# UNIT 6 FISH NOODLES AND PICKLES

## Structure



## 6.0 OBJECTIVES

After reading this unit, you will be able to:

- summarize the preparation of fish noodles;
- assess the importance of the extrusion process and justify how this technology helps in the preparation of convenience products; and
- describe the preparation of fish pickles.

## 6.1 INTRODUCTION

You will be surprised to know that fish flesh from some low value fishes as well as by-catches can also be used in the preparation of instant, ready-to-cook or ready-to-eat products. These are convenience products and have a high level of

acceptance in cities. Fish noodles are products wherein fish meat is mixed with flours and is converted in the form of noodles through the modern process of extrusion technology. Thus, on consumption of these noodles, the consumer will get the benefit of the nutrition from fishes. You know that fish pickles are delicacies in our country. They are very popular and fishermen groups prepare large quantities of fish pickles using a wide variety of low value fish such as sardines, mackerel, perches and anchovies. Fish pickles are also packed in laminated pouches or glass containers with attractive labels and marketed. You will learn about fish noodles as well as fish pickles in this unit and further justify the importance of value added products from low value fish.

## 6.2 FISH NOODLES

Noodles are very popular as fast food all over the world. Noodles are produced in homes and commercially by extrusion process. The word 'noodle' derives its name from the German word ***"****Nudel"* (meaning noodle). It is also related to Latin word "***Nodus"*** (knot). The first historical written evidence of the origin of noodles is from the records of East Han Dynasty of China between 25 AD and 220 AD. The oldest noodles so far unearthed were found at the Lqjia site (Qijia culture) along Yellow river in Qinghai, China. The age of this noodle was estimated to be 4000 years and it was supposed to be prepared from foxtail millet and broom corn millet (Oldest noodles unearthed in China, BBC news, dated 12 October, 2005).

Noodles have different names in many countries (Table 6.1) depending on shape, composition and method of preparation. Names of some famous noodles are given below:

**Table 6.1: Popular Noodles of Some Countries**

| ITALY | CHINA | JAPAN |
|---|---|---|
| **Spaghetti** | **Misua:** Is a very thin variety of salted Chinese noodles. (Fig. 6.1) | **Hiyamugi**: Thin wheat noodles. |
| **Macaroni** | **Dan Mien**: Made from wheat starch and egg. | **Kishimen**: Flat thick wheat noodles. |
| **Fettuccine** | **Gan Mien**: Wheat starch noodles. | **Ramen:** Wheat noodles, fried before drying |
| **Linguini** | **Chow Mien**: From egg and wheat. | **Soba**: Buck wheat noodles. |
| **Rravioli** | **Yi fu or Yi Mien**: Flat egg noodles. | **Somen**: Flavoured wheat noodles. |
| **Orzo** | **Lo Mien**: Flatter egg noodles. | **Udon**: Wheat noodles very thin. |
| **Cannettoni** | - | - |
| **Gnocchi** | - | - |

Italian noodles are famous globally. These noodles are also known as *Pasta.* Pasta has two shapes, the macaroni and noodle.

Fish incorporated noodles are not popular as a dish all over the world. Normally, starch noodles are cooked and mixed with fried fish in different styles and served together. Noodles after cooking are added to fish curries and served hot. This style is also popular in many Asian countries.

**Fig. 6.1: Misua noodle making in China**

Fish noodles contain fish meat. Extrusion process is a fully automatic process and different sizes of extrusion machines are now available in the market. Fish noodles can be prepared from comparatively low value fishes as well as by-catches. The most important low value fishes and by-catches are jew fish, perches, breams, ribbon fish, sole, barracuda, lizard fish, lesser sardine, etc. However, fatty fishes are not suited for noodle production, as the product gets rancid very fast and become unacceptable to consumers. Development of viable and appropriate technologies for the utilization of these under utilized fishery resources is the need of the hour. These by-catches will find acceptance in markets abroad only when they are converted to various attractive value added products. In order to improve the utilization of underutilized fisheries resources, there is a need to minimize the post-harvest losses, develop innovative processing technologies and utilize processing waste for industrial and human use. One such technology, which will be suitable for utilization of low value fish or by catch, is "extrusion technology." Use of fish mince with cereals through extrusion process will enable production of shelf-stable products at ambient temperature. Extrusion cooking is used in the manufacture of food products such as ready-to-eat breakfast cereals, expanded snacks, pasta, fat-bread, soup and drink bases.

