



# TECHNICAL ASSISTANCE TO BUILD FOOD SAFETY CAPACITY FOR THE FISHERIES SECTOR



# Spoilage of fish and quality loss

*Training for Ocean Delight, Suriname*



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# Learning Outcomes

**At the end of this session, you should be able to:**

- Understand how fish can go bad during processing.
- Recognize how bacterial and enzymatic spoilage of fish can occur.
- Know why it is important to control the growth of bacteria.
- Learn methods to prevent spoilage and quality loss by proper chilling/icing/freezing and storage of fish.
- Explain the importance of ensuring frozen temperatures are maintained.







Fish is a highly  
sensitive food and  
can easily go bad!

# TRAINING TIPS

- ✓ Microbial growth and metabolism are major causes of fish spoilage → including production of biogenic amines





“Sometimes fish processors and sellers lose money because fish goes bad, or is not processed properly”



# Unsafe, poor quality fish...



PUTS CONSUMER OFF AND DOESN'T SELL WELL



CAN MAKE YOU VERY ILL!



# If we have bad fish, it means that:



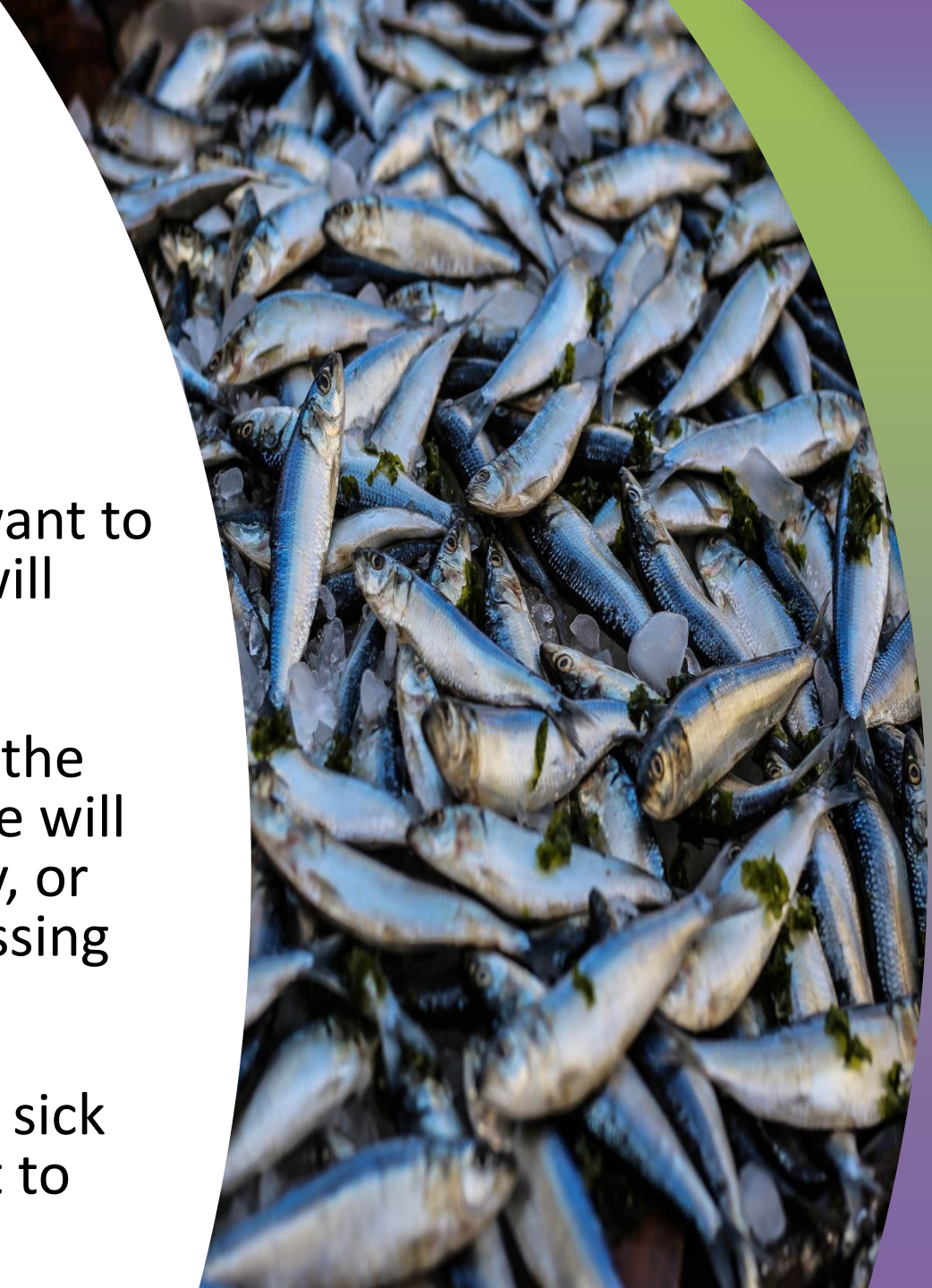
Consumers will not want to buy it and the price will have to drop



