



Module Sea Food

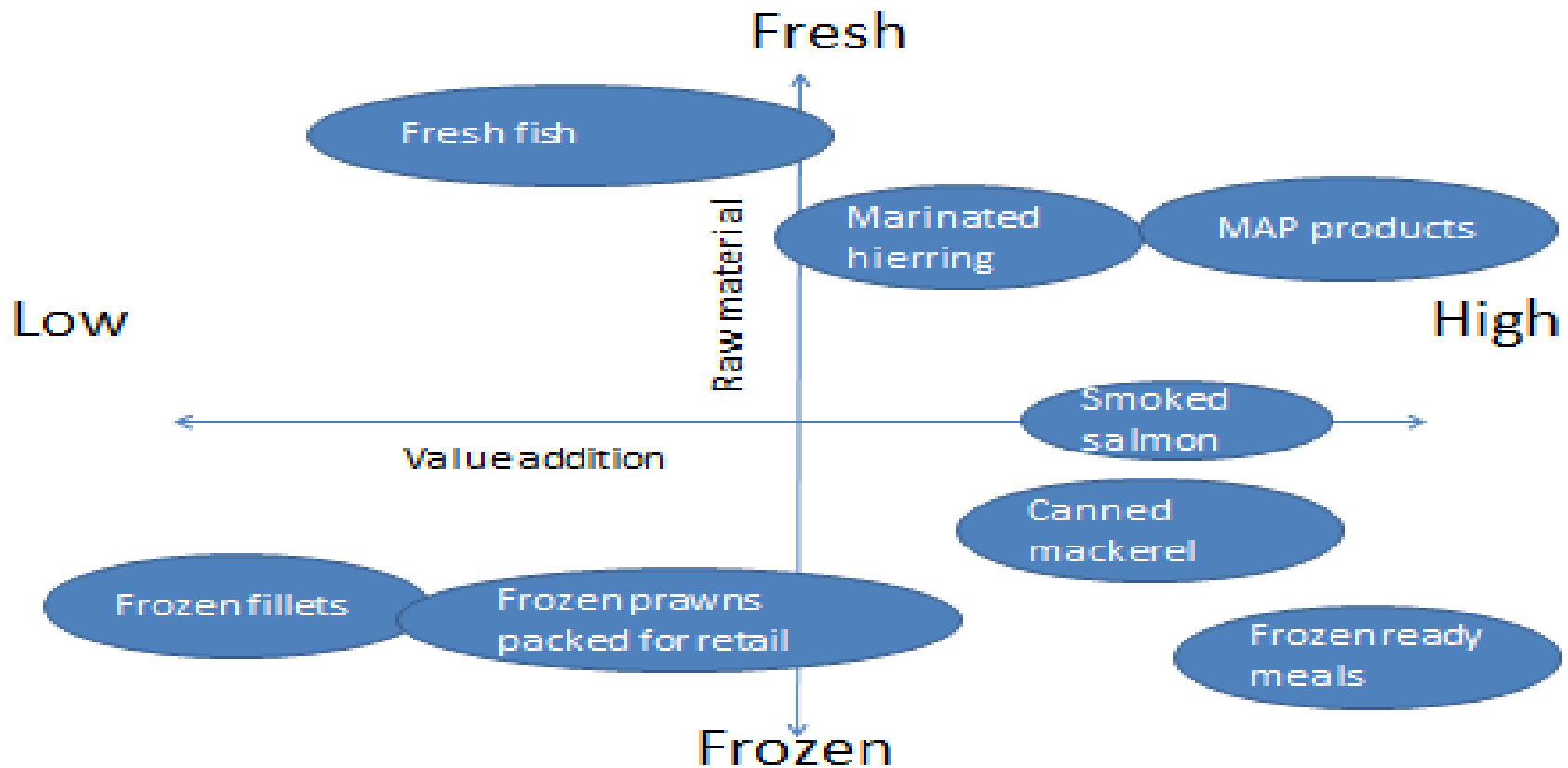
Module 28 : Production, consumption and biochemical composition of fish and sea foods



Overview of seafood Industry

- Fish farming : major food processing occupations
- Economically and socially backward people are employed in this profession
- Modern mechanized fishing vessels has brought vast changes in the attitude of the public fishing and seafood processing
- Fishing and processing activities provide employment to millions of people around the world

Seafood production process



Estimation of marine fish production



- 2.64 million tonnes, which is 0.314 million tonnes (13.5%) higher than that of the previous year
- The mechanized sector accounted for 67.9%, motorized sector 25% and artisanal sector 7.1% of the production
- The north-west coast accounted for 0.908 million tonnes, followed by south-west coast 0.86 million tonnes, southeast 0.611 million tonnes and north-east 0.227 million tonnes