### 6.2.1 Extrusion Technology

Basically, an extruder is a pump, heat exchanger and bio-reactor that simultaneously transfers, mixes, heats, shears, stretches, shapes and transforms chemically and physically at elevated pressure and temperature in a short time. At times, the extrusion cooking process is also referred as 'High Temperature Short Time' (HTST) process. The raw material in the form of powder at ambient temperature is fed into extruder at a known feeding rate. The material first gets compacted and then softens and gelatinizes and/or melts to form a plasticized material, which flows downstream into extruder channel.

Extrusion cooking can be carried out either in a single screw or twin-screw extruder (Fig. 6.2). Twin-screw extruders are used for production of a wide variety of food products and the final quality of the end products depends on the characteristics of starch used in the cereals and protein ingredient as affected by extrusion process. In extrusion process, gelatinization of starch and denaturation of protein ingredient are achieved by combined effect of temperature and mechanical shear. The conversion of raw starch and digestible materials by the application of heat and moisture is called gelatinization. During extrusion, the conditions that prevail are high temperature, high shear rate and low moisture. Once these are made available for starch, it may lead to breakdown of starch molecules to dextrins.

**Fig. 6.2: Twin screw Extruder (Photo, courtesy CIFT Kochi)**

Recent years have seen increasing requirements for new products with intricate shapes and small sizes that are beyond the capabilities of single screw systems. Twin screw extruders can fill some of these needs. The term 'twin screw' applies to extruders with two screws of equal length placed inside the same barrel. They give more flexibility and better control for controlling both product and process parameters. Twin Screw Extruder is a better choice for producing a wide variety of high value products at low volume because the screw speed is such an influential factor. Due to the high residence time and good conveyance, twin screw extruders are better choice for the smooth extrusion of high moisture content materials. High level of fish meat (above 35%) inclusion, ultra small product size and shape etc., are some advantages of the twin screw extruders. For producing battered and breaded products also, the crumbs of the required crispness can be produced only by such extruders. Corn, wheat and many other mixtures can be extruded in a wide variety of shapes and texture to please the eye and the palate. They can be coated or dusted with any other ingredients such as sugar, honey, cocoa and almost any other sweet or savoury flavour.

High moisture extrusion capability of twin screw extruders can be used to process a wide range of ingredients of plant and animal origin. You know that the demand for convenience type of foods with desirable sensory and nutritional attributes is growing rapidly. Consumers are increasingly aware of the nutritional importance of their food supply. The ability of food extruder to combine nutrition with desirable sensory qualities fits in well with the present trend towards greater health consciousness. With the demand for more efficiently produced healthy foods, high moisture extrusion is expected to grow in the near future.

The advantages of extrusion process are:

- The process is thermodynamically most efficient.
- High temperature in a short time enables destruction of bacteria and anti-nutritional factors.
- One step cooking process thereby minimizing wastage.
- Destruction of fat hydrolyzing enzymes and enzymes associated with rancidity during extrusion process.
- Extrusion cooking technology has limitless application in the processing of cereal based foods and other materials. Ready-to-serve and ready-to-cook processed foods that can be stored at room temperatures without refrigeration are the products that have very good potential worldwide. Value addition is the most talked about word in the fish processing industry these days because of the increased realization of foreign exchange and high unit value for such products. In today's wealthy society, people prefer to buy ready-to-cook and ready-to-serve convenience products from supermarkets than buying raw fish, which is cumbersome to prepare for the table. Cereal-based extruded products are now getting more and more importance and popularity in the market. A few extrusion studies have indicated the possibility of producing puffed snack foods products from rice, other flours and fish muscle blends using various extruders. They are very crisp. Besides the inclusion in breakfast cereals, the products can be used to boost the healthful content of snack mixes, baked products and salad toppings. Extruded products can supply good quality nutritional foods convenient for use in this modern life. Moreover, by-catches and low cost fishes can be utilized properly by which fishermen get more profit for their effort.

