Products from Less Utilised Fish

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Until recently the fish processing industry throughout the world was concentrated on a limited number of exotic species. Due to overfishing capture fisheries in marine sector has begun to show stagnation or decrease in production. The so-called bycatch fishes are also as good as high cost fish in nutritional point of view. To meet the increase in demand for fish the unutilised or under-utilised fish species are to be presented to the consumer as palatable attractive products. This has resulted in the development of new products from unconventional species. The recent trend in the utilisation of under-utilised species to various attractive products is presented here.

Key words: Bycatch, fish products

India with a coastline of 8,129 km and continental shelf 0.5 million km², has 2.02 million km² exclusive economic zone with an estimated sustainable resource potential 3.9 million tonnes of fish per annum. Of this nearly 50% is reported to be in the inshore waters and the rest in offshore and deep sea. As the annual marine fish production has reached nearly 3.0 million tonnes we can assume that further increase above this is not practicable. But the fish processing industries in this organised sector is concentrated only on prawn, which is less than 20% of the total catch. Seer, pomfret, rock cod, squid and cuttlefish are some of the species which are now processed by industries for export. The remaining is composed of a number of species of different species. This bycatch consisting several species of fish poses many problems to the trawler operators, such as on board handling, preservation, and storage, processing and marketing. The returns from the bycatch is poor compared to shrimp and hence the trawlers often discard portions of the bycatch to the sea. In spite of attempts to increase the share of shrimp in the catch by using more effective and selective gears, the prawn catch comes down and hence the trawlers have no other option but to increase the return by utilisation of bycatch.

Nature and composition of bycatch

The bycatch is mostly composed of jew fish, perchies, ribbon fish, sole, barracuda, lizard fish, cat fish, anchovies, lactarius, crab, bulls eye, threadfin
bream, etc. In India cephalopods, squid and cuttlefish are also have to be reckoned as by catch since no separate gears are employed at present for fishing these species. They are also mainly caught during trawling operations.

A very conservative estimate has shown that 20% of the bycatch is lost during trawling operations, improper handling and at landing centres. The composition of the bycatch and the quantity depend on the gear, area of operation and season. The total annual landing of the bycatch of fish is estimated to be around 1.3 million tonnes. It is also computed that over 1,00,000 tonnes are being discarded annually by the deep sea trawlers.

Fishes like pomfret, rock cod and cephalopods are now considered as high value fish and care is being taken during handling and processing. Other species, which are considered as low value are having almost the same proximate composition and nutritive value. But the wide variations in size and species of the bycatch present problem in sorting and handling problems. These factors have stood in the way of development of processing factories to handle these materials in the organised set up. With a view to utilise the bycatch which is capable of filling the gap of supply and demand efforts have been made to develop methods of processing them into products for human consumption, animal nutrients or products of commercial importance.

The high value fish are now processed as frozen whole or dressed, fillets and IQF products.

**Utilisation of low value bycatch**

**Traditional methods of utilisation**

**Dried and cured fish**

About 14% of the world fish catch is disposed as cured fish products. In India curing is a traditionally practised method of fish preservation and about 32% of the total landings are utilised for this. India traditionally was an exporter of dried prawn pulp and cured fish to countries like Sri Lanka, Singapore, and Malaysia and to some African and Western countries. Due to several reasons the export of cured fish from India began to decline after the Second World War. Since independence, India has made significant advances in the field of fish production and processing. The major share of bycatch particularly those caught from this deep sea are non-conventional low value fish. A profitable method of utilisation of these fish for human
consumption will be resorting to the traditional methods of preservation viz., curing. There is adequate demand for cured fish products from within the country and abroad.

Cured fish is a concentrated food rich in protein with balanced amino acid make up. This factor coupled with its low production cost and high storage life at ambient temperature makes cured fish ideal for facing the acute problem of malnutrition among the poor especially in rural areas away from the landing centres. However the salting and drying of fish are not carried out in a scientific manner to provide products of desired quality. Improper handling, processing, packing and storage techniques followed by the present curing industry causes considerable loss both in quality and quantity of the fish and the products are prone to attack by bacteria, fungi and insects during storage. Methods to improve quality and shelf life of dry fish have been worked out and recommended to industry, George Joseph et al. (1983). They comprise of better salting and drying methods, use of chemical preservatives like calcium propionate capable of preventing attack of fungi, red halophytic bacteria, use of suitable packaging materials etc. Application of certain anti insect formulations of natural origin like pyrethrum compounds and certain vegetable oils like sesame seed and hydnocarpus oil has been found to prevent attacks in dry fish. High density polythene (HDPE) bags laminated with polyethylene have been recommended for bulk packaging of dried fish under commercial conditions. PES/LDPE (polyester/low density poly ethylene) has been identified for retail packaging of cured fish.

Most of the fishes among by catch are dried in the sun after salting. For the purpose of drying fish under controlled conditions commercial driers can also be made use of. These driers are mainly useful in the rainy season, when there is no sunlight. Although it is a common practice to salt the fish before drying certain varieties of Anchoviella are dried without salting. Drying in multi deck racks fabricated out of locally available materials like bamboo or casuarinas with nylon webbing base can be commercially made use of in the beach area for drying both salted and unsalted fish.

*Smoked fish*

The flavour and consumer appeal of salted fish can be enhanced by subjecting this fish to smoking. Smoking, in addition to increasing the shelf life of fish, imparts better flavour liked by many.
Fish pickles

One of the best and popular methods of using the bycatches is pickled products. Non-fatty fishes with good meat content are preferred for pickle production. The method is simple and the preservatives used are salt, vegetable oils and acetic acid. The taste of pickles can be adjusted to preference of the consumers by selecting the ingredients and spices. Pickles can be packed in glass bottles and flexible transparent packets made of suitable synthetic films. This has got very good shelf life at ambient temperature.

