



# ***Fish Preservation and Processing***

This presentation explores the crucial role of fish preservation and processing in ensuring food security and minimizing post-harvest losses. We will delve into the science of fish spoilage, examine various preservation methods, and discuss innovative processing techniques that maximize resource utilization.

 by Rana Abuzaid

# *Introduction:*

Fish, a vital protein source, faces a unique challenge: rapid spoilage after capture. This is due to the combined effects of bacterial activity, enzymatic breakdown, and chemical oxidation of fats, all accelerated by warm tropical temperatures.

In Nigeria, for instance, an estimated 30-50% of harvested fish goes to waste due to poor handling and preservation. This highlights the urgent need for effective techniques to ensure the quality and safety of fish for consumption.

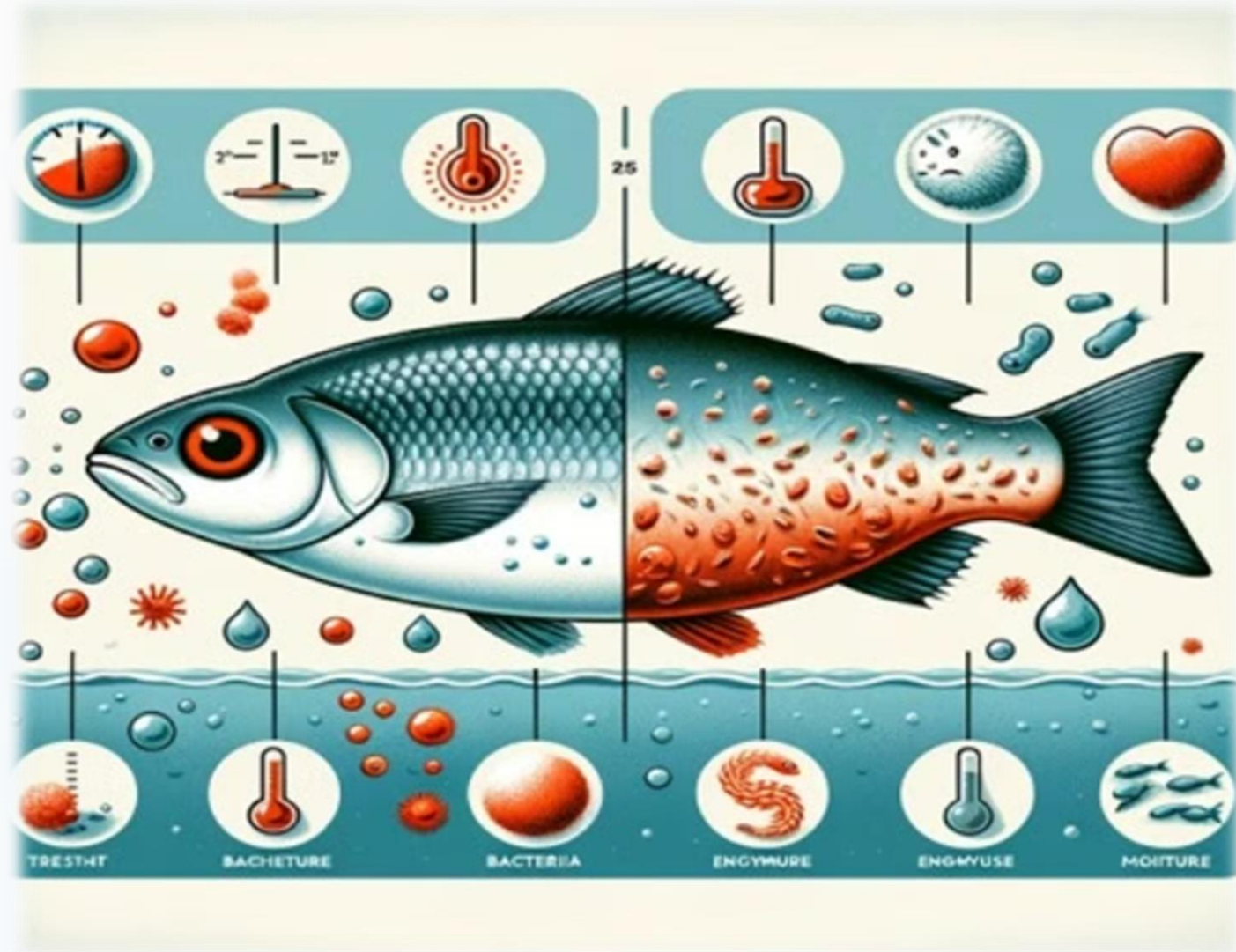


# **Freshness of fish**

- Fresh fish have bright, clear eyes and moist, bright red gills. Cloudy, sunken, or discolored eyes, as well as faded or slimy gills, indicate spoilage.