Extruded products like noodles, wafers, flakes, etc. from vegetable sources are well established in the consumer market. But, fish based extruded products are yet to gain popularity. Extrusion is a process, which combines shear, pressure and temperature leading to molecular transformations in the constituents and involves denaturation of the proteins, fragmentation of the starch molecules and changes in the non-covalent bonds between proteins, lipids and carbohydrate. Fish based extruded products have got very good marketing potential. Formulation of appropriate types of products using different fish mince, starches etc., attractive packaging for the products developed, market studies, etc. are needed for the popularization of such products. However, technological studies involving use of indigenously available starches like cassava starch, potato starch, corn starch, etc. and the associated problems, need thorough investigation. Such products can command very high market potential particularly among the urban elites. The technology can be employed for profitable utilization of by-catch and low value fish besides providing ample generation of employment opportunities.

### 6.2.2 Fish Noodles Recipe (General)

You will be interested to know that a number of formulations are available in literature. The basic variation is in the amount of fish content in the noodle. High fish content gives the noodle a fishy odour and less shelf life. Fatty fishes are not suitable as noodles develop fishy odour during storage and make the noodle unacceptable to consumers. At 15% level of incorporation of fish meat in the noodles, they become very good by sensory properties. Cooking the fish meat

in water and gently pressing the meat after removal of the cooked water gives less fishy smell to the finished products. High fish content in the noodles gives a firm structure to the products and the products becomes hard.

Fish noodles are prepared from wet fish muscle. Fresh water fish like carps are not suitable as they contain bones in the meat. The right type of fish muscle needed is bone free muscle meat.

The recipe given in Table 6.2 is a standard formula. Starches can be corn starch, tapioca starch or potato starch. Vegetable oil can be selected based on consumer preference. A part of the starch can be substituted by wheat or rice flour. The combination can be fixed by the quality of the end product. You will be surprised to know that industrial formulae are closely guarded secrets.

**Table 6.2: Recipe 1**

| Items | Quantity (in g) |
|---|---|
| Fish mince | 150 |
| Gram flour | 100 |
| Starch powder | 700 |
| Vegetable oil | 20 |
| Spices, salt, condiments, water etc. | 30 |

**Manufacturing process:** All the components are mixed well in a mixing machine or grinder to a thick mass and fed into the extruder. During extrusion process, by adjusting pressure required temperature is attained. In this process, cooking and gelatinization takes place. The noodles are finally dried in drier to get the required dryness.

### Noodles making (domestic scale)

Small amounts of noodles can be made at home using the recipe given in Table 6.3**.**

### Equipments

- Kneading machine (vermicilli making domestic extruder)
- Mixing bowl/domestic blender/food processor
- Drying trays
- Frying pan

**Table 6.3: Recipe 2**

| Ingredients | Quantity |
|---|---|
| Minced fish meat | 100 g |
| Wheat flour | 300 g |
| Fine wheat flour | 100 g |
| Salt | 50 g |
| Water | 40 ml |
| Vegetable oil | sufficient for frying |

**Procedure**

Dust the fish with fine wheat starch powder and add other ingredients and knead the whole mix in the mixer to a very thick paste.

↓

Form it into balls and further divide each ball to 4 quarters.

↓

Pass through the kneading machine until you get a 1-2 mm thick string.

↓

Cut into desired length.

↓

Fry the noodles in oil until it gets gentle golden yellow colour.

↓

Remove from the oil and dry so that last traces oil is removed.

↓

Pack the noodles in air-tight bags made of plastic film.

The noodles (Fig.6.3) can also be extruded using a domestic hand operated vermicelli extruder available in most homes using the sieve having finest holes. The extruded noodles can be sun dried and kept stored in bottles for future use.

