

# **TYBSc Fishery Biology**

## **Semester V**

**Reference notes**

**Unit 6: Quality control and packaging**

**Unit 7: Fish Marketing**

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## **Unit 6: Quality control and packaging**

### **6.1 Post mortem changes and mechanism of spoilage:**

After the death of a fish, considerable changes take place in the body. The changes, however, vary on the basis of size and types of fish, physical condition, season and death condition. Generally following changes occur in the carcass of fish.

Following the death of fish, the brain control as well as blood circulation ceases. This results in an inability to resynthesize ATP and to transport various materials essential in living cells. The death-stiffening of the muscle tissue, referred to as rigor mortis, occurs sooner or later and glycolysis forms some organic acids to decrease in pH values.

After finishing the rigor mortis, the muscle tissue loses the stiffness, followed by autolysis forming amino acids and other low molecular weight compounds. Then, microorganisms grow by utilizing these compounds which exist before and after the autolysis, and subsequently, attack high molecular weight compounds. During the spoilage by microorganisms, some specific putrefactive substances such as trimethylamine and histamine are formed depending on fish species. An outline on the postmortem changes in fish and shell fish is given in.

### **Hyperaemia:**

An excess of blood in the vessels supplying an organ or other part of the body. It can have medical implications but is also a regulatory response, allowing change in blood supply through various tissue through vasodilation.

### **Types of Hyperaemia:**

There are two types of hyperemia:

- Active hyperemia happens when there's an increase in the blood supply to an organ. This is usually in response to a greater demand for blood — for example, if you're exercising.
- Passive hyperemia is when blood can't properly exit an organ, so it builds up in the blood vessels. This type of hyperemia is also known as congestion.

### **Causes of hyperemia:**

- Each type of hyperemia has a different cause.
- Active hyperemia is caused by an increased flow of blood into your organs. It usually happens when organs need more blood than usual. Your blood vessels widen to increase the supply of blood flowing in.

**Causes of active hyperemia include:**

- Exercise. Your heart and muscles need more oxygen when you're active. Blood rushes to these organs to supply extra oxygen. Your muscles need up to 20 times their normal supply of blood during a workout.
- Heat. When you're running a high fever or it's hot outside, extra blood flows to your skin to help your body release heat.
- Digestion. After you eat, your stomach and intestines need more blood to help them break down foods and absorb nutrients.
- Inflammation. During an injury or infection, blood flow to the site increases.
- Menopause. Women who are in menopause often have hot flashes, which causes a rush of blood to the skin — especially of the face, neck, and chest. Blushing is a similar response.
- Release of a blockage. Hyperemia can happen following ischemia, which is poor blood flow to an organ. Once ischemia is treated, blood rushes to the area.
- Passive hyperemia happens when blood can't properly drain from an organ and begins to build up in the blood vessels.

**Causes of passive hyperemia include:**

- Heart failure or ventricular failure. The left and right ventricles are the two main pumping chambers of the heart. The right ventricle pumps blood to the lungs, and the left ventricle pumps oxygen-rich blood to the body. When the heart can't beat well enough to push blood through the body, blood begins to back up. This backup causes swelling, or congestion, in organs like the liver, lungs, spleen, and kidneys.

**Rigor mortis:**

Rigor mortis starts immediately or shortly after death if the fish is starved and the glycogen reserves are depleted, or if the fish is stressed. The method used for stunning and killing the fish also influences the onset of rigor. Stunning and killing by hypothermia (the fish is killed in iced water) give the fastest onset of rigor, while a blow on the head gives a delay of up to 18 hours

**There are 3 steps of rigor mortis progress in fish.**

Immediately after death, the fish muscles are totally relaxed. The fish is soft and pliable and the texture is firm and elastic to the touch. At this time, the flesh is said to be pre-rigor condition. It is possible to make the muscle

contract by stimulation in this stage, for example by means of an electric shock. Eventually, the muscles begin to stiffen and harden and the whole body becomes inflexible, the fish is said to be in-rigor stage. The muscle will no longer contract when stimulated and it never regains this property. After several hours or days, the muscles gradually begin to soften and become limp again. The fish has already passed through time rigor and is said to be in post-rigor stage.

**Autolysis:**

Autolysis means "self-digestion". It has been known for many years that there are at least two types of fish spoilage: bacterial and enzymatic. ... In some species (squid, herring), the enzymatic changes precede and therefore predominate the spoilage of chilled fish.

**Rancidity:**

It is condition produced by aerial oxidation of unsaturated fat present in foods and other products, marked by unpleasant odour or flavour. Spoilage is caused by reactions in the fat of fish giving rise to unpleasant odors and flavors. This spoilage is generally called rancidity; fish oil is more liable to spoilage than other oils due to the greater number of unsaturated fatty acids as shown by the lower saponification number and higher iodine value.

**Prevention of fish:**

Polyphenols, an antioxidant applied on fresh fish to prevent chemical spoilage

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**6.2 Brief methods for evaluating freshness and quality of fish and prawns / shrimps:****Changes in appearance, odour and texture:**

Freshness is usually judged in the trade entirely by appearance, odour and texture, of the raw fish. Since assessment depends upon the senses, these factors are known as sensory or organoleptic. The most important things to look for the freshness of fish are:

- 1) The general appearance of the fish including that of the eyes, gills, surfaces slime and scales and the firmness or softness of the flesh.
- 2) The odour of the gills and belly cavity.
- 3) The appearance, and particularly the presences and absence of discolouration along the under side, of the backbone.
- 4) The presence or absence of rigor mortis or death stiffening.
- 5) The appearance of the belly walls.

**Organoleptic Methods for evaluating freshness and quality of fish:**

The organoleptic quality of fish or a fish product can be determined by conducting sensory evaluations for various attributes such as appearance, flavour, odour and texture. Sensory evaluations should be conducted by someone that has the competency

Organoleptic criteria used for the Fish Evaluation:

Sr. No	Characteristics changes in	Fresh Fish	Stale Fish
1.	Eyes	full and prominent, normal looking	Sunk and opaque
2.	Gill Lamellae	Bright Red, Fishy Smell	Dull red, grey and slimy, foul smell
3.	Stiffness	Body is firm and stiff	Soft flabby
4.	Vent	Normal	Protruding
5.	Slime of body	Fishy smell	Foul smell

