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Value Added Fish Products

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Value Added Fish Products

Large quantities of fish/shellfish are discarded at sea because it is currently uneconomic to preserve and bring them ashore. Shrimp by-catch is the best known example of such fish. It has been estimated that the global amount of discard of by-catches is in the range of 17-39 million tons/year with an average of 27 million tons/year. Factors discouraging the landing of the shrimp by-catch are the low market value of the material, the size and species composition, the lack of suitable refrigerated storage space on-board and the possible reduction in shrimping efficiency.

Considering optimum and over-exploitation of most of the available species in the inshore areas, the gap between the maximum potential and present exploitation in India is expected to be met mostly from the deep sea fishing. Due to the recent interest in deep sea fishing in the EEZ, a lot of deep sea fishes are expected to land which may not be immediately acceptable to the consumer due to unfamiliarity with the shape, size, colour and flavor of the new varieties. The rapid development of the minced fish technology over the last four decades could make a major contribution to the increased exploitation of these deep sea varieties and the by-catches.

Consumption of fish may be greatly increased by making better use of the existing catch. Due to lack of infrastructural facilities like ice plants, landing facilities etc. the quality of the fish is downgraded particularly in developing countries leading to their use as aquaculture feed. Through improvement in infrastructure facilities, the quality of the landings can be upgraded for direct human consumption. The upgradation of these species may be achieved by use of improved handling and processing techniques on one hand and developing different products on the other preparation of value added product using a species in glut it is sure way of better utilization and distribution of the species when the landing is scanty.

Value added fish products may be i) mince or mince based products ii) battered and breaded or coated products and iii) surimi based products.

Fish mince or minced fish is the flesh separated from the fish in a comminuted form free from scales, skin and bones. The fish is often gutted and washed before preparation of mince. The fish mince finds application in processing several 'convenience foods', some of which are discussed below. Advantage of mince based product is that it conceals identity of the original fish from which it is made and consumers may not hesitate to accept mince or mince based products even though the original fish would have been unacceptable as whole fish.

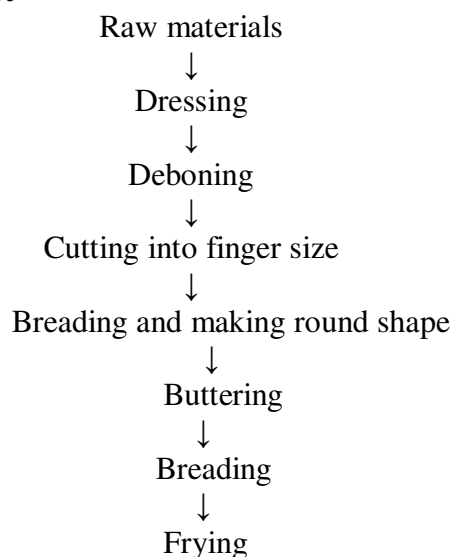
A batter can be defined as a liquid mixture composed of water, flour, starch and seasoning in to which food products are dipped prior to cooking. The breading is normally a bread-based crumb, but other coating like small potato chips or puffed grain such as rice also are popular.

Surimi is a Japanese term for mechanically deboned fish mince from white fleshed fish that has been washed, refined and mixed with cryoprotectants for better frozen shelf life because of its high gel strength, surimi is used as intermediate in processing several value added products with stimulated texture, flavour and appearance.

Some 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 crumbs	as per need
Potato	10
Egg white	as per need
Beet, Carrot, Capsicum	17
Onion	10
Vinegar	2 teaspoon full
Oil	as per need

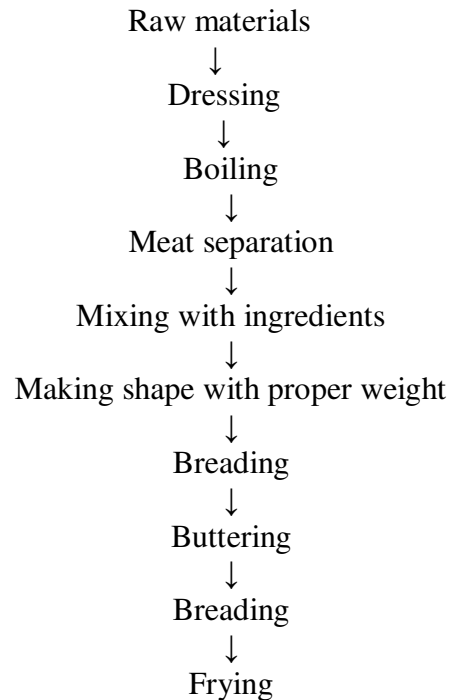
Preparation procedure

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 crumps and fry at 160° to170°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

