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## **PROSPECTS OF VALUE ADDED PRODUCTS AND IT'S FUTURE IN INDIAN MARKET**

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Fishery is a very perishable food commodity that requires proper handling and preservation to increase its shelf and retain its quality and nutritional attributes. Processing fish involves primarily the application of preservation techniques in order to retain quality and increase shelf life. It may also deal with value-adding to produce a wide variety of products. A number of methods are used to preserve fish. Some employ techniques based on temperature control, using ice, refrigeration or freezing; others on the control of water activity and include drying, salting, smoking and freeze-drying. Techniques may rely on the physical control of microbial fish loads, such as through microwave heating or ionizing irradiation or on chemical control of microbial activity and loads by adding acids, for example, to fish products. Techniques are also used that are based on oxygen-reduction, such as vacuum packaging. Most often a combination of different techniques is used to preserve fish.

Value addition is the most talked about word in food-processing industry, particularly in export oriented fish processing industry because of the increased realisation of valuable foreign exchange. Value can be added to fish and fishery products according to the requirements of the different markets. These products range from live fish and shellfish to ready-to-serve convenience products. In general, value additions mean any additional activity that in one way or another changes nature of the product thus adding to its value at the time of sale. As far as the fish-processing industry is concerned value addition is one of the possible approaches to raise profitability since this industry is becoming highly competitive and increasingly expensive. There is a great demand for seafood/seafood based products in ready to eat convenience form. A number of such diverse products have already invaded western markets. One factor responsible for such a situation is more and more women getting educated and taking up employment. Reasonably good expendable income, education, awareness and consciousness towards hygiene and health and increased emphasis on leisure pursuits are some of the other reasons. Marketing of value added products is completely different from traditional seafood trade. It is dynamic, sensitive, complex and very expensive. Market surveys, packaging and advertising are a few of the very important areas, which ultimately determine successful movement of a new product. Most of the market channels currently used is not suitable to trade value-added product. A new appropriate channel would be supermarket chain; which want to procure directly from source of supply. Appearance, packaging and display are all important factors leading to successful marketing of any new value-added product. The retail pack must be clean, crisp and clear and make contents appear attractive to consumer. The consumer must be given confidence to experiment with a new product from, target group, market area, species used and so on. The latest packaging must also keep abreast with latest technology. A large number of value-added and diversified marine products both for export and internal market based on shrimp, lobster, squid cuttlefish, bivalves, certain species of fish and minced meat from low priced fish have been identified. The technology for their production is readily available.

## **What is value addition?**

Value addition is defined as any activity along the supply chain that increases the usability, culinary attribute or economic viability of a food item. Processing of fish into a wide variety of value-added products is now common with the increase in demand for food products that are ready-to-eat or require little preparation before serving. Usually, value added fish products are perceived to be those that have added ingredients such as a coating (breaded/battered) or a sauce, are prepared neatly or in some way provide more convenience to the user. Actually it indicates a measure of factors added to the total worth of a product at each stage of the production. Value addition ties in with consumer convenience. For example, value addition can be a process for transforming fish fillets into products that are perceived by the customer as having added quality and interest.

## **Why value addition?**

The four major reasons for value addition are; (i) for higher profit, (ii) for improved processing utilization (iii) to keep pace with consumers' (iv) to provide variety of products. There are numerous varieties of fish and they differ widely from one another depending on the shapes, size, flavours, texture etc. Though flesh of all types of fish are nutritionally more or less similar, their market prices vary hugely. There are certain varieties of fish which are very expensive, while there are other varieties which are very cheap. The low-cost fish in whole form have poor/no preference among the consumers as food due to some of the factors like small/unconventional size, ugly shape, too much spiny body, and unfriendly flavour/taste etc., Therefore these low-cost fish are often used for animal feed or by-product production. Even in some cases, these fish are thrown back into the sea. However, with the application of available technologies, these fish can be directly used for human consumption through value addition.

## **Factors responsible in value-addition:**

There are several factors responsible for value addition. On one hand, producers and exporters aim at satisfying the increasing demand for value-added products from consumers. At the same time, India Government wish that value addition takes place in own country rather than in the importing country as it is to benefit job creation and higher economic activity. International trade in fish and fishery products has grown substantially over the last decades. Today, good portion of the fish caught for direct human consumption enters international trade. Developing countries account for approximately 50% of global fish exports (FAO,2005). However, many countries, especially developing countries like India export mainly raw products and only limited quantities of processed products. The former are in turn processed in industrialized countries. By so doing, the exporting countries are not extracting full benefits from their aquatic resources. Consequently, more and more development experts and institutions are advocating the transfer of value addition technologies, know-how and investment capital to these developing countries. These are also attractive in view of the fact that value addition processes generate further employment and foreign exchange earnings. However, despite the availability of technology, many projects in value-adding for export collapsed. Careful consideration was not given to the various facets of their feasibility, including quality assurance, marketing, distribution and trade barriers, before embarking on a value-adding fish process. In developed countries, value-added

innovation is mainly focused on increased convenience foods and a wider variety of high value-added products, mainly in fresh, frozen, breaded, smoked or canned form. These necessitate sophisticated production equipment and methods and, hence, access to capital. The resulting fish products are commercialized as ready and/or portion-controlled, uniform-quality meals.

### **Potentiality of value-added fishery products in India:**

The market for value-added fish and shrimp is growing in the greater space. Rise in purchasing power of the people, fast life-style, growing of nuclear families, more housewives opting for job etc. are the main factors responsible for increase in demand for these products in India. Especially in urban localities, the rich class and upper middle class prefer value added products in their food menu. Therefore opportunity exists for:

- Ready to cook retail pack of fish and shrimp of different types.
- Canned Tuna for hotel chains, expatriates, tourists, rich and upper middle class of cities.
- White fish in the form of frozen fillet, dressed fish, setae, etc.
- Mince and mince-based products like fish sausage, burger, finger, cutlet, nugget, ball etc.
- Salted and dehydrated fishes in retail packs.

### **Ready-to-serve value added fish products in retortable pouch and its importance in Indian market:**

Ready to serve fish products; viz. curry products; in reportable pouches are recent innovation in ready to serve fish products for local market. The most common reportable pouch consists of a 3 ply laminated material. Generally it is polyester/aluminium/cast polypropylene. Some of the products standardized by the CIFT are mackerel curry, Rohu curry, sardine curry, tuna curry, pomfret curry, prawn curry, seer fish moilee, pearl spot moilee, fried mussel, fish sausage, prawn kurma, prawn manchurian, fried mussel masala. These products have a shelf life of more Than one year at room temperature. As there is increasing demand in National and International market for ready-to-serve products the retort pouch technology will have a good future. Coated products and fish mince and mince-based products are also becoming popular now. Retord pouches which are made up polyester/aluminium/cast polypropylene, the product cannot be seen. During recent years pouches made up of polyester coated with aluminium oxide or silicon dioxide/nylon/cast polypropylene are available. In these type of product can be kept for a period of one year at room temperature.

### **Fish export performance of India**

India's fish exports have emerged as the largest group in agricultural exports. From a humble beginning of export, US \$10 million in 1960-61, when it was only for canned shrimps, it recorded an all-time growth of 1.3 billion in 2000-01. Since then growth has been marginal. Today fisheries export basket covers more than 60 items. A study conducted by the national centre for Agricultural Economics and policy Research, New Delhi, under the ICAR, showed that export basket of fisheries product is reasonably diversified (Table 1).

Table 1. Growth trends in the export of fisheries products (1987-88 to 2000-01)

Items/commodities	Quantity	Value
Live fish	-0.23	8.37
Fish, fresh/chilled	18.10	12.85
Frozen fish	28.08	27.58
Fish dried salted/bring	17.77	9.12
Fish fillets	9.29	9.17
Crustaceans W/N	7.04	9.09
Shrimp and prawn	6.90	9.23
Lobster	2.63	1.60
Other crustaceans	15.10	21.47
Molluscs W/N	9.92	8.72

Source: Report of NCAEP, ICAR, New Delhi, November, 2002

## Trade policies in fisheries sector of India

In India, fisheries are included in agriculture. India had followed protective policies in the past. Except for a few traditional commercial commodities, trade has been regulated through quantitation's (QRs), canalization; licenses, quotas and high tariffs. After signing WTO, lot of restrictions have been removed. Now a number of fisheries products are moved to special import license (SIL) category. They are now Freely Importable. In 2002 announced Exim policy, almost all fishery commodities were moved to the list of freely importable commodities, except 5 groups of live and whale sharks (Table 2).

