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Fresh Fish: Handling, Transportation and Preservation

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Abstract

The fresh fish has provided an immense opportunity to millions of people for employment as well as food. 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. The purpose of processing and preserving fish is to consume fish in good, safe and usable condition. Fish begins to spoil as soon as it is caught, perhaps even before it is taken out of the water as fish is a highly perishable commodity. Fish can be kept alive in floating cages, wells and fish ponds. Stocking of good quality and healthy fish seedlings or fingerlings is a prerequisite for successful fish culture and optimum profit. Similarly, price for fish produce is often higher if live fishes are transported suitably to markets and supplied fresh to consumers.

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. 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.

Fish is one of the protein foods that need careful handling. This is because fish spoils easily after capture due to the high tropical temperature which accelerates the activities of bacteria, enzymes and chemical oxidation of fat in the fish. The purpose of processing and preserving fish is to consume fish in good, safe and usable condition. The steps necessary to accomplish this begin before the fishing expedition starts, and do not end until the fish is eaten or processed into oil, meal, or a feed. Fish begins to spoil as soon as it is caught, perhaps even before it is taken out of the water as fish is a highly perishable commodity. Therefore, the key to delivering a high quality product is close attention to small details throughout the entire process of preparation, catching, landing, handling, storage, and transport. Fish that becomes spoiled or putrid is obviously unusable.

Spoilage proceeds as a series of complex enzymatic, bacterial and chemical changes that begin when the fish is netted or hooked onboard (Burt, 2003). This process begins as soon as the fish dies in gills, gut and intestine. The main objective of this study reveals the quality and acceptability of end product that depends on quality of raw material i.e. how the fish was handled onboard the vessel, how it was preserved, packaged and transported. Extreme alertness and utmost care to be taken during handling onboard.

Handling Onboard

This means that fish caught by a fishing vessel need handling so they can be stored safely until the boat lands the fish on shore. Typical handling processes are (FAO, 2011).

- Transferring the catch from the fishing gear (such as a trawl, net or fishing line) to the fishing vessel.
- Holding the catch before further handling.
- Sorting and grading.
- Bleeding, gutting and washing.
- Chilling, storing the chilled fish and unloading, or landing the fish when the fishing vessel returns to port.

The main factors affecting the quality of fish onboard are (Balachandran, 2001):

- Cleanliness of deck and fish holds as well as equipment and utensils used.
- Quality and quantity of water used.
- Temperature of fish, general handling practices adopted.
- Personal hygiene of fish handlers.

Washing

Immediately after unloading the catch should be washed well to free from dirt and other extraneous matters. Seawater when taken out of shore will have low bacterial load which is good for washing fish. Sometimes water taken from distant open sea may be chlorinated with 10 ppm chlorine level to make it safe for use.

Sorting

Depending upon the gear employed, the pelagic shoals consists generally single species whereas trawl catch comprises of several species from small to big. The sorting is done as species wise as also size-wise. Fish which are unfit for preservation or human consumption as they are bruised, diseased, decomposed are separated and thrown to sea or converted to fish meal. High value fish are sorted and preserved (Balachandran, 2001).

Removal of the Scales

For a whole flat fish, wash and cut off the head. Holding the fish by the tail and using a sharp knife, Scale it by scrapping toward the head. Scrap until all the scales are removed. Turn the fish and scale the other side.

Evisceration and Removal of Gills

Removal of gills, viscera and bleeding should be done without contamination of other fishes and no cut or bruise inflicted in belly portion. Bleeding is done in

large fishes like tuna, seer etc by slitting throat followed by immersion in cold water for 30 mins (Balachandran, 2001).



Figure 1: Removing head and scales from the fish

Handling Live Fish

Typically, the fish are placed in a container with clean water, the water temperature is then lowered and the fish are starved to reduce their metabolic rate. This decreases fouling of water with metabolic products (ammonia, nitrite and carbon dioxide) that become toxic and make it difficult for the fish to extract oxygen (FAO, 2011). Fish can be kept alive in floating cages, wells and fish ponds. In aquaculture, holding basins are used where the water is continuously filtered and its temperature and oxygen level are controlled.

The time lag between catching, transportation and landing encourages fish flesh quality deterioration and short shelf-life for such fish. This could be prevented by observing the following rules:

- Kill the fish immediately after been caught by piercing the head with a needle or any sharp object, this prolong the period the fish will stiffen.
- Cut the fish immediately and remove the gills and cut off the head.
- Wash with clean running water.
- Put the fish on ice in insulated boxes. In the absence of ice, the fish should be kept in the shade in clean containers away from intense sunlight.
- Get the fish as fast as possible to the landing area for further preservation and sales.

Preservation of Fish (Onboard)

Icing

The easiest, cheapest and reasonably efficient method of lowering the temperature of fish is by icing. Ice is an effective and ideal cooling medium. It keeps the fish

cool, moist and glossy and controls deterioration. The fish: ice ratio maintained at 1:1. The rate at which the fish spoils vary linearly with temp in the range from -1 to +2.5 °C. The shelf life of fish in ice varies from 3-15 days.

Ice works in two ways:

- It reduces the growth rate of bacteria by reducing the temperature of the fish;
- It also washes the bacteria and slime away as it melts. Because of this, it is important to keep melt water drained away from the fish.