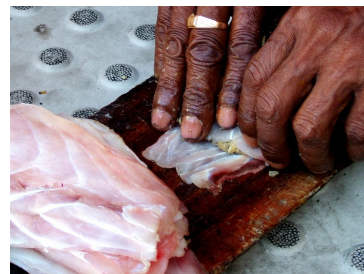
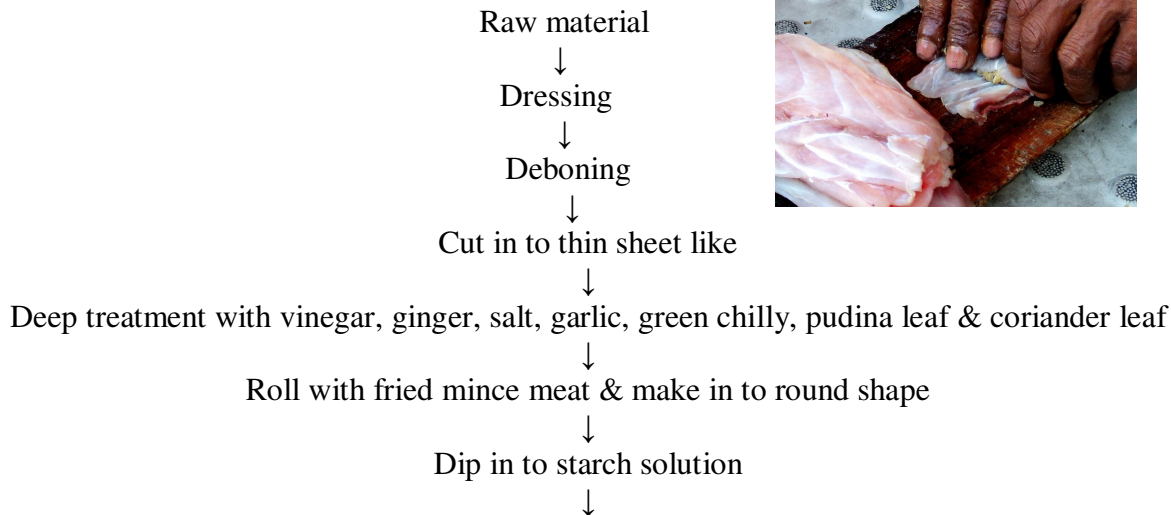
Preparation

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 than 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



Breading
↓
Frying

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

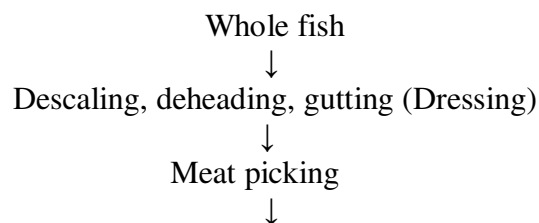
Bhetki was deheaded, descaled and all fins were cut with knife (Dressing). After dressing the fish was deskinning and filleted. The bones were removed from the fillets. Two large fillets were obtained from one fish. Each large fill was cut in to pieces of desired length. From each such piece fillets 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.

