



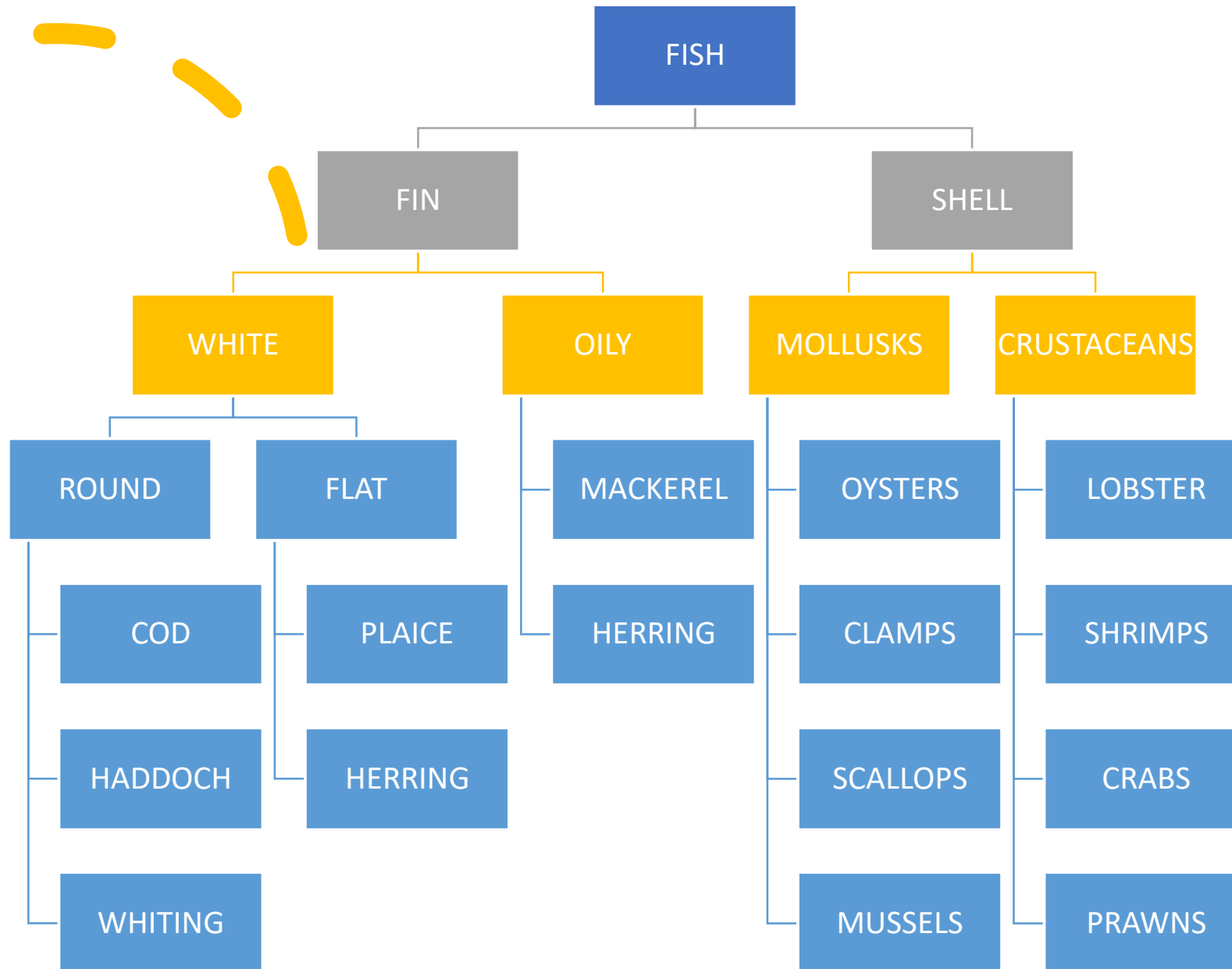
# FISH

Over 200 edible fish varieties are known. Commercially important marine types are sardines ,tuna ,catfish ,scombroids ,carps ,catla , rohu , murrels , hilsa . Although fish contains complete proteins and can be alternative for meat in the diet, fish consumption per capita is far lower than that of meat.