**Fig. 6.3: Handmade Noodles**

## 6.2.3 Fish Noodles (CIFT Process)

The fish noodles are similar to ordinary noodles commercially available in the market. The only difference is that it contains good amount of fish meat and thus having high protein content. Hence, it is an ideal food for children suffering from protein malnutrition.

A common recipe developed at Central Institute of Fisheries Technology (CIFT), Kochi is given in Table 6.4.

**Table 6.4: Recipe developed at CIFT**

| Ingredients | Per cent (weight) |
|---|---|
| Cooked fish mince | 800 g |
| Maida | 1200 g |
| Salt | 60 g |
| Water | 1.2 % |

**Preparation**

Knead the ingredients well in a mixer.

↓

Pass the mix through an extruder.

↓

Dry the gelatinized extruded noodles in an air drier maintained around 55°C until the moisture content falls below 10%

↓

Pack the noodles in laminate or co-extruded polythene bags

## 6.2.4 Proximate Composition of Fish Noodles

The proximate composition of noodles is given in a tabular form below:

| Chemical Composition | Weight in per cent |
|---|---|
| Moisture | 8.1 |
| Protein | 21.0 |
| Ash | 1.0 |
| Fat | 3.9 |
| Carbohydrate | 66.0 |

## 6.2.5 Fish Kure (Developed by CIFT)

Here, fish mince is mixed with cereal flours, spices and vegetable oil and extruded using a twin-screw extruder. The product obtained is finally coated with Chat masala to provide a mouth-watering snack that has been christened as "Fish Kure" (Fig. 6.4 and 6.5)


**Fig.6.4: Packed Fish Kure**

**Fig.6.5: Fish Kure product**

**? Check Your Progress 1**

**Note:** a) Use the space given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What is Fish Noodles?

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2) What is meant by extrusion process?

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3) What is Chow Mien?

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## 6.3 FISH PICKLES

You will agree that pickling is an age-old method of preservation of food. Vegetables are used to make pickles. Vegetables are available only in seasons and pickling method of preservation was invented by man to keep them for consumption when they are not available. This method of preservation is centuries old. The first pickled vegetable in Europe was cabbage and the product was Saukraut. India exports a large quantity of pickle and this industry is a very flourishing trade. Pickles are in great demand in countries like the Middle East where there is a large section of Indians among the population.

We all use pickle as a side dish. Today in India, almost all vegetables are available in the form of pickles. The average period of storage life (termed shelf life) is 1 to 2 years depending on the vegetable pickled, the method of pickling and types of preservatives used. Vinegar, a water solution of 4% acetic acid, is the first preservative used by man for pickling years ago. Vinegar is safe to consume and has not much acidity problem in stomach, as it is an organic acid and also a weak acid.

In India, most vegetables are pickled in homes and it is an essential side dish. A solution of salt (NaCl) is the medium. Vinegar and red chilly powder are added according to taste. Pickle has to undergo curing process to get the required taste. Freshly prepared pickle does not have much taste. During curing process, fermentation takes place and this process brings some compounds giving the typical flavour characteristic of the pickle. The period of curing is normally two weeks. Ageing enhances taste of the pickle. Average life of a good pickle is 1-2 years, if proper acidity is maintained. But, once the bottle is opened, it has only a limited life of few days. When kept for longer periods, fermentation takes place and eventually the pickle gets spoiled and inedible. Acidic fruits like lemon can be kept for long periods, but mango pickle (Fig.6.6) has a shorter life compared to lime. So when mangoes are pickled more, vinegar is added to get the required acidity and shelf life. To get the required acidity for fish pickle acetic acid is added. The pH should be between of 2 to 3 (acidic).


**Fig. 6.6: A pickle familiar to you (Mango Pickle)**

During fermentation, starch content in the pickle is converted to lactic acid and this acid acts as a preservative. Pickling can also be done by marinating (adding salt) and storing in organic acid solution. All pickles have high salt content. Hence, they taste salty.