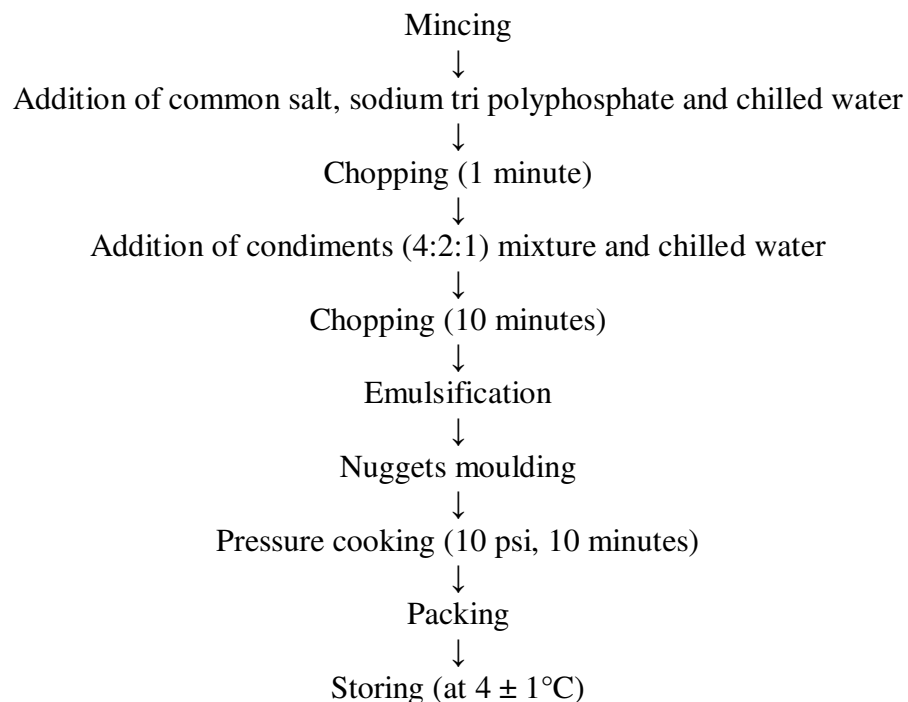
b) Preparation of roll

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

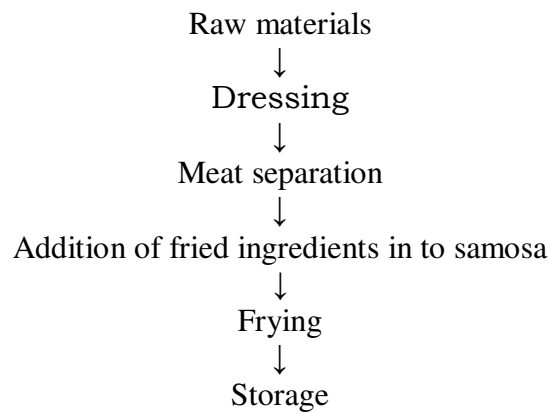
- Grind thawed fish in a mixture at low speed.
- Mix grind fish with ginger and garlic paste for 20 mins (open air).
- Heat mustard to 110°C.
- Fry onion in hot oil.
- Fry ginger and garglic paste up to brownish colour.
- Add major ingredients gently in mustard stir slowly till brownish colour.
- Add 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
	Made into paste (Paste No. 1)
	Made into paste (Paste No. 2)
	Made into paste (Paste No. 3)

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 1st 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 1st 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 over night.

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 ₃ :Na ₂ CO ₃ (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°cfor 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 is 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

Made in to paste together (1st paste)

Made in to paste together adding water (2nd paste)

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 1st paste) in an electric blender.
- Make dry chilli powder, turmeric powder and cumin powder together in to a paste (called 2nd 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 1st paste made of garlic, ginger and green chilli in the hot oil and fry it for a white.
- When the 1st paste is half-fried, add the 2nd 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 argentius*), 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 x1.5 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 1/4th 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 (<i>dressed and cut into small pieces</i>)	1 kg
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.

Aging 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.

Shelf-life One year under tropical conditions

Storage 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 100 gauge 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 form 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. Ajinomoto-----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.



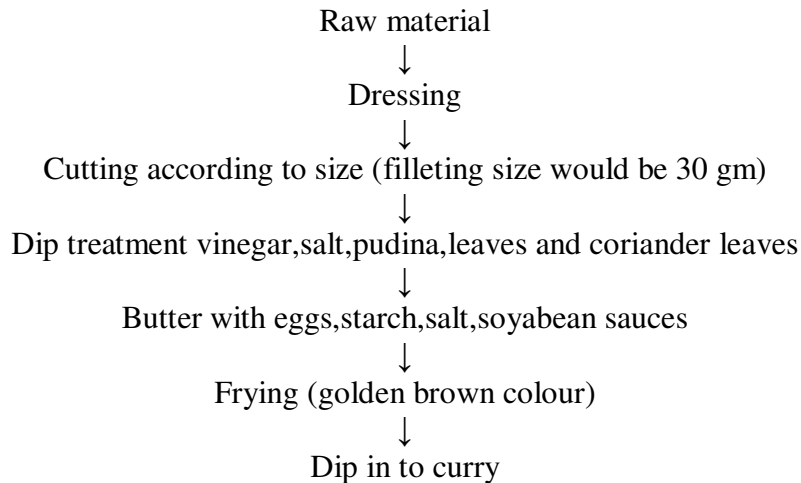
- Fry small size onions.
- Add ginger and garlic paste.
- Add big size onions.
- Add capsicum medium size.
- Add chilli..Ajanimoto, salt.