# CLASSIFICATION

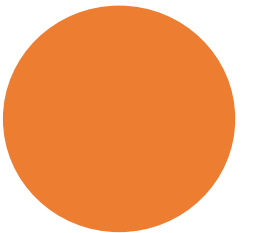
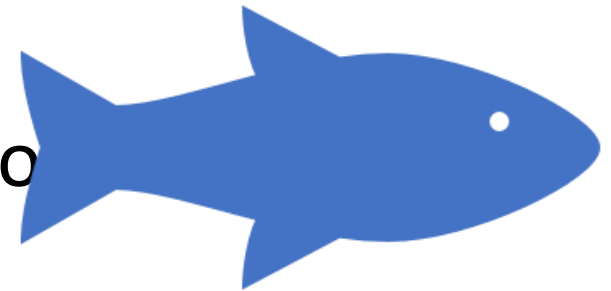
- Edible Fish are categorized as either fin fish and shell fish.
- The term fin fish refer to the fishes that have bony skeleton. most of these are from salt water ,however, some fin fish can be found in great lakes and inland water.
- Shell fish is used to designate both mollusks and crustaceans.
- Shellfish are highly perishable. Best when purchased directly from fisherman. They are expensive and short in supply. The demand has increased due to the introduction of frozen foods.
- Crustacea have legs with partly jointed outer shell. They include crab, lobster,prawns and shrimps
- Molluscs have harder outer shell and no legs. These are oyster, scallops and mussels.








# COMPOSITION AND NUTRITIVE VALUE

The composition of fish varies from fish to fish.

- **CARBOHYDRATES:** shell fish has less fat and more carbohydrate than fin fish. They contain some glycogen in muscle tissue. oyster is known for high glycogen about 2-3 percent
- **PROTEIN:** fish is an excellent source of protein due to its quality and quantity. They contain about 20 percent protein. Fish is rich in lysine and methionine.
- **FAT:** fish contains less fat and compared to meat and poultry. The lipid content in of both fish and prawn is very low and varies between 1-2.8 percent. Fish contain saturated fatty acids

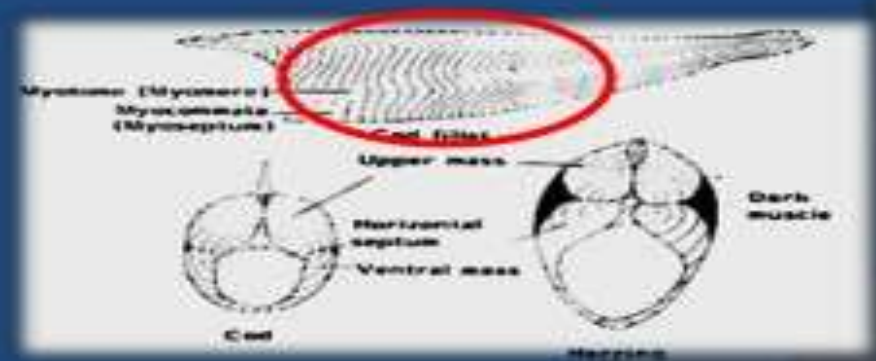
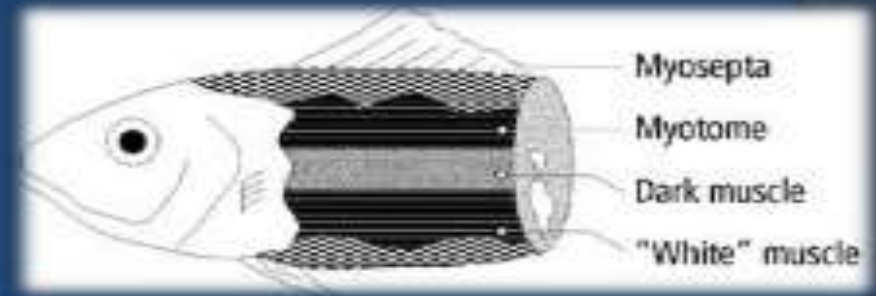