Table 2. Status of import policy of fishery products

Period	Total fish commodities	SIL	free	Restriction/prohibited
1992-1997	121	-	7	114
1997-2002	121	62	21	38
2002-2007	121	-	116	5

Source: Exim Policy, 2002. Ministry of Commerce, Government of Indi

## Imports of fish and fisheries products in India

Tariff structure has undergone a sea-change lately. India has brought down tariff/custom duty. But there is no comparison to other countries in this region. It is at an elevated level to protect our local market and fishers. But at the current rate, it will be impossible for our industry to import, reprocess and export. A quick comparison with the growth in China can clear a lot of confusion in our policies (Table 3)

Table 3. Comparison of tariff/ duty structure – India and China

India		China	
Year	Rate (%)	Year	Rate (%)
1988-89	60.0	-	-
1998-99	24.2	-	-
2000-01	44.04	2002	2002
2002-03	35.20	2003	2003
2004-05	35.20	2004	2004

Source: India, Ministry of Commerce; China, FAO of UN

## Major problems faced by exporters

- To identify buyer with integrity
- Shortage of raw material
- Infrastructure and hygiene at landing centers and fishing ports.
- Fly by night exporters (suitcase companies)
- Shipment delays

India needs a drastic look at the export trade and try to mitigate burning issues. If there is likely that our fish export trade may face many issues, and they will eventually end in closure of many processing establishments.

## Inland fish trade

India is yet to set up quality standards for fish and fishery products on a national basis. The inland fish quality is a state subject and it is controlled by municipalities or corporations of the concerned State Ministry.

There is a flourishing marine fish trade between Gujarat and Mumbai. Marine fish is coming from Gujarat to Mumbai by sea and land. The fish is preserved in ice and marketed fresh. Dried fish is exported from Gujarat coast to overseas markets where there are ethnic people of India origin. Dried Bombay-duck is an important item. Dried fish is also coming from Gujarat, chiefly from Veraval and Porbandar, to markets in south India chiefly Kerala and Tamil Nadu.

Freshwater fish from Andhra Pradesh is sent to Orissa and West Bengal regularly and there is a growing trade. Catla, rohu, mrigal and catfish are the species transported to these places. The fish under ice is transported in trucks.

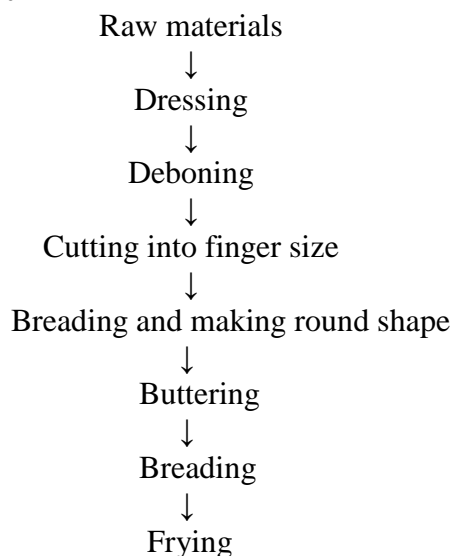
**Sea-food safety issues:** Regarding safety of fish and fishery products agenda under FAO in the 22nd Session of the Codex committee is to be adopted (De, 2010):

1. Certification of fishery products.
2. Method of analysis for fish and fishery products (Determination of Salt Content in Salted fish and Dried Salted fish, Estimation of Proportion of fish fillet and Minced fish flesh, Determination of Net Weight of Products)
3. Food additives in fish and fishery Products.
4. Inclusion of additional species in fish standards
5. Definition of Predatory species of fish to which the higher level of methyl-mercury applies.

*Some of the important value added fish products are discussed below:*

## 1. Fish Finger

### Flow chart



### Ingredients

Materials	Percentage
Minced fish meat	60
Common salt	as per need
Sugar	as per need
Pepper	0.3
Green chilli	0.3
Coriander	as per need
Ginger	1
Garlic	1
Cumin (Jeera)	0.3
Bengal grams powder	as per need
Biscuit powder	as per need
Bread crumbles	as per need
Potato	10
Egg white	as per need
Beet, Carrot, Capsicum	17
Onion	10
Vinegar	2 teaspoon full
Oil	as per need

### Preparation procedure

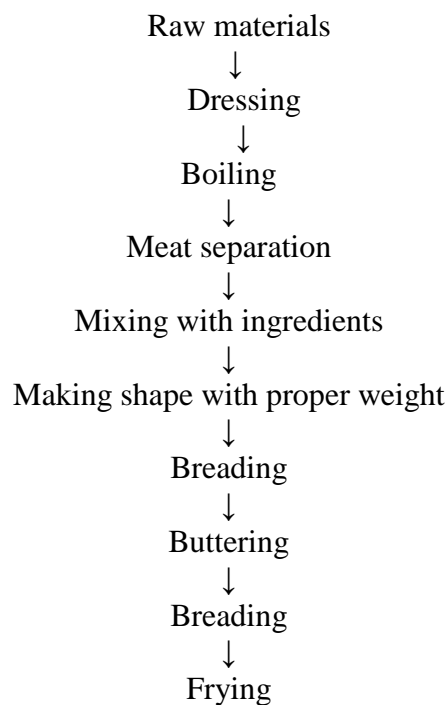
1. Remove the head, gut, scales, and fins from the whole fish.
2. Remove bone from fish flesh and cut the meat into finger size.
3. Finger sized fish meat are mixed with boiled potato, grounded onion, garlic, ginger, green chilli, pepper, vinegar, salt, capsicum, cumin, carrot, coriander leaves etc.
4. Finger shaped fish meat is given a round shape after mixing with biscuit powder.

5. The round shaped fish meat is dipped into egg white solution.
6. Breading is done with bread crumble.
7. Finally fish finger is fried properly in hot oil to give a brown colouration.

## 2. Fish cutlet

### First Method

#### Flow chart



#### Ingredients

Materials	Percentage
Fish meat	70
White pepper	0.3
Cumin (Jeera)	0.3
Coriander leaves	as per need
Bread crumbles	as per need
Potato	16
Egg white	as per need
Common salt	as per need
Onion	10
Garlic	1
Ginger	1
Green chilli	0.3
Bengal grams powder (Chola chatu)	as per need
Oil	as per need

#### Method of Preparation



1. Head, scales, fins and gut content of fish are removed and washed thoroughly.
2. Fish is boiled and flesh is removed from the bone.
3. Potato is boiled.
4. Fish meat is mixed thoroughly with potato, Bengal gram powder, garlic, ginger, onion, pepper, coriander leaves, green chilly, salt, and cumin.
5. The small amount (30 gm) of dough is taken to give a cutlet shape.
6. Each piece is dipped into the egg white and breaded.
7. Breaded cutlet is fried in hot oil until brown colouration.

## Second Method

### Ingredients

Raw fish	1 kg
Cooked peeled potato	300 gm
Peeled chopped onion	150gm
Common salt	To taste
Ginger picces	15 gm
Green chillies	10 gm
Pepper powder	2 gm
Clove	2 gm
Turmeric powder	2 gm
Refine veg. oil	100 ml

### Preparation of batter

• Maida	1 kg
• Eggs	5 nos
• Mustard oil	1 kg
• Salt	To taste
• Custard powder	20 gm
• Corn flour	20 gm
• Cream	1 cup
• Warm water	1/2 cup

Mix all the above ingredients in a mixture and roll then in a roller for 1 hour till a thick paste of batter a formed.

### Preparation

- Cook the fish and separate the meat.
- Cook the potatoes and peel and mash then, add the cooked fish minced salt and turmeric and other ingredients and then soft fry in a frying pan using veg. oil.
- This may be added to the a mash potatoes-fish mix well.
- Mould 40 gm mix in to round shape of around 2 cms thickness.
- They are dipped in batter and rilled over bread crumbs and fry at 160° to 170°C for 5 secs.

### Third Method

This is a product can be prepared from whole fish mince. Fish cutlet is a highly acceptable consumer product both for urban and rural peopal. They can be flash fried and kept stored up to 6 months.