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

Fish
 Onion
 Capsicum
 Green chilly
 Vinegar
 Soyabean sauce
 Chilly sauces
 Worcester sauces
 White pepper
 Starch
 Tomato
 Garlic
 Pudina leaf
 Coriander leaf
 Salt

Amounts

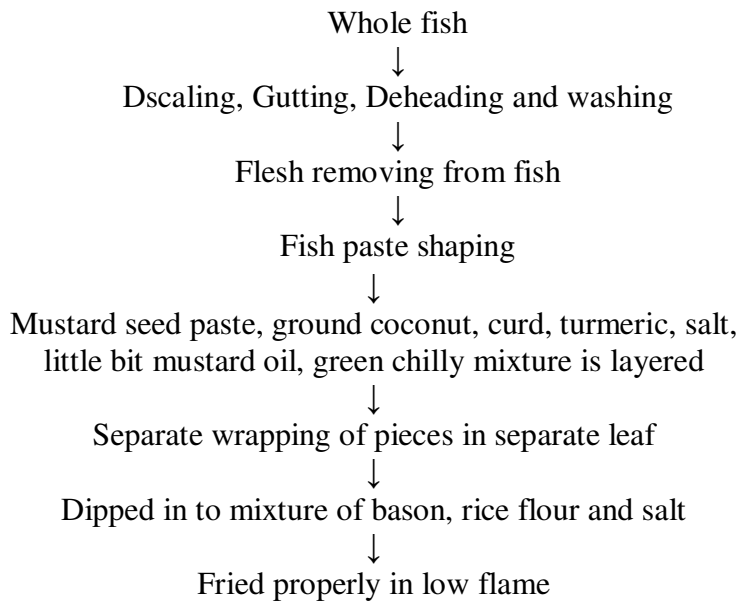
1 kg
 200 gm
 250 gm
 30 gm
 2 tea spoon
 As per need
 As per need
 As per need
 1 gm
 200 gm
 3 pcs
 50 gm
 1 tea spoon full
 1 tea spoon full
 25 gm

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
Mustered seed paste
Curd
Salt
Turmeric
Coconut paste
Mustered oil
Green chilly
Besan
Rice flour

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

Kumroo leaves

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, bason, 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 Batter Fry

Ingredients

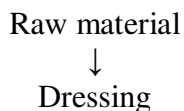
- Maida-----1 kg
- Eggs -----5 nose
- Mustard oil-----1 kg
- Salt-----to taste
- Custard powder-----20 gms
- Corn flour-----20 gms
- Cream-----1 cups
- Warm water-----1/2 liter