- Fresh fish should have a thin, clear, and slightly sticky slime. Thick, milky, or foul-smelling slime is a sign of spoilage.
- The flesh of fresh fish should be firm and bounce back when pressed. Soft or mushy flesh is an indicator of spoilage.
- The underside of the backbone should remain natural in color (white or slightly pinkish). Yellowing or browning in this area is a sign of spoilage.
- Fresh fish should have a clean, ocean-like or neutral smell. A sour, ammonia-like, or rotten odor is a clear sign of spoilage.







## ***Causes of spoilage of fish***

-**Fish spoilage** refers to post-harvest changes that reduce freshness and quality, moving from absolute freshness to unacceptable conditions.

-Spoiled fish typically show changes in physical characteristics such as color, odor, texture, eye appearance, gill color, and muscle softness.

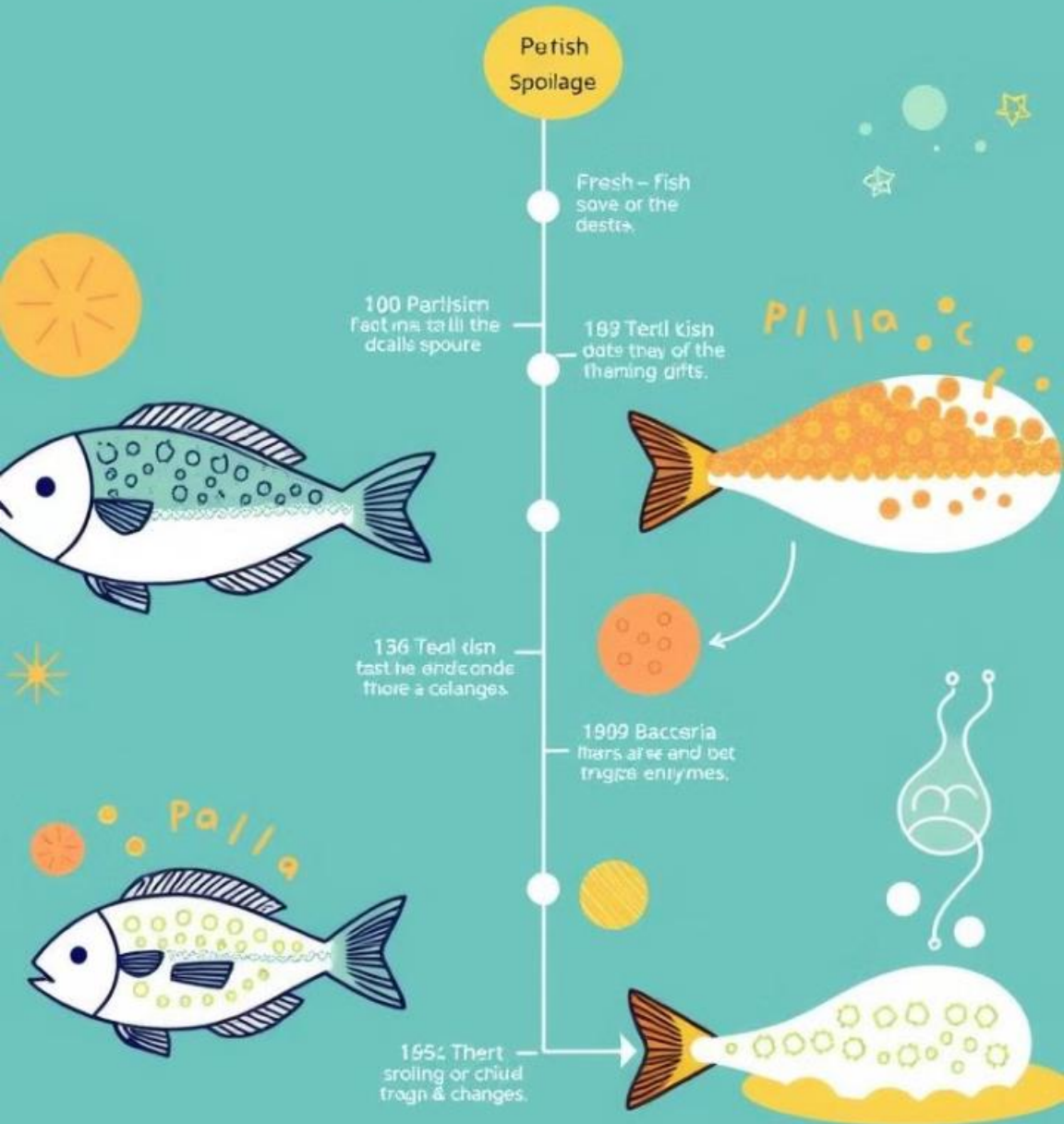
-Spoilage occurs due to **enzymatic, bacterial, and chemical activity in the fish.**