Methods of Icing Onboard: The fish holds should be robust, hard and smooth surface for easy clean. It should be free from dirt and bacteria as well as adequately insulated without any cracks and crevices (Balachandran, 2001).

Bulking

The fish hold is divided into a number of sections or pounds boards supported by upright bars or posts called stanchions. A layer of ice is spread over the bottom followed by layer of fish and ice together until the height of fish and ice become 50 cm and 5 cm ice layer on top.

Shelving

The fish hold is divided into removable shelves where the fish is spread in layers over ice. The lowest shelf with ice is 5 cm thick. Fish and ice are arranged in rows.

Boxing

Fish boxes made of plastic and aluminum alloys are used. The 5 cm thick ice layer was put at bottom and then the alternate layers of fish and ice are kept until the box is almost full.

Storage in Insulated Boxes: Boxes governed with ambient temperature and 10-15 cm thick expanded polystyrene insulation is common in use. It is usually used for low-volume high value species like shrimps, cephalopods that becoming very popular.



Figure 2: Handling fishes onboard in insulated boxes

Preservation for Short Duration

Chilling

Chilling is a very effective method of controlling spoilage in fish. The objective is to cool the fish to low temperature without freezing it. There are some alternative chilling methods which are as follows (Balachandran, 2001):

- **Refrigerated Seawater (RSW):** Seawater contains 3-4% sodium chloride and freezes at about -2 °C. RSW is circulated through tanks installed onboard the fishing vessels.

- **Chilled Seawater (CSW):** It is the method of storing fish onboard is in seawater or dilutes brine made upto the concentration of seawater by mixing it with ice. It is a very simple method.

Drying

It is one of the oldest methods of preservation. It means removal of water from body. There are different types of drying like sun drying, natural drying, and mechanical drying. Small fish are mostly sun dried on mats, or suspended. In the case of large fish, hanging is better if they are merely split. It reduces microbial activity and dried foods are less expensive.

Salting

There are many different kinds of salt, some being better than others for fish curing. It is one of the important methods of preservation. There are two types of salting *i.e.*, wet salting and dry salting. In wet salting, the principle is to keep the fish for a long time in brine. To be good, the brine must float a fish. In dry salting, the fish is salted but the juices, slime and brine are allowed to flowaway. Dry salting can be done in an old canoe, or on mats, leaves, boxes, *etc.* Another method is kench salting, where the fishes are salted in layers and brine is drained out. There are different types of curing like Mona curing, Pit curing, Colombo curing *etc.*



Figure 3: Drying and salting of fish

Transportation

Stocking of good quality and healthy fish seedlings or fingerlings is a prerequisite for successful fish culture and optimum profit. Similarly, price for fish produce is

often higher if live fishes are transported suitably to markets and supplied afresh to consumers. Sometimes, transport of large size live fishes, especially brooders is necessary for breeding purpose. Also, fish fries and juveniles are transported and released into rivers for fish replenishment under river ranching or rehabilitation programs. Conditioning of fish seedlings or live fishes (preparing for transport) and their transport with least stress from source to WHS or ponds, rivers, markets etc. as the case may be increase fish survival rate, better the transport economics and provide healthy fish seeds for stocking or live fishes for other intended purposes. The traditional method for transport of fish seeds using open containers or hundies and slings practiced in plains may not be fit for north-western Himalayas in general.

Two basic transportation systems are available for transport of live fishes, *i.e.*, (i) **The closed system** of transport: packing of fishes in polythene bags under oxygen pressure, and (ii) **The open system**, where fishes are transported in water-filled open carrier of trucks.

The three common methods in transportation of live fish are (Balachandran, 2001):

- **Waterless method:** in case of shellfishes like clam, mussels, oysters, shrimp and crabs.
- **Plastic bag method:** for ornamental fishes and fry/ larvae of freshwater fish.
- **The tank method:** the fish is kept in water tanks and open to the atmosphere.
- Transport of fish seedlings in ploy-bags filled with limited water and oxygen reduces the volume and weight of transport water and provides economical advantage for transport up to 48 hours.
- During fish transport in closed systems with pressurized oxygen atmosphere inside bags, oxygen content in transport water is not a limiting factor usually.
- Large size fishes in higher quantity can only be transported with ease in open carrier of trucks up to a short distance, which can be covered in a maximum of 12-14 hours.

Guidelines for Transport

- During transport of live fishes, fishes remain in a limited quantity of water that causes crowding and increased oxygen consumption due to increased metabolism in them leading to higher concentration of CO and ammonia, reduction of pH 2 and increased bacterial contamination in transport water.

- Do not excite fishes by carefully handling them, since excitement or anxiety increases oxygen consumption three to five times in them. If transport duration is less transport density may be increased moderately.
- Transport the seeds either during morning or evening or night to have the benefit of cooler journey transit.
- Conditioning prepares fish seedlings or live fishes to newer environment, where they will be maintained at higher density.



Figure 4: Fishes packed in polythene bags

Conclusion

The fresh fish handling, preservation and transportation has created an immense interest among the researchers and industrialists to know more about the scenario of fish spoilage.

If the fish handled with utmost care with good hygienic practices, then spoilage of fresh fish can be avoided. This topic concludes the basic finding of handling onboard of fresh fishes as well. The major impact of preserving fresh fishes leads to prevent spoilage. So, there should be more articles related with this topic to create awareness among fisherman as well as fish processors in near future.

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