It may be left over at the end of the day and we will have to throw it away, or lose money by processing (eg smoking, drying)



It might make people sick (and they won't want to buy from us again)





# Ways to tell if fish has gone bad

## SMELL



It no longer smells fresh

## TASTE



The taste is off

## APPEARANCE



It loses bright colours and appears dull

## GILLS



Gills change from red to brown

## TEXTURE

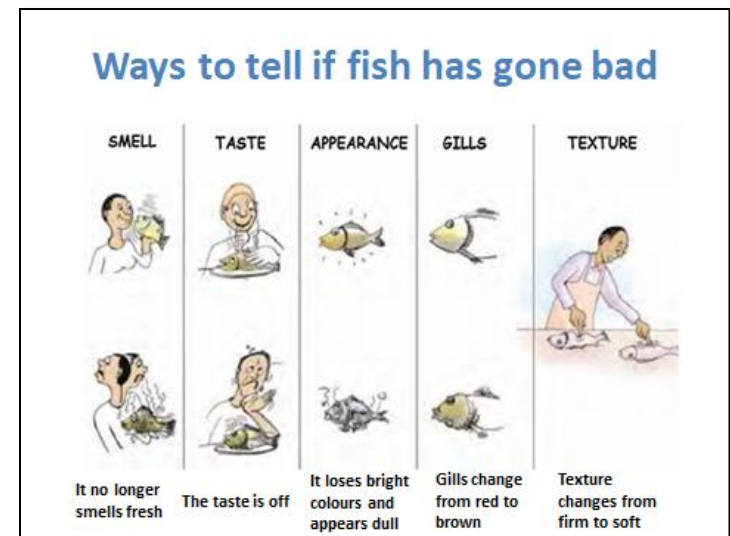


Texture changes from firm to soft

# TRAINING TIPS

✓ The following criteria may be used to assess freshness of fish:

- unobtrusive odour
- firm and resilient flesh
- brilliant red colour of gills
- bright, glossy colour
- glossy black pupils



# Why does fish go bad?

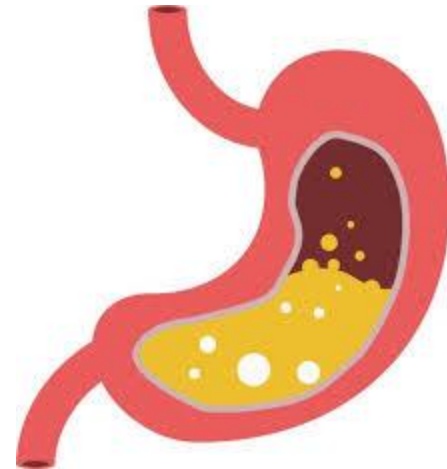
## BACTERIA

- **REMINDER:** Bacteria are very small creatures that we cannot see without a microscope.
- They eat the fish and multiply quickly.
- They excrete poisons and materials which make the fish smell bad.



## ENZYMES

- These are chemicals which all living creatures have.
- Enzymes help us to digest the food in our stomach.





# Where do these bacteria and enzymes actually come from?

**Bacteria and enzymes are naturally on, and in fresh fish:**

**Bacteria are found:**

- On the skin
- In the guts (intestines)
- In the gills

**Enzymes are found in the guts:**

- After death, enzymes in the fish continue to work to digest it
- This is why fish guts spoil first, and why fish spoil faster when they have been feeding

**When fish goes bad it is usually a combination of  
bacteria and enzymes**

To keep fish fresh,  
we must try to stop bacteria from multiplying!