### Recipe

#### Ingredients

Minced meat	1000 g
Cooked, peeled potatoes	300 g
Peeled chopped onions	150 g
Common salt	30 g
Ginger pieces	15 g
Green chillies chopped	10 g
Pepper powder	2 g
Clove powder	2 g
Turmeric powder	2 g
Refine veg. oil	100 ml

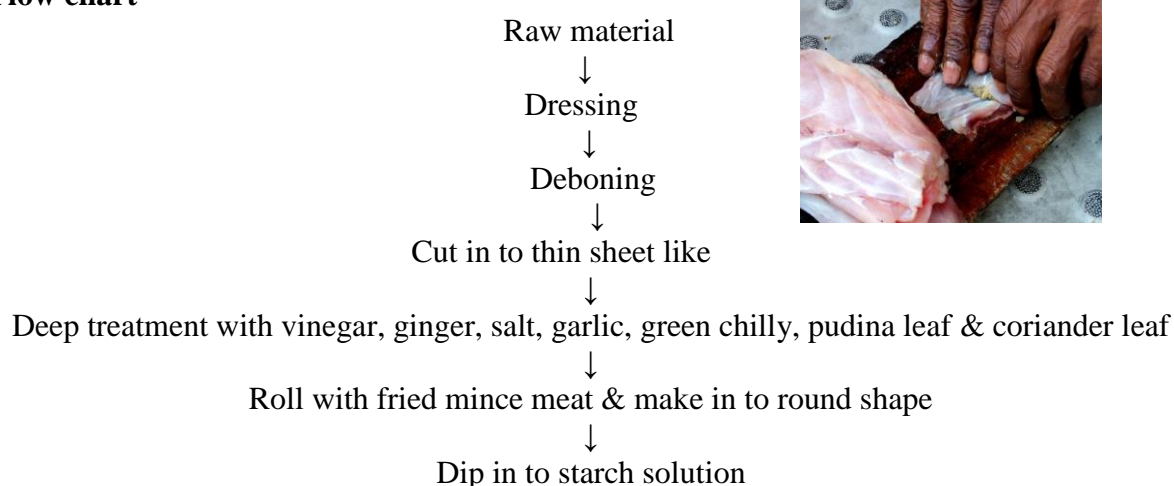
#### Preparation

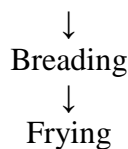
Cook the fish and separate the meat. Cook the potatoes and peel and mash them. Add the cooked fish minced, salt and turmeric powder and other ingredients and then soft fry in a frying pan using vegetable oil. This may be prepared added to the smashed potatoes-fish mix and mix well. If spicy cutlets are to be prepared add spice mix at this stage and mix well. Mould 40 g mix in to round shape of around 2 cm thickness. They are then dipped in batter and rolled over bread-crumbs. The battered and breaded fish cutlets are flash fried in vegetable oil maintained at 160-170°C for five seconds. They are than packed in consumer packets and kept stored under 20°C. Cutlets are to be deep fried prior to consuming.

*Storage life* : 6 month at 20 °C.

### 3. Fish Roll

#### Flow chart





## Ingredients

Materials	Quantity
Minced meat	1 kg
Common salt	25 g
Monosodium glutamate (MCG)	3.0 g
Garlic	25 g
Onion	200 g
Ginger	50 g
Green chilli	15 g
Jeera (cumin) powder	50 g
White pepper	2.5 g
Starch emulsion	For dipping as per requirement
Bred crumble	For dipping as per requirement

## Preparation Method

### a) Fillet Preparation

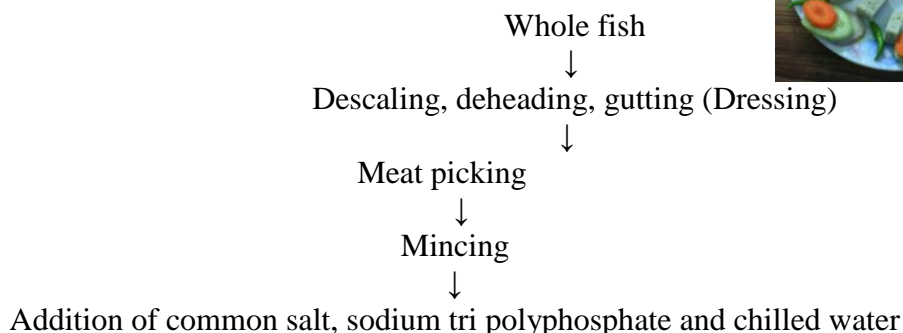
Bhetki was deheaded, descaled and all fins were cut with knife (Dressing). After dressing the fish was deskinning and filleted. The bones were removed from the fillets. Two large fillets were obtained from one fish. Each large fill was cut in to pieces of desired length. From each such piece fillets of desired breads were sliced. Those thin rectangular shaped fillets were dipped into the solution of salt, vinegar and juice of ginger and garlic for 30 minutes.

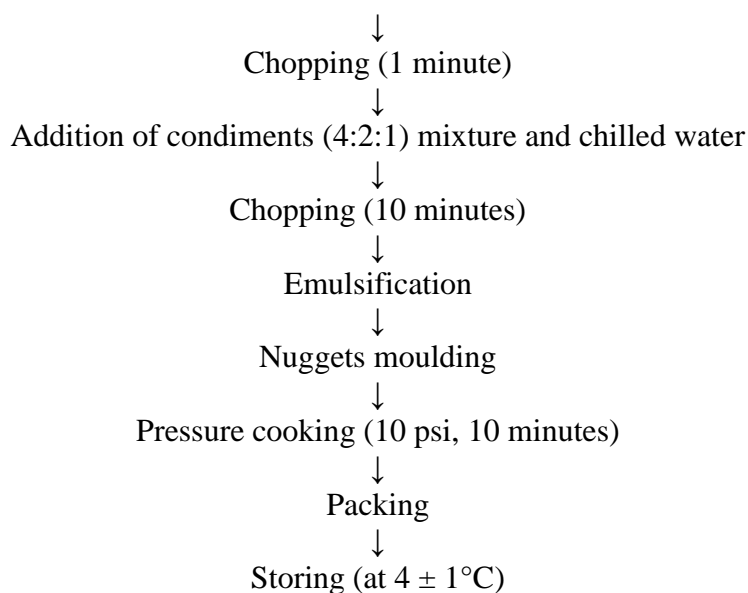
### b) Preparation of roll

All ingredients were added to the minced meat according to the recipe. It is mixed thoroughly with the help of silent cutter. Spiced minced meat is kept at one side of the single treated fillet. Meat was elongated to such an extent that only little spaces at both sides are left. 20 g of spiced meat was placed in each fillet. Then the fillet was rolled and two sides of roll are pressed inside. Finally the roll is fried properly.

## 4. Fish nuggets

### Flow chart





## Ingredients

Materials	Percentage (%)
Common salt	1.5
Sodium tri polyphosphate	0.5
Monosodium glutamate	3.0
<i>Condiments</i>	
a) Garlic	0.8
b) Onion	1.8
c) Ginger	0.4
<i>Spice mixture</i>	
a) Jeera powder	0.75
b) Chilly powder	0.5
c) Cinnamon, cardamom, black pepper	0.25
Wheat flour	different levels-3, 6, 9 & 12
Chilled water	

## Preparation Method

### a) Preparation of condiments mixture

The condiment is prepared by blending peeled chopped onion, garlic and ginger (in the ratio of 4:2:1 respectively) in a mixture grinder to the consistency of a fine paste.

### b) Preparation of meat emulsion

Minced meat emulsion for fish nuggets was prepared in bowl chopper. Salt and sodium tri polyphosphate were added to the meat and blended for 1 minute. The condiment mixture were added and again blended for 30 seconds. This is followed by addition of spice mixture and wheat flour and blending continued for an additional period of 2-3 minutes to get

desired emulsion. Sufficient care was taken to keep the end point temperature below 10°C by addition of chilled water.

#### *c) Molding of fish nuggets*

Meat emulsion was formed in to balls weighing 250 g each and these balls were kept in aluminium boxes.

#### *d) Cooking of fish nuggets*

The mound nuggets were kept in boxes. The lid of such boxes were closed and cooked in preheated autoclave. The cooking is done at 10 psi pressure for 10 minutes.

### 5. Fish Samosa

#### First Method

##### Ingredients

- |                      |     |
|----------------------|-----|
| 1. Long -----        | 20g |
| 2. Mota elachi-----  | 10g |
| 3. Chota elachi----- | 10g |
| 4. Dalchini-----     | 5g  |
| 5. Coriander-----    | 75g |
| 6. Kali mirch-----   | 10g |



##### *Preparation of major ingredient*

- Roast all above mention ingredients in medium heat till flavor is scented.
- Grind all ingredients and store in packet (polyethene bag).
- These ingredients can be use for all fish food preparation

##### Procedure

- Grind thawed fish in a mixture at low speed.
- Mix grind fish with ginger and garlic paste for 20 mins (open air).
- Heat mustard to 110°C.
- Fry onion in hot oil.
- Fry ginger and garglic paste up to brownish colour.
- Add major ingredients gently in mustard stir slowly till brownish colour.
- Add the mixture of fish and garlic paste
- Fry then in medium heat to 10 mins at 160°C to good scent is felt.
- Collect all fried materials in pan for cooling.