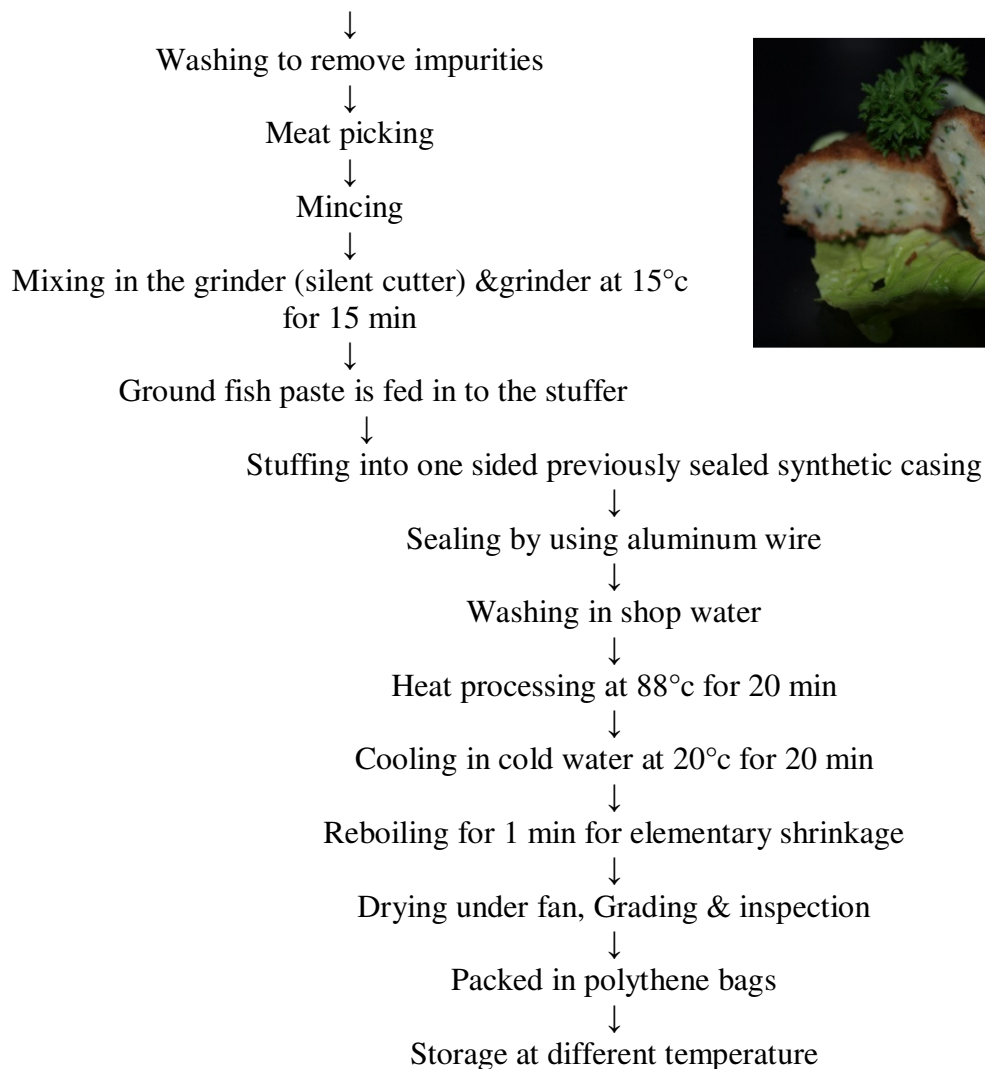
Mix all the above ingredients in a mixture and roll them in a roller for 1 hour till a thick paste of better is found.

- Heat all ingredients with constant steering in a rod $\frac{3}{4}$ th of the oil till the colour become black brown.
- Fry the ginger and green chillies 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 (poncean 4R = 60% and carmosia = 40%)	0.13
Pepper	0.20
Chilli	0.40
Coriandar	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 weight 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 then dried.

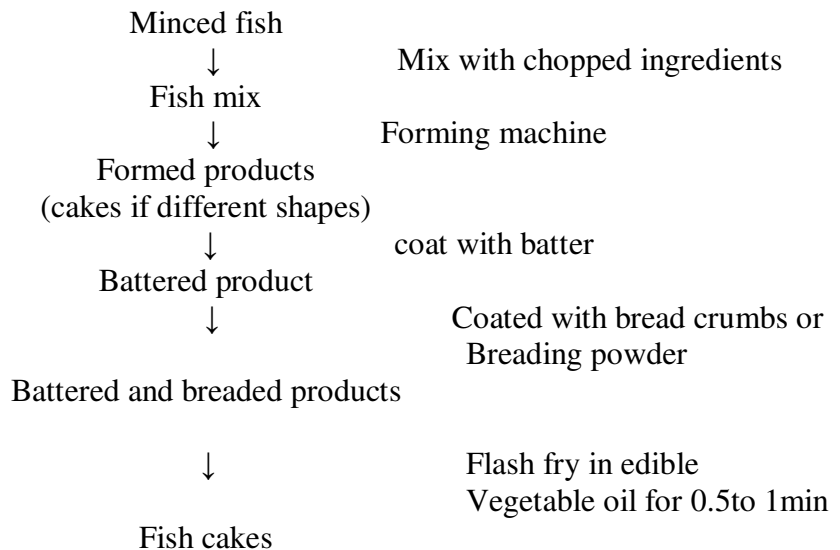
15. Fish cakes burgers or Patties (Brunei Darussalam)