**Reminder**

# Bacteria do not multiply in...



**DRY CONDITIONS**



**VERY HOT TEMPERATURES**



**COLD**

**Most bacteria are killed when it gets too hot and dry. This is why smoking and drying of fish stops it from going bad!**



# **Bacteria and Temperature**

# TRAINING TIPS

- The following slides will illustrate how what the workers are doing contributes to creation of the necessary temperatures to control bacterial growth → through procedures that cause chilling/icing/freezing.
- The temperature danger zone will also be introduced and the importance of working quickly at this temperature range to ensure bacterial growth is minimized.



At 4°C and colder, bacteria grow slowly. **This is called the refrigeration temperature.**







At  $-18^{\circ}\text{C}$  and colder, **bacteria do not grow but are still alive. This is called the freezing temperature.**

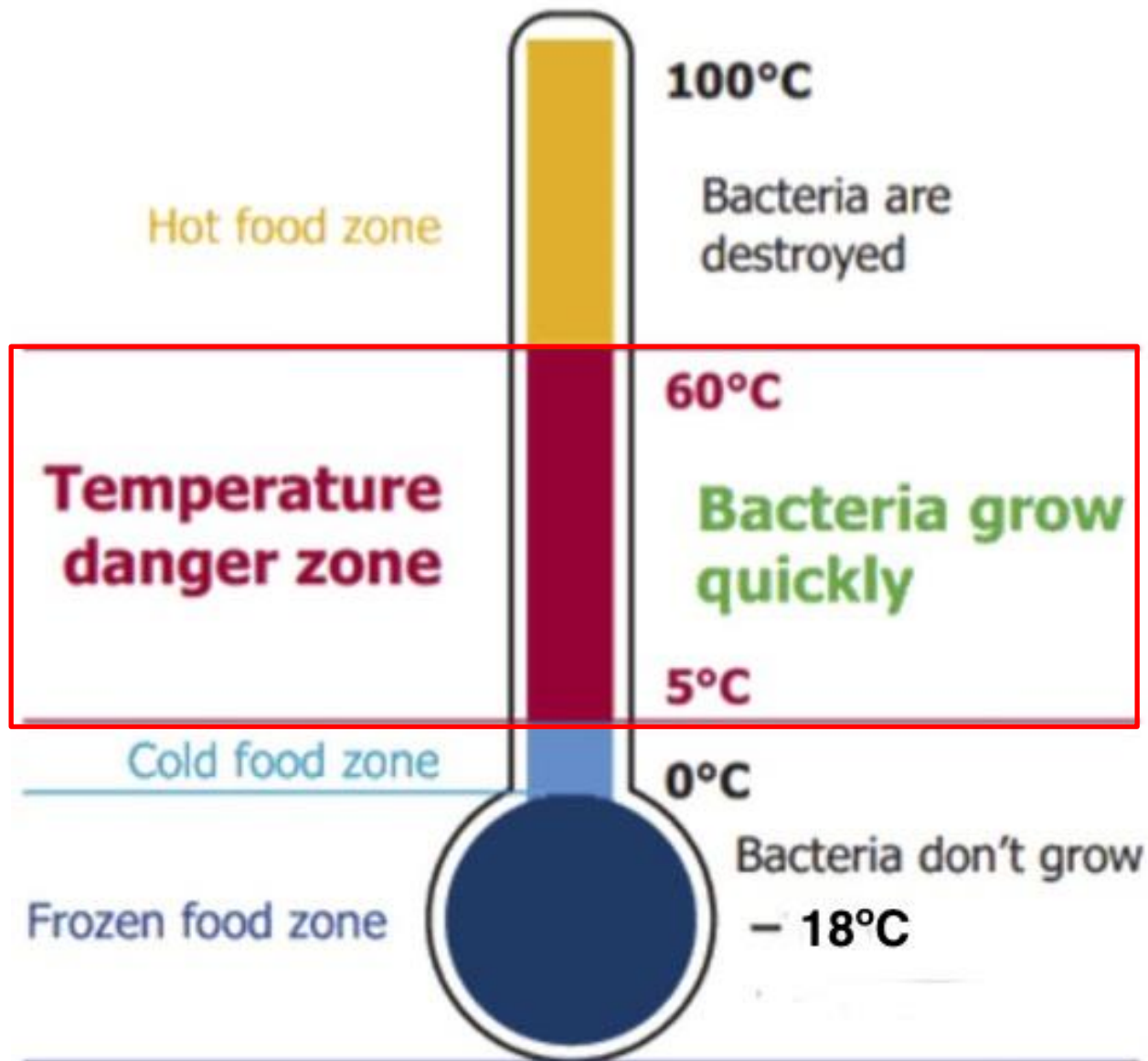




Between 4°C and 60°C bacteria grow quickly. **This is called the temperature danger zone.**