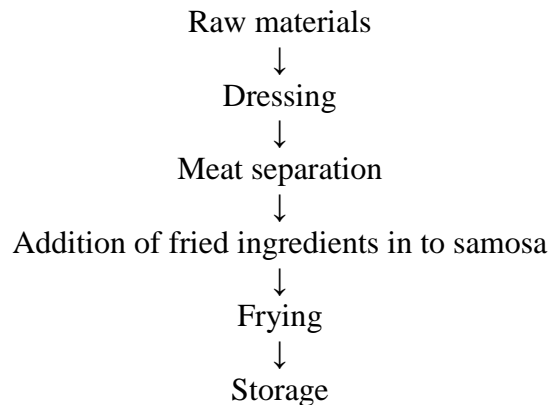
##### Method of preparation of samosa

- Make dough of maida by adding ghee and salt (to taste) and mangarella.

- Roll of small amount of dough in a roller for making round sized and cut into triangular shape.
- Add fried materials to triangular dough and fold diagonally and keep in pan for some time.
- Fry in hot mustard oil till brownish colour appears.
- Collected in a clean pan.
- Serve hot fish samosa to customer.

## Second Method

### Flow chart



### Ingredients

Materials	Quantity
Minced meat	1 kg
Common salt	25gm
Onion	200gm
Garlic	25gm
Ginger	50gm
Tomato	3gm
Turmeric	2-3 teaspoon full
Chilly powder	little bit
Curry leaves	2 teaspoon full
Pepper	2.5gm
Bread crumble	100gm
Maida	1 kg
Ground nut	25gm
Coconut	25gm

### Preparation method

1. At first ginger, garlic, green chilly powder and onion are fried slightly with oil.
2. This fried spices mixed properly with minced meat.
3. Then the whole mixture is fried again slightly.
4. Fried ground nut, coconut, coriander leaves and biscuit dust are mixed with the meat thoroughly.
5. Wheat flour and dalda are mixed properly to prepare dough with mixing of water.

6. Then spread the dough to a thin sheet.
7. Finally samosa shape is given of the fine sheet of wheat dough and meat is poured inside it.
8. Lastly the samosa is prepared for frying in refine oil.

## 6. Fish Sandwich

Using minced fish meat a paste product can be prepared which can be spread between bread pieces to make sandwich (*Otolithus argenteus*), pink perch (*Nemipterus japonicus*) can be used. Sciaenid was proved to be the best.



### Recipe

Ingredients	Amounts
Fish muscle (minced meat)	1kg
Mustard seed	4g
Methi	4g
Green chilli	20g
Garlic (peeled)	100g
Ginger (peeled)	25g
Chilli powder	15g
Jeera powder	30g
Turmeric powder	3g
Oil	500ml
Salt	28g
Sugar	5g
Cinnamon (Dalchini) powder	4g
Cardamom (Elaichi) powder	2g
Butter	200g
Lemon	Approx. 4nos
Coriander leaf	Up to taste

### Method of Preparation

- Procure sciaenid fish (Dhoma, each 80-150g) from the market.
- Remove scale, eviscerate and wash thoroughly with portable water to make it free from blood and any other extraneous matter.
- Boil the fish for 10-15 mins. Allow it to cool to room temperature.
- Separate muscle from skin and bone by hand.
- Make fish muscles in to a fine paste in an electric or stone grinder.
- Make garlic, ginger and green chilli in to a paste together (called the 1<sup>st</sup> paste) in an electric blender.
- Make dry chilli powder, turmeric powder and cumin powder together in to a paste (called paste no. 2) by adding sufficient water and mixing.
- Chinnamon cardamom is made in to powder and then made in to paste by adding water and mixing (called paste no.3)

- Add all oil in the frying pan and heat it. Add half-broken mustard seed and menthi seed in the hot oil and fry for 1-2 min.
- Now add the paste no. 1 made of ginger, garlic and green chilli in the hot oil and fry it for 3-4 min.
- When 1<sup>st</sup> paste is half-fried, add paste no.2 and continue frying until characteristic odour of fried species emerges.
- Add sugar during frying of paste.
- Add paste no.3 and continue frying for 1-2 min. until characteristic odour emerges.
- Add the fish paste and continue frying in a low flame for a while with vigorous stirring. Take care that nothing sticks to the bottom of the vessel.
- Stop frying when characteristic smell emerges.
- Remove the frying pan from the flame and butter is added and mixed with the contents thoroughly.
- Then lemon juice extracted from approximately 4 lemon is added and mixed (lemon juice is added to test).
- Toast the bread pieces and spread the paste prepared (about 12g) for each sandwich (1/2 slice).
- Add coriander leaf over the paste before serve.

The paste remains in good acceptable form at room temperature for about 18 hours. Without any spoiled smell. However at refrigerator it remains acceptable for 4 days. However, before use it is to be warmed. The cost of production for 1/2 slice sandwich is about Rs.2/-.

## 7. Fish Pakora (All ingredients is for 1 kg)

### Ingredients

Wheat flour-----	500g
Eggs-----	4nos
Cream-----	2 cups
Corn flour-----	50g
Ginger-----	50g
Garlic-----	150g



### Methods

#### Step 1

- Grind ginger and garlic for making paste.
- Mix prawn/fish in ginger garlic paste.
- Marinate overnight.

#### Step 2

- Roast wheat flour till brownish colour and allow cooling for 20 mins.
- Beat eggs and add to flour and mix for 20mins.
- Add cream and mix for 10 mins.
- Add warm water and mix for 10 mins.
- Add prawn/fish and ginger garlic paste to whole mixture and keep for 1 hours.



- Remove one piece at the time and fry till brownish colour.
- Collect in clean sophisticated pan for delivery.
- Serve hot pakora in wash plate to customer.

## 8. Fish Papad

Papad is the dried product commonly preferred all over India as a side dish. The technology is already know and simple. Commonly papad is prepared with flour of black gram (*Phaseolus mungo* L) dal. Attempts have been made to prepare papad using other gram flours such as green gram, arhar, cowpea, Bengal gram etc. in place of black gram. Different species are used to add different taste to the papad. Fish was incorporated in papad to make papad more nutritious and tastier. The flour of black gram pulse (urad dal) was used as main ingredient.

### Recipe

Components	weight
Black gram flour (urad dal )	100g
Fish meat (wet )	80g
Salt	6g
NaHCO <sub>3</sub> :Na <sub>2</sub> CO <sub>3</sub> (1:1) (sodium bicarbonate : sodium carbonate )	1.5g
Ginger	0.5g
Garlic	0.5g

### Method of preparation

- Procure sciaenid fish (Dhoma, each 80-150 g) from the market.
- Remove scale, eviscerate and wash thoroughly with portable water to make it free from blood and any other extraneous material.
- Boil the fish for 10-15 mins. Allow it to cool to room temperature.
- Separate muscle from skin and bone by hand.
- Make muscle in to a fine paste in an electric or stone grinder.
- Make grinder and garlic in to a paste.
- Add 80g of fish paste into 100g of urad dal along with other ingredients as shown in the recipe and knead into dough for a long time to get soft less sticky dough.
- Make the dough in to small balls and roll into thin discs of 0.6 to 0.7 mm thickness. Use little oil to make the rolling easy.
- The papads are dried in a mechanical drier at 54°C for 45 minutes to a moisture level 11-12%. The papad may also be dried in sun. Packs the papads in 100g gauge polythene bags and seal the bags.

The papad remain in good acceptable condition for 6 month. No mould growth was observed. The papads after frying in oil had good fishy smell and crispy texture. It was highly acceptable to a sensory panel. The commercial sensory evaluation involving large number of people showed that the product was very popular. Cost of production Rs.90 per kg of fish papads.

## 9. Pickles

Pickling of fish and shellfish to enhance their keeping quality is an ancient practice and there are historical evidences to suggest that it was followed by the ancient Indians, Egyptians and Chinese. Pickling is one of the safest means of easy preservation of fish/shellfish. Pickle prepared from finfish and crustaceans in various styles are gaining acceptance in recent days. Pickles are good appetizer and add to the palatability to starch based bland tasting Asian dishes besides being highly nutritious. The technology is simple and can be adopted by the rural people/fisher folk after short training. No costly equipment is involved. So investment is low cost industry can be started. However, strict hygiene and sanitary conditions are to be maintained. This product has got good export potential, particularly in those countries where large number of Asians lives. At present there exist an expanding export and domestic market for fish and prawn pickle.