Ingredients

Minced fish	50.5%
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



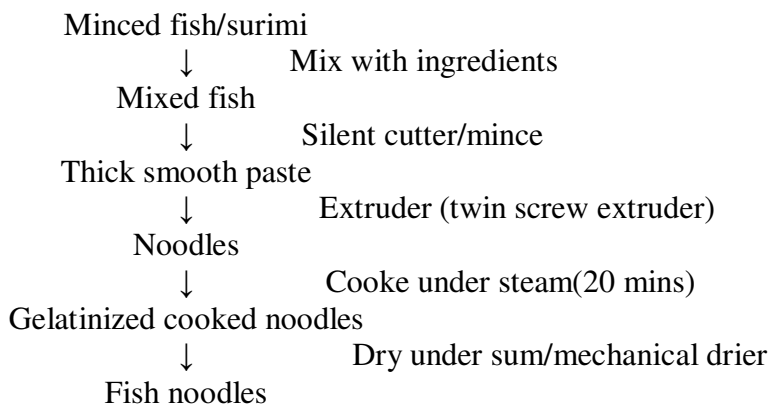
16. Fish noodles

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



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

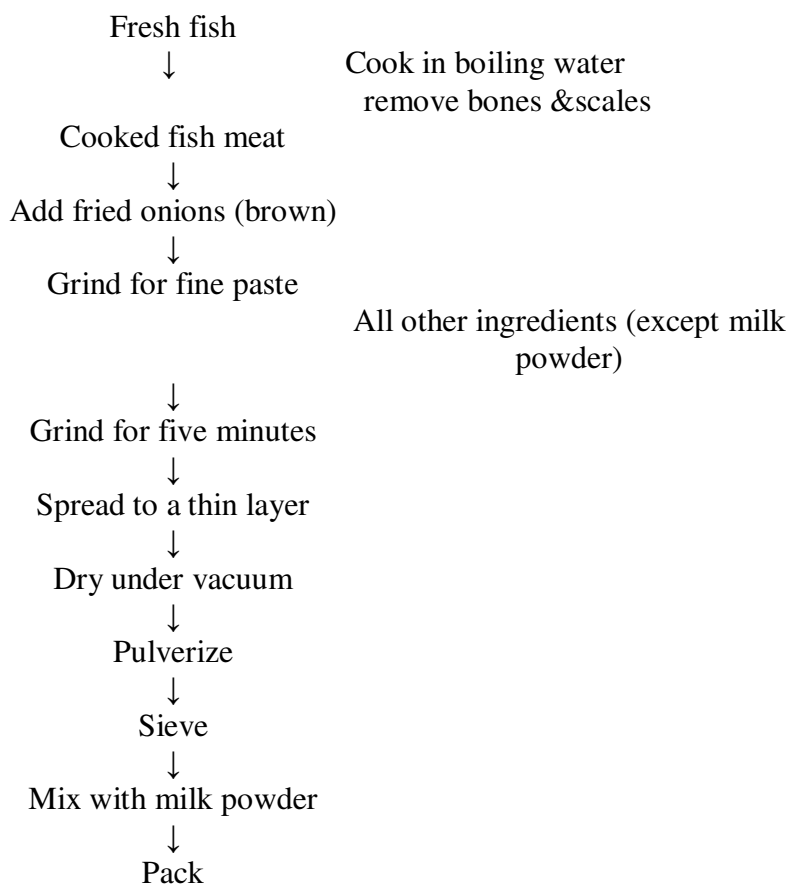
Materials

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

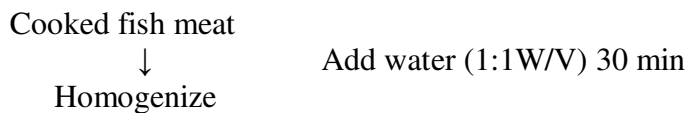
Ingredients

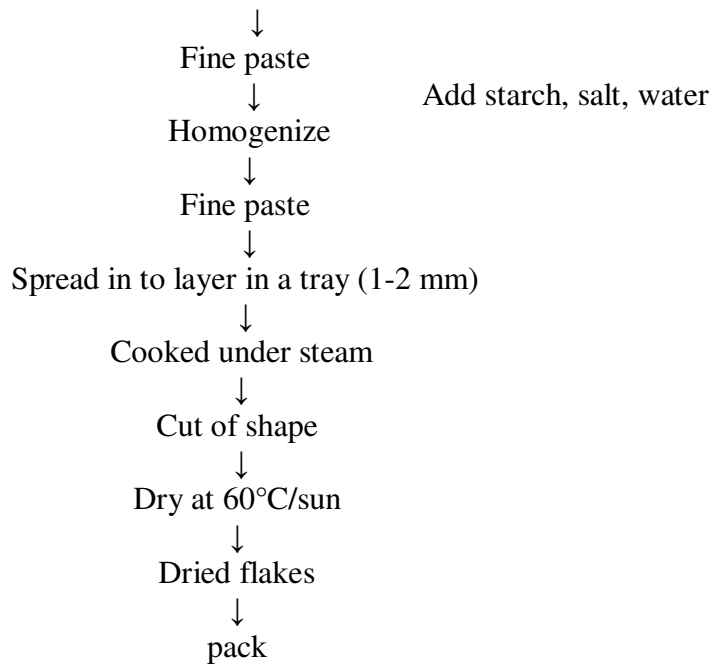
Components by weight

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

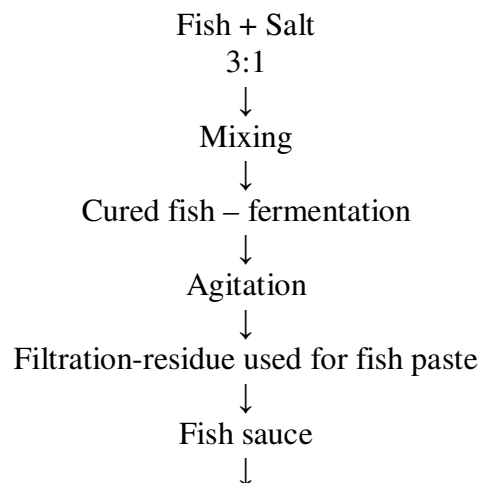
The flakes are to be fried in vegetable oil kept heated around 160-170°C. they swell to two to three times its initial volume. They are very