Freshwater Aquaculture

➤ Prawn

- The giant prawn popularly known as ‘Scampi’ is migratory and completes its life cycle in both fresh and coastal seawater
- Freshwater prawn (*Macrobrachium \ rosenbergii*) culture was initiated in saline affected waters of Punjab and Haryana
- Prawn production ranged from 872 to 2,285 kg/ha



➤ **peninsular carps**

- Seven sets of *Labeo fimbriatus* were bred successfully using a portable hatchery at Bangalore.
- More than 0.1 million spawn were obtained.
- Sub-adults and fingerlings of *Puntius pulchellus* were collected from the Western Ghats and are being cultured under captivity on artificial feed
- In vitro culture of freshwater pearl mussel
- Primary in vitro cell culture of nacre secreting pallial mantle epithelial tissue explants of freshwater pearl mussel (*Lamellidens marginalis*) was carried out successfully.



Brackish water aquaculture

➤ Shrimp feed

- Shrimp feed developed by the CIBA was successfully tested in a farmer's pond at Kalpakkam, near Chennai
- The 0.52 ha pond was stocked with tiger shrimp *Penaeus monodon* seed and the farmer used CIBA shrimp feed during the culture.
- After 137 days of culture, the farmer harvested 1,665 kg of shrimp and obtained a production of 3,330 kg/ha.



Consumption of Fish and Sea Food:

- Global consumption of fish as food has doubled since 1973
- The FAO reports that growth of fish consumption as food in the relatively richer countries
- Large increases have also occurred in the consumption of crustaceans and noncephalopod mollusks such as oysters and clams
- Saturation of diets in developed countries, population and urban growth, are a consistent explanation towards stagnated production technologies



Biochemical composition of fish

- Fish is an easily perishable commodity and deterioration in quality is due to the changes taking place to the various constituents like proteins, lipids
- The four major constituents in the edible portion of fish are water, protein, lipid (fat or oil) and ash (minerals)
- Fishes are a very heterogeneous and highly specialized group evolved through biochemical adaptation and evolution, consisting approximately of 24000 species, showing extreme variations in size, shape, appearance
- There is generally an increase in the oil content of the muscle from the tail portion towards the head. Similarly the light and red muscle will vary in the biochemical composition of fish

Biochemical composition of fish



Water	65-90 %
Protein	10-22 %
Fat	1-20 %
Mineral	0.5-5 %



Water in fish tissue

- The proportion of water in the flesh varies widely, though in a majority of cases the variation is much narrower, between 70-80%.
- One of the examples of very high water content is Bombay duck (*Harpodon nehereus*) a species found abundantly along the north-west coast of India
- Water is present in two forms in the tissues, bound to the proteins and in the free form. Water is lost from the tissue in many ways during processing
- There exists an inverse relationship between the water content and lipid content of fish, such that the sum of the percentages of the two approximates 80 percent.



Lipids

- Lipids include a wide heterogeneous group of compounds. Lipids are defined as the fraction of any biological material extractable by solvents of low polarity.
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- In fatty fish like oil sardine, mackerel, herring etc. the main site of storage of lipids is the muscle
- The lipid content of the muscle of oil sardine (*Sardinella longiceps*) is about 3-4% in June-July, which increases to about 18% by November-December.



- Phospholipids, another important constituents of lipids are essential components of cell membranes
- It is the lipid-globular protein mosaic structure that determines important functions like permeability of cell membranes, transport of various substances into and outside the cell
- Unlike in the case of depot fat, the proportions of phospholipids do not show wide variation. Normally it is in the range of 0.5 to 1% of tissue



Fatty acid composition of fish lipids

- The major chemical entity in most lipid molecules like glycerides, phospholipids, wax esters is fatty acid.
- The nature of the fatty acids present in fish lipids is very complex. Fatty acids with carbon chain varying from 10 to 22 and unsaturation varying from 0-6 double bonds are of common occurrence.
- The proportion of trans isomers is usually very negligible. High degree of unsaturation, with 5 or 6 double bonds per molecule is very common and abundant in fish



- The fatty acid profile of depot lipids is different from that of other tissue lipids
- Depot lipids generally are richer in saturated acids when compared with lipids muscle tissue.
- The number of fatty acids present in the lipids of any species is quite high.
- About fifty different acids (including isomeric forms) have been identified in some species. However, a comparatively small number of acids account for about 85-90% of the total fatty acids.
- Myristic, palmitic and stearic acids are the important saturated acids present in fish from Indian waters. Among the monounsaturated group, palmitoleic and oleic acids are the important members and in the polyunsaturated group, arachidonic acid, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the major components.



Suggested readings

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