### First Method

#### a) Prawn pickle

Prawn pickle was prepared using *parapenaeopsis stylifera* (karikadi), which is available in plenty during September to December and is very cheap. Other varieties like *Metapenaeus affinis*, white prawn was also used. The standard recipe for the preparation of prawn pickle is as follows.



#### Recipe

Ingredients	Amounts
Peeled prawns	1 kg
Mustard seed	4 kg
Menthi seed	4 kg
Peeled garlic	100 gm
Ginger (fresh)	25 gm
Green chilli	30 gm
Chilli powder	30 gm
Turmeric powder	5gm
Cumin	30gm
Salt	80gm
Sugar	5gma
Oil	250ml
Vinegar	300ml
Benzoic acid	250mg

### Preparation Method

- When the prawns procured from the landing center repeatedly with portable water to make it free from sand and any other extraneous material.
- Peel the prawn hygienically in a sanitary environment.
- Weight the peeled prawns.
- Mix the 50% of the salt as shown in the recipe with the peeled prawn and keep aside for 1-1/2 hrs for the salt to penetrate in to the muscle.

- Make garlic, ginger and green chilli in to paste together (called the 1<sup>st</sup> paste) in an electric blender.
- Make dry chilli powder, turmeric powder and cumin powder together in to a paste (called 2<sup>nd</sup> paste) by adding sufficient water and mixing.
- Add 50% oil in frying pan and fry the salted prawn. Keep the fried prawns aside.
- Add half-broken mustard seed and menthi seed in the hot oil and fry for 1-2 minutes.
- Now add the 1<sup>st</sup> paste made of garlic, ginger and green chilli in the hot oil and fry it for a while.
- When the 1<sup>st</sup> paste is half-fried, add the 2<sup>nd</sup> paste and continue frying until characteristic odours of fried species emerge.
- Add sugar during frying of paste.
- Add the fried prawns in to the fried spice mixture and continue frying in a low flame with vigorous stirring. Take care that spice does not stick to the bottom.
- Stop frying when characteristic smell emerges.
- Remove the frying pan from the flame and allow the contents to cool under a fan.
- When the temperature of the contents is little higher than the room temperature, add vinegar and benzoic acid and mix thoroughly.
- Wash the glass bottle with hot (90°C) water and dry it.
- Pack the pickle in glass container. Take care that a layer of oil and vinegar remain on the top of the content. Close the container with acid proof lid.
- Label the bottle having all statutory matter printed on it.
- The product remains acceptable at ambient temperature for 7 month. It was free from *Escherichia coli*, *staphylococci* and *salmonella*. Cost of production: Rs.35/- per bottle of prawn pickle containing 200g pickle.

## b) Fish pickle

Fish pickle can be prepared from the meat of sciaenid species (*Otolithus argenteus*), pink perch (*Nemipterus japonicus*) and any other lean fish. Fresh water fish like Rohu (*Labeo rohita*), catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), can also be used. Here fish is dressed and fillet is prepared. Fillets are cut in to small pieces of 1.5 x 1.5 cm pieces. These pieces are used as raw material. The recipe is almost same as that of prawn pickle. Only change in the recipe is that oil needed here is 300ml instead of 250ml. The method of preparation is same as that of prawn pickle. Cost of production: Rs 25/- for a bottle containing 200g of fish pickle.



## Second Method (All ingredients for 1 kg)

### Ingredients

Salt petre	100 gm
Mustard oil	500 gm
Chilli powder	1 tbs
Gur/Jaggery	150 g
Cumin powder	2 tbs
Vinegar	15 ml

### Method

*Step I*

- Keep fish/prawn in a stainless steel and rub them with a mixture of salt and salt petre and marinade for 12 hours then wipe away the salt with a clean cloth.
- Heat mustard oil and add the fish/prawn one piece at a time.
- Remove the fried fish/prawn and keep them in a tray.

*Step II*

- In a bowl, mix turmeric, chilly and cumin powder and 2 tbs salt.

*Step III*

- Heat ouil and add tamarind paste and remaining salt and salt petre.
- Add vinegar and gur. Cooked till gur melts, removed and set aside.
- Sprinkle each pieces of fish with a small quantity of cumin, chilly, turmeric and salt mixture.
- Place 1/4<sup>th</sup> tamarind and vinegar mixture in a bottle.
- Take fish/prawn, coat them well with remaining tamarind-vinegar mixture and place them in jar.
- Pour the remaining tamarind and vinegar mixture.
- Add preservatives and close bottle and seal.

**Third Method****Recipe**

Fish	1 kg
<i>(dressed and cut into small pieces)</i>	
Mustard seed	10g
Green chilly (cut into pieces)	50g
Garlic (peeled)	80g
Ginger (peeled and chipped)	80g
Chilly powder	35g
Turmeric powder	2g
Gingelly oil	200g
Vinegar	400ml
Salt	100g
Sugar	10g

**Preparation**

Fillet the fish and remove the skin. Cut them into small pieces. Small sized species like anchoviella can be used as such after washing and cleaning. Mix with salt in the ratio 1:1 (w/w) and keep for 2-3 h. fry the fish in minimum quantity of vegetable oil of choice like refined peanut oil, olive oil, palm oil, cotton seed oil etc.

All other ingredients, except turmeric and chilly powder, are gently fried in the same oil, in a frying pan, used for frying fish. Turmeric and chilly powder are then added followed by fried fish. Mix well and add sufficient quantity of boiled cooled water just to cover the

materials. If saltiness is not sufficient more salt should be added. Cool the contents and pack in airtight glass bottles. Acid resistant pilfer proof caps are used to seal the bottle.

<i>Aging</i>	Aging of pickle is very important. Aging for 2 to 3 months adds new flavour and imparts the traditional taste to fish pickles. In commercial process pickles in large vats made of ceramic. They are then repacked into consumer packs based on market demands.
<i>Shelf-life</i>	One year under tropical conditions
<i>Storage</i>	Ambient temperatures

## 10. Fish Chakli

Piston or ram type extruder is used in different regions of India to prepare starch or pulse based fried snacks. These types of products are very popular among the people of India. Chakli (spiral) is one such popular product in Maharashtra. Fish meat was incorporated in to chakli to enhance its taste, flavour and nutritive value.



### Recipe

Ingredients	Amounts
Rice flour	100gm
Fish meat	70g
Sodium Bicarbonate	1gm
Chilli powder	2gm
Salt	2.5gm
Ginger	1.0gm
Garlic	0.5gm

### Method of preparation

- Procure sciaenid fish (Dhoma, each 80-150g) from the market.
- Remove the scale, eviscerate and wash thoroughly with portable water to make it free from blood and any other extraneous material.
- Boil the fish for 10-15 mins. Allow it to cool to room temperature.
- Separate muscle from skin bone by hand.
- Make muscle in to a fine paste in an electric or stone grinder.
- Make ginger and garlic in to a paste.
- Add 70gm of the fish paste in to 100gm of rice powder along with other in gradients as shown in the recipe and knead in to soft dough by adding sufficient amount of water.
- Place smooth soft dough smeared with little oil in the piston type hand extruder having a designed die at the end of the extruder.
- Press the piston, give the spiral shape to the material which comes out of the die.
- Deep fry spiral (chakli) in groundnut oil at low flame till golden brown colour to a moisture level to around 3%.
- Pack the chaklis in 100gauge polythene bags and seal it.

The chaklis remain in prime acceptable condition for 14 days. After that time due to increase in moisture crispiness decrease, but it still remain in acceptable from up to 21 days. Cost of production: Rs. 70 per kg of fish chakli.

## 11. Chilli fish (All ingredients are for 1 kg)

### First Method

#### Ingredients

1. Ginger garlic paste-----300g  
(100g ginger + 200g garlic)
2. Corn flour-----500g
3. Curd-----2 cups.
4. Cream-----1/2 kg
5. Ajinimoto-----1 tbs.
6. Soya bean sauce-----1/2 cups.
7. Lime cordial-----1/2 cups.
8. Mustard oil-----1/2 kg.
9. Capsicum-----1 kg.
10. Onion-----1/2 kg.
11. Salt-----to taste.

#### Methods

##### *Step 1*

- Prepare ginger garlic paste.
- Mix corn flour, curd and cream along with 2 cups of warm water.
- Mix fish with the above mixture, and keep over night at fridge.