### 6.3.1 Preparation of Fish Pickle

Mix the fish with salt (30-50%) and keep it for 2 hours.

↓

Fry the mass in minimum quantity of vegetable oil.
(Selection of oil for frying depends on the regional preferences. Refined peanut oil, gingely oil, mustard oil and coconut oil are used for pickling. In Europe, olive oil is used).

↓

Fry all other items in oil except sugar.

↓

Add turmeric and chilly powders towards the end.

↓

Add fried fish and if needed, add sufficient quantity of boiled and cooled water and mix all ingredients well.

↓

Add sugar and vinegar.

↓

Add more salt, if sufficient saltiness is not in the pickle.

↓

The pickle is now ready to be bottled.

### 6.3.2 Difference between North and South Indian Pickles

The basic difference between pickles made in the South and Northern parts of India is in the use of vegetable oil used for pickling. In the North, mustard oil is used for manufacture of pickles. In the south, sesame oil (gingely oil) and groundnut oil (peanut oil) are used. As a souring agent, tamarind or lime is used in North whereas, in south, vinegar is used. Pickles available in the north also contain cumin seeds, ajwain and fennel. There is a wide variation in the recipe for pickles prepared in India and elsewhere in the world. Pickles prepared in Kerala generally contain less oil.

**A recipe for fish pickle**

| Items | Quantity |
|---|---|
| Fish (Dressed and cut to small pieces) | 1000 g |
| Mustard seed | 10 g |
| Green chillies (cut to pieces) | 50 g |
| Garlic pieces | 80 g |
| Ginger pieces | 80 g |
| Chilli powder | 35 g |
| Turmeric powder | 2 g |
| Gingely oil | 200 ml |
| Vinegar | 400 ml |
| Salt | 100 g |
| Sugar | 10 g |

**Recipe for the Prawn pickle**

| Ingredients | Quantity |
|---|---|
| Prawns (peeled and deveined) | 1000 g |
| Green chilly pieces | 60 g |
| Garlic pieces | 100 g |
| Ginger pieces | 125 g |
| Chilli powder | 35 g |
| Turmeric powder | 2 g |
| Gingely oil | 200 ml |
| Vinegar | 400 ml |
| Salt | 100 g |
| Sugar | 5 g |

## 6.4 FISH PICKLE WITH TAMARIND

This is a very popular pickle in India, particularly in Tamil Nadu and Sri Lanka. Seer fish (Fig.6.7) is commonly used for the preparation of tamarind pickle. Fish, having firm texture and dark flesh like Horse mackerel and perches are also suited.

**Fig. 6.7: Seer fish**

A common recipe and method of preparation are given below:

| Ingredients | Quantity |
|---|---|
| Fish pieces | 500 g |
| Salt | 5 g |
| Turmeric powder | 2 g |
| Vegetable oil (Gingely oil) | 75 ml |
| Tamarind pulp | 75 g |
| Vinegar | 100 ml |
| Coriander powder | 15 g |
| Cumin powder | 25 g |
| Fennel powder | 40 g |
| Chilli powder | 20 g |

**Note:** Salt and sugar should be added to required taste.

### 6.4.1 Preparation

Wash the fish pieces well in potable water and drain the water.

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Partly dry the fish pieces with paper towels.

↓

Coat the fish with the mixture of turmeric and salt.

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Deep fry the fish in vegetable oil until it become brown and crispy.

↓

Drain the oil and keep the fried fish separately.

↓

Prepare a paste of tamarind in vinegar by macerating or squeezing.

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Separate the seed and insoluble fibres from the tamarind extract.

↓

Filter it through a nylon sieve.

Take a dry frying pan and roast coriander, cumin and fennel until they darken.

↓

Add tamarind extract and chilli powder to it.

↓

Add all fried fish pieces into the pan and shake well with a wooden spoon.

↓

Simmer for few minutes and add salt and sugar to get the best taste.

↓

Store the pickle in brown bottles.

You will find that this is an excellent accompaniment to cooked rice along with other curries.