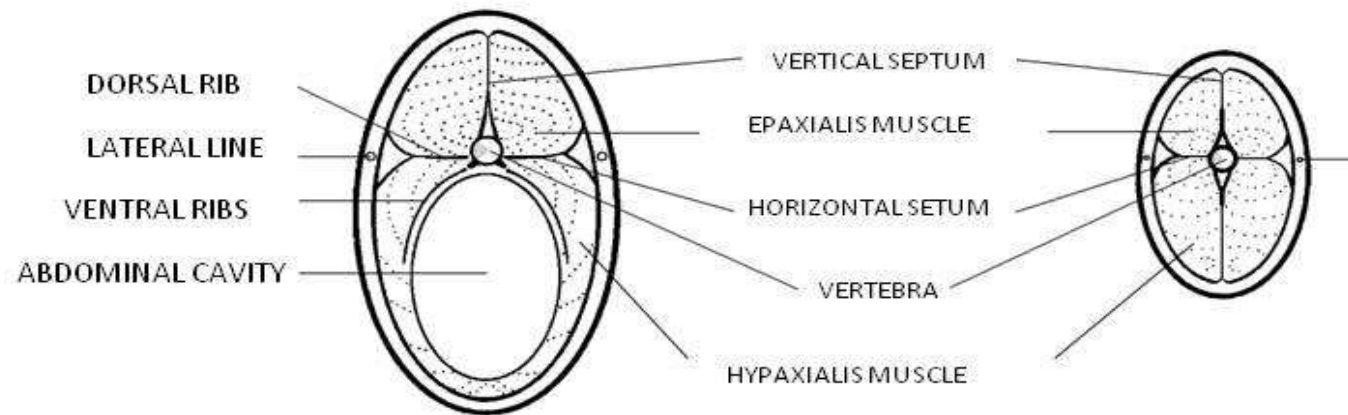
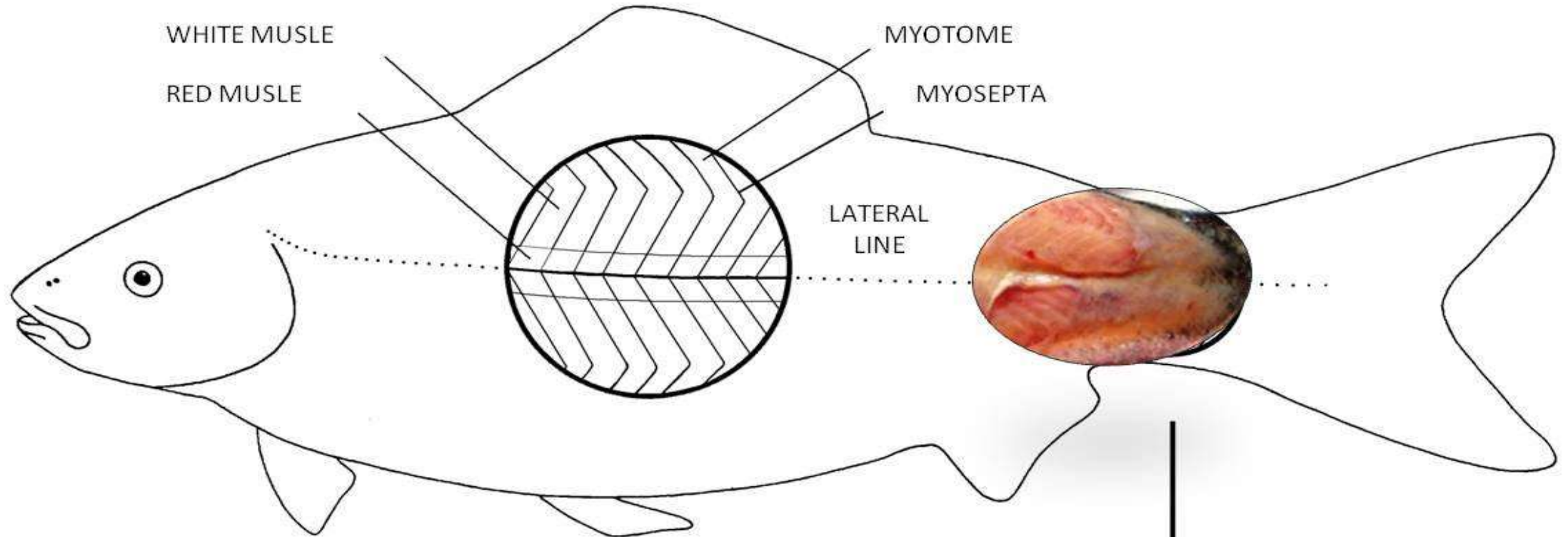
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- MINERALS: Fish are rich in calcium particularly small fish when eaten with proteins. Marine fish or ocean fish are good source of iodine ,selenium and fluoride . Selenium is a powerful antioxidants. Oysters are a good source of copper, iron and zinc.
  - VITAMINS: Sea food contains significant amount of B12, especially shellfish. Fish liver oils are excellent source of fat- soluble vitamins.
  - Fish protein concentrate- it is the name given to edible fish product suitable for human consumption. The fish protein concentrate, an essentially odorless powder is very rich in protein—70-80% with high lysine content.
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# Structure of fish muscle