##### *Step 2 Preparation of gravy*

- Remove the fish with mixture from fridge.
- Fry each piece at a time in a kadai.
- Keep them in a clean tray after frying.
- Fry small size onions.
- Add ginger and garlic paste.
- Add big size onions.
- Add capsicum medium size.
- Add chilli..Ajinimoto, salt.

##### *Step 3 Preparation of final products*

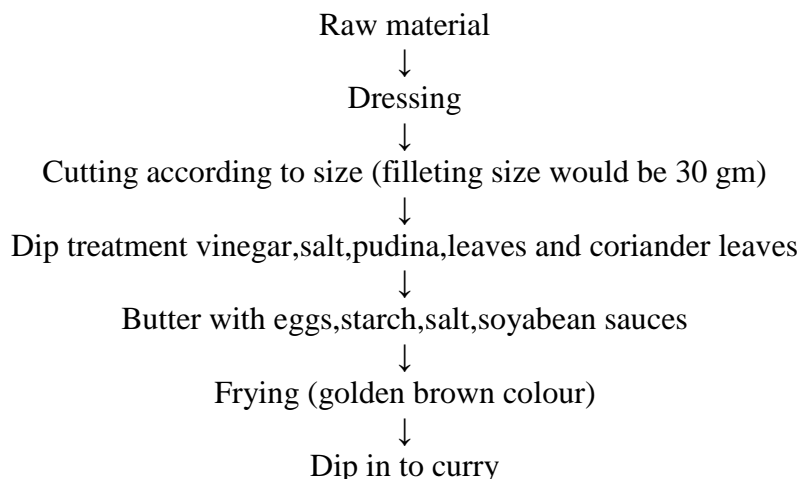
- Add the fried fish to the gravy and fry for 10 mins.
- Add water little by little.
- Add lime cordial.
- Add Soyabean sauce.



- Add salt to taste and little amount of water.
- Add corn flour, curd and cream and fry for another 5-6 mins.
- Keep in pack and serve to customer.

## Second Method

### Flow chart



### Ingredients

Metarials	Amounts
Fish	1 kg
Onion	200 gm
Capsicum	250 gm
Green chilly	30 gm
Vinegar	2 tea spoon
Soyabean sauce	As per need
Chilly sauces	As per need
Worcester sauces	As per need
White pepper	1 gm
Starch	200 gm
Tomato	3 pcs
Garlic	50 gm
Pudina leaf	1 tea spoon full
Coriander leaf	1 tea spoon full
Salt	25 gm

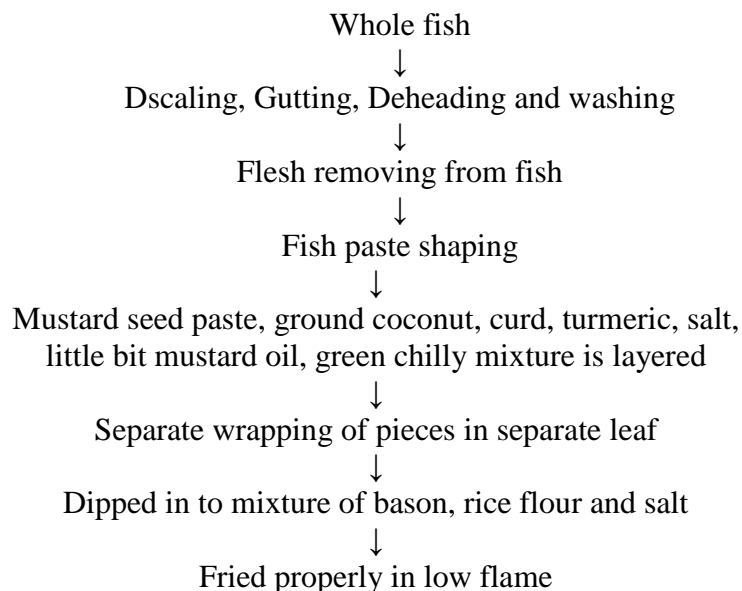
### Preparation method

1. Head, gut and scales are separated from the whole fish dressing.
2. Bones are removed from the fish meat (meat picking).
3. Then boneless fish meat is mixed nicely with vinegar, salt, green chilly, pudina leaves, coriander leaves and garlic pastes.
4. Now the meat with spices is cut into small rectangular shaped pieces and weight of it is approximately 30 g.
5. Then the pieces are dipped into the solution of eggs, starch, salt, aginamoto (MSG) and finally fried it to get a brown colour.

6. Prepare a curry with capsicum, onion, green chilly, soybean sauce, waorse, white pepper, starch and tomato.
7. Fried fish meat pieces are dipped into the curry.

## 12. Fish Patury

### Flow chart



### Ingredients

#### Materials

Fish minced meat  
 Mustard seed paste  
 Curd  
 Salt  
 Turmeric  
 Coconut paste  
 Mustered oil  
 Green chilly  
 Besan  
 Rice flour  
 Kumroo leaves

#### Amounts

100 gm each, 5 dough  
 2 teaspoon full  
 1 table spoon  
 As per need  
 As per need  
 1 teaspoon full  
 150gm  
 2 pcs  
 150gm  
 1 table spoon full  
 5pcs

### Method

1. Take the fish meat past and make in to different shapes
2. Wash the leaves and removes water.
3. Mustered oil seed and green chilly are grounded well.
4. Mix this paste with ground coconut, curd, turmeric, salt and little quantity of mix also the chopped green chilly.
5. Previously shaped fish meat it coated with the mixture and wrapped each pieces separately with leaf.
6. Mix grounded rice, basan, and little quantity of salt.



7. Dip the leaf wrapped fish paste pieces in bason mixture and fry each pieces separately.
8. Fry in low flame so that fish will be boiled.
9. Take out the fried pieces when it becomes red in colour.

### 13. Fish Butter Fry

#### Ingredients

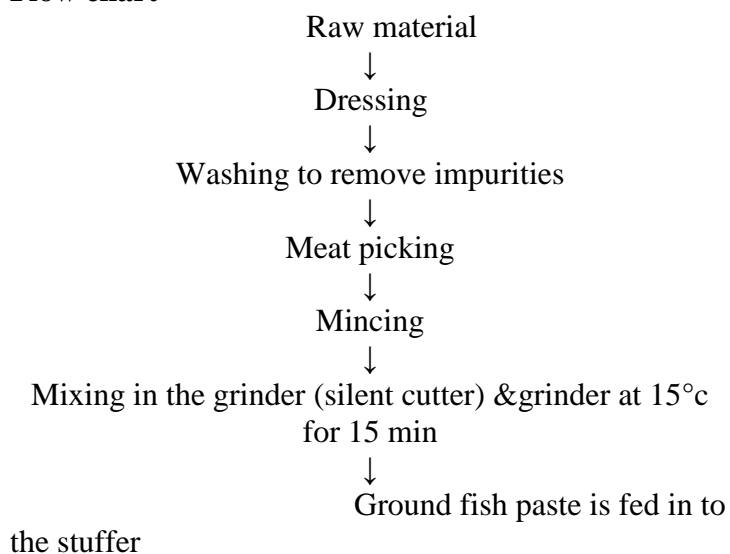
- Maida-----1 kg
- Eggs -----5 nose
- Mustard oil-----1 kg
- Salt-----to taste
- Custard powder-----20 gms
- Corn flour-----20 gms
- Cream-----1 cups
- Warm water-----1/2 liter

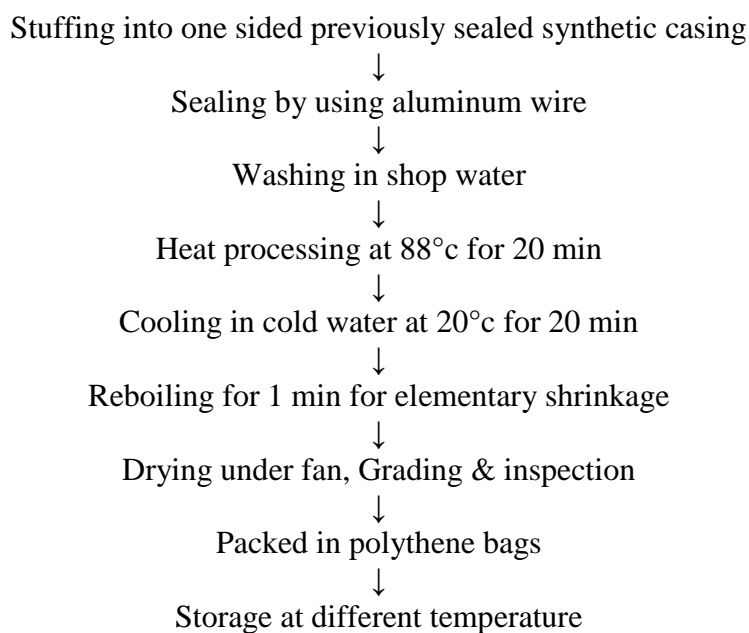
Mix all the above ingredients in a mixture and roll them in a roller for 1 hour till a thick paste of better is found.

