

**Rayat Shikshan Sanstha's
Annasaheb Awate College, Manchar
Department of Zoology**

Class: S.Y.B.Sc.

Semester: IV

Paper: Applied Zoology II (ZO-242)

TOPIC: FISHERIES (PART II)

Topics:

- 1. Fishery By-products**
- 2. Fish preservation techniques**

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Fishery By-products

1. Describe various fish by-products in detail

- Fishes are consumed as food in fresh condition.
- Some of them are also utilized after the preservation.
- During preservation and processing, some materials of fish and prawn are discarded as waste.
- Some trash and distasteful fishes are unsuitable for human consumption.
- These waste material and above fishes become an important source to produce fish by-products.
- All these are good sources of high-quality protein, fat, minerals etc.
- Some of the fishery by-products are as follows:

1. Fish meal:

- It is the dried fish powder from which oil has been extracted.
- It is the residual cake after oil extraction.
- Fish meal is a nutritious feed supplement mainly or proteins, minerals, and vitamins.
- Raw Material: mackrels, sharks, rays, ribbonfish, silverbelly etc.

2. Fish flour:

- This is very superior quality of fish meal which is used for human consumption.
- Raw Material: mackrels, salmons, oil sardine, sharks, rays, etc.

3. Fish oil:

- It is an important source of Omega 3 fatty acids and is used in the production of feed, in pharmacological products, in paints and resins, and also as human food: margarines, pastries or dietary supplements.

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4. Fish glue:

- Fish glue is a good adhesive obtained from trim-mings, bones and skin of fishes belonging to order — Gadiformes (Cods, Pollack, Hakes, etc.).

5. Fish fin soup:

- It is a Chinese delicacy.
- The fins (except caudal fin) of shark are cut near the root, washed in sea water, dusted with a mixture of wood ashes and lime and dried in the sun or smoked.

2. Write short notes on Fish meal

- Fish meal is the dried fish powder from which oil has been extracted.
- It is the residual cake after oil extraction.
- Fish meal is a nutritious feed supplement mainly or proteins, minerals, and vitamins.
- Raw Material: mackrels, sharks, rays, ribbonfish, silverbelly etc.
- Chemical Composition:
 1. Proteins : 55-80%
 2. Fats : 2-15%
 3. Mineral : 10-12%
 4. Water : 6-12%
 5. Small quantities of iron, calcium, phosphorous
 6. Traces of vitamin A, B, D, K
- Uses:
 1. It increases milk, meat & egg production
 2. Supplementary diet in animal farms
 3. Manure for plants such as coffee, tea, tobacco (low grade fish meal)
 4. Poultry, cattle & piggery feed

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3. Write short notes on Fish flour

- This is very superior quality of fish meal which is used for human consumption.
- Raw Material: mackrels, salmons, oil sardine, sharks, rays, etc.
- Method of extraction: solvent extraction method.
- Chemical Composition:
 1. Proteins: >90%
- Uses:
 1. Used for human consumption
 2. It can be used in several forms, but the best use (also an easy use) is its blending with wheat or maize flour
 3. It is also added in small quantities for enriching the nutritive value of bread, biscuits, cakes, sweets, soap and gravel.
 4. It has been found that mixing of fish flour at level up to 10% does not alter the taste and the overall appearance of breed is rather, better.
 5. It is a favoured item in Africa and South-East Asian countries.

4. Write short notes on Fish manure and gunao

- Fish manure and guano are inferior quality of fish meal.
- It is not fit for animal consumption.
- Fish manure is a by-product of the curing yards, fish glue industries and oil extraction plants, where trash or spoilt fishes have been employed.
- Raw material: Mackerel, horse mackerel, sardine, etc., which are spoilt and unfit for use as food is used for preparation of fish manure.
- Composition:
 1. nitrogen : 5-7%
 2. phosphates : 4-6%

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3. lime (CaO) : 1-5%.

- For such nutrient content, fish manure is useful in raising coffee, tea and tobacco crops.
- Fish guano is the by-product of the body oil extraction plant which is the dried refuse left after the oil is pressed out.
- Here oil bearing species such as oil sardines are used as raw material.
- Fish guano contains high concentration of nitrogen (8-10%) and appreciable quantities of phosphoric acid.
- For this, guano is several times more effective than any animal manure.

