, physical hazards on fishing boats include metal objects, wooden splinters and broken glass. Physical hazards can be controlled by removing potentially dangerous objects from the boat, placing the fish in a good container and not taking glass objects onboard.

Tips for trainers

Ask the trainees to discuss what physical hazards they have experienced and what that they did or can do to remove them.

FISHING 1. PHYSICAL HAZARDS

GET STUCK IN FISH AND MAKE IT DANGEROUS TO EAT



REMOVE PHYSICAL HAZARDS AND KEEP FISH IN A CONTAINER TO PROTECT IT

Picture 2. Chemical hazards

This picture is showing chemical hazards that can be present on a fishing boat. Any substance, liquid, gas or solid, which can poison the person who eats contaminated fish, is known as a chemical hazard. Chemical hazards may be present in the water in which the fish live e.g. agricultural or industrial pollutants, or be present on the boat e.g. boat fuel, oil, cleaning products. Chemical hazards can be reduced by avoiding fishing in polluted waters, not allowing poisonous substances onboard and placing the fish in a good, closed box rather than the bottom of the boat.

Tips for trainers

Ask the trainees to give examples of chemical hazards they know of and what actions they have taken to control them.

Picture 3. Biological hazards

This picture deals with biological hazards than can be found aboard boats. Germs (bacteria and viruses) are biological hazards. Bacteria and viruses that cause disease in humans are called pathogens or disease-causing germs. Pathogens may be present in polluted water, so it is important that fishing only takes place in clean water away from towns and factories which release pollutants (sewage, animal waste products) into the lake or sea. It implies also not fishing near or in the harbour or the landing site beach. Coming into contact with unclean hands or dirty surfaces during handling on the boat also cause fish to be contaminated with pathogens so it is important that the fishermen handle the fish in a hygienic way and protect the catch from contamination by placing it in a clean box. Another hazard which can be seen as biological, are animals and insects which can spread bacteria and dirt on the boat surfaces.

Tips for trainers

Ask the trainees to discuss what steps should be taken to stop disease bacteria from getting onto their fish. Simple steps that can prevent germs from contaminating the fish include fishing in unpolluted waters, keeping the boat and fishing gear clean, observing good personal hygiene and keeping animals away from the boat.

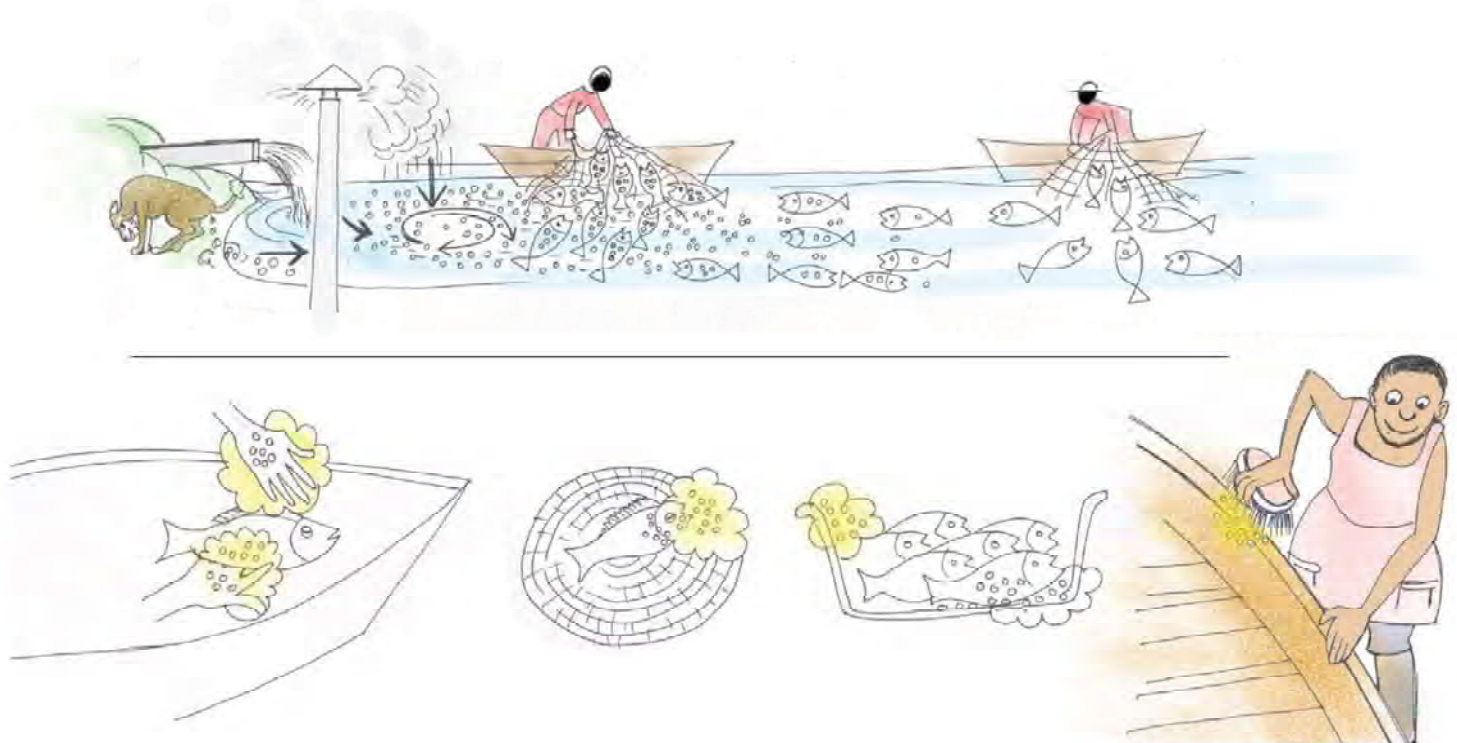
FISHING 2. CHEMICAL HAZARDS



CATCHING FISH IN DIRTY OR POLLUTED WATER CAN MEAN THE FISH IS ALSO DIRTY AND CAN HARM THE CONSUMER

FISHING 3. BIOLOGICAL HAZARDS

BACTERIA, VIRUSES AND SOME POISONS CAN CONTAMINATE FISH IN WATER AND AFTER CATCHING



DIRTY BOAT, GEAR AND EQUIPMENT CONTAMINATES FISH...SO KEEP IT CLEAN!

Picture 4. Factors causing spoilage

Physical damage, bacterial growth and enzyme activity are the main causes of fish spoilage and loss of quality. Fishing method, time exposed to high temperature, dirty boats and equipment can all increase how quickly fish spoils before it is landed.

Tips for trainers

Ask the trainees to look through each frame on this picture and discuss how spoilage and/or contamination with pathogens may occur.

Spoilage starts as soon as the fish dies. The longer the fish is left in the water the more it will spoil. Short fishing trips, during which fish are hauled on board quickly, produce good quality fish at landing.

In many tropical fisheries, warm water and air temperatures allow spoilage germs to grow quickly and damage the fish. Enzymes found in the fish gut, also cause fish spoilage, and are most active at warm temperatures. The longer fish are exposed to high temperatures, the more they will spoil. It is therefore important to shield the fish from sunlight by using a cover, or placing the fish in a box with ice as soon as possible. See Chapter 4.

Allowing animals onto the boat and using the boat for transport of products other than fish increases the risks of contamination. Fishing boats should only be used for fishing.

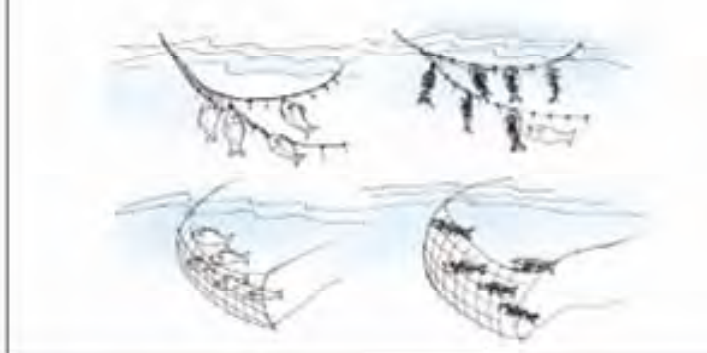
Harbour water and waters close to villages and towns are usually polluted and should not be fished. In addition, beach and harbour water should not be used for cleaning fish and boats. If possible, only potable water or clean water found offshore should be used for cleaning purposes.

FISHING 4. SPOILAGE FACTORS

BAD HANDLING DURING HAULING AND HIGH TEMPERATURE



LEAVING FISH IN WATER



BAD HANDLING ON BOARD



CONTAMINATION

Picture 5. Keeping the fishing boat clean

This picture shows the importance of cleaning and that good hygiene practice during fishing produces fish that is safe to eat (hazard free) and of high quality. These practices can be done more easily if the fishing vessel is designed well and has space to carry out practices properly. For example the surfaces that come into contact with fish should be smooth and easy to clean and made from material which will not corrode. Wooden boats should be painted with food grade paint to protect the fish from possible contamination of bacteria present in wood. Ideally fishing vessels should have built-in insulated fish holds which can be easily cleaned and protect fish from physical damage as well as high temperatures and wind or use good fish boxes. Insulated fish holds or boxes should be made from fibreglass and polyester resins.

Boxes used for onboard storage of fish or ice should be clean, easily cleaned, strong, have smooth surfaces and be in good repair.

A fishing vessel should be designed so that the fish are protected against damage and contamination from fuel and dirty water and other things. The design should also make it easy to handle fish. It should also be easy to clean and disinfect using a recommended disinfectant and the instructions that come with the chemical. Disinfectants are used to kill bacteria whereas soap and detergents are used to get rid of dirt as well as wash some bacteria away. The boat and equipment should be thoroughly cleaned using clean water and approved detergent before each fishing trip. In addition, the boat and equipment should be regularly inspected for damage and necessary maintenance carried out. See Annex 1 for more information on cleaning.

Bait fish are likely to be spoiled and contain large numbers of spoilage bacteria that would contaminate the catch. Special care must be taken to separate bait fish from the catch to avoid the contamination of the latter. Fishing gear is difficult to clean properly and can also contain large numbers of spoilage bacteria. Despite this, the more you spend time cleaning these, the less spoilage bacteria there remains on your fishing gear, the less chance you have of contaminating your fish and speeding up spoilage. Fish hooks etc, are a physical hazard and so should always kept separately from the fish catch.

Both domestic (goats, chickens, ducks, dogs, cats, cows) and wild animals (birds, rats, mice, flies, cockroaches) can carry disease causing germs and should not be allowed entry to the boat or allowed to live in the boat. Removing fish waste / debris that might attract animals and covering the boat with a tarpaulin can reduce this problem. Animals should not be allowed in places where the boat moors or fish is being handled or stored.

Tips for trainers

Ask the trainees to discuss the disadvantages of using wooden fish boxes.