- Fish muscle is composed of striated muscle fibers arranged in a parallel, longitudinal shape.
- Fish has muscle cells running in parallel and connected to sheaths of connective tissue (myocommata), which are anchored to the skeleton and the skin. The bundles of parallel muscle cells are called **myotomes**





# SELECTION OF FISH

- The skin should look bright, moist and shiny. The scales should be attached to the body. The skin on stale fish show sign of wrinkling and shrinking of skin.
- The eye of freshly caught fish is convex ,the pupil black and cornea translucent. The eye should be bulging and not sunken.
- The gills of freshly caught fish is red in color as the blood in them oxidizes and they rapidly turn brown.
- If the bone is stuck firmly to the flesh the fish is fresh but if the bone is removed easily it is stale.
- The surface should be free of dirt and slime.
- The flesh should be firm to touch with no traces of browning or drying around the edges



- A fish having odor indicates deterioration due to oxidation of polyunsaturated fat and bacterial growth

## SELECTION OF SHELL FISH

- PRAWNS: firm ,strong color and no unpleasant smell
- SCALLOPS: pinkish whites in color ,feels firm and give-off clear liquid
- CLAMS,OYSTER AND MUSSELS: tightly closed and heavy for their size, shell should not be cracked

# STORAGE AND PRESERVATION

- It is estimated that 10-15% of fish is spoiled during catching and further handling. Fish spoils quickly and should be used as soon as possible. It should be kept covered in the coldest part of the refrigerator for no longer than 2 days.
- Shrimps contain greater amount of free amino acids than fish and also highly active proteolytic enzymes, the cathepsins. They are therefore highly perishable and require adequate refrigeration.
- COLD STORAGE— Fish are packed with crushed ice in suitable containers. This will prevent spoilage for 1-2 days. Fresh fish or dressed fish in good condition will keep well for about a week, if they are packed with crushed ice and stored at 0 degree Celsius. The dressed fish or fillets are preserved by coating with salt powder in the ratio 1 part of salt to 3 parts of fish. The salt powder should contain sodium benzoate.

- **CANNING**- In canning, fish is dressed and washed. It is cut into pieces and filled in cans in saline. The cans are double steamed under vacuum .the sealed cans are sterilized at steam pressure at 121.1degree Celsius for 90 minutes. The sterilized cans are cooled in running water, wiped and kept in a cool place 10-15 degree Celsius. Fishes like salmon, tuna, sardines,mackerel,herring,lobster, crabs, clams, shrimp and mussels are canned.
- **CHILLING**-The enzymes that cause spoilage of fish are active at low temperatures and fish oils become oxidized at fairly low temperature, fish catches subjected to temperatures above freezing deteriorate fast.
- The most common chilling methods are wet ice, mixtures of ice, and sea water, or ice water or salt –water icing. The shelf life of cold water fish chilled to 0degree c immediately after post mortem is 1-2weeks .
- Oxidative deterioration, dehydration, toughening, loss of juiciness and excessive drip are some of the problems in frozen stored fish.

- **FREEZING**- It is an ideal process for preserving fish. Most trawlers prepare and freeze their catch at sea. When it is in prime condition. The frozen fish products are available in number of different forms. The rate of freezing can exert some influence on the final quality of thawed fish. The attainment of fish temperatures to -18 degree Celsius lower, in a period of 2 hour produce good results. All freezing methods can be used for freezing fish. Air blast freezing is used for individually packaged fish and shell fish product.
- **SMOKING**- it is a method of preserving surplus stock of fish. Smoked fish have a stronger flavor than fresh fish. The fish is either salted or non salted before it is smoked. it is then hung on rods in an oven or kiln. The smoke is blown over the fish for varying lengths of time. For cold smoking the temperature of the smoke must not rise above 29 degree
- **SALTING AND DRYING**- It is the most important methods of fish preservation. It include following step—
  - Cleaning and dressing
  - Drying and packing.



# Fish cookery

- Methods of cooking fish- fish is usually cooked by dry heat- broiling , baking ,and frying. Moist heat is also effectively employed to protect the delicate flavor of the fish. Fish such as salmon, mackerel and herring contain some amount of fat and require addition of very little fat in cooking. Some fish like cod, haddock, halibut and bass ,contain very little fat and require added fat during cooking.
- OVEN BAKED –fish that is oven baked enclosed in a sort of oil paper are mostly consumed.
- Some Indian recipes of fish are fish fry, kolambu ,cutlet ,and crabs with gravy.

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