**Microbial Methods for evaluating freshness and quality of fish and prawns / shrimps:**

- **Total counts**

- Microscopic examination
- Common plate count agars

**Total plate count (TPC):** Total number of microbial flora is changed with the time in fish or fish products. The numbers per gram of fish or fish products or per square centimeter of the surface area indicate the quality of fish from the microbiological view point. Total plate count or viable bacterial count is determined by the culture of bacteria present in fish sample using a suitable bacteriological media that could recover maximum number of bacteria in fish tissue. A known weight of fish sample is minced aseptically and serial decimal dilutions are pour-plated with the media. For marine fish agar agar and for processed fish products tryptone glucose beef extract agar media are commonly used. Inoculated plates are incubated at 37°C for 24 hours and the bacterial colonies are counted. From the colony counts, TPC is calculated by multiplying with appropriate dilution factor. TPC does not strictly indicate the edibility of the fish. Fish with low TPC may bear pathogen that would have more dangerous if consumed. Therefore, qualitative analysis is done to determine the presence of any pathogenic or health hazard bacteria. Different types of selective or ordinary media are used for the identification of pathogenic organisms in fish. For example, SS-agar or XLD agar medium are used to detect coliform bacteria like *Salmonella*, *Shigella*, *E. coli*

#### ■ Spoilage bacteria

- Different peptone-rich substrates containing ferric citrate have been used for detection of H<sub>2</sub>S-producing bacteria such as *Shewanella putrefaciens*, which can be seen as black colonies due to precipitation of FeS
- *Vibrionaceae* that also will form black colonies on an iron agar to which an organic sulphur source is added

#### Chemical Methods for evaluating freshness and quality of fish and prawns / shrimps:

A variety of chemical compounds or groups of compounds accumulate post-mortem fish muscles. These chemicals are either intermediate or end products of biochemical changes occurring in the muscles of fish after death.

**Proximate composition:** Because of influence of chemical composition on keeping quality, proximate chemical composition like moisture, lipid, protein and ash contents of fish samples from the time or day of harvest to different storage periods or conditions are often investigated. Proximate composition may vary with species, sex, season, place of harvest, feeding condition, etc. So, conclusive results are very difficult to obtain.

**Hypoxanthin value:** As a consequence of post-mortem changes, breakdown of ATP to ADP, AMP, IMP and finally to hypoxanthin takes place. Hypoxanthin content of muscle increases on storage of fish. Estimation of hypoxanthin is an objective test of freshness of fish. However, the estimation of hypoxanthin is too cumbersome and it is seldom employed in practice. Fish with a hypoxanthin value of 7-8 micro moles/g is considered spoiled.

**Histamine content:** Histamine develops in freshly caught fish after 40-50 hours of death, if the fish is not properly iced. To avoid histamine formation in tuna, skipjack and mackerel, care is taken to ice or freeze fish as quickly as possible. Histamin is a major problem in warm water pelagic species that causes a form of food poisoning known as scombroid poisoning, as the name derived from the family name of tuna and mackerel, scombroidae. The term is also applied to other family members too. The symptoms of scombroid poisoning are facial flushing, rashes, headache and gastro-intestinal disorders.

Histamin is produced from histidine which is one of the constituents of muscle protein of all fishes. Generally, pelagic fishes contain sizable amount of histidine in free state as well as bound state within protein. Upon death, histidine in fish muscle is converted to histamine by bacterial enzymes. Histamin content over 20mg/100g in canned fish is prohibited by the US-FDA standard.

**pH:** Change in pH of the fish muscle is an usual good index for freshness assessment.

**Trimethylamine:** Marine fish contains sizable amount of trimethylamine oxide (TMAO) which is reduced to trimethylamine (TMA) during the spoilage of fish. TMA determination is a useful index to measure the quality of stored fish. Fish with a level of 1.5 mg TMA nitrogen/100 g fish is considered acceptable, while 10-15 mg/100 g limit is set for moderately spoilt fish and beyond this range is set for highly spoilt fish.

**Ammonia:** Bacteria can generate small amounts of ammonia in spoiling fish, mainly from free amino acids; the amount of ammonia can give an indication, though not a particularly accurate one, of the extent of spoilage. Much larger amounts of ammonia are produced during spoilage of the elasmobranch fishes, skate and dogfish for example, because they have large amounts of urea in their flesh. Shellfish, also, may develop more ammonia than most marine fish and at an earlier stage. There are several chemical and enzymic methods for measuring ammonia.

**Peroxide value:** Oxidative rancidity developed in fish tissue is determined by the estimation of peroxide value. Good quality fish should have a peroxide value quite less than 10. Peroxide value above 20 for any fish is considered rancid.

**Thiobarbituric acid value (TBA):** It is also determined as an index of oxidative rancidity in fish. For a good quality moderate lipid fish, TBA value of less than 2 is usually accepted.

### 6.3 Sanitary operations during fish Packaging

Fishery product, which means any human food product in which fish is a characterizing ingredient; and Processing which, with respect to fish and fishery products, means; handling, storing, preparing, heading, eviscerating, shucking, freezing, changing into different market forms, manufacturing, preserving, packing, labeling, dockside unloading, or holding.

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#### 6.3.1 Maintenance of hygiene of food contact surfaces, storage and equipment:

Visual check of all food contact surfaces for proper cleaning and sanitation. Use a strong flashlight or other shadow-free lighting source when inspecting hidden areas. Disassemble and inspect food contact equipment to identify areas which may trap soils. Frequency: Daily pre-op for raw seafood line, plus after every break for ready-to-eat line. Confirm visual checks with bacterial contact plates or luminometer.

Frequency: Monthly or more frequently if results indicate. (Note: swabs are used in place of contact plates in areas that are difficult to access).

Luminometer — weekly or more frequently if results indicate. Visually confirm that proper procedures, equipment and chemicals are used for cleaning and sanitizing.

Use a five-step approach. Use test papers to record proper strength for sanitizers.

1. Frequency: Daily pre-op for raw seafood line, plus after every break for ready-to-eat line.
2. Pans, knives, and other utensils are placed in a soak tank containing general purpose detergent (concentration controlled by proportioner). After soaking 30 mins. The items are rinsed and dipped in sanitizer (100 ppm chlorine).
3. All processing waste removed from work areas, and tables and floors are dry cleaned. Tables are cleaned with general purpose detergents followed by rinsing then exposure to 200 ppm chlorine. Floors, splash zone of walls (4 feet above floor), and sinks are cleaned then sanitized with 400 ppm quats or 200 ppm chlorine.
4. Periodically (weekly) use an acid detergent to remove stains and scale.
5. Periodically switch (monthly) to another class of sanitizer to prevent selecting tolerant types of microorganisms.

If surfaces are inadequately cleaned, fully reclean and resanitize following the five-step procedures. Check sanitizer concentrations. Train employees semiannually or more frequently if indicated by monitoring.

**Food Contact Surface:** “Those surfaces that contact human food and those surfaces from which drainage onto the food or onto surfaces that contact the food ordinarily occurs during the normal course of operations” . Typical food contact surfaces include utensils, knives, tables, cutting boards, conveyor belts, ice makers, ice storage bins,

gloves, aprons, etc.”