Wooden boxes are impossible to clean properly and contain large numbers of bacteria which will contaminate any fish that come into contact with them. Additionally, wooden boxes may produce splinters that present a physical hazard.

Immediately after capture the fish should be stored with ice in a closable, insulated fish box or proper fish hold. Correct icing practice will result in fish temperature being reduced to that of melting ice and so significantly reduce spoilage. Any low-quality fish that is caught should be kept separate from good quality fish to avoid contamination. Fish which are caught alive should be killed immediately they come on board to avoid them being bruised or damaged and to stop the fish struggling which can speed up spoilage.

Ask the trainees to describe how they currently store fish on the boat and suggest improvements.

Some markets require that good handling and hygiene practices are used during fishing - ignoring these requirements can lead to countries being banned from exporting fish to export markets such as the European Union or to neighbouring countries. These bans can cause much financial hardship in fishing communities.

Ask the trainees to discuss how storing the catch in the same container as the bait or fishing tackle can affect fish quality.

Ask the trainees to describe the methods they use to wash boats and equipment.

Good practice would be to remove solid waste by hand, rinse the boat / equipment with clean water, scrub down with detergent and finally rinse off the detergent with clean water. Then, the disinfecting step should be carried out by the application of a recommended disinfectant on boat / equipment, according to the instructions for using the particular chemical. Normally, after a recommended time, the disinfectant is rinsed off using clean water. It is important to remove any water that may remain after washing the boat. Water close to the fishing beach or harbour water should not be used for cleaning as this water may be polluted. See Annex 1 for information on cleaning.

Only tap water from the public water supply or clean offshore water / borehole water that has been treated with chlorine should be used in the cleaning and rinsing processes for boats and equipment.

Fishing gear used should be that allowed by law. All human and other wastes from the fishing trip should be

got rid of in a way which is safe for public health and the environment.

Ask the trainees if this requirement presents problems to them.

Recap questions

Ask the trainees to list the 5 most important things they have learned. What can make fish spoil or go bad during fishing?

What should we do to stop fish spoiling during fishing?

FISHING 5. CLEANING

KEEP BOAT
CLEAN



CLEAN YOUR GEAR



CLEAN EQUIPMENT MEANS CLEAN FISH

6. HYGIENE AND HANDLING AT THE LANDING SITE

What we should do to keep the landing site clean

How to handle fish well at the landing site

Landing site managers and operators will know the basic facilities (buildings and equipment) required at landing sites to allow hygienic handling and storage of fish and understand the importance of keeping facilities clean and in good condition. They will also understand the importance of good handling and hygiene practices at the landing site to prevent contamination and spoilage.

Dangers that might make fish unsafe to eat and can be found at fish landing sites include:

Contamination of fish with metal, glass and wood splinters;

Contamination of fish with chemical hazards such as fuel, oil, cleaning chemicals and exhaust fumes from vehicles and generators;

Contamination of fish with germs found in near shore water;

Contamination of fish with germs from surfaces the fish make contact with e.g. landing site floor;

Contamination of fish with germs carried by domestic animals and pests;

Contamination of fish with germs carried by the fish handlers;

Contamination of fish with germs present in unclean water and ice, etc.

Typical causes of fish spoilage at fish landing sites?

Not keeping the fish cool during landing, selling and transfer to the fish truck, collecting vessel or processing establishment;

Delays in transferring fish from the boat / collecting boat to chilled storage facilities;

Rough handling by throwing and dropping the fish.

Training images

Picture 1. Poor practices at the fish landing site

Fish should be landed in gazetted landing sites. It should be landed from fishing boats and weighed, sold or processed quickly and kept chilled. This picture shows the conditions and activities that can sometimes be seen at fish landing sites. There is a high risk of fish being contaminated with disease causing germs at sites where basic facilities (clean water, toilets) are absent and unhygienic practices take place. This increases the

risk of passing on diseases to consumers and landing site users.

Tips for trainers

Ask the trainees to study the picture and compare it with conditions found at their own landing sites.

Ask the trainees to identify causes of contamination and explain how contamination might be stopped.

Answers should include:

Using the beach as a toilet may result in fish being contaminated with germs present in human waste;

Bathing and washing dirty clothing along the beach can contaminate the lake water with germs;

Domestic animals taken onto fishing boats can contaminate the boat with their waste which can then contaminate fish which come into contact with the boat surfaces;

Not fencing off the landing site increases the risk of contamination by visiting people and domestic animals.

LANDING SITE 1. POOR PRACTICE



BAD PRACTICE CAUSES POOR QUALITY AND MAY HARM THE CONSUMER

Picture 2 . Good landing site

This picture shows the basic facilities that must be present at landing sites to allow fish to be handled hygienically. A good landing site should have a covered area to keep fish under after landing and be designed so that fish can be landed properly without it being dropped or dragged through near shore water. A jetty can help with this. The site should be equipped with a good drainage system and a waste disposal system. The site should be big enough to allow people to move freely and for equipment to be used well. Space for expanding the site in the future should be thought about when planning and locating a landing site. In addition, the fish handlers must avoid bad practices that can cause contamination. Landing sites should be fenced off from other activities and there should be a gate at the entrance. Ideally, it should have a sorting area and a weighing area. Landing sites should have good toilets and washing facilities for those using the site and a storage room for the fish and insulated boxes. People using the site should not be allowed to smoke, spit, eat, drink, sleep, wash laundry, or carry out fish processing within the fenced area. No vehicles or engines should be serviced or fixed in the fenced area.

The local management unit or committee at the landing should be responsible for making sure all the activities are carried out properly and the site is kept clean. It is good to have an office at the site for management and meeting purposes and a room for any fish inspection activities to take place. The office can be used to record data and prepare reports as well as have meetings with workers. A store is useful for keeping cleaning equipment.

A landing site should only be for handling fish - no other goods should be allowed to pass through it. Landing sites should be kept clean and free from pests and vermin. Equipment used there should be washed and cleaned using water, detergents and disinfectant. All equipment used for cleaning should also be cleaned after use and stored in a proper place. The management committee should have a cleaning schedule, keep records of cleaning activities and make sure that cleaning is done properly. Cleaners should be trained in what to do. Landing sites workers should wear clean, protective clothing and take care to prevent the fish from coming into contact with in-shore water during unloading by carrying fish in boxes.

Clean, safe water must be available for cleaning the site and equipment. Ideally, the site will be connected to the town water supply. Water from boreholes or other sources must be treated to destroy any germs that may be present. It is important that only approved chemicals are used to treat the water according to the manufacturer's instructions and that the person responsible for treating the water is properly trained. Hand washing facilities, supplied with hot water and soap should be present. Fish must be unloaded quickly and carefully from the boat and it should not be exposed to warm temperatures. Fish should be transferred from the boat using a crate, tray or box which can be easily cleaned. The box should not be made of a material that can rust. Ideally, the landing site will be provided with a chill room for storage of fish that cannot be transferred

immediately to the fish truck. An alternative is to store the fish, with ice, in an insulated container that is kept in secure accommodation. Toilets should be secure and easy to clean. It is important that toilets are always supplied with soap and clean water and that fish handlers always wash their hands properly after using the toilet. Toilet facilities at landing sites which provide export markets have to meet both national and international standards. Wash basins must be supplied with clean running water. Soap and paper towels should also be present. Toilets should be flushable and provided with toilet paper.

Tips for trainers

Ask the trainees to look at picture 2. What things can prevent contamination of fish at a good landing site?

Answers should include:

Use of clean protective clothing reduces contamination risk;

Placing fish, with ice, in clean plastic containers reduces spoilage and contamination;

Secure fence and guarded entrance prevents unauthorised access, reducing risk of contamination;

Quickly transferring fish to a clean fish truck and storing in ice reduces spoilage and contamination;

Keeping animals away from landing site reduces contamination;

Keeping site clear of waste reduces risk of contamination.

Roof provides shade, protecting fish from the sun;

Floor of jetty is smooth and in good repair, making it easy to clean;

The jetty is clean and tidy – there are notices reminding workers to keep the jetty clean;

The jetty is supplied with tap water;

Landing site workers are wearing boots and protective clothing;

The fish barrows are made of materials that will not rust and are easy to clean;

Boats can moor next to the jetty allowing direct transfer of fish from boat to shore.

Recap questions

What are the features of a good landing site?

What things should we not do at the landing site?

What things should we do at the landing site?

LANDING SITE 2. GOOD PRACTICE



**GOOD FACILITIES & PRACTICES HELPS MAINTAIN QUALITY AND
MAKES FISH SAFE TO EAT**

7. PROCESSING AND DISTRIBUTION OF PROCESSED FISH

How we can produce good quality processed products

Good processing and storage practices

Boat owners, crew, processors, processed fish traders, vehicle owners, casual labourers at landing sites, will learn how to produce good quality, safe, processed fish products and how to prevent losses from occurring. They will learn about how to process, pack and store the product well and how to add value to their products.

Processing often removes water from fish making it hard for bacteria and enzymes to survive. Heat during smoking will kill bacteria and destroy enzymes. Processing if done well can produce good quality products that can fetch a high price in the market and also can be stored for longer. Good quality products can also sell quickly because consumers prefer them.

Training Images

Picture 1. Poor processing practices

Processing poor quality fish will produce poor quality products. For smoked fish this will mean the fish will break more easily. Processing in unclean places will mean more bacteria and dirt can be added to the fish making it spoil quickly or making the consumer sick.

Insects, such as maggots from flies and beetles will eat the fish during processing and storage. Animals will also eat fish. This causes quality deterioration and post-harvest losses.

If fish gets damp after processing then moulds can grow on it which makes the fish unsightly and cause losses.

Trainers Tips

Ask the group what they think causes smoked and dried fish to go bad or fetch a low price. Encourage them to give examples. Then ask the group to look at this picture and identify what they can see which is not good. Then go through each example and explain the problem:

If you process low quality fish then you get low quality products e.g., for smoked fish, it can break easily. Poor quality in – poor quality out!

If we leave fish in the sun and on the ground before processing then it will get contaminated and we will get poor quality processed products. Preparing fish on the ground adds dirt and bacteria on the fish. Hence, it will make it spoil and can make the consumer sick.

Insects cause a lot of losses because they eat processed fish and also transmit bacteria.

Animals will eat fish and also put bacteria and dirt on it. Fish left exposed to sun and flies will suffer losses. Processing must take place in a proper environment.

Ask the group if they have any questions or comments.