5. Write short notes on Fish Glue

- Fish glue is a good adhesive obtained from trimmings, bones and skin of fishes belonging to order — Gadiformes (Cods, Pollack, Hakes, etc.).
- The raw materials are washed, chopped and steam-heated in steam-jacketed cookers.
- The mass is then covered with water and to it is added small quantity of acetic acid. It is then cooked for 6-10 hours. The liquor is extracted and concentrated to form glue. The residue is dried and is used as manure.
- Fish glue is used for:
 1. Smearing the backs of glued stamps and labels.
 2. Glue obtained from cod is of better quality and is used in photo-engraving.
 3. Low quality fish glue is used as adhesive for paper boxes, shoes and other things like furniture where joining is required.

6. Write short notes on Isinglass

- Isinglass is a gelatin-like material obtained from the swim bladder or air-bladder of certain fishes.

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- When put in water, it swells up but does not dissolve in it.
- At high temperature it hydrolyses in water to produce strongly adhesive gelatin.
- Swim bladder is a hollow sac, the outer layer is thick and fibrous, while the inner one is thin, often with a silvery lustre.
- The thin, inner silvery shiny layer of the air-bladder of some fishes, such as sturgeons, carps and catfishes, is used to derive isinglass.
- Isinglass has the following uses:
 - (1) Isinglass is used mainly for clarification of wine, beer and vinegar.
 - (2) It is used for the preparation of special grade cement and plaster.
 - (3) Formerly it was used as a substitute for gelatin in confectionery.

7. Write short notes on Fish liver oil

- Oil produced from liver of fishes like Cod, Tuna, Halibut and some of the Sharks are called liver oil.
- Raw Material:

Fishes used: Three classes of fish livers of commercial values are recognizable.

 - i. Fish livers with high oil content and low vitamin A potency. They include cods whose liver yields 60-75% oil with 500-20,000 i.u/g vita.
 - ii. Fish livers with low oil content and high vitamin A potency: They include Tuna, whose liver yields 4-28% oil with vitamin A potencies of 25,000-600,000 i.u/g.
 - iii. Fish liver with high oil content vita. A. They include fishes like hammer headed sharks, the liver of which yields 25-75% oil with vitamin A (potency of 300,000 i.u/g). The extraction of oil from liver is done by the methods given below.
- Chemical Composition:

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1. Fat : 55-75%
 2. Proteins : 5-15%
 3. Vitamin A & D
- Method of extraction:
 1. Boiling method
 2. Steaming method
 3. Flotation method
 4. Alkali enzyme method
 - Uses:
 1. Used for human consumption
 2. Treatment of Rickettsia & Xerophthalmia

8. Write short notes on Fish fin soup

- Shark fins are used for making soup.
- There are two main grades of shark fins; one is fine one, obtained from small sharks, and the other is the coarse one which is prepared for big sized sharks.
- They are first soaked in plain water or softened in water acidified with vinegar (acetic acid).
- The softened fins are then treated with 10% acetic acid at 60°C for about one hour. After removing skin, extraneous muscle, cartilage bones, etc. fins are boiled till the fin rays got separated from the remaining cartilage bones and muscle.
- The rays are separated manually, washed well, then soaked in cold water, containing small quantity of hydrogen peroxide for 2 hours and then washed.
- The fine product can be used immediately for the preparation of shark fin soup.
- The softened clean fin rays, after separation of extraneous materials can be washed well and dried in the sun.

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- Fish food as medicine: e.g. Mackerel

Fish Preservation Techniques

1. Write short notes on Chilling

- Chilling is a means of short-term preservation of seafoods achieved by the reduction in temperature using ice.
- It is the preservation of the fish at 0°C to prevent the spoilage for short time.
- It is the most effective method of preventing putrefaction and extending the life of fish.
- During chilling autolytic enzymic activities are checked by lowering the temperature.
- This is obtained by covering the fish with layers of ice and temperature is lowered / maintained to about 0°C.
- Chilled fishes must be stored properly at constant temperature.
- Advantages: Ice is effective for short term preservation such as is needed to transport landed fish to nearby markets or to canning factories, etc.
- Disadvantages: Icing and chilling can maintain fish fresh only for a very limited period. Quality deterioration takes place in chilled fish.