A complete SSOP plan will account for all food contact surfaces that could lead to direct or indirect contamination of foods during processing. A monitoring program should ensure that, 1) processing equipment and utensils (food contact surfaces) are in suitable condition for sanitary processing, 2) equipment and utensils are properly cleaned and sanitized, 3) the type and concentration of sanitizer(s) is acceptable as applied, and 4) that gloves and outer garments which might contact food are clean and in good condition.

Clean, sanitary food contact surfaces are fundamental to the control of pathogenic microorganisms. The contamination of seafood through either direct or indirect contact with insanitary surfaces potentially compromises the safety of that product for consumption. The sanitary condition of food contact surfaces must be demonstrated for compliance with the sanitation control procedures. Effective sanitation standard operating procedures will outline the basic cleaning and sanitizing schedule (example, 2-28). Cleaning and sanitizing typically involves five steps: dry clean, pre-rinse (brief), detergent application (may include scrubbing), post-rinse and sanitizer application.

#### **Equipment and utensils.**

- a) All plant equipment and utensils shall be so designed and of such material and workmanship as to be adequately cleanable, and shall be properly maintained. The design, construction, and use of equipment and utensils shall preclude the adulteration of food with lubricants, fuel, metal fragments, contaminated water, or any other contaminants. All equipment should be so installed and maintained as to facilitate the cleaning of the equipment and of all adjacent spaces. Food-contact surfaces shall be corrosion-resistant when in contact with food. They shall be made of nontoxic materials and designed to withstand the environment of their intended use and the action of food, and, if applicable, cleaning compounds and sanitizing agents. Food-contact surfaces shall be maintained to protect food from being contaminated by any source, including unlawful indirect food additives.
- b) Seams on food-contact surfaces shall be smoothly bonded or maintained so as to minimize accumulation of food particles, dirt, and organic matter and thus minimize the opportunity for growth of microorganisms.
- c) Equipment that is in the manufacturing or food-handling area and that does not come into contact with food shall be so constructed that it can be kept in a clean condition.
- d) Holding, conveying, and manufacturing systems, including gravimetric, pneumatic, closed, and automated systems, shall be of a design and construction that enables them to be maintained in an appropriate sanitary condition.
- e) Each freezer and cold storage compartment used to store and hold food capable of supporting growth of microorganisms shall be fitted with an indicating thermometer, temperature-measuring device, or temperature-recording device so installed as to show the temperature accurately within the compartment, and should be fitted with an automatic control for regulating temperature or with an automatic alarm system to indicate a significant temperature change in a manual operation

- f) Instruments and controls used for measuring, regulating, or recording temperatures, pH, acidity, water activity, or other conditions that control or prevent the growth of undesirable microorganisms in food shall be accurate and adequately maintained, and adequate in number for their designated uses.
- g) Compressed air or other gases mechanically introduced into food or used to clean food-contact surfaces or equipment shall be treated in such a way that food is not contaminated

### 6.3.2: Water quality, ice, sewage and waste water disposal and effluent treatment plant

A primary safety concern for any food processing operation should be the safety of water. A complete SSOP plan must first account for the sources and treatment of water that comes in contact with food or food contact surfaces or is used to make ice. It must also consider cross-connections between the safe water supply (potable water) and any unsafe or questionable water supply (non-potable) or sewer disposal systems. In seafood processing plants, cross-connections have been found in many places, such as, hard plumbing between potable and non-potable water lines; unprotected hose bibs (i.e., those with no backflow prevention devices); hoses lying in pooled water or submerged in wash tanks; or metering pumps used for cleaning chemicals without a backflow prevention device.

All fish processing industries should have uninterrupted water supply of potable quality which is free from diseases causing organisms, toxic substances, and objectionable odour and taste. However, depending on the availability, the quality of water used for different purposes could vary. Since the sanitary quality of food is affected by the quality of the water, there is a need to use good quality water.

In a fish processing industry water is required for activities such as unloading and storage of small sized fishes, bulk storage of fish (Ex. Refrigerated seawater, brine, ice flakes), and cleaning purpose (cleaning of processing facility, equipments, containers etc), washing of raw material and processed material, product preparation, ice making, cooling, generating steam for cooking, blanching, retorting etc.

#### **Water quality requirements:**

The water used in processing industry should be of potable quality. As large quantity of water is required for various purposes, it should not affect the quality of food and contaminate with harmful organisms. The water used should meet physical, chemical and microbiological quality requirements.

The physical quality requirement for process water used in processing industries is that it should be free from any noticeable colour, odour, taste and undissolved material. The type and concentration of chemical substances dissolved in water contribute for chemical quality of water. Presence of higher concentration of calcium and magnesium salts contributes for extent of hardness of water. The use of soft water is recommended in processing industries as it does not affect product quality.

Microbiologically the process water contains natural water microflora and may or may not with human pathogenic microorganisms. The natural flora of water contaminates the product and may involve spoilage under suitable conditions. The presence of pathogenic microorganisms in water is mainly due to contamination with domestic sewage. Thus, water should be treated effectively using standard water treatment procedures to make it free from pathogenic organisms.

The standards for water quality used in fish processing industries should ensure that the water is free from harmful microorganisms, deleterious and toxic chemicals and objectionable colour, odour and taste.

#### **Sewage and waste water disposal and effluent treatment plant:**

Seafood-processing wastewater characteristics that raise concern include pollutant parameters, sources of process waste, and types of wastes. In general, the wastewater of seafood-processing wastewater can be characterized by its physicochemical parameters, organics, nitrogen, and phosphorus contents. Important pollutant parameters of the wastewater are five-day biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), fats, oil and grease (FOG), and water usage. As in most industrial wastewaters, the contaminants present in seafood-processing wastewaters are an undefined mixture of substances, mostly organic in nature. It is useless or practically impossible to have a detailed analysis for each component present; therefore, an overall measurement of the degree of contamination is satisfactory.

**Sewage disposal.** Sewage disposal shall be made into an adequate sewerage system or disposed of through other adequate means.

Rubbish and any offal shall be so conveyed, stored, and disposed of as to minimize the development of odor, minimize the potential for the waste becoming an attractant and harborage or breeding place for pests, and protect against contamination of food, food-contact surfaces, water supplies, and ground surfaces.

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#### **6.4 Various packaging materials used in freezing and canning industry**

*Fish and seafood have a high nutritional value but are at the same time sensitive, perishable foods. Packaging protects the products from harm and contributes towards reducing losses during transport, storage or at the retailer's. The functions that packaging has to fulfill are accordingly diverse. And requirements are constantly growing, for the materials used to produce it are today expected to be as sustainable and recyclable as possible. Packaging should protect the product from contamination and prevent it from spoilage, and at the same time it should:*

- extend shelf life of a product
- facilitate distribution and display
- give the product greater consumer appeal
- facilitate the display of information on the product

1) A **polyolefin** is a type of polymer produced from a simple olefin (also called an alkene with the general formula  $C_nH_{2n}$ ) as a monomer. For example, polyethylene is the polyolefin produced by polymerizing the olefin ethylene. Polypropylene is another common polyolefin which is made from the olefin propylene. Polyolefin sheets or foams are used in a wide variety of packaging applications, sometimes in direct contact with food.