Picture 2. Good processing practices

Fish that is processed should be fresh and in good condition, not contaminated with anything and kept on ice before processing. Fish should be prepared in a hygienic way before processing and washed in clean water thoroughly to remove blood, slime, scales and bacteria. Fish should be checked for parasites and if any are found they should be removed. To some extent, freezing, heating and salting can kill living parasites depending on the temperatures and amount of salt used. Processing must be done in a proper place where there is no chance the fish will get contaminated with anything. The processing place and all equipment and utensils must be kept clean and in good condition. In addition, fresh fish and equipment used for processing fresh fish should not come into contact with processed products as this can contaminate processed products with bacteria which may cause food poisoning. If anything is added to the fish such as a food additive, it must be a permitted substance. At no time should pesticides or insecticides be used on fish during processing, on equipment used for processing or on final products as these chemicals are very dangerous to the consumer and the processor. Any waste products from processing must be disposed of in way which does not harm the environment either the water or land. Waste should be kept and got rid of in a closed place that does not allow flies, rats and other pests to breed and be a nuisance. Sun drying, salting, smoking or other processing should be done in a proper, separate area or place. Finished products must be packaged and handled in a careful way to avoid contamination and so they remain safe to eat.

Drying

Drying is a simple way of preserving fish and is often done using sun, salt or smoking. Drying works because it takes out water from the fish making it difficult for bacteria to survive and enzymes to work. If bacteria can't live or enzymes can't work then they cannot make the fish go bad.

It is important to dry fish quickly and avoid it getting contaminated with dirt, sand and bacteria, so to avoid

spoilage and make better quality products. Fish should be sun dried away from sources of contamination such as roads, factories, farms and areas where burning or fires are going on. There are different ways of drying fish well. Using raised racks is the recommended way because it keeps the fish away from some animals, dirt and sand. Wind and air can move around both sides of the fish and dry it. It is easier to move the fish to a dry place away from the rain, if the racks can be lifted. Otherwise, fish dried on racks should be covered with plastic sheets when it rains. There is some financial cost involved and there must be enough rack space to cope with gluts of fish. The drying rack material should be non-corrodible. It may be necessary to use methods to scare birds away as they can contaminate drying fish as well as eat fish. Drying fish on clean concrete or cement surfaces is good because it means the fish won't get dirt and sand on them. But the surface must allow rain water and water from the fish to drain away. The area should also be fenced off to stop animals coming in. Another method is to dry the fish on clean fishing nets, placed on the ground, allowing water from fish to drain away. But care must be taken to protect the fish from dust and animals.

Salting

Fish should be salted and kept off the ground either on racks or a raised platform which is easily cleaned. Salting can also be done in appropriate containers such as clean plastic barrels or cement lined vats. Salt used should be clean and meant for use on food. It should be stored in a way which means it won't get contaminated e.g. in clean sacks in a store. After use, salt should not be reused but disposed off as waste. Salting of fish should be done in a way and with equipment which makes sure that during processing the fish will not get contaminated with chemicals or other hazards such as dust, animal faeces, fly maggots etc. Moreover, salt with small crystals is good for fatty fish and large crystals are good for lean fish. Some salt, especially from the sea, can contain bacteria which can give the final product a pink colour. Brown or yellow colouring of salted fish can be caused by the type of salt used, as different salts contain different chemicals. If salt is mixed with water to produce a brine in which fish are placed, then only potable water should be used.

Care must be taken when drying to avoid high temperatures which can cause a hardening of the outside surface of the fish. The hard surface layer can stop the inside of the fish drying properly and so it will spoil.

Some fish are processed to allow a certain strong flavour or soft texture to develop. Salt is used to control this type of fermentation process when some bacteria and enzymes are allowed to remain active. These fermented products should be handled and processed in the same way as all processed products and care must be taken to avoid contamination with food poisoning bacteria.

Smoking

Good smoked products are more easily produced using an improved smoking oven like the one called

a “chorkor oven”. This has a smoking pit or chamber and the fish are placed on wooden framed racks with wire mesh and these are stacked on the chamber. This method uses less fuel wood than traditional methods and produces better quality products. Smoking should be carried out in a clean, well ventilated place protected from rain and animals. The process should not cause any problems to neighbours or other products. For hot smoking the temperature of the middle of the fish should reach at least 65°C during processing as this is the temperature fish begins to cook. For oily / fatty fish, smoking can stop the oil causing a colour change in the product and also stops the fish having a rancid flavour. After smoking the fish should be cooled in a way which avoids contamination with dirt, dust and bacteria. Smoking equipment should be kept clean, with oil and soot removed regularly, to avoid contamination of products. Wood and other fuel materials like wood shavings should be kept in a good dry place where they do not come into contact with contaminants or fish. Only good clean wood that has no paint or varnish on it should be used so that the fish will not get bad chemicals on it. Some wood products used for smoking can be poisonous, putting chemicals on the fish. Such woods and materials must not be used. Smoke drying puts different chemicals on the fish. Some of these are called Polycyclic Aromatic Hydrocarbons or PAH. These are thought to be harmful to consumers and to processors. They are linked with causing cancer. The things which can affect the amount of PAH on smoked fish are the type of wood or fuel used, the distance between the fire and fish, fats dripping onto the fire and causing more smoke, direct or indirect smoking, filtering the smoke and the length of time of smoking process.

Guidelines to avoid high PAH content in smoked fish products:

Use wood and fuel which does not impart a high PAH content. For example conifer and pine woods should be avoided.

Don't use very dry wood as this can burn quickly and produce high levels of PAH

Do not use wood treated with chemicals

Do not use waste products like tyres or waste oil or other waste products which already contain high levels of PAH

Filter the smoke before it reaches the fish

Increase the distance between the fire and the fish

Use indirect smoking rather than direct smoking

Avoid very high temperatures when producing smoke, since dark brown or black processed fish have a high level of PAH

Minimise the time the fish spends in contact with the smoke

Reduce burning of fats during processing

Regularly clean the smoking equipment e.g. metal racks

Frying

Deep-frying fish in cooking oil is quick and uses little space and capital investment as compared to smoking. Deep fried fish is a tasty product and can have a good market. The oil should be heated in a food grade metal pan to a high temperature, ideally between 180° to 200° C. Fish will cook quickly depending on their size. When the oil turns a dark colour then it should not be used anymore and replaced with fresh oil. As fried fish is ready to eat it must be handled and packed carefully so that it does not get dirt or bacteria on it as this may cause illness in the consumer.

Processing checklist

Here is a list of things to do to make sure processed fish products are processed properly:

- Always choose good fresh fish for processing as this gives good processed products;
- Fish products waiting to be processed should be kept cool and protected from contamination by being stored in easy to clean containers fitted with lids;
- Fish products should not be placed on the ground as they will pick up dirt and bacteria;
- Fish used to make salted and dried products should be protected against flies;
- Fish should be processed as soon as possible to avoid spoilage;
- Fish being dried should be put on racks;
- When drying fish on racks turn them by hand every one or two hours so they dry quickly;
- Take any waste material away from the processing site and get rid of it in a good way;
- Make sure there are no trees or vegetation near the processing place as these are good places for insects and vermin to live;
- Surfaces that touch the fish like tables or racks should be washed with soap and clean water after use (see Annex 1);
- Sweep and clean the processing area and remove rubbish make sure there is no rubbish lying around which can attract flies, rats and other pests;
- Dispose of waste and rubbish properly by keeping it in covered bins which are emptied and cleaned daily;
- Prevent animals from entering the processing area;
- Use clean equipment and utensils;
- Make sure there are good toilet facilities and these are kept clean.

Trainers Tips

Explain that we are now going to look at some of the things which we can do to produce good quality

products which can fetch a high price. Use Picture 2 to explain how we can improve drying. Explain each image and the benefits. Ask the group to discuss how these practices can be introduced and whether they can see any difficulties in using them. If any difficulties are mentioned then see if you can come up with ways of dealing with them. The issues to discuss include:

Good quality in – good quality out!

Keep the place clean in getting rid of any insects or vermin living there, and of bacteria and dirt, which could get on to the fish;

Always dry fish on raised drying racks not on the ground;

Keep the processing area neat and tidy and remove any waste material quickly;

Wash the fish in clean water before processing to remove any sand, dirt, bacteria, slime, scales and use boxes that can be cleaned;

Fence off the processing area;

Keep all equipment like tables, bowls, knives clean;

Use good smoking ovens which can save wood and make good quality products which can sell quickly and get a good price.

PROCESSING 1. POOR PRACTICE

POOR QUALITY
IN POOR
QUALITY OUT!



POOR QUALITY
CAUSES
BREAKAGES



DRYING ON GROUND
ADDS DIRT AND
BACTERIA



POOR ENVIRONMENT
MEANS POOR QUALITY AND
LACK OF CUSTOMERS



INSECTS CAUSE
LOSSES



PROCESSING 2. GOOD PRACTICE

PROCESS GOOD QUALITY FISH



WASH FISH IN CLEAN WATER



USE RAISED RACKS



GOOD WASTE DISPOSAL



**IMPROVED TECHNOLOGY
PRODUCES BETTER QUALITY**



KEEP EQUIPMENT CLEAN



**KEEP AREA CLEAN
AND WASH IT**



Picture 3. Good packing, storage and labelling

Good quality smoked and dried fish can be kept for 2 to 3 months. Salted and dried fish can keep for longer if it is stored well. During storage and when selling fish it is important to keep the fish safe and protect it from sources of contamination and things which will affect quality.

Smoked and dried fish should be kept in a proper store which has good air flow, is cool, and protected from rain, insects, rats and other animals. The fish should be kept so that it does not absorb moisture causing mould growth and a risk of bacterial spoilage. The sacks or containers of fish should be easily got to and kept on pallets to keep them off the floor. It is good to sell first the fish which have been in the store the longest. All packaging material must be new and designed for food.

Processed fish can be packed into plastic bags and labelled to add value. These packs can contain from 50 g to 5 kg of product depending on what the consumer requires. These packed products are ideal for supermarkets and retail shops.

There will be national legislation on labelling foods and these should be followed, but generally a label should include the following:

Name of the product and this should not mislead the consumer

List of ingredients

Weight of the contents

Name and address of the producer, distributor, or seller

Country of origin of the product e.g. where was product produced

A code to show who the producer is and which batch of product the individual pack is from

Date marking and storage instructions

Instructions on how the product should be used

Trainers Tips

Discuss the good things we can do when packing and storing the fish. Ask the group to look at this picture and say what they think are the good things they can see and why. Go through the images on the picture and make sure that all the good practices have been mentioned. Ask the group if they have any questions or comments. The issues include:

Pack fish properly in clean packaging designed for food and keep the processed fish in a cool, dry place with good ventilation;

Don't use pesticides (or any other chemicals) on processed fish or on any surfaces with which it come in contact with fish;

Labels are good as they help the consumer understand what the product contains and that the product meets national standards. Labelled products can sell for a higher price.

Recap or test questions

The trainer can use the following questions to recap and emphasise the main issues:

Why does smoked or dried fish go bad? How does smoking and drying work?

How can we improve how we process the fish?

When we pack and store fish what should we do? Ask if there are any questions.

