PROPER FISH HANDLING: A PREREQUISITE TO GET EXCELLENT PRODUCT

In African countries generally, fish are poorly handled, some die in the harvesting gear, while others get mixed up with sand and other contaminating debris at the landing shores. In aquaculture, the method of harvesting which usually involves the dragging of sein nets on the bottom of a pond) contaminates the fish with mud and silt. The scales skin of some fish, like Clarias and Chrysichthys species can be badly bruised and damaged.

In addition to poor handling, the fish may pass through a long chain of distribution network before reaching the ultimate consumer. The simplified distribution chain for fish in most situations is:

Fisherman ⟶ wholesaler ⟶ Retailers ⟶ consumers

Fish must remain in acceptable quality to the end of this chain.

The high temperature and high relative humidity of the tropics greatly facilitates spoilage, resulting in a considerable loss of fish. To maintain good quality of fish from fisheries, good handling practices must involve keeping the fish cool, fish undamaged, fish flesh clean.

SPOILAGE INDICES

Bacterial are unicellular microscopic organisms which occur almost everywhere in nature. They are living things which often cause fish spoilage. They might have a generation time of 20 minutes at 30^{o}C. In such a case a single bacterium may give rise to 4000 bacteria in 4 hours, 16 million in 8 hours and one billion in 10 hours, if temperature,

water content of the fish, osmotic pressure, pH medium, redox potential and the nutrient composition of the environment are conducive.

Bacteria Spoilage

Some bacteria are naturally present in the living fish but their multiplication and growth is limited by the general metabolic reactions of the fish (low pH of gut, anaerobic environment in the gut and its enzymes, acid in the viscera which often digest the bacteria and cause the gut condition to be unfavourable for their growth). When a fish dies, these metabolic actions are slowed down and micro-organisms begin to multiply. The bacteria living in he gills penetrate the flesh and the vascular system. Those lining the gut penetrate the nearby tissues through the pertorieum. Bacteria in the slime penetrate the skin into the environment tissues. The enzymes in the gut breakdown its lining and thus give way for bacteria to enter into the tissues. These bacteria secret digestive juices and enzymes which breakdown the tissues and cause spoilage of the fish. The end result of microbial invasion of the tissues is the loss of fresh flavour and odour of the fish replacing it with a sour and stale odour which changes to Ammoniacal, putrid and faecal odour at the later stage of spoilage.

The initial elastic texture of the fish changes to softer flesh with grittiness making the fish exceedingly soft flabby retaining finger identifications in the skin. The flesh of such spoilt fish is later torn from the backbone (unfit for human consumption and must be discarded, down graded for the production of animal feed supplements (an economic loss, hence minimize fish spoilage through proper handling of fresh fish.

Enzymatic Spoilage

Enzymes are high molecular weight metabolic catalyst, protein in natureand are needed in small quantities. They operate in their native forms and become denatured when conditions become unfavourable. Temperature, acidity, substrate concentration and enzyme activation and synchronization affect enzyme activities

Enzymatic spoilage is known as AUTOLYSIS i.e. self digestion. It is a process whereby enzymes, against which the fish is normally protected alive, under optimal conditions for enzymatic activity, post mortem digest the fish tissue. Such enzymes are present in the fish gut, on the skin and in the tissues. Autolysis causes off-odour, off-flavour and softening of flesh and tissues. It causes general disruption and permission of movement of enzymes and oxygen in the muscle. Such enzymes include Proteolytic and Cathepsins enzymes. They make the fish unpalatable, unattractive and unfit for consumption.

Cutting should be carefully and thoroughly done, and belly cavity should also be thoroughly washed.

Cathepsin is more active in fish than in meat resulting in faster autolysis in fish.

Chemical Spoilage

This is caused by the reaction of the fat of fish giving rise to unpleasant odour and flavour. This is called RANCIDITY which is as a result of highly unsaturated fatty acids in fish oil

ASSESSMENT OF FISH SPOILAGE

1. **Physical method**
2. **Instrumental test**: Placing a Torrymeter on the skin of about 16 randomly selected fish and picking 1 of the result as representative of the entire lot

3. **Subjective method**: involves the use of human sense organs and not machines, chemicals or reagents. It is often called sensory tests. This may be bias but it represents the customers view. Example of organoleptic test involves the utilization of sense of touch, smell, sight and taste for quality assessment of fish

Sight: gill colour, presence or absence of indentation.

