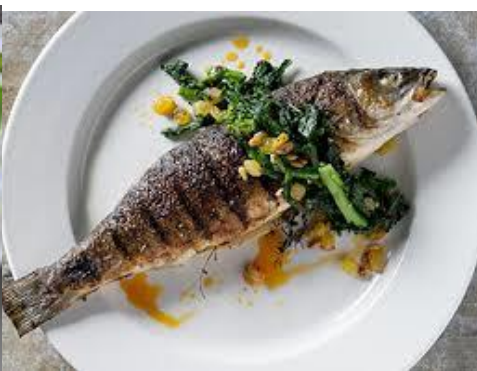


# Effects of different types of cooking in nutritional quality of fish



# Cooking methods of fishery products

- ▶ Curry
- ▶ Frying
- ▶ Grilling
- ▶ Boiling
- ▶ Canning



# Fish curry - Boiling

- ▶ High in Niacin, phosphorus, vitamin, selenium; and low in sugar
- ▶ **Minerals** show changes during boiling due to their solubility
- ▶ **Cholesterol** will increase.
- ▶ **Omega 3 fatty acids** will decrease





# Frying - Changes in fat

- ▶ Frying - fat penetrates into it, replaces part of water and omega-3 fatty acids, it contains
- ▶ Typical fried flavour is due to lipid degradation products originating from frying oils.
- ▶ Frying tuna degrades its omega-3 content up to **70-85%**.
- ▶ If oil is heated to a high temperature for a long period of time, **toxic aldehydes** are formed.
- ▶ Aldehydes increase risk of **cancer** and other diseases



# Frying - Changes in carbohydrate & minerals

- ▶ **Carbohydrates** varies from only 95% to 100%, indicating frying method has no influence
- ▶ **Minerals** changes during frying but negligible

# Frying - Changes in Protein

- Frying **does not change digestibility** of the protein.
- When reducing substances are added to fried food, ie. **carbohydrates** (fish balls), it lowers slightly **protein digestibility**

State of fish	Hake	Sword fish	Fish balls
Raw	0.92	0.94	0.92
Fried	0.91	0.96	0.89

# Frying - Changes in Vitamin

- ▶ Several vitamins are **very sensitive** to higher temperatures and oxidation
- ▶ Loss is certainly very high in surface layers.

## Vitamin E

- ▶ Lost along with oxidation of unsaturated fatty acids during heating.

## Vitamin B and C

- ▶ Vitamins B1, B2, B6 and C retained in frying than in boiling, steaming, or stewing



# Canning - Changes in Protein

- ▶ **Proteins** are denatured, coagulated & precipitated.
- ▶ Coagulation & precipitation adversely affect **protein digestability** and hence impair nutritive value
- ▶ **Enzymes** are completely inactivated
- ▶ **Arginine, threonine, cysteine** - partially destroyed.





# Canning - Changes in Fat and oils

- ▶ Undergoes **hydrolytic and oxidative rancidity**
- ▶ Oxidative rancidity is prominent - accelerated by heat, metal ions, moisture.
- ▶ For every increase of  $10^{\circ}\text{C}$  - rate of oxidation doubled.
- ▶ **Moist heating** reduce fat rancidity.



# Canning - Changes in vitamins

- ▶ Fat soluble **vitamins A and D**, relatively **stable** to heat, but **loss** occurs in the presence of oxygen
- ▶ Heat liable water soluble **vitamin thiamin and ascorbic acid** are **lost** but **riboflavin instable** to heat.
- ▶ High temperature short processing - less destructive to water soluble vitamins

# Canning - Changes in carbohydrates

- ▶ **Browning reaction** occurs at higher temperature - degrades carbohydrates.
- ▶ **Caramelization** also degrades CHO at high temperature.

# Grilling

- ▶ Grilling & broiling are similar to cooking but at dry heat.
- ▶ Grilling - heat source comes from below.
- ▶ Grilling imparts great flavour to food.





# Grilling - Loss of nutrients

- ▶ Up to 40% of **B vitamins and minerals** lost during as nutrient-rich juice drips from meat.
- ▶ Formation of **polycyclic aromatic hydrocarbons (PAH)**, potentially cancer-causing substances when fat drips onto a hot surface.



# Raw fish

- ▶ Health-conscious people consume raw foods.
- ▶ Raw fish - good source of Omega 3, fats and proteins - easy to digest - easily assimilated in the body.
- ▶ Vitamins and minerals not lost
- ▶



# Raw fish

- ▶ **Popular fishes common in raw fish cuisines:**
  - Salmon
  - Herring
  - Tuna
  - Carp
- ▶ **Sushi and Sashimi**
- ▶ Two popular dishes that are made with raw fish. Quite popular in Japanese, Chinese and Thai cuisines



# Common effects of cooking in fish

- ▶ Texture tend to be soft compared to raw fish.
- ▶ Heat induce conversion of collagen to gelatin
- ▶ Levels of EPA and DHA almost doubled
- ▶ Fat content lowered when boiling because of absorption of water
- ▶ Fat content increased when frying because of oil penetration
- ▶ Micro wave heating - losses of EPA(25 %) and DHA (55%).
- ▶ Canning completely destroys these fatty acids