## 6.5 SALMON PICKLE

Salmon is a very popular fish in Europe (Fig.6.8). It is a delicacy in Europe. But, this pickle is a ready-to-use one and has to be refrigerated to preserve. The shelf life is very short.

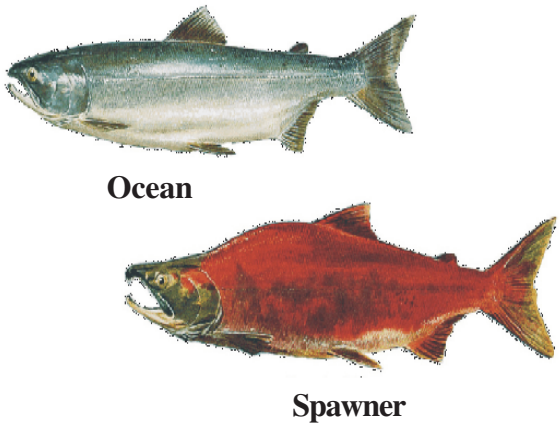


**Fig.6.8: Salmon**

### Recipe

| Ingredients | Amount |
|---|---|
| Salmon pieces, one inch cubes | 1.36 kg |
| White vinegar | 500 ml |
| Water | 150 ml |
| Sugar | 75 g |
| Salt | 30 g |
| Spices powder | 60 g |
| Onion slices, red pepper pieces | 1 g |

### 6.5.1 Method of Preparation

Gently cook the fish pieces for 1-2 minutes in a vessel with water until they become red to pink.

↓

Drain out the water.

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Take all other items except onions and red pepper in a sauce pan with some water and bring to boil.

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Add the fish pieces, onions and red pepper to the pan and mix well.

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Warm the vinegar to 80$^{o}$C and pour it into the pickle and mix well.

↓

The pickle is ready.

This pickle has to be refrigerated and develops good taste after ageing for 2-3 days. The pickle is normally kept in porcelain or glass jars.

### 6.5.2 Packaging and Storage

In ancient times and even today, porcelain jars are widely used to store the pickle. Glass bottles are also good. Polypropylene jars have replaced porcelain and glass containers as they are breakable during transport. A layer of oil gets separated from the pickle and float on the top of the bottle. It keeps maintaining an anaerobic condition in the bottle and also preventing the attack of fungus from external environments. Pickles retain freshness, flavour and smell as long as they are kept airtight and free from absorption of moisture from environments and elsewhere. Commercial manufacturers of pickle add vinegar, citric acid and sodium benzoate to prevent the attack of bacteria.


**Fig. 6.9: Fish pickle in co-extruded HDPE/LDPE Films**

Pickle is now available in laminated pouches made of polyester (LDPE/HDPE) co- extruded films also (Fig. 6.9). Glass is still the prime choice of many packers as it is hygienic and can be heat sterilized prior to packing.

## 6.6 AGEING

Period of ageing varies from two weeks to 2 months. Ageing is done in packed bottles. During ageing, halophilic bacterias (salt loving) grows in the pickle and causes fermentation. During this period, a lot of carbon-dioxide gas is produced. This gas can cause bulging of the pouches and breakage of the containers. Hence, initially for few days after preparation the pickle is stored in vessels not tightly closed. Final packing is done only after this reaction is over.

Some pickles develop good flavour only after ageing. The solid particles take sometime to absorb the salt and spicy taste. If the pieces have thick skin, the time taken will be long. Most of the pickle will taste highly salty when prepared fresh. After few days, salt will be taken by the solids and there will be a fall in salty taste of the liquid. Hence, the addition of salt is critical and varies from pickle to pickle. Fish being soft, the salt and spices will be absorbed fast and it can be used immediately.

**? Check Your Progress 2**

**Note:** a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) Why pickling is done?

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2) How is fish pickle prepared?

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3) What do you understand by the term ageing?