2. Write short notes on Freezing

- Freezing means removal of heat from the body.
- Freezing is a method low temperature preservation of fish that can ensure very long shelf life and can also provide a processed product very much similar to fresh fish.
- Main principle behind this method is cool temperature do not favors the all activities of microorganism and also its enzymatic activity becomes inactivates, due to low temperature.

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- Freezing is achieved either by using mixture of ice salt or refrigeration.
- There are 2 types:
 - 1. Deep Freezing/ quick freezing:**
 - This method is used for large periods of preservation.
 - It is a more effective but costly process.
 - Before freezing, fishes are washed properly and kept at a temperature of -18°C for a longer period.
 - For this process, only the fresh fish in good condition are deep-frozen. Before keeping the fish in this process, the heads of large fishes are removed and they are also gutted and washed.
 - This process is without spoilage and fish can be kept for a longer period.
 - 2. Freeze drying:**
 - This process is lengthy as well as expensive and used for the preservation of only good quality fish.
 - This process involves two steps, first freezing of the fish and then the second step is drying of fish by sublimation.
 - In this technique, ice is changed into water vapor without melting.
 - By this process, the color and nutritive substances are completely preserved.
 - In this technique, the fish is frozen at -20°C by keeping them in a freezing chamber.
 - As soon as freezing is over, the frozen fishes are kept in trays and are transferred to the cabin containing horizontal heating plates for drying in a vacuum.
 - The fishes are well dried due to hot plates and then they are placed in air-conditioned chamber.

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3. Write short notes on Salting

- Salting is a very old and common practice used in fish preservation in India and other parts of the world.
- Salting is nothing but the partial dehydration of fishes by osmosis with sodium chloride.
- Due to intense salting, microbes are killed and diastasis is stopped.
- In this process before salting, the heads of the fishes are removed, gutted and washed, and then salted as soon as possible.
- There are different methods of salting such as dry salting, cold salting, light, or strong salting.
- Types:
 - 1. Dry salting:**
 - In this method, alternate layers of fish and salt are placed.
 - This is called dry salting.
 - 2. Wet salting or brine:**
 - In this process, the fishes are dipped in salty water called brine.
 - The brine or saltwater is used in two different concentrations.
 - In light brine, the salt concentration is 16% and strong brine is used containing 25% salt.
 - After this saltwater treatment, the fishes are dipped in salt.

4. Write short notes on Drying

- Sunlight is the cheapest and most abundant source of heat energy used for drying purposes.

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- Drying a very old and common practice of fish preservation adopted by tropical countries like India, Japan, China, and others where sun rays are very powerful to dry the fishes easily.
- By this method, small-sized fishes are dried.
- The fishes are kept for dehydration on a mat or anything for 3 to 5 days and during this period turning over the fishes is continued.
- After complete dehydration, the dry fishes can be stored.
- These dried fishes are also used for making fish fertilizer.
- The larger fishes are cut into pieces for easy drying.
- However, this method is not perfect for longer preservation.
- Types:
 1. **Sun curing:**
 - The body of fish is opened from the ventral side.
 - Viscera and gills are removed.
 - Then the fish is washed and salted in the ratio of 1: 3 to 1: 8 (salt: fish) which is related to the size of the fish.
 2. **Mona curing:**
 - These organs are directly removed from the mouth without cutting body.
 - Fishes are cleaned, salted, and dried as earlier.
 3. **Wet curing:**
 - It is also like sun curing with the only difference in the packing of salted fish as such.
 - This method is used only for fatty fish.

5. Write short notes on Canning

- Canning is a method of preservation in which spoilage can be averted by killing microorganisms through heat.

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- Canning is the expensive process of fish preservation and hence it is not commonly used.
- However, it is widely used in advanced countries like America, France, Japan, and Spain.
- This is a lengthy, complicated but very advanced process of preservation.
- In this process, the best quality fishes are selected and their heads and viscera are removed.
- Then these eviscerated fishes are treated with brine (saltwater), washed, dried, and cooked in olive oil.
- This process is used to remove excess water for 2 to 5 minutes.
- Then the cooked fishes are packed in olive oil in tins and sealed and sent to markets.