# Temperature Danger Zone





# Where can bacteria come from?

Bacteria can be found in dirty places such as:

- Fishing boats
- Equipment, utensils & surfaces
- Dirty hands
- Beaches



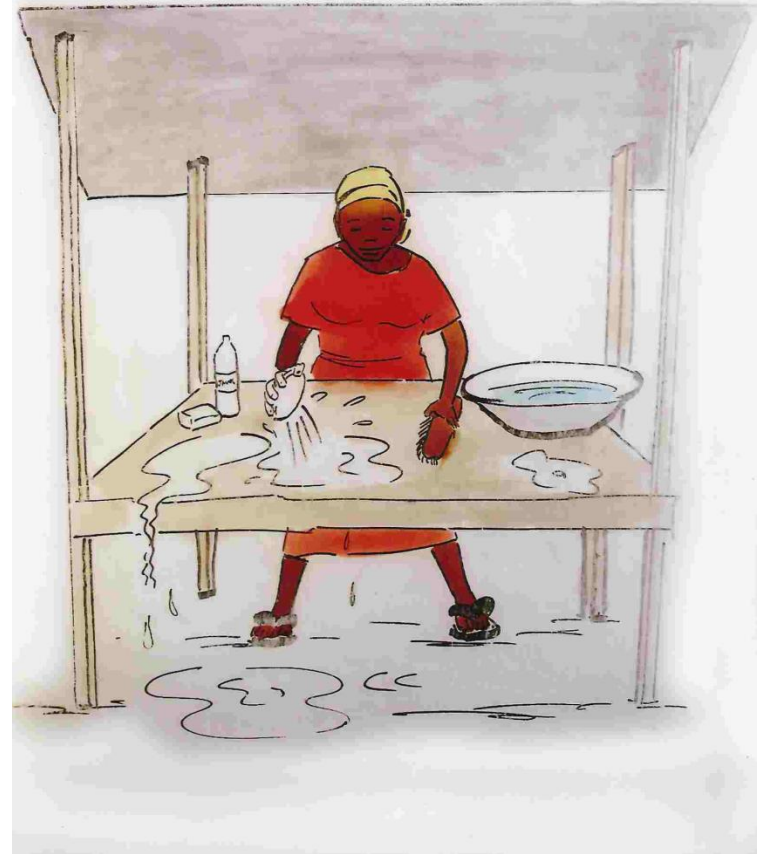
**By keeping things clean we can reduce the amount of bacteria that gets onto the fish**

# The Golden Rule for Keeping Fish Fresh

**KEEP IT COLD**



**KEEP IT CLEAN**



**Using ice to cool fish**

Ice takes a lot of heat energy from the fish → which is used to melt the ice → which turns into water





Ice only cools fish when it:

- Is in contact with the fish
- Melts and turns into water



Ice is a good way to cool fish because:

- It is cheap and effective
- It is easy to transport, store and use
- It can be used at sea and on land
- It is safe



# The difference between freezing and cooling



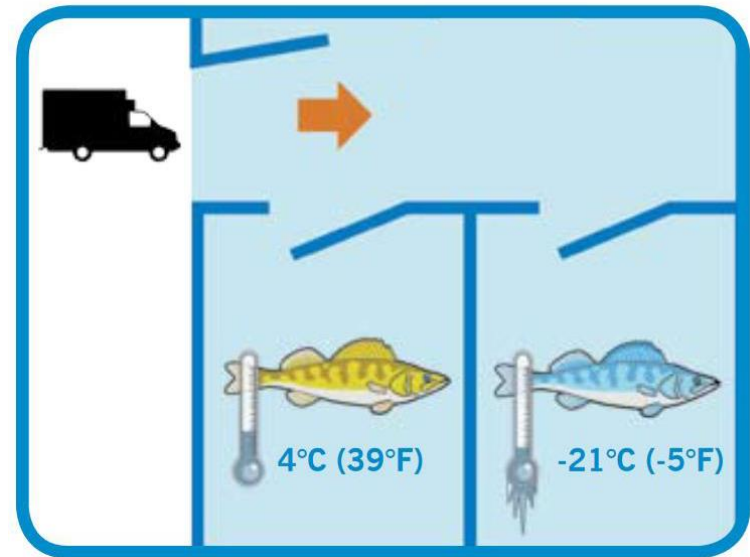
- Cooling → reducing the temperature
- Freezing → reducing the temperature below the freezing point of the fish