#### **2) Wax duplex carton**

Fish is essential for controlling the detrimental effects of oxygen and desiccation by barring the entry of air and escape of moisture. Another property to be looked into is its capacity to protect the contents from flavour contamination, entry of microorganisms, mechanical damage and exposure to light. Folding paperboard (duplex board) carton is the most important primary package used in the export of frozen sea foods. These cartons are given a wax coating for protection of the contents from loss of moisture. The material used for the purpose is a solid bleached sulfate board. Frozen 'blocked' weighing 2kg are packed in such cartons lined with 100/125 gauge low density polythene sheet.

**3) Master carton** is a corrugated box that is used for freight consolidation. It is a form of tertiary packaging. While shipping products from the factory to the warehouse, the distributors and the retail stores, the products need to be bundled accordingly. This is where a master carton comes handy. Here is a simple representation of a master



carton-

**4) Cans** were first developed in the early 19th century. The tin plate metal containers used in early days called "canisters" from which the term 'can' is believed to have derived. Each container has certain exclusive uses; in the course of development we can see that one container is invading other fields. The selection of one container over the others is usually decided on the basis of process and product, cost of production etc. Tin Cans The most frequently used container for packing food is tin plate can. The tin can is made of about 98% steel and 2% tin coating on either side. The base steel used for making cans is referred as CMQ or can make quality steel. Corrosion behaviour, strength and durability of the tin plate depend upon the chemical composition of the steel base. The active elements are principally copper and phosphorus.

Depending upon the degree of workability, strength and corrosion resistance required in the case of tin plates, four types of steel are specified. They are L type, MR type, MC and type M. First three are produced by the cold reduction process. Type M is similar to type MC in composition but produced by a hot reduction process. You will be surprised to know that tinned food or foods packed in tin coated cans gradually lose their natural colour. A lacquer coating on the inner side can prevent this. This lacquer coating protects the steel and tin and prevents direct contact with the food material. The can body protects the contents against the entry of micro-organisms, insects, air, light and moisture. They are light in weight and can be handled with ease. A very important advantage is that they can be sterilized at high temperature and pressure.

**Aluminium Cans** It was noticed that the organoleptic qualities of foods packed in tin containers gradually decreased when they are kept for longer periods. This led to the introduction of another important container, the aluminium alloy can. Aluminium containers were used for packing meat and fish products as early as 1918. These

are now being used extensively in European countries because of the availability of the raw material and less cost for its production due to plenty of electricity in those countries. Various types of aluminium and its alloys are used for packaging. The aluminium in grade of 1000 is called pure (99- 99.7%) and these are used for foil and slug for impact extruded cans. The alloys in grade 3000 are used mainly as sheets for deep drawn cans and craned cans. Manganese is added to increase the strength. The best promising alternative to tin plate has been considered as aluminium modified by alloying with manganese and magnesium. Aluminium possesses good corrosion resistance. They offer good resistance to external atmospheric corrosion. Aluminium containers are easy to fabricate. It is possible to set up a can manufacturing unit for a good canning factory. Machinery for such units is simple and highly profitable. Cans are produced in a wide variety of sizes and shapes with attractive appearance. They are light in weight. Aluminium has got a good scrap value. Aluminium cans being light in weight, require special attention during heat processing. After heat processing, cooling has to be done under pressure. Aluminium cans with easy opening lids are becoming more and more popular now-a-days.

**Tin Free Steel Cans** This was developed in Japan under different names such as can super, Hinac coat, Hi-top by different manufacturers. They are prepared by electroplating cold roller steel sheet with chromium in chromic acid. TFS is an important alternative to tin cans. TFS has a steel base with a chromium/chromium oxide coating on the surface replacing the tin in conventional cans. The appearance of the can is bright or semi bright as compared to tin plates. Because of the low abrasion resistance of Tin free steel it needs to be protected by a lacquer film. However, the surface of the TFS provides an excellent substrate for lacquer adhesion, which ensures superior performance in terms of product compatibility for many food products. Polymer coated TFS cans have applications in sea food packaging. You see cans were traditionally used for heat sterilized products. Today, there are several choices available: standard tin plates, light weight tin plate, double reduced tin plate, tin free steel and vacuum deposited aluminium on steel and aluminium. For food products packing, they are coated inside to get desirable properties like acid resistance and sulphur resistance. But, care has to be taken to avoid tainting the lacquer. Metal cans are advantageous as packages because of superior strength, high speed manufacturing and easy filling and dosing. Disadvantages of metal cans are weight, difficulty in reclosing and disposal.

### 5) Lacquered Cans

A



protective layer is coated on the inner surface of the metal can after heat treatment in order to protect the food, which is also known as lacquer.

Application of lacquering

Lacquer can be coated on the metal can by:-

- (i) Sheet coating by using roller coater
- (ii) Coil coating by reverse roller coater
- (iii) Spraying

**Importance of lacquering process**

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(i) Protect the metal from corrosion

Most of the cans are made up of steel or aluminium which are susceptible to corrosion. Lacquer which is coated on top of the metal can act as protection to the metal can.

(ii) Protect the can from any possibility of interaction between the metal and the food products

Lacquered can can limit the interaction between the can itself and the food product.

(iii) To avoid the discolouration of pigments such as anthocyanin

Fruits that are high pigmented such as berries are sensitive to reducing the environment and hence will turn colourless. Metal can with lacquer can protect the discolouration of fruits packed inside the can.



## 6) RETORT POUCHES:

Retort pouches are made mainly of synthetic materials, Retortable pouches, as the name implies, pouches capable of retorting, are the latest development in the canning industry. The retort pouch is a rectangular type of package usually made of a three-layer lamination. Some manufacturers give additional layers for better barrier properties. It is usually made up of an outer polyester, middle aluminium foil and inner polypropylene layer. The outer laminate, which is polyester, provides atmospheric barrier

properties as well as mechanical strength. The aluminium ply provides protection from gas, light and moisture and ensures a better shelf life. The inner polypropylene layer provides the best heat-sealing medium.

## 6.5 Quality Policy and Quality Analysis: ISO 22000/HACCP/ BRC/IFS

A quality policy is a brief statement that aligns with standard purpose and strategic direction, provides a framework for quality objectives, and includes a commitment to meet applicable as well as to continually improve.

Top management is responsible for establishing, documenting, and communicating the quality policy as well as making it available to relevant interested parties.