Edible fish powder

This is another product made form certain varieties of bycatch. Non-fatty fish rich in protein and less ash content are preferred for this product. The processing consists of dressing the fish, removing the scales and viscera and bones and drying the cooked fish at elevated temperature and powdering to fine powder. The edible fish powder is rich in protein and has slight dry fish flavour. Process for the preparation of edible fish powder after partial hydrolysis is also developed. This finds use to fortify vegetable preparations and bakery items to provide the required nutritive value. The yield, protein content and protein efficiency ratio of edible fish powder prepared from Pseneopsis cyanea is as follows:

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<table>
<thead>
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<tbody>
<tr>
<td>Yield</td>
<td>12%</td>
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<tr>
<td>PER</td>
<td>2.67</td>
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<tr>
<td>Protein content</td>
<td>55.73%</td>
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FAO has also set standards for edible fish powder.

Minced fish

The most important breakthrough is utilisation of low value fish has been the production of fish mince and mince-based products, where by considerable value addition is achieved.

Fish mince or minced fish is the flesh separated in a comminuted form free from scales, skin, bones and fins of fish in principle meat can be separated from any species of fish in this style but it comes significant when applied to low value fish which otherwise faces difficulty in marketing and utilisation. Significant value addition will occur to such fish by application
of this technology because of the use of mince in the processing of a variety of value added products.

The process of production of fish mince involves selection of fish with low fat and more meat content from by catch, knobbing for separating meat, tails and fins and picking the meat using meat bone separator. The freshness of the raw material profoundly influences the quality of picked meat. The functional properties of fish mince from different species slightly vary. It is possible to improve them by suitable chemicals, physical treatments and preserve as frozen blocks. The frozen blocks are glazed with water and provided with a protective packaging while in cold store.

**Mince based products**

Minced fish can be used for the preparation of a number of products like fish sausage, cakes, cutlets, patties, balls, pastes, surimi, texturised products, etc. The processes for the production of most of these products are available and some of them are much suitable for starting small-scale industries. Thankamma *et al.* (1998)

**Fish fingers**

Minced fish is mixed with 10% salt and is frozen in the form of rectangular slabs. The frozen slab is sawed into uniform size pieces of about 7.5x2x1.5cm. The pieces are battered, breaded and flash fried for 20 seconds. Alternatively fingers can be made from slabs of frozen fillets.

**Fish cutlets**

Fish cutlet is made using cooked mince. Cooked mince is mixed with cooked potato, fried onion, spices etc. and formed into an appealing shape. The formed cutlets are battered, breaded and flash fried.

**Fish patties**

Burger is made using mince from lean white fish. Cooked mince is mixed with cooked potato, mild spices etc. and formed into a round flat shape. It is then battered, breaded and flash fried. Several other products like fish butter, paste etc. can be made using the mince.

**Fish wafers**

Fish wafers are very popular in South East Asian countries. The method of preparation of fish wafers using fish mince developed in India is simple
and can be adapted as a small-scale industry. Apart from fish mince other materials like tapioca (Cassava starch), corn flour, etc., are used which are available in plenty. For large-scale production mechanisation/automation can be affected. Suitable packaging for fish wafers have also been identified.

**Surimi and surimi based products**

Surimi is a Japanese term for mechanically deboned fish mince from white-fleshed fish that has been washed, refined and mixed with cryo protectants for good frozen shelf life. Washings removes fat, blood, pigments, soluble proteins and odoriferous materials and increases the concentration of myofibrillar proteins which improves the gel strength and elasticity of the product. Because of its gel strength surimi is used as an intermediate in the processing of several products with simulated textures, flavours and appearance like shrimp. The properties of surimi depend upon the fish from which it is made. Rathnakumar and Shamasundar (1998). The fish of choice is Alaska Pollack which is low in fat and has white flesh. A decline in the catch of this fish has forced to look for other varieties of fish. Among the by-catch available in India threadfin breams, barracuda, ribbonfish, lizardfish, priacanthus and croakers are suitable for surimi processing. Surimi processing plants have been set up in Veraval, Raunagiri and Visakhapatnam.

**Fibrised products**

Simulated shellfish products are in great demand and they are based on surimi. Imitation crab legs, shrimp, lobster and scallop meat are the generally processed fibrised products.

**Kneaded products**

Several kneaded products are becoming popular in Japan over the years. Based on the manufacturing process these are grouped into Kamaboko (Steamed), Chikua (boiled) hampen (boiled), fish ham and fish sausage (smoked and retorted).

**Curried products in retortable pouches**

Fish like mackerel and sardine can be made into curried products packed in flexible pouches and sterilised in over pressure autoclave which is having unlimited shelf life at ambient temperature. These products are having good demand as ready to serve food items and non-conventional fish species can...
be marketed as valuable products for direct consumption. (Vijayan & Balachandran, 1986; Vijayan et al., 1988).

Recent R&D programmes in post harvest technology are concentrated on development of products for human consumption from low cost and less utilised fish in an environmental friendly way. The processing waste is also gaining importance as they are being used for development of valuable by products for human consumption, animal feeds and products of chemical, cosmetic and pharmaceutical applications. This will lead to complete utilisation of the bycatch and less important fish which will help in filling the gap of supply and demand of fish in addition to employment and revenue generation.

References
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