- Heat all ingredients with constant steering in a rod  $3/4^{\text{th}}$  of the oil till the colour become black brown.
- Fry the ginger and green chilies to light brown in oil and add to this fish masala, turmeric powder and chili powder until they become light brown.
- Add the processed slurries of onion and tomatoes in to the mixture.
- Cut slice of soft fish are mixed vinegar and then into paste.
- Add water and salt.
- Heat the whole material well until they become cooked well.
- Keep on clean pan for serving to customer.

### 14. Fish sausage

#### Flow chart





### Ingredients

Material	Percentage (%)
Minced fish meat	70.00
Common salt	2.50
Sugar	1.00
Monosodium glutamate (MCG)	0.20
Colour solution (ponceau 4R = 60% and carmosia = 40%)	0.13
Pepper	0.20
Chilli	0.40
Coriander	0.03
Ginger	0.05
Garlic	0.05
Starch powder	7.00
Crushed ice	10.00
Fat	5.00

### Preparation method

The ingredients and spices required for the preparation of the fish sausage were weighed and mixed in a silent cutter for 10-15 minutes with the addition of cold water, spices, fat and colour solution. The temperature was maintained below 10°C during the entire process of mixing. The ground meat was then packed into animal casing (goat intestine). Stuffed sausages were then washed and boiled at 88°C to 90°C for 60 minutes, cooled in water at 15°C for 15 minutes and then reboiled at 100°C for 30 sec. the sausages thus prepared were fan dried.

### 15. Fish cakes burgers or Patties (Brunei Darussalam)

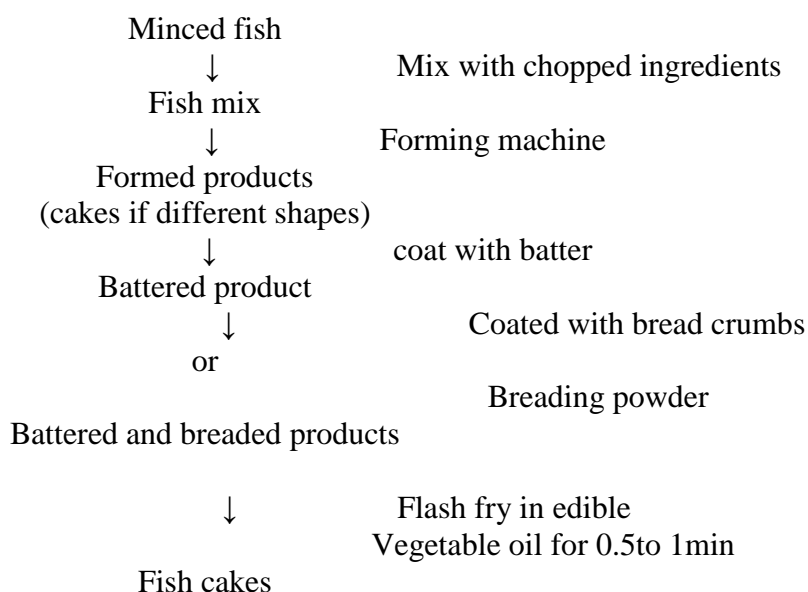
#### Ingredients

Minced fish	50.5%
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Chilled water	34%
Chopped Onion	150
Onion flakes	3.1%
Vegetable oil	2.1%
Salt	0.1%
MSG (optional)	0.5%

### Flow chart for fish cakes burgers

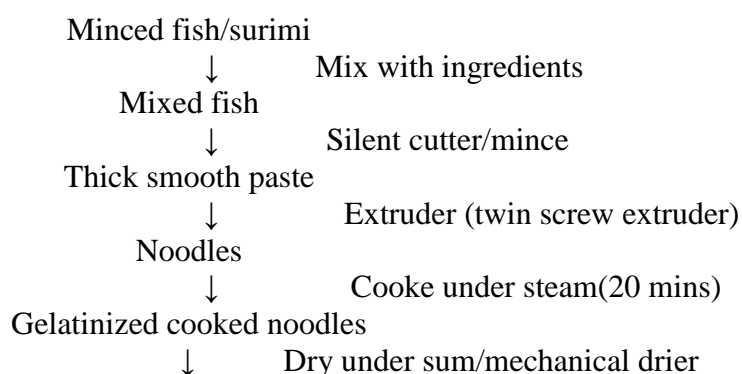


## 16. Fish noodles

Mostly urban people in many countries consume fish noodles. One advantage nowadays is that, noodles can be prepared by extrusion when in small scale as a domestic process for low-income group. Fish mince or surimi is the raw material. The fish meat is mixed with flour of cereals wheat, soya, rice etc. and other ingredients. The paste is extruded as noodles, cooked and consumed. Starch is an important binder cum adhesive. It gelatinizes the noodles on cooking. The basic procedure is given below.



### Flow chart of fish noodles



## Fish noodles

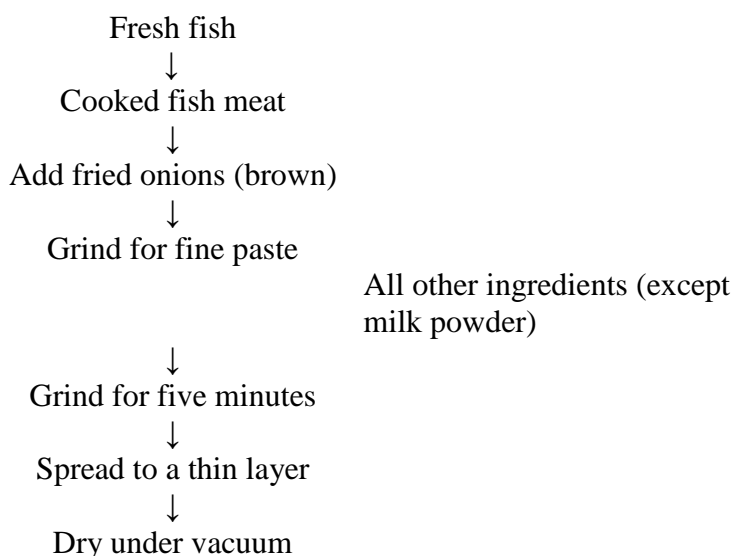
**17. Fish-soup powder**

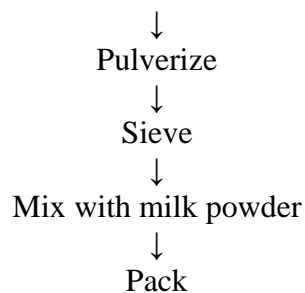
White flesh of many low value fish threadfin bream, sciaenid, perches etc. can be used to prepare instant fish soup powder. This product has high consumer acceptability and is now produced in India by several manufacturers. Incidentally it is a high value item for urban population. A common recipe is given below:-

**Recipe****Materials****Parts by weight**

Pickled fish meat	1500
Chopped Onions	1500
Hydrogenated vegetable oil	200
Common salt	340
Coriander powder	35
Cassava starch	500
Milk powder	200
Sucrose/glucose	45
Pepper powder	36
Garlic	10
Ascorbic acid	3
Carboxymethyl cellulose	6
Monosodium glutamate	20

**Preparation of soup:** Take 50g in a vessel. Add sufficient water to make a fine paste. add 150 ml water. Boil for two to three minutes, serve hot.

**Flow chart of preparation fish soup**



## 18. Fish Flakes

Cooked fish meat or cooked fish mince is use for preparation of flakes. Flakes are to be fried in oil prior to use.