PROCESSING 3. PACKING AND STORAGE

STORES SHOULD BE
SECURE,
WEATHERPROOF
AND HAVE GOOD
AIR FLOW



PACK IN A
CLEAN PLACE
WITH GOOD
CLEAN
PACKAGING



NEVER USE
INSECTICIDES
OR
DANGEROUS
CHEMICALS



LABELS ADD-
VALUE AND
GIVE
CONSUMER
CONFIDENCE

8. HANDLING AND PROCESSING SMALL PELAGICS

How to process small pelagic fish using different methods

Good handling, packaging and storage practices

Boat owners, fishermen, traders, processors, vehicle owners, casual labourers at landing sites, will learn how to produce good quality small pelagic fish products and how to prevent losses from occurring. They will learn about how to process, pack and store the product well and how to add value to their products.

There are several different species of small pelagic fish also known as lake sardines or anchovies. They are typically 2 to 5 cm in length and are important fish for many people such as fishers, fish traders and processors and consumers. They are also used as ingredients in farmed animal feeds. Picture 1 shows some examples of small pelagic fish.

There are many problems faced by people involved in processing, packaging and storage of these fish. The weather makes it difficult to sundry the fish and poor quality final products mean that the end price paid is often low. However, there are ways we can upgrade the quality and safety of products for the local and regional markets (and potential international markets). Production of high quality and safe products will lead to reduced post-harvest losses, increased income and better consumer acceptance.

Training Images

Picture 2. Causes of losses

Fresh small pelagic fish will spoil because of bacteria and enzymes. These fish are also often oily and the oil in the fish can cause it to go brown in colour after it is dried. This rancidity of oil also gives the fish a bitter taste. Drying removes water and helps stop bacteria and enzymes from working but it does not stop the oil in fish turning it brown.

Small-pelagics are caught and processed in large quantities. This makes it difficult to process them easily. It is also difficult to use ice and get ice to fishing areas. Several catches of fish will be made in fishing trip and the first catch may stay in the boat for a long time leading to spoilage. If this first catch is mixed with later catches then it can spread bacteria and enzymes to the fresher fish and make them spoil quicker. During fishing poor handling causes quality losses. Fishermen stand on fish causing physical damage and spreads enzymes and bacteria to other fish. Dirty water lying in the bottom of boat and dirty equipment also adds bacteria to fish and makes it spoil quicker.

Any delays between landing and processing gives bacteria and enzymes a chance to make the fish go bad. Poor

weather conditions slows drying also giving a chance to bacteria and enzymes to spoil the fish. Fish dried on the bare ground or on dirty nets it is likely to pick up sand, dirt and more bacteria. Sometimes the place where the fish is dried is open and animals wander in bringing dirt and bacteria. Insects are also a problem and can add more bacteria. Flies also lay eggs on the fish and if processing is delayed then these will hatch into maggots which will eat the fish. Some fish will also be eaten by birds leading to a physical loss.

During storage and transport, if the dried fish get wet either from rain or lake water or humidity then the colour will change and spoilage may occur. During storage, insects can attack dried fish and eat it.

Trainers Tips

Ask the group what they think causes small pelagic fish to go bad or fetch a low price. Encourage them to give examples. Then ask the group to look at this picture and identify what they can see which is not good.

The answers should include:

poor on-board handling leading to damaged fish;

drying on rocks maybe quick but the heat can burn the fish and make it change shape. These areas are also unclean;

drying on sand maybe be quick but it is not good as fish gets contaminated with bacteria, dirt and sand;

over packing often causes breakages;

rain makes it difficult to dry fish and leads to spoilage;

animals and birds will eat fish and their dirt will add bacteria;

sand contaminates fish making it difficult to eat;

oil in the fish will go rancid causing a brown colour and bitter taste.

LAKE SARDINE 1. FISH SPECIES



Picture 3. Good fishing practices

Poor quality is often caused by poor fishing practices and poor on-board handling. It is best to use fishing boats and gears which make it easy to look after fish properly after it is caught. Having enough space to handle fish well is important. Store the fish in clean plastic baskets or containers after catching and before landing. Such containers must have a hole in to allow any water to drain away. Shallow plastic baskets are seen as ideal containers for small pelagics. Salt can be added to the fish immediately after catching. At least 30 g of salt can be added to every 1 kg of fresh fish caught (more salt can be added depending on what the final consumer prefers). Salting helps to preserve the fish and helps prevent the brown colour change in dried products.

To help make sure that good quality fish is landed then the boat and all equipment which comes into contact with fish must be clean. Cleaning should be done before fishermen go fishing. The fishermen themselves should also be clean and wear clean clothes to avoid putting bacteria and dirt on the fish

Trainers Tips

Ask the group what they think about the fishing method shown in picture 3 and discuss what are the advantages and disadvantages of the method.

Picture 4. Good drying practice

Before sun drying, fish should be washed, if they are not clean. Soaking in a salt solution can be used to remove any worms in the fish gut.

Drying is a simple way of preserving . It takes out water from the fish making it difficult for bacteria to survive, and enzymes to work. If bacteria can't live or enzymes can't work then they cannot make the fish go bad.

It is important to dry fish quickly and avoid it getting contaminated with dirt, sand and bacteria, so to avoid spoilage and make better quality products. Fish should be sun dried away from sources of contamination such as roads, factories, farms and areas where burning or fires are going on. There are different ways of drying fish well. Using raised racks is the recommended way because it keeps the fish away from some animals, dirt and sand. Wind and air can move around both sides of the fish and dry it. It is easier to move the fish to a dry place away from the rain, if the racks can be lifted. Otherwise, fish dried on racks should be covered with plastic sheets when it rains. There is some financial cost involved and there must be enough rack space to cope with gluts of fish. The drying rack material should be non-corrodible. It may be necessary to use methods to scare

birds away as they can contaminate drying fish as well as eat fish. Drying fish on clean concrete or cement surfaces is good because it means the fish won't get dirt and sand on them. But the surface must allow rain water and water from the fish to drain away. The area should also be fenced off to stop animals coming in. Another method is to dry the fish on clean fishing nets, placed on the ground, allowing water from fish to drain away. But care must be taken to protect the fish from dust and animals.

Small-pelagics should be dried to about 30% of their original moisture content, not too dry and not too wet. Weigh before and after drying to check the weight-loss as this can give an indication of the moisture content. Fish should lose approximately half or 50% of its fresh weight during drying to give the right moisture content. 100 kg of fresh fish should produce 50kg of dried fish. Dried fish should be packed in clean dry sacks. An ideal weight for a sack of fish is 20 kg as this can be easily carried.

Good quality dried fish can be kept for 2 to 3 months. During storage and when selling fish it is important to keep the fish safe and protect it from sources of contamination and things which will affect quality. Dried fish should be kept in a proper store which has good air flow, is cool, and protected from rain, insects, rats and other animals. The fish should be kept so that it does not absorb moisture causing mould growth and a risk of bacterial spoilage. The sacks or containers of fish should be easily got to and kept on pallets to keep them off the floor. It is good to sell first the fish which have been in the store the longest. All packaging material must be new and designed for food.

Processed fish can be packed into plastic bags and labelled to add value. These packs can contain from 50 g to 5 kg of product depending on what the consumer requires. These packed products are ideal for supermarkets and retail shops.

There will be national legislation on labelling foods and these should be followed, but generally a label should include the following:

- Name of the product and this should not mislead the consumer

- List of ingredients

- Weight of the contents

- Name and address of the producer, distributor, or seller

- Country of origin of the product e.g. where was product produced

- A code to show who the producer is and which batch of product the individual pack is from

- Date marking and storage instructions

- Instructions on how the product should be used

Trainers Tips

Explain that we are now going to look at some of the things which we can do to produce good quality products which can fetch a high price. Use this picture to explain how we can improve drying. Ask the group to discuss how these methods could be introduced and whether they can see any difficulties in using them. If any difficulties are mentioned then see if you can come up with ways of dealing with them. Issues to discuss include:

Drying on clean nets is better than the sand or ground as it stops some contamination with sand and dirt;

Clean products are produced by using racks, although drying can be slower than the current method; Different designs of drying racks;

If it rains the racks can be stacked in a nearby store or covered with plastic sheets;

Before processing it is good to wash the fish in clean water to remove sand and bacteria.

LAKE SARDINE 2. BAD PRACTICES

DRYING ON GROUND
ADDS BACTERIA &
DIRT

LOSSES CAUSED BY
ANIMALS



POOR PROCESSING MEANS
POOR QUALITY

POOR PACKING AND
PACKAGING CAUSES
DAMAGE

RAIN MAKES
DRYING DIFFICULT

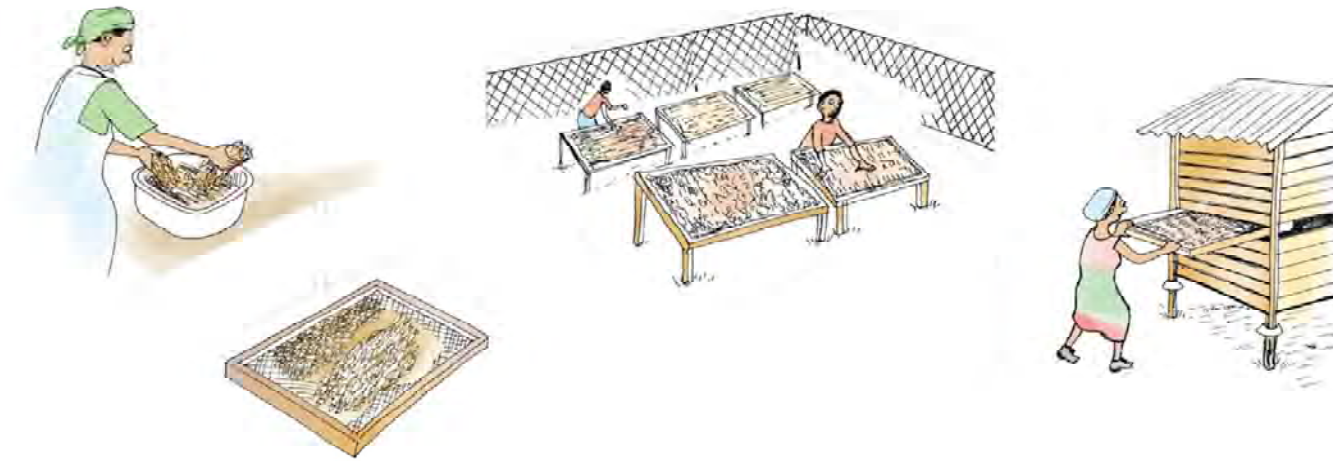
LAKE SARDINE 3. FISHING



LAKE SARDINE 4. GOOD DRYING

WASH IN CLEAN WATER TO REMOVE DIRT, SAND AND BACTERIA. SOAKING IN SALTED WATER (BRINE) HELPS PREVENT COLOUR CHANGE AND IMPROVES TASTE.