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**Activity 1**

Visit a local landing centre and buy one kg of medium quality fresh fish. Clean it thoroughly and cut it into pieces. As per the recipe given in this unit, prepare the other ingredients needed to make fish pickle. Prepare fish pickle. Store in a cool dry bottle. After one week ask some friends to taste it and give their opinion..

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## 6.7 LET US SUM UP

The world seafood processing scenario is undergoing rapid change.Conventional products are slowly disappearing from the market followed by their emergence

in new style. Value addition and diversification to match the changing style of the urban population is the need of the day. There is a great demand for seafood products in ready-to-eat form such as fish noodles, fish pickles etc. A number of such products have already invaded the Western market. One factor responsible for such a situation is the increase in women education and their employment in offices and factories. The envious position of India as a major contributor of marine product to the global market is likely to be substituted unless we come forward with a wide range of value added products to cater to the World market. In this unit, you could learn about the preparation of a nutrient rich convenience product prepared from fish meat i.e., fish noodles. You were also able to justify the importance of extrusion technology that facilitates the preparation of many such convenience foods. The unit also gave you a good description of the uses and preparation of fish pickle. Fish pickles are very popular with Indians all over the World. Another importance for these fish products such as noodles and fish pickles is that, by-catches and low cost fishes can be utilized properly by which fishermen get more profit for their effort.

## 6.8 GLOSSARY

| | | |
|---|---|---|
| **Ageing** | : | Storage to enhance quality. |
| **Bulging** | : | Swelling. |
| **Cassava Starch** | : | Tapioca starch. |
| **Cumbersome** | : | Heavy to carry. |
| **Denaturation** | : | Undergoing irreversible structural changes. eg. For proteins. |
| **Fermentation** | : | Undergoing chemical changes through the action of organic agents. eg. enzymes. |
| **Gelatinization** | : | Making it transparent. |
| **Intricate** | : | Complicated. |
| **Palate** | : | Upper mouth. |
| **Pasta** | : | Italian noodle. |
| **pH** | : | Negative logarithm of hydrogen ion concentration, measure of acidity. |
| **Rancidity** | : | A particular unpleasant taste developed in fatty foods due to oxidation of fat. |
| **Salmon** | : | A common food fish seen in cold waters. |
| **Saukraut** | : | Cabbage pickle. |
| **Sensory** | : | Testing by senses, say by tongue, nose, touch etc. |
| **Shear** | : | A cutting equipment. |
| **Spawner** | : | A fish ready to lay eggs. |
| **Thermodynamically** | : | By using heat and work. |

## 6.9 SUGGESTED FURTHER READING

Gopakumar, K.1997. *Tropical Fishery Products*, Published by Oxford and IBH Publishing Company, New Delhi.

Gopakumar, K. 2002. *Textbook of Fish Processing Technology*, DIPA, Krishi Anusandhan Bhavan, Indian Council of Agricultural Research, New Delhi.

## 6.10 REFERENCES

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## 6.11 ANSWERS TO CHECK YOUR PROGRESS

**Check Your Progress 1**

1) The fish noodles are similar to ordinary noodle commercially available in the market. The only difference is that they contain good amount of fish meat and thus having high protein content.

2) The extrusion cooking process is also referred as High Temperature Short Time process. The raw material in the form of powder at ambient temperature is fed into extruder at a known feeding rate. The material first gets compacted and then softens and gelatinizes and/or melts to form a plasticized material, which flows downstream into extruder channel.

3) It is a Chinese noodle made from egg and wheat.

**Check Your Progress 2**

1) Pickling is a method of preservation invented by man to keep vegetables and fish fresh for consumption when they are not available.

2) Initially, mix the fish with salt (30-50%) and keep it for 2 hours. The mass is fried in minimum quantity of vegetable oil. Fry all condiments in oil except sugar. Turmeric and chilly powders are added towards the end. Add fried fish and if needed sufficient quantity of boiled and cooled water is also added and mix all ingredients well. Add sugar and vinegar. If sufficient saltiness is not in the pickle, add more salt. The pickle is now ready.

3) Ageing is a process of keeping the pickle for periods ranging from one week to two months.