### ISO 22000

The ISO 22000 certificate is the first international quality standard for companies along the entire production chain of the food industry, primary producers, transport companies or retailers. In structure and content, ISO 22000 is based on the requirements of a quality management system as outlined in ISO 9001 and is extended to include the HACCP principles.

Certification according to ISO 22000 provides a comprehensive, dynamic and effective risk control of food safety

based on risk analysis and good manufacturing practice (GMP) and increases food safety throughout the food chain business.

### **HACCP**

The system of risk analysis and determining of critical control points (HACCP) in production is one of the most effective tools to prevent risks to food safety.

Implementing the HACCP concept gives you the chance to prove that hygiene and food safety are a priority. HACCP, the Hazard Analysis and Critical Control Points concept, helps you identify and avoid potential hazards in the production of foodstuffs.

### **BRC**

Developed by the British Retail Consortium (BRC), the association that protects the interests of British retailers, the BRC Global Standard states clearly defined requirements for food safety. These include implementation of HACCP standards, well-documented quality management systems and monitoring of hygienic conditions. Almost all UK retailers expect their suppliers be BRC certified. BRC offer a one-stop service and certify food manufacturers in line with the BRC Global Standard for food. And for manufacturers of packaging materials, we provide certification in compliance with the BRC Global Standard for packaging

### **IFS**

The International Food Standard (IFS) was developed in 2003 for in-house brands sold by German, French and Italian retailers. It makes sure that quality stays stable along food industry production chains. With IFS Food or IFS Logistic certification - for transport and logistics companies and freight carriers - you show your customers that the food you manufacture and sell meets the highest safety, quality, and legal standards.

## **Unit 7:FISH MARKETING**

Topics Covered:

7.1 Traditional marketing vis-a-vis role of fishery co-operatives with reference to operations at Satpati, Sasoon dock and Karanja

7.2 Global marketing and Export-Import procedures and role of Marine Products Exports Development Authority (MPEDA)

7.3i) Fund raising:

- Financial institutions
- Schemes and subsidies
- Basic accounting
- Costing and feasibility report

ii) Role of NABARD (National Bank for Agriculture and Rural Development) for refinancing and NFDB (National Fishery Development Board, Hyderabad) for funding through the State Government

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**7.1 Traditional marketing vis-a-vis role of fishery co-operatives with reference to operations at Satpati, Sasoon dock and Karanja**

**Traditional Marketing of Fish:**

- **Primary Fish Markets:**
  - Fish landing centers are usually primary markets, where fish is sold directly by fishers to middlemen or consumers.
  - Traditional fish marketing in these regions is based around local markets
  - Fish is often auctioned off in bulk early in the morning, with price negotiation playing a key role in this system.
  - Fish is transported to nearby towns, cities, and villages for sale through a network of traders and distributors.
- **Price Determinants:**
  - Prices are influenced by the day's catch volume, weather conditions (affecting fishing), demand, species type, and freshness.
  - Seasonality is a critical factor. During the monsoon ban on fishing (June to August), prices rise due to limited supply.
  - The role of middlemen often increases the prices by the time fish reaches the consumer, reducing fisher profits.
- **Transportation and Storage:**
  - Traditionally, fish is transported on ice in trucks or boats with limited cold chain logistics, which affects the freshness and shelf life.
  - Limited access to advanced preservation technologies can result in spoilage, making timely sale critical.

**Role of Fishery Cooperatives:**

Fishery cooperatives play a vital role in improving the livelihood of fishers and streamlining the marketing process, particularly in coastal regions like Satpati, Sasoon Dock, and Karanja.

- **Satpati Fishery Cooperative:**
  - Located in Palghar district, Satpati is one of the largest fishing villages in Maharashtra.
  - The cooperative assists fishers with access to better fishing gear, loans, ice plants, and processing units.
  - Through collective bargaining, fishers secure fairer prices, bypassing middlemen, and ensuring better profits.
  - Cooperative initiatives have led to the establishment of local fish processing plants, improving the value chain through freezing and preservation facilities.
  
- **Sasoon Dock Cooperative:**
  - Sasoon Dock in Mumbai is one of the oldest and busiest fishing docks in India, where cooperatives play a critical role in handling the daily fish landings.
  - The cooperative provides organized auctioning systems, maintaining transparency in pricing and preventing exploitation by traders.
  - The cooperative engages in activities like vessel licensing, fisheries management, and promoting sustainability.
  - Fisherwomen, who play a key role in the local fish market, benefit from cooperative efforts, with initiatives supporting their business endeavors.
  
- **Karanja Fishing Cooperative:**
  - Located in Raigad district, Karanja is known for its shrimp farming and marine fishing.
  - Cooperatives here provide essential services like financial support, training, and access to markets.
  - The cooperative promotes sustainable fishing practices by advocating for responsible fishing methods and providing fishers with environmental education.

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- Cooperative-backed shrimp processing and export operations have improved the community's income levels.
- The cooperative assists in price stabilization and market access, helping fishers sell their catch directly to exporters or processing companies.

**Cooperatives vs. Traditional Marketing:****● Advantages of Fishery Cooperatives:**

- **Collective Bargaining Power:** Cooperatives enable fishers to negotiate better prices, access government schemes, and reduce dependency on middlemen.
- **Access to Technology:** Cooperatives provide access to ice plants, cold storage, and transport facilities, helping preserve fish quality and reduce spoilage.
- **Financial Aid and Microfinancing:** Fishermen's cooperatives often extend loans, insurance, and grants for boats, nets, and equipment.
- **Sustainability Initiatives:** Cooperatives help enforce sustainable fishing practices, such as adhering to seasonal bans and protecting breeding grounds.

**● Challenges Faced by Cooperatives:**

- **Limited Infrastructure:** While cooperatives provide services, they often face limitations in scaling operations or establishing extensive cold chain systems.
- **Dependence on Government Support:** Cooperatives are reliant on government subsidies, policies, and grants, which can be inconsistent.
- **Market Penetration:** Despite improvements, many cooperatives struggle to fully replace the traditional network of middlemen, especially in remote regions.

**● Traditional Marketing Challenges:**

- **Lack of Price Control:** Fishers, especially small-scale ones, are at the mercy of middlemen who set prices, reducing profits.
- **Spoilage and Waste:** Traditional methods of handling and transporting fish without modern cold storage lead to higher levels of waste due to spoilage.
- **Low Profit Margins:** Fishers, especially in unorganized sectors, receive lower

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returns on their catch due to the fragmented nature of traditional markets.

