

**M.Sc. (Final) Semester –IV (Zoology)**  
**Paper IV (a): Fishery Biology- Applied Ichthyology**

**Fish-based Industry and their by-products**

There is a large quantity of very small fish landed as by-catch which do not find a ready market as fresh fish. Fish processing and filleting industries turn out large quantities of fisheries waste. All these are good sources of high quality protein, fat, mineral etc.

**1. Fishmeal**

Fishmeal is a traditionally used livestock feed supplement. Fishmeal has high quality protein containing high levels of lysine, methionine and cysteine, three of the essential amino acids which the animal bodies cannot synthesize, and this makes it an unrivalled constituent of feed stuff. It is also a good source of B-group vitamins like cyanocobalamine (B12), chlorine, niacin, pantothenic acid and riboflavin. Fishmeal is rich in minerals like calcium, phosphorus, copper and iron and is also the source of some trace element. It is produced by cooking--pressing----drying----and grinding skeletal remains along with adhering proteinaceous tissues of fish from filleting and canning operations. Or by processing whole miscellaneous fish mainly caught along with prawns, which include jew fish, sole, silver-bellies, ribbonfish and the like. The composition of fish meal differs considerably due to variations in raw materials used.

During recent years organized fish meal industry has showed sign of revival. In 1972 there were 7 such plants in the country with an installed capacity of 175 tonnes/day. About a dozen modern fish meal plants of wet-reduction type are now in operation at various fishing centers.

**2. Fish oils**

Fish oil is of two types, the liver oil and the body oil. Fish liver oils were used for therapeutic purposes in the treatment of vitamin A and D deficiencies. Body oils have recently won much attention because of the content of polyunsaturated fatty acids (PUFA), particularly  $\eta$ 3 PUFA used in the control of heart ailments in humans.

## Fish-liver oil

The therapeutic values of fish-liver oil were discovered in 18th century, and fish liver oil became a common medicinal product. Both vitamin A and D are found in certain fish-liver oils. The most important fish-liver oils obtained are from cod, haddock and shark. Halibut and tuna livers are also rich sources of vitamin A and D. The weight of liver, fat content and presence of vitamins dependent on a number of factors like species, age, sex, nutritional status, stage of spawning and area from where it was caught.

### 3. Fish Silage

When fish is available which cannot be used for direct consumption for several reasons, it is used for production of fish meal, which has got ready market as an animal-feed. If material is available at a place where there is no fish meal plant and no reasonable transport to the nearest plant, there may be severe restrictions on fish meal production because of fish odours, one has to look for alternate processes. When animal farms are very near to landing centres, it is worthwhile to go for silage production.

Fish silage can be defined as a product made from whole fish or parts of fishes to which no other material has been added, other than an acid, and in which liquefaction of fish is brought about by enzymes already present in the fish. Fish silage can be made from whole fish or parts of fish by treating it with mineral acid (sulphuric acid) or organic acid (formic acid). Ensiling can also be achieved by lactic acid produced by fermentation of sugar using lactic acid bacteria or starter culture. As the source of sugar, molasses is added to the fish or fish offal. The product is a stable liquid with a malty odour, which has very good storage characteristics and contains all water present in the original material. It is a simple process and requires little capital equipment particularly if non-oily fishes are used. The use of oily fish usually requires oil separation, for which temperature of the silage is raised to 70-90°C and floating oil is separated by decantation or centrifugation.

Fish silage is used as cattle feed. Either the whole mass or the decanted liquid portion can be used. When solid feed is desired, the silage is mixed with rice bran or other feed ingredients.

#### 4. Fish protein concentrate (FPC)

Fish protein concentrate (FPC) is any stable fish preparation, intended for human consumption, in which protein is more concentrated than in original fish.

FAO defines following 3 types of FPC:

Type A: It is virtually odourless and tasteless powder having a maximum total fat content of 0.75%.

Type B: Powder having no specific limits as to odour of flavour, but definitely having a fishy flavour and a maximum fat content of 3%.

Type C: Normal fish meal produced under satisfactorily hygienic conditions.

Though Fish protein concentration is intended for human consumption it is not relished for consumption as such. It is therefore incorporated as a protein supplement in human diet. 5%-10% level FPC in bread and biscuit is considered the acceptable limit.

#### 6. Fish glue

It is a kind of good glue obtained from trimmings, bones and skins of fish. These latter substances are washed, minced and steam heated. The mass is covered with plenty of water and the medium made acidic with acetic acid. It is cooked for 6-10 hours. The liquor is extracted and concentrated to form the glue, whereas the residue is used, after drying as manure. Fish glue is considered a good adhesive and is used for smearing the backs of glued tamps and labels.

#### 7. Isinglass

Isinglass is a good substitute for gelatin. It swells in cold water but does not dissolve in it. At higher temperature it is used in confectionery as a substitute for gelatin; it is also used as an adhesive in the form of court plaster or other cements. But its chief use is clarification of beer, vinegar etc.

Isinglass is in fact a collagen derived from the thin inner silver shiny layer of the air-bladder of some fishes, particularly sturgeons, carps and catfishes. The air-bladder is collected washed thoroughly and then the outer thick and fibrous layer of the wall is separated from the inner layer which is exclusively isinglass raw material.

#### 8. Fish leather

The skin of some fishes such as cod, salmon, halibut, toad fish, sharks and rays yields good and ornamental leather. Fish leather particularly of sharks is used in making of shoes, wallets, bags because the leather is durable, flexible and ornamental and can also be dyed in different colours.

The skin of larger individuals is collected. It is then soaked in brine and left for a day. Next day it is salted and again put in brine containing 10% HCl. The skin is then taken out drained and scraped on the surface, particularly in case of sharks to remove fine denticles. After this the skin is tanned by usual process.

#### 9. Insulin

Fish is replacing cattle's in providing raw material for the manufacture of insulin. The pancreas of shark is very rich in insulin. Whales also provide a considerable quantity of insulin.