

# FISH

- Fish are an excellent source of High Biological protein. They are complete protein foods, containing all 10 essential amino acids.

## CULLINARY USES (IE) : USES IN COOKERY



Soups (eg) : Chowder



Entrées (eg) : Crab/Lobster



Main Course (eg) : Grilled Hake



Sandwiches (eg) : Tuna Sandwich

## CLASSIFY FISH

### A : PHYSICAL SHAPE

- Round Fish (eg) : Cod, Salmon
- Flat Fish (eg) : Sole, Plaice.



Cod Fillets

### B : HABITAT

- Fresh Water (eg) : Fresh Water Trout
- Sea Water (eg) : Sea Water Trout



Trout Fillets

### C : COMPOSITION

- White Fish (eg) : Cod, Haddock.
- Oily Fish (eg) : Trout, Salmon.
- Shellfish (eg) : Molluscs (no legs)
- Crustaceans (shell) (eg) : Prawns, Oysters, Lobster.



Prawn

## STALING OF FISH

**NB : 2016 Q2(B)**

- Raw Fish has a very high water content therefore a “magnet” for bacteria. Fish spoil quickly for a number of reasons.

### A : NO GLYCOGEN

- When fish are caught at sea, they struggle violently in the nets, using up a lot of energy (ie) : using up their glycogen stores.
- When fish are dead, they have no glycogen stores left. This means that there will be **NO LACTIC ACID** produced, lactic acid is a natural preservative.

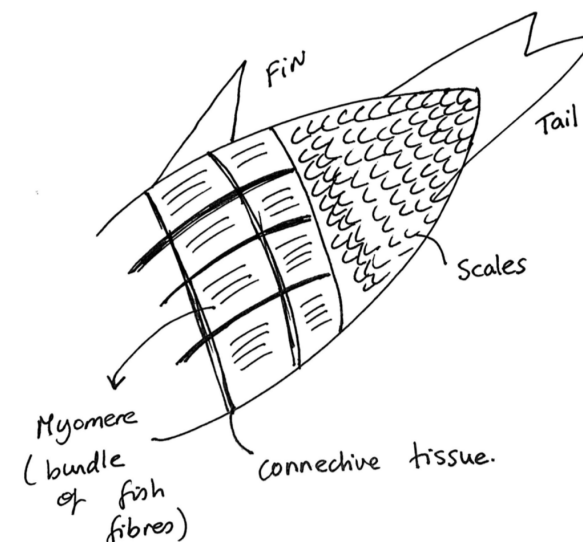
### B : HYDROLYTIC RANCIDITY

- Oily fish (eg) : Salmon, Trout, Mackerel) cannot be stored in a freezer for long because they “spoil”/go rancid!
- Oily fish have a maximum shelf life of 3 months in a freezer compared to 6 months shelf life for white fish.
- This is because enzymes in oily fish can still work at -18°C in the freezer.
- This can bring about hydrolytic rancidity where triglycerides in the fish “split”, spoiling the fish with an unpleasant taste and odour.

### C : HIGH MOISTURE CONTENT/BACTERIAL ACTIVITY

- Raw, dead fish are high in moisture. Bacteria are attracted to these types of food (eg) : Sushi.
- When fish are dead, saprophytic bacteria feed off fish flesh and produced a nitrogen based compound called **TRIMETHYLAMINE** giving the fish a bad odour!
- These bacteria secrete enzymes into the fish flesh to break down nutrients to produce this bad smelling compound.

## STRUCTURE OF FISH



- Fish Flesh is composed of bundles of fibres called myomeres.
- Myomeres are held together by connective tissue (lesser amount than meat).
- Scales should be firmly attached to fresh fish.
- Shellfish have coarse fibres, making it more difficult to digest. If shellfish are living in polluted water, the bacteria in water may contaminate it and cause food poisoning.
- When fish is heated, the connective tissue in between the myomeres dissolve and convert to gelatine causing fish to break up “flakes”.
- **Tinned Fish** : Bones are softened because of the high temperature (121°C → 15 minutes). Tinned fish is therefore an excellent source of calcium.



## EFFECTS OF COOKING

- Protein coagulates and shrinks (flesh becomes opaque at 60°C - 70°C).
- Connective tissue changes to gelatine causing fish to break up if overcooked.
- Some loss of B group vitamins.
- Minerals and extractives may dissolve into the cooking liquid (therefore, liquid is sometimes used for sauces).
- Bacteria and parasites (worms, eggs) are destroyed if heated enough.