## 7.2 **Global marketing and Export-Import procedures and role of Marine Products Exports Development Authority (MPEDA)**

### 7.2.1. Global Marketing of Marine Products:

- o Global marketing is “marketing on a worldwide scale reconciling or taking commercial advantage of global operational differences, similarities and opportunities in order to meet global objectives
- o Global marketing is also a field of study in general business management to provide valuable products, solutions and services to customers locally, nationally, internationally and worldwide.
- o International marketing is the export, franchising, joint venture or full direct entry of an organization's product or services into another country. This can be achieved by exporting a company's product into another location, entry through a joint venture with another firm in the target country, or foreign direct investment into the target country.

The advantages of global market:

- Economies of scale in production and distribution
  - o Lower marketing costs
  - o Power and scope
  - o Consistency in brand image
  - o Ability to leverage good ideas quickly and efficiently
  - o Uniformity of marketing practices
  - o Helps to establish relationships outside of the "political arena"

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- o Helps to encourage ancillary industries to be set up to cater for the needs of the global player
- o Benefits of e-Marketing over traditional marketing
  
- **Export Market for Marine Products:**
  - o Global demand for seafood is on the rise, driven by dietary shifts, population growth, and increased health consciousness.
  - o Major markets for marine exports from India include the USA, European Union, Japan, China, Southeast Asia, and the Middle East.
  - o Key products include shrimp, prawns, cuttlefish, squids, fish fillets, and value-added seafood products.
  
- **Value Addition and Quality Standards:**
  - o Exporters increasingly focus on value-added products such as ready-to-cook, ready-to-eat, and processed seafood to meet international demand.
  - o Stringent quality standards (e.g., HACCP, ISO, BRC, and EU standards) must be followed, particularly regarding food safety, hygiene, and traceability.
  - o The introduction of eco-labels (e.g., Marine Stewardship Council certification) enhances marketability in eco-conscious markets.
  
- **Market Access and Competition:**
  - o Indian exporters compete with other major seafood producers such as China, Thailand, Vietnam, and Ecuador.
  - o Strategic marketing, including branding, digital promotion, participation in international seafood fairs, and establishing direct links with retailers, helps penetrate competitive markets.

**7.2.2. Export-Import Procedures in the Fishery Industry:**

- **Step 1: Registration of Exporters**

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- o Fish exporters must register with the **Directorate General of Foreign Trade (DGFT)** and obtain an Importer Exporter Code (IEC) number.
- o Registration with **Marine Products Export Development Authority (MPEDA)** is mandatory for exporters to comply with seafood trade regulations.
- **Step 2: Quality Control and Certification**
  - o Marine products must adhere to specific quality and safety standards (such as HACCP) enforced by MPEDA and international regulatory bodies.
  - o Seafood batches are inspected and certified by **Export Inspection Agencies (EIA)**, ensuring compliance with foreign country requirements.
  - o Pre-shipment testing for residues, contaminants, and microbial safety is mandatory in many countries, such as the EU and USA.
- **Step 3: Packaging and Labeling**
  - o Products must be packaged as per international standards to maintain quality during transport. Packaging should comply with food safety, tamper-evidence, and environmental requirements.
  - o Proper labeling, including nutritional information, origin, expiration dates, and certification marks (such as MSC or organic), is crucial for customs clearance.
- **Step 4: Documentation**
  - o **Proforma Invoice:** A preliminary bill indicating the goods to be exported, their value, and other terms of sale.
  - o **Bill of Lading** or **Airway Bill:** Shipping documents provided by the carrier.
  - o **Certificate of Origin:** Issued by a Chamber of Commerce or relevant authority, confirming the product's country of origin.
  - o **Health Certificate:** Required by many importing countries, ensuring that the seafood is safe for human consumption and free from diseases.
  - o **Phytosanitary Certificate:** Often needed for specific live or fresh products to ensure that they are free of pests and contaminants.

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- **Step 5: Customs Clearance and Shipping**
  - Exporters submit all required documents to the **Customs Authority** for clearance.
  - Goods are shipped using refrigerated containers or air cargo with proper cold chain management to maintain product freshness.
- **Step 6: Payment Mechanisms**
  - Payment options include **Letter of Credit (LC)**, **Documentary Collection**, or **Open Account**, depending on the agreement between the exporter and importer.
  - Proper risk management practices, including marine insurance, are crucial to mitigate losses from product damage during transit.

**7.2.3. Role of Marine Products Exports Development Authority (MPEDA):**

MPEDA is a key government agency under the Ministry of Commerce & Industry, Government of India, responsible for promoting the export of marine products from India. MPEDA's activities encompass trade promotion, quality control, and regulation in the marine sector. The Marine Products Export Development Authority (MPEDA) was set up by an act of Parliament during 1972. The erstwhile Marine Products Export Promotion Council established by the Government of India in September 1961 was converged in to MPEDA on 24th August 1972.

MPEDA is given the mandate to promote the marine products industry with special reference to exports from the country. It is envisaged that this organization would take all actions to develop and augment the resources required for promoting the exports of "all varieties of fishery products known commercially as shrimp, prawn, lobster, crab, fish, shell-fish, other aquatic animals or plants or part thereof and any other products which the authority may, by notification in the Gazette of India, declare to be marine products for the purposes of (the) Act". The Act empowers MPEDA to regulate exports of marine products and take all measures required for ensuring sustained, quality seafood exports from the country. MPEDA is given the authority to prescribe for itself any matters which the future might require for protecting and augmenting the seafood exports from the country. It is also empowered to carry out inspection of marine products, its raw material, fixing standards, specifications, and training as well as take all necessary steps for marketing the seafood overseas.

- **Export Promotion and Market Expansion:**
  - MPEDA organizes trade fairs, exhibitions, and buyer-seller meets to promote Indian seafood products internationally.

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- o It supports exporters in marketing initiatives, helps build brand value, and facilitates market access in new regions.
- o Through partnerships and negotiations, MPEDA works to reduce trade barriers, such as tariffs or quotas imposed by importing countries.
- **Quality Control and Certification:**
  - o MPEDA enforces strict quality control measures through processing plant inspections, monitoring fishing practices, and ensuring compliance with global standards like HACCP.
  - o It provides certification and inspection services, ensuring that Indian marine products meet the quality and food safety requirements of international markets.
  - o MPEDA operates various testing laboratories that conduct pre-shipment checks on seafood for contaminants, antibiotic residues, and microbiological safety.
- **Sustainability and Resource Management:**
  - o MPEDA plays a key role in promoting sustainable fishing practices. It encourages the use of responsible aquaculture techniques to ensure the conservation of fish stocks and the marine environment.
  - o MPEDA supports eco-friendly shrimp farming and offers guidance to ensure adherence to sustainability certifications, like MSC and ASC (Aquaculture Stewardship Council).
- **Infrastructure Development:**
  - o MPEDA provides financial assistance for infrastructure development, including cold storage facilities, ice plants, and refrigerated transport.
  - o It offers subsidies and support for modernizing fishing vessels, improving hygiene in fish handling, and installing processing equipment that meets international standards.
- **Training and Skill Development:**
  - o MPEDA conducts training programs for fishers, processors, and exporters on various aspects of fisheries, including hygiene standards, processing techniques, and export regulations.