Additional contributing factors include:

- High moisture content
- High fat content
- High protein content
- Weak muscle tissue
- Ambient temperature
- Unhygienic handling

# Fish Spoilage

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## ***Fish Spoilage: A Multi-faceted Process***

1

### **Rigor Mortis**

The first stage, rigor mortis, is characterized by muscle stiffening as the fish's energy stores deplete. This process can be manipulated to improve the texture of fish for specific preservation methods.

2

### **Autolysis**

Following rigor mortis, autolysis occurs, where the fish's own enzymes begin to break down its tissues, leading to softening and changes in flavor. The rate of autolysis is highly temperature dependent.

3

### **Bacterial Invasion and Putrefaction**

Finally, bacteria invade the tissues, leading to putrefaction and the production of foul odors and flavors. This stage is a major cause of fish spoilage and makes the fish unfit for consumption.

# ***Enzymatic Spoilage: The Internal Breakdown***

## **Proteolytic Enzymes**

Proteolytic enzymes, naturally present in the fish's muscle and viscera, initiate the **breakdown of proteins**, leading to softening and a mushy texture. These enzymes can also cause belly bursting by leaking into the muscle tissue.

## **Lipases**

Lipases, another type of enzyme, **break down fats**, leading to the production of free fatty acids and off-flavors. This process, known as lipolysis, contributes to rancidity and reduces the overall quality of the fish.





# *Microbial Spoilage: The External Attack*

## Pseudomonas and Shewanella

Pseudomonas and Shewanella are common bacterial culprits in fish spoilage. These bacteria **produce enzymes that break down proteins and fats**, leading to off-flavors and a slimy texture.

## Trimethylamine (TMA)

The presence of trimethylamine (TMA) is a strong indicator of microbial spoilage. Bacteria convert trimethylamine oxide (TMAO), a natural compound in fish, into TMA, which creates the characteristic **ammonia**-like odor associated with spoiled fish.

## Biogenic Amines

Bacteria can also produce biogenic amines, such as **histamine** and **cadaverine**, which can cause food poisoning. These **toxins** are a serious concern in fish spoilage and require careful control.