(IMPORTANT: When frozen fish is thawed, it should be indistinguishable from fresh fish)

**Purpose: to lower the temperature so that you slow down the rate at which the fish goes bad**

# Temperature controls the rate at which fish goes bad

- Frozen fish must be kept frozen and should be stored at **-18°C (0°F) or colder**.
- All other fish and fish products must be kept cold and should be stored at **4°C (39°F) or colder**.
- Ice used to keep fish cold should be made from clean water that is safe to drink.



**KEEP FISH AWAY FROM  
DANGER ZONE  
TEMPERATURES**

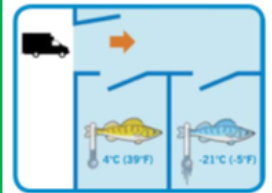


# TRAINING TIPS

- ✓ Temperature is the most important factor to consider when controlling the rate at which fish goes bad.
- ✓ Examples:
  - Cod will remain edible for up to 15 days at 0°C, but may be unfit to eat after only six days at 5°C.
  - White fish frozen quickly and then stored at a controlled temperature of - 30°C will keep in good condition for nine months or more; the same fish kept at - 10°C will remain in good condition for about a month.

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**KEEP FISH AWAY FROM  
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# The cold chain **MUST BE** maintained **ALWAYS...**

*Maintaining cold or freezing temperatures at **EVERY** step in the process is very important:*

Catching → Production → Transport →  
Reception → Storage → Sale to consumer



➤ Cooling: Storage coolers (Between 0°C and 4.4°C)



➤ Adding ice: throughout processing stages, storage coolers, transportation





➤ Rinsing with ice cold water: Washing of fresh fish, glazing frozen fish



➤ Freezing: Storage freezers (Below 18°C)

**Why else is it important to keep fish cool during processing?**

Strict control of the cold chain is essential to prevent the formation of histamine → → →  
Maximum core temperature of fish allowed at arrival in the factory: 4.4°C





# What is histamine?



- Bacteria that naturally occur in the gills and gut of salt water fish break down a chemical in the fish called histidine → is converted to histamine

# Once histamine is formed...

- It cannot be eliminated by heat (cooking) or by freezing.
- Freezing inactivates the enzyme-forming bacteria but they can re-commence multiplication on thawing.

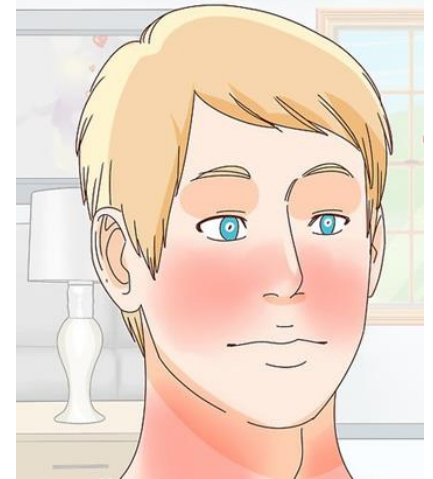


**Eating fish with harmful levels of histamine can cause histamine (Scombroid) food poisoning.**



# Symptoms of histamine poisoning

- Tingling and burning sensations around the mouth
- Facial flushing
- Sweating
- Nausea
- Vomiting
- Headache
- Palpitations
- Dizziness
- Rash
- Peppery or metallic taste





# Histamine-producing fish species

## Scombroid dark-meat fish



**Tuna**



**Mackerel**



**Bonito**



**Marlin**



**Skipjack**

## Nonscombroid fish



**Mahi mahi**



**Sardine**



**Herring**



**Blue fish**



**Yellowtail**

# Why freeze fish?



Frozen fish stays fresh for a long time because bacteria cannot multiply in frozen fish

Fish can be frozen when it is cheap and can be sold when prices are higher

Frozen fish can be transported and sold to customers in other countries far away (e.g export markets)

# Any questions?