- o It promotes best practices in post-harvest handling and aquaculture, thereby improving the quality and marketability of Indian marine products.

- **R&D and Technology Transfer:**

- o MPEDA collaborates with research institutes to develop new technologies for value-added seafood products, sustainable aquaculture, and efficient processing.
- o It works with stakeholders to implement advancements in aquaculture technologies, cold chain logistics, and quality preservation methods.

- **Financial Assistance and Schemes:**

- o MPEDA provides financial assistance to exporters through schemes that promote the modernization of processing plants, upgradation of facilities, and capacity building.
  - o It offers subsidies for eco-friendly fishing equipment, packaging technology, and promotional activities to help Indian exporters compete in global markets.
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**i) Fund raising:**

- **Financial institutions**
- **Schemes and subsidies**
- **Basic accounting**
- **Costing and feasibility report**

**1. Financial Institutions for Fund Raising in Fisheries:**

Several financial institutions offer loans and financial services to support the fishery sector. These institutions provide financing for equipment, infrastructure, working capital, and other related needs.

- **Nationalized Banks:**

- o Provide loans for fishing boats, processing units, cold storage, and aquaculture projects.

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- o Offer working capital for small and medium enterprises (SMEs) in fisheries.
- o Loans are often provided under priority sector lending schemes for agriculture and allied activities.
- **NABARD (National Bank for Agriculture and Rural Development):**
  - o Provides refinance facilities for banks offering loans to fisheries, aquaculture, and related industries.
  - o NABARD supports infrastructure development, processing units, cold chains, and modernization of fishing fleets.
  - o Offers concessional loans and promotes rural entrepreneurship in the fishery sector.
- **Cooperative Banks:**
  - o Offer loans and financial services specifically to members of fishery cooperatives.
  - o Provide microfinancing and group loans, especially for small-scale fishers and fish farmers.
- **Fishery Cooperatives and Regional Rural Banks (RRBs):**
  - o Cooperatives play a significant role in raising funds for local fishers and providing low-interest loans.
  - o Regional Rural Banks work closely with NABARD to finance fishery projects in coastal and rural areas.

**2. Schemes and Subsidies for Fisheries:**

The government of India, along with state governments, provides various schemes and subsidies to promote the growth of the fisheries sector. These schemes assist in acquiring infrastructure, equipment, and modern technologies.

- **Pradhan Mantri Matsya Sampada Yojana (PMMSY):**
  - o A flagship scheme aimed at developing sustainable and responsible fisheries and aquaculture.

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- o Provides financial assistance and subsidies for modernizing fishing vessels, developing aquaculture farms, building cold storage units, and fish processing infrastructure.
- o Promotes entrepreneurship in fisheries and fish farming, with a focus on women and marginalized communities.
- **Blue Revolution Scheme:**
  - o Focuses on increasing fish production and productivity in a sustainable manner.
  - o Provides subsidies for modern equipment, better fishing practices, hatchery construction, feed management, and fish seed farms.
  - o Emphasizes integrated development of inland, marine fisheries, and aquaculture through technology interventions.
- **Fisheries and Aquaculture Infrastructure Development Fund (FIDF):**
  - o Provides long-term finance for the development of modern fishery infrastructure, such as cold chains, processing plants, and fish markets.
  - o Assists private entrepreneurs, cooperatives, and fish farmer producer organizations (FFPOs) in accessing low-interest loans.
- **Subsidies for Fish Farmers and Processing Units:**
  - o Subsidies are available for purchasing fishing boats, engines, nets, feed, and inputs for aquaculture.
  - o Additional support for establishing fish seed farms, hatcheries, and processing units.
  - o Many schemes provide up to 40-50% subsidy for setting up fish processing and value-added product units.

**3. Basic Accounting for Fishery Businesses:**

Effective financial management is essential for the smooth operation of fishery businesses. Basic accounting practices ensure that funds are properly managed and financial health is maintained.

- **Recording Transactions:**

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- o All financial transactions (sales, purchases, expenses, wages) must be recorded in journals and ledgers.
  - o Regular tracking of income from sales, grants, and subsidies, as well as expenses for fishing gear, feed, transportation, and salaries.
  - **Balance Sheet:**
    - o A balance sheet summarizes the assets (fishing boats, equipment, inventory), liabilities (loans, credit), and capital of the business.
    - o Helps determine the financial standing of the fishery business at any given point in time.
  - **Profit and Loss Statement:**
    - o A profit and loss (P&L) statement tracks revenue earned versus expenses incurred over a specific period.
    - o Essential for understanding whether the business is profitable and identifying areas for cost reduction.
  - **Cash Flow Management:**
    - o Ensures that the business has enough liquidity to cover daily operations, pay salaries, and handle unexpected expenses.
    - o Monitoring cash inflows (from sales and loans) and outflows (for supplies, wages, and utilities) is crucial for business stability.
  - **Taxation:**
    - o Compliance with income tax and GST (Goods and Services Tax) regulations is necessary.
    - o Properly maintaining records helps claim subsidies and avail tax benefits under government schemes for agriculture and fisheries.
- 4. Costing and Feasibility Report for Fishery Projects:**
- A feasibility report is a document that assesses potential solutions to the business problem or opportunity, and determines which of these are viable for further analysis.
  - The purpose of the feasibility report is to present the project parameters and define the

potential solutions to the defined problem, need, or opportunity. Having brainstormed a variety of potential solutions, the project team expands on each of these potential solutions, providing sufficient detail, including very high-level costing information, to permit the project leader to recommend to the approving authority all of the viable potential solutions that should be further analyzed in the next phase (Business Case). Project constraints and limitations of expenditure are among the various factors that will determine viability.

- A feasibility report in fish industry assesses the practicality and financial viability of fishery projects, such as aquaculture farms, fish processing plants, or cold storage units. It provides an understanding of the costs involved and the expected returns.

- **Cost Estimation:**

- o **Capital Costs:** Initial investment in boats, engines, aquaculture ponds, processing machinery, and infrastructure like cold storage.
- o **Operating Costs:** Recurring costs such as fuel, feed, wages, maintenance, transportation, and utilities.
- o **Fixed Costs:** Include depreciation of equipment, loan interest, and insurance.
- o **Variable Costs:** Include day-to-day operational expenses, like raw material costs (fish feed, seeds, etc.), and labor.

- **Revenue Projections:**

- o Estimate potential income based on the production capacity, market prices, and expected yield.
- o Revenue calculations should also consider seasonal fluctuations, market demand, and export opportunities.