# Chemical Spoilage: The Oxidative Threat



## Lipid Oxidation

Lipid oxidation is a major concern in fish rich in polyunsaturated fatty acids. This process involves the **breakdown of fats** through a series of free radical reactions, leading to rancidity and off-flavors.



## Metal Catalysts

Metals, such as **iron and copper**, can act as catalysts in lipid oxidation. This makes it crucial to control metal content in fish processing and storage.



## Temperature and Oxygen

Both temperature and oxygen levels play a significant role in lipid oxidation. Controlling these factors is crucial to prevent or slow down this process.



# Preservation for Short Duration: Maintaining Freshness

1

## Chilling

Chilling with ice is the most basic method of preserving fish for short periods. This helps to slow down bacterial growth and enzymatic activity, but it does not eliminate these processes entirely.

2

## Ice Water

Using ice water, a more effective method, allows for quicker cooling and helps to remove bacteria and slime from the fish. This method is particularly suitable for transporting fish over short distances.

3

## Proper Handling

Even with chilling, proper handling is essential. This includes avoiding rough handling, draining melt water from the fish, and minimizing the time the fish spends out of the cold.



# ***Salting***

## ***Dry salting***

Involves sprinkling salt on fish to drain fluids. It is done on simple surfaces with layers of salt between fish layers, commonly used on fishing boats. Saltiness can be reduced by soaking the fish in water.

## ***Wet salting***

Involves preserving fish in brine using a sealed container. The fish is cleaned and slit for better absorption, kept submerged with a weight, and stored in a cool place. The brine can be reused up to three times.



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## **Drying**

Drying involves exposing fish to sunlight or air to remove moisture, which inhibits bacterial growth and extends shelf life.



# Smoking

## Smoking and roasting

preserve fish for up to 12 hours, typically for immediate consumption or market transport.

- Fresh fish is smoked over a small fire for 30 minutes and can be stored in an aerated container.

## Hot smoking preserves

fish for up to 48 hours.

- Small fish are salted and dried, then smoked for an hour. Larger fish are smoked in two stages: slow and fast fire. It can be stored for 2-3 days.







# ***Canning: A Sterilization Process***

Canning involves heat treatment of fish in sealed containers, destroying bacteria and enzymes, and creating a shelf-stable product.



# Demerits of Fish Preservation



## Chilling

Chilling can cause denaturation of fish flesh, affecting texture and flavor.



## Salting

Excess salting can lead to the growth of salt-tolerant bacteria, causing spoilage.



## Smoking

Smoking can accelerate fat rancidity and reduce the digestibility of fat products.



## Canning

Canning can result in the loss of certain vitamins and nutrients.



# Handling the Catch



## **Transferring the Catch**

Moving the fish from the fishing gear to the vessel with minimal damage.



## **Bleeding, Gutting, and Washing**

Removing blood, internal organs, and scales to improve quality and reduce spoilage.



## **Sorting and Grading**

Separating fish by size, species, and quality for different markets.



## **Chilling**

Cooling the fish to slow down spoilage and extend shelf life.





# Processed Fish Products: Expanding Options

1

## **Fish Mince**

Fish mince is a versatile ingredient used in a variety of products, such as fish portions, fish cakes, and fish sausages.

2

## **Surimi**

Surimi is a concentrated fish protein used in products like fish cakes, fish sticks, and fish balls.

3

## **Fish Sauce**

Fish sauce is a fermented condiment used in many Asian cuisines, adding a unique umami flavor.

4

## **Fish Meal**

Fish meal is a protein-rich product used as a feed ingredient for livestock and aquaculture.





# Key Takeaways and Recommendations

1

## Importance of Preservation

Proper fish preservation is essential for minimizing waste and ensuring the availability of high-quality fish products.