RAISED RACKS PROTECT FROM ANIMALS. TURN FISH BY HAND TO SPEED UP DRYING.



DRYING TRAYS MAKE IT EASY TO MOVE AND STORE FISH

Other processing methods

As well as sun drying there are other methods which can be used to process small pelagics. These include smoking, frying and freezing. These methods can be used all year round including during rainy seasons, when sun drying may be difficult.

Smoking is best done using an improved smoking oven. See Chapter 7. After washing in clean water, and soaked in brine, fish are drained on racks before sun drying for 4 to 5 hours. Smoke at 80°C for 2 hours before being left to cool and then packed and labelled.

Deep-frying fish in cooking oil is quick and uses little space and capital investment as compared to smoking. Deep fried small pelagic are a tasty product. See Chapter 7.

Freezing can also be used. See Chapter 9. Frozen products are kept in cold storage and distributed using refrigerated transport to retailers who have the appropriate cold storage or chill cabinets. Dried products can also be kept in cold storage to improve the storage life and prevent the brown colour change. Although, this is a costly storage method.

Recap or test questions

The trainer could use the following questions to recap and emphasise the main issues: Why do small pelagic fish go bad ?

How does drying work?

What other processing methods can be used to process small-pelagic fish? How can we improve processing?

When we pack and store fish what should we do? Ask if there are there any questions.

9. HOW TO PRODUCE GOOD QUALITY FROZEN FISH

How to produce good quality frozen fish

Boat owners, crew, processors, fresh and processed fish traders, vehicle owners, casual labourers at landing sites chill and cold storage owners, blast and plate freezers owners will learn how to make, handle and store frozen fish.

Only good quality, cleaned and chilled fresh fish should be frozen, as freezing will only slow down spoilage and maintain quality. It will not make poor quality fish better. Poor quality in, poor quality out! Check the quality of fish before freezing and any fish which is poor quality should be rejected and not frozen.

Training Images

Pictures 1 and 2. Freezing fish, good and bad practice

Make sure the fish to be frozen are good quality and clean as well as properly chilled. Chilled fresh fish already have a low temperature and this means freezing will be quicker and less energy will be used in freezing. If fish are to be gutted or prepared in some way, such as filleting or cutting into steaks, before freezing then this must be done quickly and in a clean place and in a way that avoids contamination with bacteria and dirt. Preparation should be done using clean facilities, equipment, tools. Clean water must be available for washing the fish after processing and cleaning equipment and premises. Washing the fresh fish in chilled water (water with ice) is a good way of cleaning fish before freezing takes place as it also keeps the temperature of fresh fish low. Always put any waste products into a closed container e.g. plastic bin and at the end of the day dispose of it in a proper way which does not cause any public health or environmental problems.

Fish should be prepared and frozen as quickly as possible. Make sure that the fish are not warm and are of an even chilled temperature. Do not overload the freezer with fish as this will mean freezing takes place slowly and may lead to quality losses and physical damage of products. Freezing time depends on the thickness of the fish, the initial temperature of the fish, the quantity of fish and the equipment being used. There are two common types of freezer recommended for freezing fish: blast freezers and plate freezers. It is not good practice to try and freeze fresh fish using cold storage facilities. Cold stores are used to maintain frozen products at the right temperature, -18°C or less. They are not designed to be used as freezers. Freezing will be slow in a cold store and the heat from fresh fish will raise the temperature in the cold store and may cause partial thawing of frozen products already in the store. After freezing the fish should be moved to a cold store

as soon as possible, where the temperature is -18°C or less. After freezing the fish can be glazed to protect them from dehydration during cold storage. To do this the fish are dipped in clean chilled water. This forms a layer of protective ice around the product. After freezing frozen fish can be packaged and labelled. This can add-value to the product. Frozen products can be kept for several months in a cold store. Fatty fish, because of the oil content, will not keep as long as lean fish. For freezing, cold storage and selling, it should be “first in first out” so that fish do not stay longer than necessary at any stage of the distribution chain. As like fresh fish, frozen fish do not keep forever and chemical changes will take place in the fish even though they are frozen. These changes will have an effect on the colour and taste of the fish and therefore its quality. Care must be taken to keep the door closed on cold stores. When the door is open warm air enters and this can raise the temperature of the products causing partial thawing of the fish and a loss of quality. The same problem occurs when the electricity supply to a cold store is interrupted for long periods of time. A reliable electricity supply is required for both freezing and cold storage. Care must also be taken when storing different frozen products in a cold store to avoid cross contamination.

During transportation and selling, the temperature of frozen products should be kept at -18°C or less. Changes in temperature can lead to partial thawing which will affect the quality.

Trainers Tips

Ask the group to look at these pictures and describe the bad and good things they can see. Discuss the challenges to producing good quality frozen fish and the benefits.

Picture 1. Poor freezing practice

This shows that fish arrives warm and not iced, already spoiled. It is not washed, left on the floor and then over packed into an old freezer, with the lid still open...It is then transported in sacks on the back of a pickup to the market....

Picture 2. Good freezing practice

Shows good practice. Fish is on ice, washed and processed (gutted if possible) in a proper clean environment, frozen properly, glazed and then packed into plastic bags and labeled. Then put into a cold store. It is packed into boxes and put into a refrigerated van for transport.

Recap or test questions

The trainer should now use the following questions to recap and emphasize the main issues:

What do we mean by “poor quality in poor quality” out? How do we make sure we produce good quality frozen fish? What should we do to frozen fish after freezing?

Ask if there are any questions.

FROZEN FISH 1. BAD FREEZING

POOR QUALITY IN
POOR QUALITY OUT!

POOR HANDLING MEANS
POOR QUALITY
PRODUCTS



OVER FILLING MEANS
POOR QUALITY AND
HIGH ENERGY COSTS

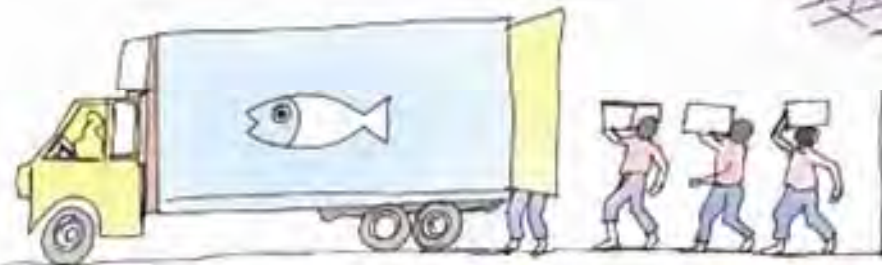
FROZEN FISH WILL THAW AND SPOIL IF NOT
TRANSPORTED WELL

FROZEN FISH 2. GOOD FREEZING

CHILL, WASH AND PACK
BEFORE FREEZING



FROZEN FISH SHOULD BE
STORED IN A COLD STORE



MAINTAIN THE COLD CHAIN

10. TRANSPORT OF FISH

General conditions for good transport of fish by boats and trucks

This chapter will help collector boat owners and operators as well as fish transporters in general to be aware of the necessary conditions to ensure fish are protected from contamination and spoilage during transport.

Refrigerated, insulated trucks and collecting boats are common means of fish transport. Fish trucks usually transport fish from landing sites directly to processing sites or markets. While collector vessels may, in addition to transporting fish to processing establishments, carry fish between landing sites for onward transport to markets and processing establishments.

All fish transport vehicles or boats should be certified by an authorized officer. Temperature and protection of fish from contamination are the main factors that have to be controlled during transport. The design should be such that it avoids the fish being contaminated with anything for example by fuel. Where ice is used, adequate drainage must be provided so that the melt water does not stay in contact with the products. Fish containers used during transport should be insulated, vermin proof, easily cleaned and designed for food. They should be kept clean. Vehicles, vessels and containers should be cleaned in designated places using potable water and disinfectant. People should not be allowed to sit on fish or fish containers during transport. Testing the temperature of products before loading will determine whether more ice is needed.

General conditions for transport boats and trucks are recommended as follows:

- They must be regularly inspected and approved by a designated inspection authority or service;
- Fish storage compartments must be designed to avoid contamination of fish and spoilage;
- Fish storage compartments must be insulated, and lined with strong, smooth, easy to clean materials ;
- The storage areas must be fitted with sealable doors to keep the fish at a low temperature during transport ;
- The weight of ice should be equal to the weight of fish being transported (1:1 ratio);
- Fish should be handled carefully to avoid being damaged;
- Transport vehicles and boats should be washed with clean water and approved detergents;
- Transport vehicles and boats for fish must only be used for the transport of fish;
- Functioning of the chill or cold storage area should be independent of that of the engine of transport vehicles or boats;

Fish temperatures should be recorded at the start, during and at the end of transport.

Training images

Pictures 1 and 2 Transport of fish by boat and road - bad and good practices

Collecting boats and trucks are important types of fish transport. Ice should be used to keep the fish chilled and ice should be used only once. This ice should not be reused since it will be contaminated with dirt, fish slime, blood, bacteria etc. A 1:1 fish to ice ratio should be used. Fish should not be exposed to sunlight during transport or to high ambient temperature and should be handled carefully at all times to avoid bruising and damage. Un-iced fish without any protection will spoil quickly and suffer contamination.

A collector boat fitted with a fish hold that is made of wood is not recommended as wood is difficult to clean and presents a contamination hazard to fish that come into contact with it. Wooden holds could be improved by fibreglass and polyester resin lining. These must also allow drainage of melt water.

When fish is being off-loaded from a vehicle or boat, the handler should proceed quickly, wear protective clothing and the fish should be placed in an appropriate container to avoid it being contaminated. Fish should never be thrown as this results in physical damage – and damaged fish spoil more quickly.

Ideally a fish storage compartment should be insulated and properly lined to allow easy cleaning. It should also be refrigerated. Fish can be transported in secure, hygienic and temperature controlled conditions in this type of vehicle/boat. A truck or boat should be well maintained and correctly washed down and disinfected after each trip. It is also important that the temperature of the cargo is carefully monitored and that the crew are trained in good hygienic practice. Trucks should be marked with the word “Fish” written in big letters (letters should be 30 cm high or more) to show that they are designed for carrying fish only. If the fish is chilled then its internal temperature should not go above +2°C and if frozen then the temperature should be maintained at -18°C or less.

Tips for Trainers

Ask the trainees to describe what they see in each of the 2 pictures and why they think what they see is either good or bad.