Flavour: for degree of freshness, is also a combination of taste and odour caused by volatile organic compound. It is the most used objective test rather than taste panel evaluation even though too expensive (chromatograph which measure a flavour at a time). Thus they often train taste panel to prevent bias

Texture: state of the muscles, firmly held condition of the belly, presence of blemish and parasites on fish, visual examination in cured fish, general appearance, bulging cans, broken fishes.

Touch: texture of fish, elastic form, soft or flabby, fragmentation in dried whole fish, if fish end without breaking, it is flexible, **Brittle--**if it break into small

Smell--good and bad flavour, smoked or cooked (limited use because not all can smell)

Taste: sweet, bitter, salt and sour (salty or acid fermented and marinades-analytical method gives better results).

FISH PRESERVATION

Some of he fish preservation techniques have broadly grouped into two:

- Low temperature technique and,
- High temperature techniques

Low Temperature Techniques

This technique preserves fish by lowering their body temperature to a level that inactivates micro-organisms. It also reduce if not eliminate he activities of microbes. Low temperature techniques of preservation are also known as modern fish preservation methods and it includes:

a. Chilling: chilling involve the use of ice-blocks or ice flakes, refrigerated sea water (RSW), or chilled sea water (CSW)
b. Freezing: it is carried out using freezer e.g. blast freezing (using blast freezer), plate freezing, etc.
c. Cold storage using cold room

Boxing

This involve laying fish on a 5cm thick ice at the bottom of a container (made of wood, metal, plastic, etc) followed by alternate layers of ice and fish with ice layered at the top of the uppermost layer of fish. Boxing has advantages over bulking and shelving in that fish could easily be separated into species, sizes or catches by using different boxes. Also removing fish boxes from fishing vessels are much less laborious than in bulking or shelving.

Bulking

This is laying fish on a bed of ice about 5cm thick and place alternate layers of ice and fish at a fish to ice ratio of one to one up to a total height of one meter. The demerits of bulking are that fish in bulk storage may suffer damage from pressure of the fish on top, including shrinkage and excessive loss in weight.

Shelving

This is a method whereby fish are laid out on shelves formed between the vertical partitions in the fish-hold. This method can be described as shallow bulking and where it is done correctly, it is a good method of storage. Fish can be stored by arranging fish orderly belly downwards and head to tail on ice 5cm thick on shelves with the fish completely surrounded by ice.

FREEZING

Freezing is one of the easiest and least time consuming methods of food preservation. Most food retains their natural colour, flavour and texture better than when other methods of food preservation are used. In addition, the kitchen remains cool and comfortable during the process.

High Temperature Techniques

This technique involves the use of heat i.e. raising the temperature of fish to a level not suitable for microbial multiplication and reducing the moisture content of the fish. This technique includes:

a. Drying: this involves the use of solar radiation to increase the temperature of the fish and to reduce its moisture content. Example of solar fish drier include: mud/bamboo solar drier, oil drum solar drier, solar dome drier, etc.

b. Smoking: this involves the use of smoke from fire wood in smoking kilns to dried and preserve the fish. Example of smoking kiln include traditional Ghananians mud oven, NIOMR and Kaiinji gas smoking kiln, Chorkor fish smoking kiln, etc.
c. Salting and Drying: applying salt to the body surface of fish and sun drying the fish.

DIFFERENCES BETWEEN HIGH TEMPERATURE TCHNIQUES AND LOW TEMPERATURE TECHNIQUES

High temperature	**Low temperature**
This constitute the traditional methods of fish preservation	**This constitute the mothern methods of fish preservation**
It takes place even at the absence of electricity	May not take place except thre is electricity or source of light
Can take place at the village, level at any where and at any time	May only be used in the towns and cities wherenthere is source of power
Low cost	Expensive
Takes place under high ambient temperature	Takes place under low temperature (<4^{o}C)
Labour intensive	Not laborious
Temperature may not often be controlled because there is no regulator	Temperature is often controlled (has regulator)
Time consuming	Time managing
Not ofen hygienic	Highly hygienic
Allow few quantity to processed at a time	Large quantity can be processed at a time
Needs little or no skill	Required skill in operation
Quality of products varies	Quality of product is uniform
Package is not often attractive	Package is very attractive
e.g. smoking, sun drying, and salting	e.g. freezing, chilling, icing and cold room