- **Breakeven Analysis:**

- o A breakeven analysis calculates the minimum level of production or sales needed to cover the total costs.
- o This analysis helps determine whether the project is feasible and when the business will start generating profits.

- **Profitability Analysis:**

- o Assess the expected profitability by calculating the return on investment

(ROI), net present value (NPV), and internal rate of return (IRR).

- o These metrics help investors and lenders determine if the project is worth funding and financially sustainable in the long term.
- **Risk Assessment:**
  - o Identify potential risks, such as fluctuations in market prices, environmental factors (e.g., natural disasters), diseases in aquaculture, and regulatory changes.
  - o Develop mitigation strategies to reduce the impact of these risks on the business.
- **Sustainability and Market Feasibility:**
  - o Evaluate the environmental sustainability of the project, especially in terms of overfishing, resource depletion, or water pollution.
  - o Assess market demand for the fish species or products being produced, as well as the competition and price trends in the target market.

**7.3. ii) Role of NABARD (National Bank for Agriculture and Rural Development) for refinancing and NFDB (National Fishery Development Board, Hyderabad) for funding through the State Government**

**1. Role of NABARD (National Bank for Agriculture and Rural Development)**

NABARD plays a pivotal role in supporting the fishery sector through refinancing and development initiatives aimed at promoting rural livelihoods and sustainable practices.

**A. Refinancing for Fishery Sector**

NABARD provides refinance support to banks and financial institutions that offer credit to fishery businesses. Its focus is on empowering rural fishers, fish farmers, and small-scale entrepreneurs.

- **Refinance to Banks and Cooperatives:**
  - o NABARD provides refinance to Regional Rural Banks (RRBs), State Cooperative Banks, and commercial banks, enabling them to extend credit to fishers and fish farmers.
  - o This financial support helps banks provide concessional loans to borrowers for fisheries-related activities, including aquaculture, marine fishing, and fish

processing.

- **Long-Term Loans for Infrastructure:**
  - NABARD offers refinance for long-term loans that fund infrastructure development such as cold storage units, ice plants, processing plants, and fish markets.
  - The refinancing covers the cost of modernizing fishing boats, nets, and equipment to improve productivity and sustainability.
- **Support for Fishery Cooperatives:**
  - NABARD supports fishery cooperatives by refinancing loans extended to members of these cooperatives for the procurement of boats, nets, and post-harvest equipment.
  - This enables cooperatives to collectively own and operate fish-processing facilities, enhancing value addition and market access.
- **Focus on Aquaculture and Inland Fisheries:**
  - NABARD prioritizes the development of inland fisheries and aquaculture by providing refinance for pond construction, fish seed farms, feed management, and hatchery operations.
  - It also supports shrimp farming and inland cage culture through credit facilities aimed at promoting sustainable aquaculture practices.

#### B. NABARD's Role in Development Projects

- **Development Schemes:**
  - NABARD collaborates with state governments and the central government to implement various fishery development schemes. This includes financing integrated fish farming, shrimp farming, and fish breeding programs.
  - NABARD is involved in capacity building, providing training, and ensuring that fish farmers and fishers adopt best practices.
- **Rural Infrastructure Development Fund (RIDF):**
  - Through RIDF, NABARD finances the development of rural infrastructure such as fish landing centers, fishing harbors, cold storage chains, and processing

units.

- o The focus is on improving post-harvest facilities to reduce wastage and increase the quality and shelf life of fish products.
- **Interest Subvention and Credit Support:**
  - o NABARD offers interest subvention on loans for fishery activities, making credit affordable for small fishers and fish farmers.
  - o The bank also supports microfinance initiatives for small fishers, especially women, enabling them to access working capital at concessional rates.

## **2. Role of NFDB (National Fisheries Development Board, Hyderabad)**

The National Fisheries Development Board (NFDB), established in 2006, operates under the Ministry of Fisheries, Animal Husbandry, and Dairying, Government of India. NFDB promotes sustainable fisheries development through funding, policy advocacy, and collaboration with state governments and various stakeholders.

### **A. NFDB Funding Through State Governments**

NFDB provides funding to state governments for fisheries development projects that aim to improve productivity, infrastructure, and livelihoods in the sector.

- **Aquaculture Development:**
  - o NFDB offers funding support for the development of inland aquaculture, including fish seed production, pond construction, cage culture, and integrated fish farming.
  - o Financial assistance is provided to state governments to promote modern aquaculture practices, including biofloc and recirculatory aquaculture systems (RAS).
- **Funding for Marine and Inland Fisheries Infrastructure:**
  - o NFDB provides funds for the construction and modernization of fishing harbors, landing centers, ice plants, and fish markets, ensuring better post-harvest management and reducing spoilage.

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- o The focus is on building cold chains, refrigerated vehicles, and processing facilities to enhance the value of fish products and increase exports.

- **Funding for Fish Farmer Producer Organizations (FFPOs):**

- o NFDB funds the establishment and capacity-building of FFPOs, encouraging collective farming, procurement, and marketing among fish farmers.
- o This ensures economies of scale, reduces input costs, and enhances the marketability of fish products.

**B. NFDB Support for Capacity Building and Skill Development**

- **Training and Extension Services:**

- o NFDB funds state governments to organize training programs and workshops on best practices in fish farming, processing, and post-harvest management.
- o Skill development initiatives are also funded to enhance the capacities of fish farmers, fishers, and women involved in fisheries.

- **Promotion of Sustainable Practices:**

- o NFDB advocates for sustainable fishing and aquaculture practices, providing financial incentives to state governments for promoting eco-friendly aquaculture, such as organic shrimp farming and integrated multi-trophic aquaculture (IMTA).
- o It provides funds for research and development in the fisheries sector to adopt new technologies for increasing productivity and environmental sustainability.

**C. Schemes Implemented by NFDB via State Governments**

- **Pradhan Mantri Matsya Sampada Yojana (PMMSY):**

- o NFDB is responsible for implementing PMMSY, which provides financial assistance to fishers, fish farmers, and entrepreneurs for projects related to aquaculture, fish processing, and marketing infrastructure.
- o Under PMMSY, state governments receive funds to promote fisheries infrastructure, including biofloc units, hatcheries, and fish processing

plants.

- **Blue Revolution Scheme:**
  - Under the Blue Revolution Scheme, NFDB supports states in promoting marine fisheries, inland fisheries, and aquaculture development.
  - The scheme focuses on fish seed production, feed management, cold storage, and marketing infrastructure, with significant funding routed through state governments.
- **Financial Assistance for Processing Units and Cold Storage:**
  - NFDB provides grants and subsidies for setting up fish processing units, cold storage chains, and value-added seafood product plants. State governments coordinate with NFDB to distribute these funds to eligible fishers and entrepreneurs.