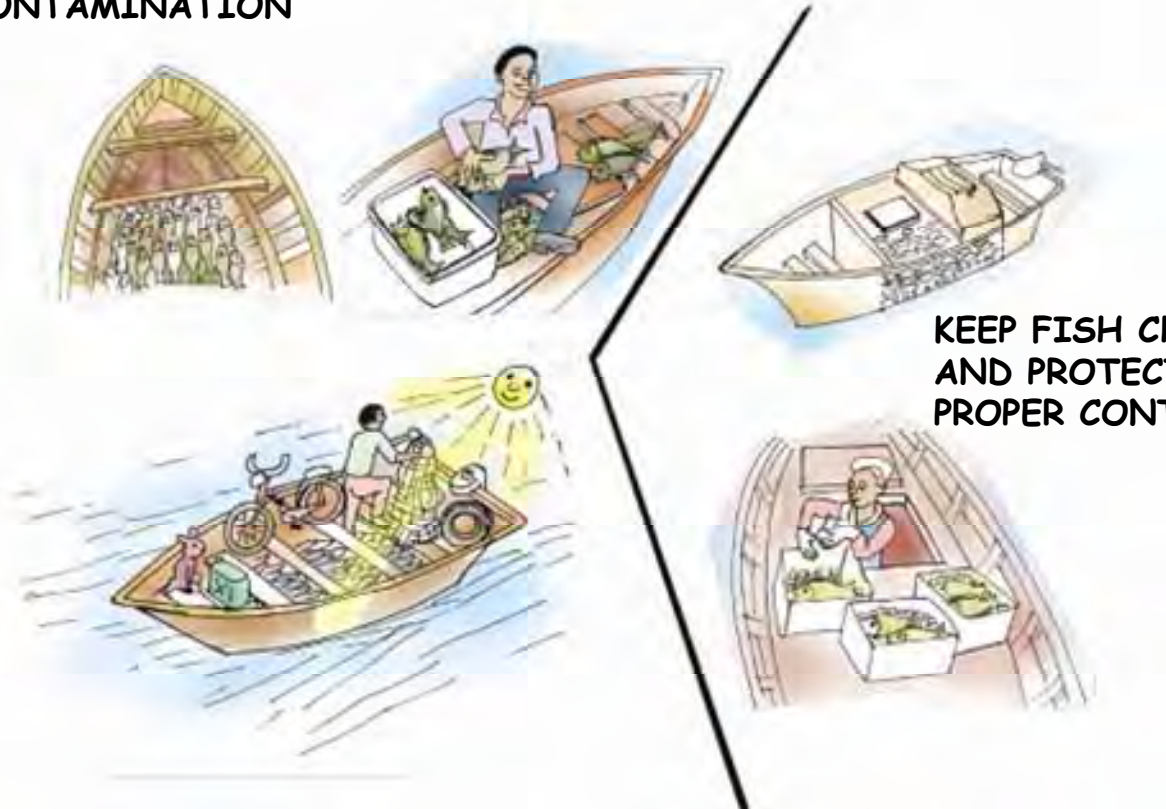
Recap questions

What should we do to make sure fish is transported in good condition?

Why is transporting fish in a purpose built vehicle or boat better than in an open pick-ups or boat? Ask if there are any questions.

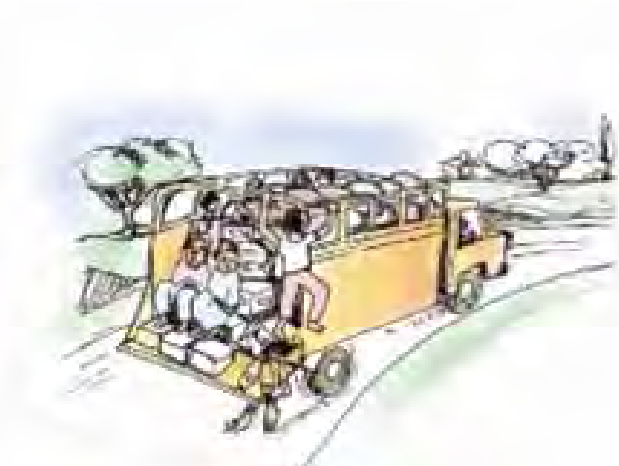
TRANSPORT 1. WATER TRANSPORT

**POOR HANDLING MEANS SPOILAGE
AND CONTAMINATION**

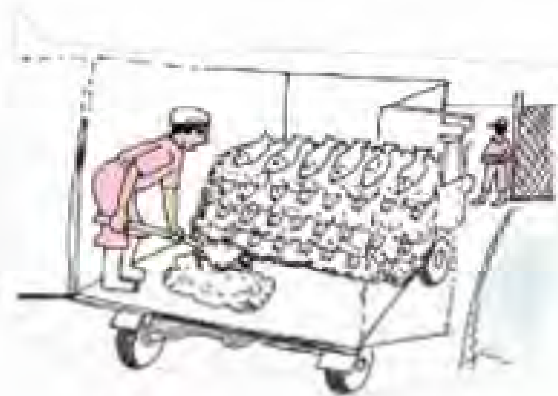


**KEEP FISH CHILLED
AND PROTECTED IN
PROPER CONTAINERS**

TRANSPORT 2. ROAD TRANSPORT



BAD TRANSPORT CAUSES DAMAGE AND SPOILAGE



**USE ICE, CLEAN
CONTAINERS AND PROPER
VEHICLES TO MAINTAIN
QUALITY**

11. FISH SELLING

What we will learn about

How to handle fish well during selling

Fish traders will learn how to look after fish well and maintain quality and makes sure the fish is safe to eat for the consumer.

Training Images

Pictures 1 and 2 Bad fish selling and good fish selling

Fish should be sold in a proper place meant for selling food away from things which contaminate fish. A market should be covered so that fish and the seller are protected from sun, heat and adverse weather conditions. Fish should be handled carefully and not thrown or put on the ground. They should be displayed on a raised surface which is easy to clean and disinfect, such as cement or ceramic tiles. This display counter should be sloping to allow water to drain away. Fish should be chilled using ice on display and during storage. The fish on display should be not heaped to make chilling difficult. As well as ice being easily available, there must be a supply of clean water for washing the fish, display surface and equipment such as knives and scales and boxes. Fish sellers must have access to hand washing facilities and proper toilets. Care should be taken not to let the surface of the fish dry out. Clean water or ice should be used to keep the outside of the fish wet. Wash the display surface and equipment daily after use. It is good to use a detergent and disinfectant to get rid of as much dirt and bacteria as possible. See Annex 1. Any waste products should be kept in a closed container such as a plastic bin with a lid. The waste must be got rid of in a proper way at the end of each day. Any fish which is stored must be kept on ice in a proper insulated easily cleanable box designed for food. Good icing practice should be used. See Chapter 4. The market area should not have animals or pests present and pest control must be applied. . If a chill or cold store is available then this should be used for storing fish which have been iced and are in proper containers such as insulated boxes. Fresh fish must be displayed separately from cooked or processed products to avoid cross contamination. If an ice making machine is available, it should be well maintained and properly managed.

Fish sellers should know why fish spoil and how to assess quality. Anyone selling fresh fish should have a medical check every 6 months. They should apply good personal hygiene and wear clean light coloured protective clothing. See Chapter 3. There should be no spitting, sneezing, coughing over the fish, smoking, chewing or eating while selling fish.

The selling place must be kept clean to prevent contamination of products, reduce the presence of pests and vermin, make the working conditions good and make the place good for consumers to visit. If the cleaning is done by a third party then sellers must make sure that the cleaning and maintenance is properly done, especially if the sellers are paying fees to use the market or sell their fish.

It is good to display information using posters or placards for consumers about the products such as how to tell if the fish is good quality, nutritional information, how to store fish, how to prepare it and what can happen if the fish is not handled properly.

Most fresh fish selling practice apply to processed fish. In addition processed fish (smoked, salted and dried) should be sold in a proper place and separated from fresh fish selling activities. Any fish which is stored at the site must be kept in a cool, dust free, well ventilated box or place which is protected from animals and pests. The fish should be placed so that air can circulate. Boxes or packages of fish should be kept off the ground on pallets.

Processed fish should not be washed with water to remove any contaminants as this may increase the chance of spoilage and mould growth. Make sure that products don't have insects or mould as these can affect the consumer and quality of the fish. Net or fine mesh covers can be used to protect fish from insects.

Trainers Tips

Pictures 1 and 2 show bad and good selling practices for fresh and processed fish. Ask the group to discuss what they see in Picture 1 and why what they see is bad. Ask the group to discuss what they see in Picture 2 and why these things are good.

Recap or test questions

The trainer can use the following questions to recap and emphasise the main issues:

What do we need to do or have to make sure we sell our fresh fish in good quality for a good price? What do we need to do or have to make sure we sell our processed fish in good quality for a good price?

Ask is there are any questions.

FISH SELLING 1. BAD PRACTICE

BAD PRACTICES CAUSE SPOILAGE AND MAKES FISH DANGEROUS TO EAT



FISH SELLING 2. GOOD PRACTICE

A PROPER CLEAN MARKET HELPS KEEPS QUALITY



CONSUMERS LIKE
TO BUY FISH IN A
GOOD PLACE

12.GOOD FISH HANDLING FOR FISH FARMING

How to handle farmed fish to make sure it is good quality and safe for the consumer.

Fish farmers will learn what to do on their farm to make sure they harvest and sell good quality fish which are safe for the consumer.

Handling and hygiene practices in fish farming are similar to capture fisheries but here we try and point out some of the differences.

Remember to always check with your relevant authority to make sure you are doing all the right things.

Training Images

Picture 1. Good aquaculture practices - growing

This picture shows examples of good aquaculture practices during growing of fish. [Site of the farm](#)

The water used on the farm is one of the most important resources. Fish will absorb chemicals from the water they live in and also pick up viruses and bacteria from it. These can then be passed onto the consumer when they eat the fish. It is therefore important that the water used for the farm is not polluted with effluents, chemicals or large numbers of bacteria. Always check the quality of the water before it is used for fish farming. And make sure the farm is well away from any pollution source like industries and farms where pesticides are used. If you find the water is not good quality then don't use it or change the source of water.

Source of fry

If you don't produce your own fry on the farm and buy in your fry or fingerlings, make sure you know where they come from and that they come from a reliable and reputable supplier and that the fry are of good quality free from chemicals.

Growing fish

Equipment and growing ponds and cages should not cause any physical damage to the fish. Make sure any nets used for harvesting fish or growing fish in do not cause damage.

Avoid using chemicals and industrial fertilizers if possible, unless it is really necessary. Veterinary drugs may

be needed if the fish get sick but make sure instructions are followed. Use chemicals according to specialist advice and according to Good Aquaculture Practice (GAP). If you use integrated farming to fertilize ponds and increase production, bear in mind that any chemicals used in other farming activities may find their way into the ponds and fish.

Conclusion - use only chemicals and medicines that are allowed and according to instructions.

Make sure you let your fish have time to get rid of any chemicals in them before you harvest. Always use the manufacturer's guidance on how to do this.

Use good quality wet (fresh fish) and dry (pellets) feed for your fish, from a reliable source. Keep dry food in a proper store which is cool, dry, well ventilated and secure from pests such as rats to avoid it getting spoiled.