## BUYING FISH

- No unpleasant odour (Trimethylamine).
- Flesh firm, close grain.
- Eyes are bright and prominent.
- Gills are red.
- Skin is shiny and unbroken.
- Scales are plentiful and firmly attached.

**NOTE :** Bord Iascaigh Mhara (BIM) launched Ireland's first accredited fishmonger qualification "Certificate in Fishmonger skills" in October 2019 (image taken from launch)



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## FISH

**W**hen shopping for whole fish look for fish with bright, clear, bulging eyes. If the eyes are sunken, discoloured or slime covered, don't buy.

With filleted fish the flesh should be moist with a translucent sheen and a blue or pink tinge. Make sure you buy in shops that keep fish surrounded by fresh ice. Fresh white fish, such as cod, haddock and whiting, will have a fresh 'seaweed' odour.

Once you get home, refrigerate the fish quickly and use within a day. Cook fish thoroughly, until it is opaque and flakes easily with a fork.

Hygiene is as important around fish as any raw food. Don't store cooked and raw fish near each other, wash hands and surfaces that come into contact with raw fish.

Even if eating raw fish is becoming fashionable, be careful – you can never be sure that fish isn't a home for parasites or bacteria. Raw fish – and this includes marinated fish – is a definite no-no if you are pregnant, (or might be), because of listeria. Care needs to be taken too with crab and meat from all filter-feeders like oysters and mussels.

## ECONOMIC VALUE OF FISH

- Price varies at different times of the year. During bad weather periods, fish is hazardous and the price of fish goes up due to scarcity.
- Approximately 70% waste if cleaning whole fish (skin, bone, gut, head, tail removed)
- Shellfish are particular wasteful – large shell and a small amount of fish flesh (eg) : scallops.
- Cheaper to buy fish on the bone than filleted (depending on the shop)
- Cheap Fish → Herring, Mackerel.
- Expensive Fish → Lemon Sole, Sea Bass, Swordfish.

- NB :** If asked about the "Economic Value" of a food, ask :
- When is the food cheap/inexpensive?
  - When is the food expensive?

## ECONOMIC VALUE OF FISH

	White	Oily	Shell
Protein	17%	18%	20%
Lipids	0.5%	10-20%	2-5%
CHO	0%	0%	0%
Minerals	Iodine, Phosphorous	Iodine, Phosphorous	Iodine, P, Calcium
Vitamins	B	A, B, D	B
Water	80%	65%	75%

## NUTRITIVE VALUE OF FISH

### PROTEIN

- 1<sup>st</sup> Class.
- High Biological Value (high in essential amino acids)
- HBV 80% - 90%.
- Actin and Myosin are the main proteins present in fish.

### LIPIDS

- Oily fish contain polyunsaturated fatty acids (Omega-3) (eg) : EPA and DHA (essential fatty acids).
- Shellfish have a small amount of lipid, yet are high in cholesterol.
- White fish (trace amounts) as liver is removed.

### CARBOHYDRATE

- 0%.
- Glycogen is used up in the struggle in the nets.

### MINERALS

- Iodine, Phosphorous and Potassium found in fish.
- Calcium is high in tinned fish and whitebait.
- Fish have only ¼ of the iron content of red meat, however shellfish is high in iron (it is not a main source of iron as shellfish is not eaten in large amounts).

### VITAMINS

- Oily fish are high in fat soluble vitamins A & D.
- All fish contain B vitamins.
- Vitamin C.

### WATER

- 65% - 80% depending on type of fish.



## DIETETIC VALUE OF FISH

### LOW KILOCALORIE DIETS

- Should include white fish (Cod, Hake) because it is virtually fat free. White fish is a lean protein food so it is nutrient rich without extra kilocalories.

### OMEGA 3 FATTY ACIDS

- Oily fish (Salmon, Trout) contain Omega 3 fatty acids which help make blood less sticky, easier to flow and less likely to clot and cause a stroke therefore ideal for people with heart disease.
- These fatty acids are good for brain function and concentration and help keep joints flexible.

### LACKS CARBOHYDRATE AND VITAMIN C

- All fish lacks carbohydrate and vitamin C therefore when including fish in the diet serve with foods rich in these nutrients (eg) : fish pie (potato topping) and a green salad.

### METABOLISM

- All types of fish (White, Oily, Shell) contain Iodine which is essential for the proper functioning of the thyroid gland. This influences a person's metabolic rate.

### DIGESTIBILITY

- White fish is very easy to digest therefore suitable for the diets of elderly people and convalescents.
- Shellfish however has coarse fibres and is difficult to digest.