### Recipe

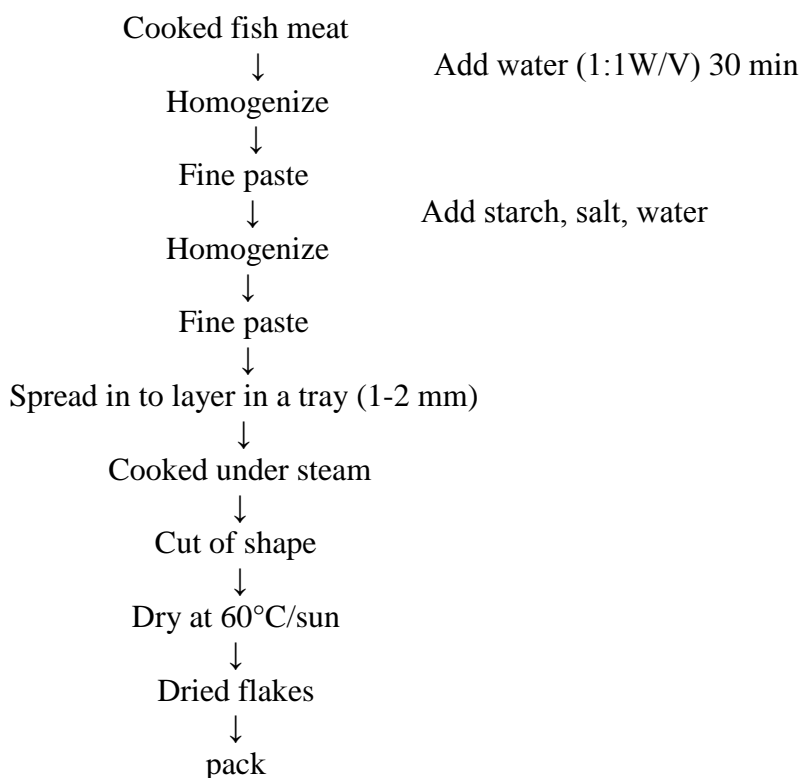
#### Ingredients

#### Components by weight

Cooked fish meat	2
Corn starch	1
Cassava starch	2
Common salt	0.05
Water	3.5
Total	8.5



#### Flow chart of preparation of fish flakes



### How to use

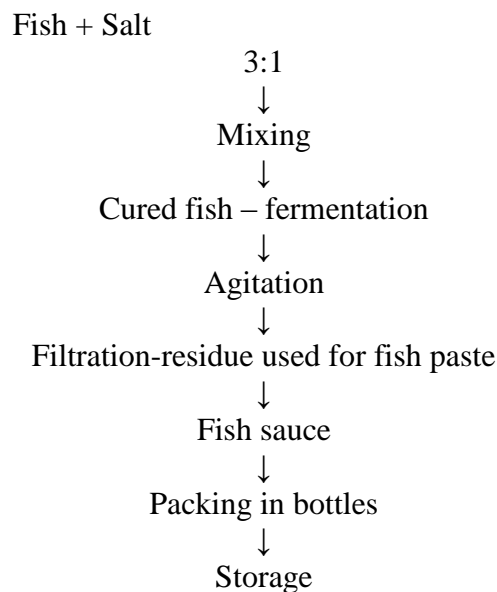
The flakes are to be fried in vegetable oil kept heated around 160-170°C. they swell to two to three times its initial volume. They are very crisp and delicious to eat. If dried at high temperature above 60°C they lose their capacity to swell and become hard on frying. Spices can be added in the final stage if processing to make it appealing to the consumers.

## 19. Fish Sauces

Fermented fishery products are very popular in south-east Asian countries. Fish sauce is a heavily salted liquid product having salt content varying from 20 to 30% depending upon the method and source of preparation. Sauce manufacturing is highly modernized and the whole processing of packing and filling are automated.



### Flow chart



Fish sauces have a developed market and they are also exported to Europe and America. The technology is very simple. It is one of the best ways of using low-value by catches.

## 20. Fish Satay

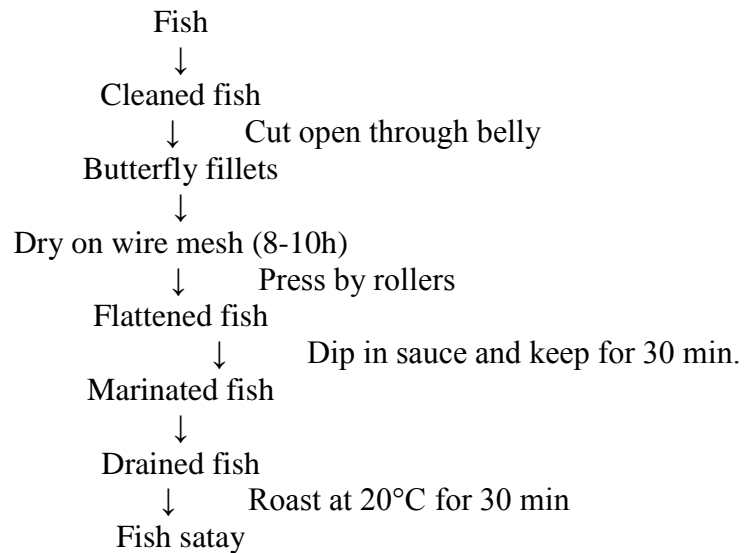
Fish satay is a product popular in many south-east Asian countries. It is a marinated hard dried product. The technology of production is simple and low cost. There are no stipulated quantity standards the product is prepared from variety of fish species. Industries engaged in commercial satay production have their own quality standards.

### *Formula of marinating sauce*

Soya sauce  
Sugar  
Chilli powder

Salt  
Ginger  
Pepper

### Flow chart



## 21. Fish Balls

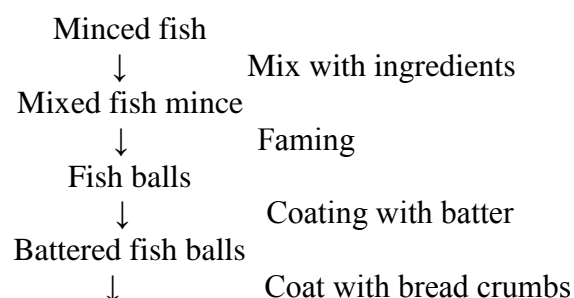
Fish balls are very similar to fish cakes but they are shaped in the form of balls.

### Ingredients

Minced fish	55%
Water	1.5%
Chopped carrot	14.8%
Tempura bread crumble	5%
Spring onions	3%
Edible oil	2%
Onion flakes	2%
Garlic powder	1.5%
Salt	1.2%
Pepper	0.5%
MSG	0.5%



### Flow chart



### Breaded fish balls

These fish balls can be stored at -20°C as unfried and sold. Flash fried fish balls have high shelf-life but the possibility of getting rancid is higher.

## 22. Fish curries

Fish curry is an important item of the food in many country of Asia like Indian Bangladesh, sri lanka, Myanmar, Thailand etc. fish curry is prepared and consumed immediately and has a shelf-life of one or two day under ambient temperatures. A variety of ingredients are added in the preparation of fish curry. It is highly nutritious and is a side-dish of rice. Preparation is laborious and time consuming and takes hours of labor



In view of the short shelf-life and high consumer acceptability several attempts have been made to process the curries under metal cans. However, the canned curries have very poor acceptability as the tin cans react with the spices and damage the taste of the fish curry.

The introduction of retortable pouches has paved the way for production of instant fish curries with high storage life and consumer acceptability.

### Recipe

#### Ingredients

#### Weight (g)

Fish (dressed and cut in to small pieces)	1000
Onion (ground in to slurry)	500
Tomato (ground in to slurry)	250
Ginger (peeled and grated)	20
Green chilly (cut in to pieces)	15
Chilly powder	25
Turmeric powder	3
Fish masala powder	25
Peanut oil	200
Vinegar (1.5% glacial acetic acid) ml	15
Salt	60
Water (ml)	750

Heat the onion slurry with constant stirring in about three fourth of the oil till the colour becomes light-brown. The tomato slurry is also fried with oil to become light-brown. Fry the ginger and green chillies to light-brown in oil and add to this fish masala, turmeric powder and chilli powder until they become light-brown. Add the processed slurries of onion and tomato in to this mix. The cut slice of soft fish are mixed with vinegar and then to the paste. Add water and salt. Heat the whole material well until the fish is cooked well and slurry becomes thick. Cool them. Pack them in retortable pouches and process them as per standard procedure of RT processing.

### Future of Indian fish trade



The Indian fish trade is export oriented, almost 100%. No processing factory is there in the country to cater exclusively the local population. Appropriate quality standards are also not available species-wise. There is an urgent need to set up standards for fish and fishery products sold within the country. Future of Indian fish trade depends on this as purchasing capacity of the people is going to enhance in the years to come, and market prices are going to be high for fresh fish in India.

### Conclusion:

Value added production is just one of many possible strategies that must be considered by a company or by a policymaker. Alternative uses of the relevant economic resources must be evaluated in order to arrive at the optimal long-run strategy. Fishery products play a very important role in the economy of our country, so, we must have the proper idea about value-added fishery products.

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