crisp and delicious to eat. If dried at high temperature above 60°C they lose their capacity to swell and become hard on frying. Spices can be added in the final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

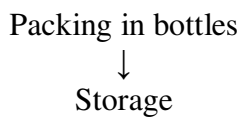
19. Fish Sauces

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.

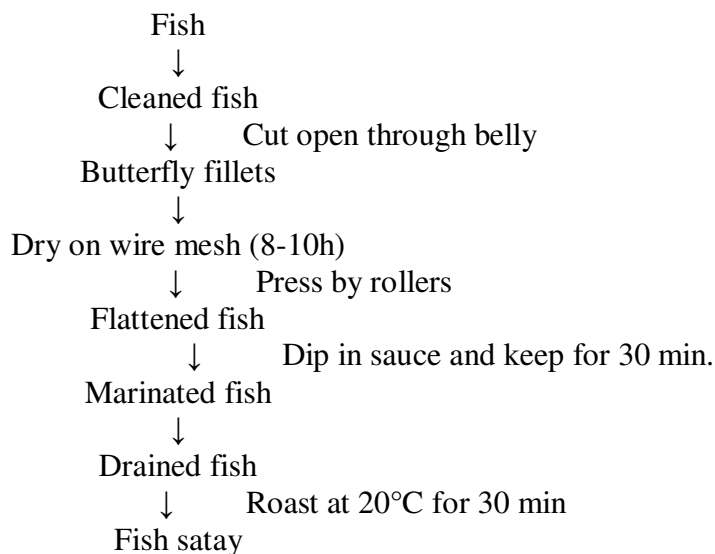
20. Fish Satay

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.

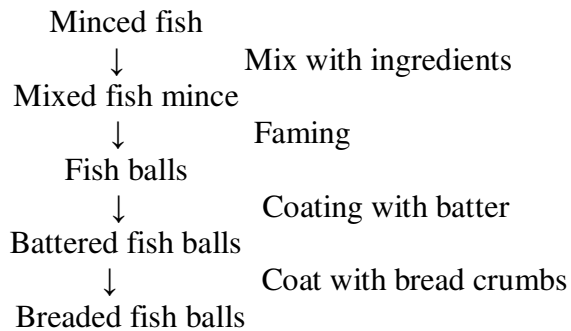
Ingredients

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



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 sunder 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.

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