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## PROCESSING OF FISH

### A : FREEZING FISH

- Fish is kept on ice for storage before freezing.
- Fish freezes well when filleted.
- Freezes well when processed into fish fingers, fish cakes, fish in sauces.
- Blast frozen **-30°C**.
- Loss vitamin B in thawing (drip loss).
- **NB** : Best method of processing fish as the nutritive value remains nearly the same.
- **Recommended Storage Times** :
  - **White Fish** : 6-12 months. → Freezer
  - **Oily Fish** : 4-6 months. → Freezer
  - **Shellfish** : 1-2 months. → Freezer
  - **Smoked Fish** : 4-6 weeks. → Fridge
- **NOTE** : Oily fish should not be stored for more than as the lipid would go rancid.
- Fish should be frozen within 24 hours of being caught.



## B : CANNING FISH

- 121°C/15 mins (kills bacterial spores → endospores).
- Usually oily fish are canned (eg) : Salmon, Tuna, Herring, Sardines.
- **Canned In :**
  - Oil.
  - Tomato Sauce.
  - Brine (salted water).
  - **NEW :** Mayonnaise, Mediterranean sauces/peppers etc.
- Some loss of Thiamin, Vitamin B1.
- Tinned fish is a good source of calcium (softened bones).
- Oily fish canned (Vitamin A+D) present.



- The fumes impregnate the fish flesh (aldehydes) and preserve the fish.

Natural Smoking →



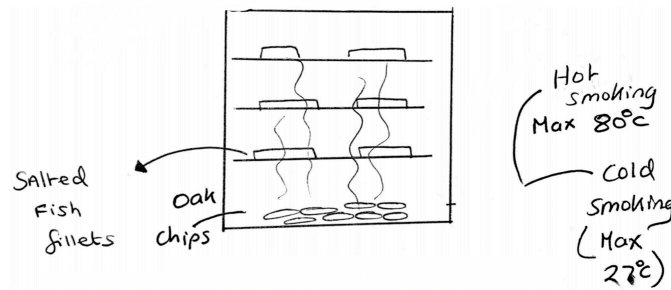
## 2 : ARTIFICIAL SMOKING

- Fish is soaked in artificial dyes and flavourings (cheap).

## C : SMOKING FISH

### 1 : NATURAL SMOKING

- Fish that is smoked include Herring, Salmon, Trout, Mackerel.
- The fish fillets are salted, this draws out moisture from the fish cells, the salt is washed off the fish.
- The fish fillets are then placed in a smoke house with wood chips.



### A : POACHING

- Fish is placed in a simmering liquid (eg) : milk/water, which has been seasoned.
- Usually takes 6 – 8 minutes to cook depending on thickness of fish.

### B : GRILLING

- Fast method.
- Moderate heat.
- Seals in flavour/juices.
- Fish is usually turned once during cooking.
- Suitable for fish fillets, cutlets and flat fish.

### C : STEAMING

- No fat.
- Fish is placed on a plate, covered and steamed over a saucepan of water.
- Ideal for elderly and low kilocalorie diets.



## D : BAKING

- Fish is baked in an oven.
- It may be stuffed, seasoned and wrapped in tin foil or greaseproof paper.
- Healthy option.

## E : FRYING

- Shallow frying in oil.
- Deep frying if cooked in batter or breadcrumbs.
- Stir fry (eg) : Tiger Prawns.
- Frying adds great flavour.

## F : BARBEQUING

- Only marinade fish for 15 – 20 minutes, otherwise it will disintegrate during cooking (eg) : toasted sesame oil and soy sauce for salmon.
- Smokey flavour.

**NOTE** : Fish can also be cooked in the microwave oven, it remains moist and cooks very quickly.

## PREPARATION OF FISH FOR COOKING

- Do NOT wash under cold running water (according to FSAI).
- Remove skin (if desired/necessary) and any blood around the centre of the bone.
- Remove any pin bones from fillets.
- **NOTE** : Head, fins, entrails and loose scales are removed from whole fish.

## STORING FRESH FISH

- If fish has to be stored for more than one day, it should be frozen.
- Ideally fresh fish should be eaten on the day of purchase.
- Ideally fresh fish should be stored on ice in the supermarket.
- When fish is brought home, the plastic wrapping should be removed, fish is **NEVER WASHED (FSAI)**, pat dry and place on a plate. Cover loosely with tin foil.
- Store in the coldest part of the fridge.
- Keep fish (raw) away from cooked foods in the refrigerator to prevent cross – contamination.
- Temperature of :
  - **Fridge** : 1°C - 5°C
  - **Freezer** : -18°C
- Once tinned fish is opened, use within one day.