Make sure the feed is free from pesticides and other chemicals. If you make the feed yourself, make sure you use good ingredients from a reliable source.

Fish must be handled quickly and carefully when grading to make sure they are not damaged or stressed. Simple equipment such as graders using racks or mesh can be used to minimise handling, make grading of fish quick and prevent damage to the fish due to too much handling.

Grading is best done in the morning or evening when the temperature is cool as the fish will get less stressed.

Trainers Tips

Ask the group to look at each image in this picture and describe what they see is happening. Explain the good practices that are shown in the picture and ask the group to discuss which of these is easy to practice and why and which are more difficult to do and why. Discuss how you can reduce the challenges to applying good practices.

Ask the group if they have any questions.

FISH FARMING 1. GROWING

WHERE AND HOW YOU FARM AFFECTS
QUALITY



CAREFUL HANDLING
GIVES GOOD QUALITY



GRADING EQUIPMENT
REDUCES HANDLING AND
DAMAGE



GOOD QUALITY FEED
STORED WELL MEANS
FISH ARE HEALTHY AND
GOOD TO EAT

Picture 2. Good practice in harvesting and transporting

This picture shows some examples of good practices in harvesting and transportation. Feed the fish 24 hrs before harvesting but there is no need to feed them again as the food will not be digested and the fish will not have a chance to get rid of any waste products. If the fish have full stomachs, they can dirty the water they are transported in (if they are marketed in live condition).

Harvesting should be done in a way which does not damage the fish or stress them. The equipment used must not cause any physical damage to the fish.

Harvesting should be done quickly. It is best to harvest the fish when the temperature is cool such as in the morning. If you harvest early morning, it is good also for marketing as the buyers have time to take the fish to market the same day.

Fish should be washed in clean water after harvesting to remove mud, weed and bacteria.

If the fish are to be sold dead, then stun them and chill them as soon as possible using ice and clean washable (plastic) containers or boxes. Do not overfill boxes or containers with fish as this causes physical damage.

Always handle the fish with care...do not throw or drop them...or stand on them as this will make them spoil quickly and result in a lower price!

Weigh fish carefully. Transport them as quickly as possible to market. Clean and disinfect all equipment and boxes after it has been used.

For live fish, don't put too many fish in the tank and use a proper aeration system. Don't feed live fish being transported as this can cause water pollution. Use proper equipment and well aerated clean water. For some fish like tilapia, salt can be added to the water if the fish are being transported live, as this can help reduce stress. Always maintain the right temperature, oxygen levels and pH. Transporting the fish when it is cool in the morning or evening is best. Remove any dead or diseased fish before and during transport.

Keeping records

Keep records of when fish are treated with chemicals or medicines so you know when to harvest them so they will be safe to eat.

Keep records about on the type of product, fish species, pond number, date and time of harvest, size or grade of product, transport vehicle number, quantity of fish, batch number. Record what brand of feed was used and the ingredients. Keep records of staff health checks and problems.

Trainers Tips

Ask the group to look at this picture and ask them to describe what they can see and why these are good practices. Ask if they have any questions.

FISH FARMING 2. HARVESTING

HARVEST WHEN COOL AND USE PROPER EQUIPMENT



USE PROPER CONTAINERS
AFTER HARVESTING

WASH USING CLEAN
WATER AND ICE

USE PROPER TRANSPORT

Picture 3. Good practice in personal hygiene and cleaning in fish farming

This picture shows good practices of personal hygiene related to fish farming. See also Chapter 3.

Personal Hygiene

Everyone working on the farm should have a good level of cleanliness. Anyone that is ill with an infection or disease should not be working on the farm until they have completely recovered. Cuts and wounds must be covered up. Make sure there are good toilets and washing facilities available.

Cleaning

Clean and disinfect the equipment after use. See Annex 1. Have a written process of how you clean and disinfect the farm facilities and equipment. Make sure someone is responsible for cleaning.

Trainers Tips

Ask the group to look at this picture and describe what they see. Ask them why they think it is important to have good personal hygiene and cleaning practices when fish farming.

Recap or test questions

The trainer should now use the following questions to recap and emphasise the main issues:

What should we do when we grow our fish to make sure they are good quality and safe for the consumer to eat?

What are the things we should do when we harvest our fish to make sure they get the best price? Why is personal hygiene and cleaning important when fish farming?

Ask if there are any questions.

FISH FARMING 3. HYGIENE

CLEANLINESS
PROTECTS FISH
FROM HARMFUL
BACTERIA



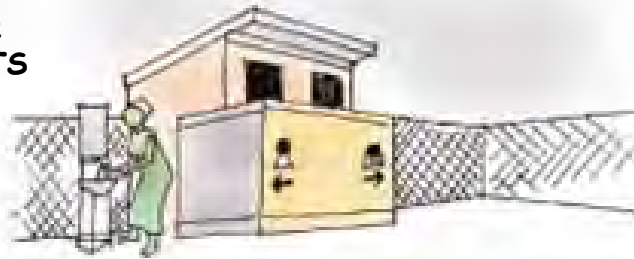
WEAR CLEAN
CLOTHES



WASH HANDS
BEFORE AND
AFTER
HANDLING FISH



USE
PROPER
TOILETS



KEEP EQUIPMENT CLEAN



13. RECORD KEEPING FOR QUALITY AND HYGIENE

Why keeping records of how fish is handled and hygiene is important

Boat owners, crew, processors, fresh and processed fish traders, vehicle owners, casual labourers at landing sites, will learn why it is important to carry out checks on boats, landing sites and transport and what sort of things they are looking for and why keeping records is important.

Training Images

Picture 1. What to check for fishing, landing and transport and why

Checking that fish is handled in a good way and that the right equipment and facilities are being used is good practice either for a business or regulatory authority. To help a checklist of questions or things to look for can be used. Checking is important because if bad practices are being used then this could mean that bad fish is being sold. If bad fish is sold then it can cause problems for consumers and mean that consumers stop buying fish causing a loss to business. If bad fish is sold, it might mean that in the future fish is prevented from entering domestic or regional markets.

Checklist to help find out whether good practices are being used are given in Annex 2 of the manual. It is important to know that these checklists can also be used by fishermen, fish handlers, traders, processors and transporters to check whether their own practices are good.

Trainers Tips

The trainer should follow these steps to help explain the main issues and help the group.

Explain to the group that we are going to recap on some of the main things which cause fish to go bad and the good practices we should be doing. And that these things should be checked so that people know and also the government knows what is happening and whether any problems exist. Discuss the checklists in Annex 2 and how these can be used.

Ask if any of the group have any questions or comments.

Ask the group to say what they think are bad practices that can occur. Then ask them what the good practices are.

Explain that the good things include:

Fish must be protected from contamination

Fish is kept in clean, well maintained and easy to clean container

Fish is iced quickly

Boat must be clean

Fish is unloaded quickly

Fishermen must be clean and treat the fish well and wear clean clothes and be medically fit

Fishermen are trained in fish handling and good hygienic practices

All equipment and surfaces and buildings should be clean, easy to clean, smooth, strong and in good condition

Fish boxes must be drainable

The area must have good drainage and waste disposal process

Toilets and hand washing facilities should be available and supplied with clean water

Access to landing site should be controlled

Fish are landed quickly and not placed on ground

Ice should be made from clean water

Fish should be iced and kept cool

Fish handlers should be trained in good hygienic practices and in fish handling

Fish and ice are protected from dirt and heat and fuel and kept in proper boxes or containers

Fish is loaded and unloaded quickly before and after the journey and always kept cool or properly iced

Ice is made from clean water

Equipment and boat/truck washed after use using clean water and disinfectant

Fish handlers clean and wear clean overalls and rubber boots are medically fit and are trained in fish handling

Vehicle/boat and engine regularly maintained

Ask the group to look at picture 1 and discuss what they see and why record keeping is good.

RECORD KEEPING 1. WHAT TO CHECK FOR



CHECK TO MAKE SURE FISH IS HANDLED WELL AND IN A GOOD ENVIRONMENT....CHECKLISTS CAN HELP WITH THIS

Picture 2. Traceability

This picture deals with the typical stages through which fish goes, from capture to consumer. Some buyers in some markets need to know the details of who caught the fish, for example which boat and where it was caught and where it was landed as well as how it was handled or processed. They need to know this information so if there is a problem with the fish or it causes a problem to the consumer, they know where the fish comes from and work out why the fish had a problem and prevent the same problem occurring in future. It also helps trace where other fish went in case these also need to be recalled or buyer notified of any problems. These markets are often overseas in Europe for example but also to some extent, in your neighbouring countries for example those in the COMESA (Common Market for Eastern and Southern Africa). To help these buyers someone needs to collect this information and keep records of where the fish comes from and which boat caught it. This is called “traceability”. Information that is required for traceability includes:

- Where the fish was caught;
- Date fish was caught;
- Which boat caught the fish and boat registration number;
- Where the fish was landed;
- The quality and species of the fish;
- Transport vehicle used and registration number.

Trainers Tips

The trainer should follow these steps to help explain the main issues and help the group. Ask the group to identify the different activities in this picture. Explain that some buyers want the information about who caught the fish, where it was caught and how it has been handled at the different stages it passes through to get to the consumer.

Ask if there are any questions or comments.

Recap questions

Ask why managers and fish inspectors should check that good practices are being used and how they could do this?

What do they look for when doing their checks? What is traceability and how is it used?

Ask if there are any questions.

RECORD KEEPING 2. TRACEABILITY

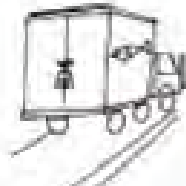
KNOW WHERE FISH COMES FROM SO THAT WE CAN KNOW WHERE PROBLEMS MAY OCCUR



WHO CAUGHT IT?
WHERE WAS IT CAUGHT?
WHEN WAS IT CAUGHT?



WHERE WAS IT LANDED?
WHAT WAS ITS QUALITY?



WHO TRANSPORTED IT?
HOW WAS IT TRANSPORTED?



WHERE WAS IT PROCESSED?
AND HOW?



14. ANNEXES

ANNEX 1: GOOD CLEANING PRACTICE

Cleaning fishing boats, landing sites, equipment and vehicles is very important if we are to avoid a build up of waste materials which attract vermin, insects and reduce the risk of contaminating fish and fish products with spoilage and disease causing bacteria.

A typical cleaning and disinfecting process may involve as many as seven separate steps as follows: Pre-cleaning

Preparation of area and equipment for cleaning which involves steps such as removal of all fish, shellfish and their products from area, protection of sensitive components and packaging materials from water, removal by hand or brush of fish scraps, etc.

Pre-rinse

A rinsing with water to remove remaining large pieces of loose waste materials and dirt.

Cleaning

The removal of waste materials and dirt, grease or other objectionable matter with detergents or soap and water.