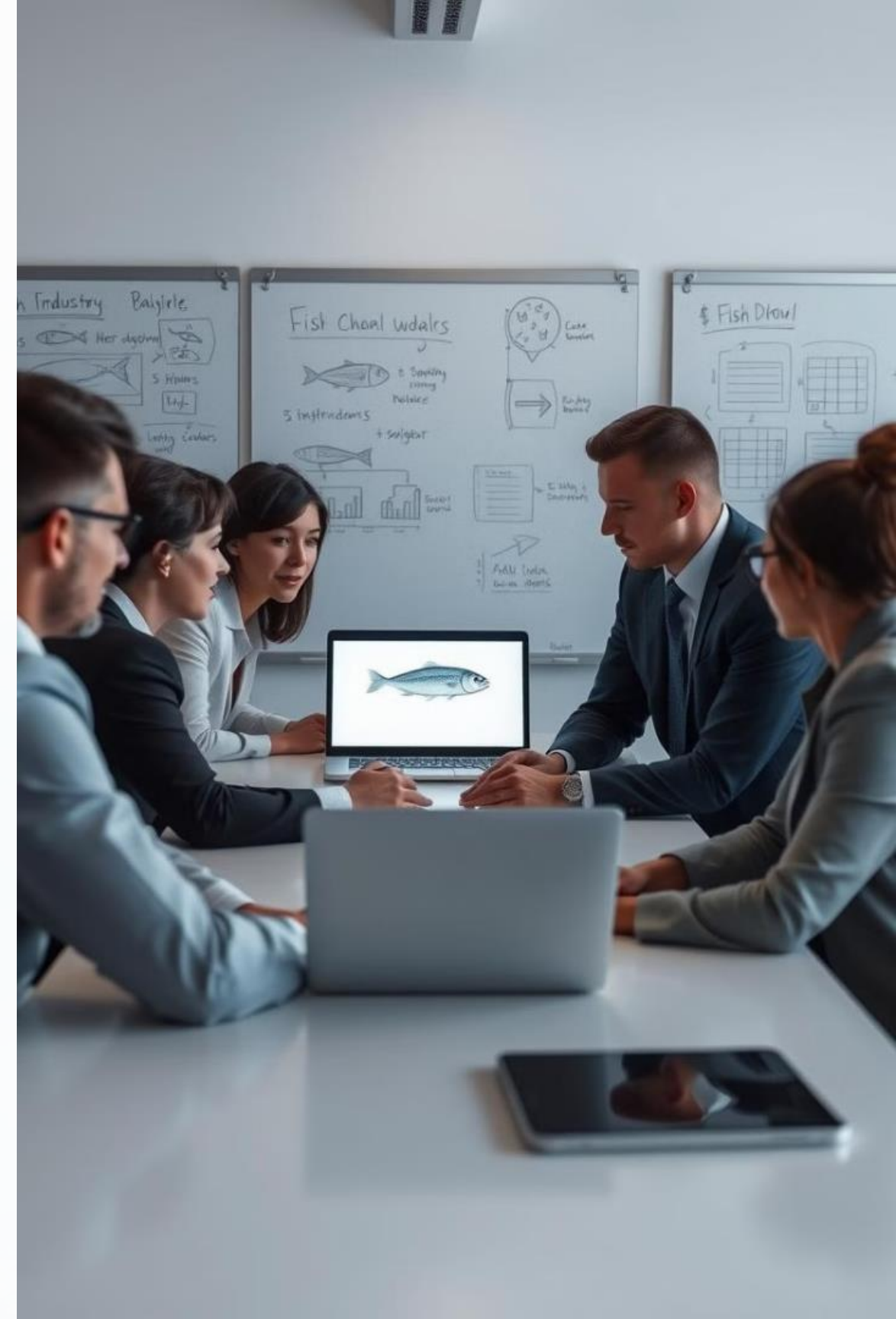
2

Government investment in fish processing infrastructure and research can boost the industry and create economic opportunities.

3

## Continued Research

Further research is needed to develop innovative and sustainable fish preservation and processing techniques.



Thank you for coming and we hope this information is useful to you.

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