Rinse

A rinsing with potable or clean water, to remove all waste and dirt and detergent or soap residues.

Disinfection

Application of chemicals, approved by an official agency having jurisdiction, and/or heat to destroy most micro-organisms on surfaces.

Post-rinse

A final rinse with potable or clean water to remove all disinfectant residues.

Storage

Cleaned and disinfected equipment, container and utensils should be stored in a way that would prevent their contamination.

Check of the efficiency of the cleaning

The efficiency of the cleaning should be controlled as appropriate. Handlers or cleaning personnel should be well trained in the use of special cleaning tools and chemicals. They should be trained in methods of dismantling equipment for cleaning and knowledgeable in the causes of contamination and the hazards involved.

ANNEX 2: CHECKLISTS TO MONITOR HANDLING AND HYGIENE

1. Fishing Boat and Equipment

Date:.....

Landing Site:

Checked by:	Fishing boat
Boat owner	Name of the owner :
Fishermen
Fish Inspector
Name :
.....	Registration Number:
.....

	QUESTIONS	YES	NO
01.	Is the fish protected from contamination?		
02.	Is the fish stored in clean, well maintained and easy to clean container?		
03.	Is the fish iced on board?		
04.	Are the things which touch the fish clean, smooth, easy to clean and long lasting or strong?		
05.	Are the things which touch the fish in good condition and easy to clean and disinfect?		
06.	Is the fish kept somewhere so that it doesn't touch water or engine oil lying in the bottom of the boat?		
07.	Are good fish handling and storage practices being used during fishing and landing and the fish are not being damaged?		
08.	Are the fish unloaded quickly and not getting dirty?		
09.	Are the fish being iced quickly after fishing?		
10.	Are the fish being iced or re-iced soon after landing?		

11.	Are the boat and fish boxes or containers washed using clean water after landing has been completed or before going fishing?		
12.	Do the fishermen wear clean clothes?		
13.	Do the fishermen wash themselves before fishing and keep themselves clean and practice good habits while fishing and landing?		
14.	Are any fishermen having diseases or illnesses?		
15.	Are the fishermen trained in good hygiene practices and fish handling and know about bacteria and how they can cause illness in consumers?		

Corrective actions / Observations

.....

2. Landing Infrastructure, Equipment & Materials

Date:.....

Landing Site:

Checked by:	Landing Site
Landing Site Management	Gazetted landing site
Fishermen	
Seller	Registration Number:
Fish inspector
Name:	
.....	
.....	

	QUESTIONS	YES	NO
01.	Are the things that fish touch clean, easy to clean, smooth, strong and in good condition?		
02.	Is the equipment used to handle fish and ice clean, easy to clean, non-corrosive, strong and in good condition?		

03.	Are the containers used for keeping fish and ice in clean, easy to clean, non-corrosive, strong, with lids, in good condition and allow drainage of water?		
04.	Does the fish handling/selling/storing area have a roof that is easy to clean?		
05.	Does the handling area have good lighting so fish can be handled at night if need be?		
06.	Is the floor raised above ground level, easy to clean and has good drainage?		
07.	Is there a good waste disposal process?		
08.	Are there good clean toilets and hand washing facilities?		
09.	Is there a good supply of clean water?		
10.	Is the access to landing site controlled so that only those allowed to use the area can enter?		
11.	Are there good signs up about prohibiting smoking, spitting, eating and drinking in areas where fish is handled?		
12.	Are the fish taken quickly from the boats to the landing and are the fish handled well?		
13.	Are fish not placed on ground or floor?		
14.	Does someone check the quality of the fish and are the results recorded somewhere?		
15.	Are the fish protected from contamination and kept cool or iced and under the roofed area?		
16.	Is the temperature of the fish measured and the results available?		
17.	After selling at the landing site are the fish transported away quickly?		
18.	Is an ice factory available nearby the landing site?		
19.	Is ice clean and kept clean ?		
20.	Is the landing site cleaned using clean water and where necessary disinfected?		
21.	Are tools and equipment used to handle fish and ice washed with clean water after use, where necessary disinfected and safely stored?		
22.	Are there records kept of when cleaning is done?		
23.	Are animals not found in the site?		
24.	Are the fish not exposed to vehicle exhaust fumes?		
25.	Is all waste material and rubbish got rid of in a good way?		
26.	Is someone keeping records of how people are handling fish?		

27.	Are fish handlers in good health?		
28.	Are the fish handlers trained in how to look after fish properly and how to keep the site clean?		
29.	Are the fish handlers wearing clean protective clothing & proper footwear such as rubber boots?		

Corrective actions / Observations

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3. Collector boat, Equipment & Materials

Date:.....

Landing Site:

Checked by:	Landing Site in which is registered the collector boat
Landing Site Management	Gazetted landing site
Collector boat owner	
Fish Inspector	Registration Number of the collector boat:
Name :
.....	Collector boat owner:
.....

	QUESTIONS	YES	NO
01.	Are fish and ice protected from dirt and heat?		
02.	Are the fish and ice kept in clean, well maintained, easy to clean fish holds or boxes?		
03.	Are the things which fish and ice touch clean, smooth, easy to clean, strong and non corrosive?		
04.	Can the water from melted ice drain away from the fish easily?		
05.	Is the equipment that touches the fish and ice in good condition, easy to clean and disinfect non corrosive and stored safely?		
06.	Are the fish and ice kept separate and away from fuel and oil?		

07.	Does the vessel not transport unauthorised passengers or goods?		
08.	Does the crew handle fish and ice well and store the fish properly?		
09.	Does the equipment not damage the fish?		
10.	Are the fish taken out of the boat quickly and carefully so the fish don't get dirty?		
11.	Is ice loaded onto the boat using containers made of clean, smooth, easy to clean, strong, non corrosive materials?		
12.	Are the people that bring the ice prevented from getting on the vessel?		
13.	Is the fish iced well using good icing practice?		
14.	Is the ice made from clean (potable) water and is it from an authorised ice supplier?		
15.	Are all the collecting vessel surfaces washed using clean water and disinfected after landing?		
16.	Are the fish and ice containers washed with clean water and disinfected after use?		
17.	Are all the tools and equipment that touch the fish and ice washed with clean water and disinfected after use?		
18.	Are the fish handlers clean and wear clean overalls and rubber boots?		
19.	Do none of the fish handlers have any illnesses?		
20.	Do the fish handlers have a medical certificate to say they are healthy and fit to work?		
21.	Are the fish handlers trained in fish handling?		

Corrective actions / Observations

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4. Truck structure, Equipment & Materials

Date:.....

Landing Site:

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Checked by:	Landing Site on which is registered the Truck
Landing Site Management	Gazetted landing site
Truck owner	
Truck driver	Registration Number of the truck
Fish Inspector
Name	: Truck owner:
.....
.....	Insulated truck with ice?
	Insulted truck with cold storage?

	QUESTIONS	YES	NO
01.	Are the inside surfaces of truck smooth, strong, non corrosive and easy to clean and disinfect?		
02.	Can melt water from ice drain away?		
03.	Is the truck insulated or refrigerated so that the fish and ice will be kept cool during transport?		
04.	Are the tools for handling fish and ice made of smooth, strong, non-corrosive, easy to clean and disinfect materials?		
05.	Are the containers or boxes for holding fish and ice made of smooth, strong, non-corrosive, easy to clean and disinfect		
06.	Is the ice clean and from an authorised supplier?		
07.	Is the truck in good condition generally and regularly maintained and service records are available?		
08.	Is enough ice used to cool the fish quickly and keep it cool?		
09.	Are the fish and ice loaded quickly and in way that they don't get dirty?		
10.	Are any fuel, lubricants etc not allowed to come into contact with fish and ice?		
11.	Does someone check the fish temperature regularly and are the records for this available?		

12.	Is the truck washed with clean water and disinfected after each use in a special washing place?		
13.	Are the containers and tools washed with clean water and disinfected after each use and safely stored?		
14.	Are there records of when cleaning is done available?		
15.	Is the health and hygiene of fish handlers checked by someone regularly and do they have a certificate showing they are fit to work?		
17.	Are the fish handlers wearing clean and protective clothing?		
18.	Are the fish handlers trained in fish handling?		

Corrective actions / Observations

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La bonne gouvernance et la bonne gestion des pêches et de l'aquaculture permettent d'améliorer la contribution du secteur à la sécurité alimentaire, au développement social, à la croissance économique et au commerce régional ; ceci en assurant par ailleurs une protection renforcée des ressources halieutiques et de leurs écosystèmes.

La Commission de l'Océan Indien (COI) ainsi que la COMESA (Common Market for Eastern and Southern Africa), l'EAC (East African Community) et l'IGAD (Inter-Governmental Authority on Development) ont développé des stratégies à cette fin et se sont engagés à promouvoir la pêche et l'aquaculture responsable.

SmartFish supporte la mise en œuvre de ces stratégies régionales en mettant l'accent sur le renforcement des capacités et des interventions connexes visant à :

- la mise en œuvre d'un développement et d'une gestion durables des pêcheries;
- le lancement d'un cadre de gouvernance pour les pêcheries durables dans la région;
- le développement d'un suivi-contrôle-surveillance efficace pour les ressources halieutiques transfrontalières;
- le développement de stratégies commerciales régionales et la mise en œuvre d'initiatives commerciales;
- l'amélioration de la sécurité alimentaire à travers la réduction des pertes post-capture et la diversification.

SmartFish est financé par l'Union Européenne dans le cadre du 10ème Fond Européen de Développement.

SmartFish est mis en œuvre par la COI en partenariat avec la COMESA, l'EAC et l'IGAD et en collaboration avec la SADC. Une collaboration étroite a également été développée avec les organisations régionales de pêche de la région. L'assistance technique est fournie par la FAO et le consortium Agrotec SpA.

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By improving the governance and management of our fisheries and aquaculture development, we can also improve food security, social benefits, regional trade and increase economic growth, while also ensuring that we protect our fisheries resources and their ecosystems.

The Indian Ocean Commission (IOC), the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Inter-Governmental Authority on Development (IGAD) have developed strategies to that effect and committed to regional approaches to the promotion of responsible fisheries and aquaculture.

SmartFish is supporting the implementation of these regional fisheries strategies, through capacity building and related interventions aimed specifically at:

- implementing sustainable regional fisheries management and development;
- initiating a governance framework for sustainable regional fisheries;
- developing effective monitoring, control and surveillance for trans boundary fisheries resources;
- developing regional trade strategies and implementing regional trade initiatives;
- contributing to food security through the reduction of post-harvest losses and diversification.

SmartFish is financed by the European Union under the 10th European Development Fund.

SmartFish is implemented by the IOC in partnership with the COMESA, EAC, and IGAD and in collaboration with SADC. An effective collaboration with all relevant regional fisheries organisations has also been established. Technical support is provided by Food and Agriculture Organization (FAO) and the Agrotec SpA consortium.

