YIELD AND UTILIZATION
YIELD AND UTILIZATION OF POMADASYIDS

INTRODUCTION

Capture fishery is currently at an all time high of 90 mt and the yield of marine fishery has multiplied more than six folds within the last 45 years, with the increasing fishing fleets which ultimately resulted a further serious problem of the large fraction of 'discarded fish' (27 mt) i.e of unwanted, incidental catch that is thrown back into the sea rather than being used (e.g. as a protein source for low income groups and a protein supplement for farm animals, etc.), (Klaus Becker and Ulfert Focken, 1998). Fish being a rich source of protein food should be made to use it in any form for the people who really need it. It has now been well established that regular consumption of fish reduces cardiac problems and increases longevity (Venugopal et al., 1998). At present, there is a wide gap between supply and demand and therefore, fish which was regarded as a cheap food item years ago has become a luxury in many parts of the world.

Shrimp trawling all over the world is associated with a large by-catch. In most shrimp fisheries the by-catch comprises 80-95 per cent of catch volume and it has been estimated that approximately 1,00,000-1,30,000 t of shrimp by-catch was discarded by various size of fleets in east coast of India during 1988 (Ann Gordon, 1991). The information available on the species and size distribution of the discarded by-catch is general rather than specific. The main selection criterion in retaining or discarding fish seems to be size, but the cut-off point is different for each type of trawler. Everything less than 20 cm was discarded (80-90% of the by-catch (Kullberg, 1988). Raveloson (1990) recorded Pomadasys hasta as a shrimp by-catch from Madagascar coast. Correa Ivo et al. (1996) recorded some species belonging to the family Pomadasyidae were one among the most important by-catch in the trap and gill net lobster fisheries in ceara state, Brazil.
Sujatha (1995) recorded three species, *Plectorhinchus polytaenia*, *Pomadasys commersonni* and *Pomadasys maculatum* as trawl by-catches from the trawl landings of small trawlers berthed at Visakhapatnam in east coast of India. The commercial trawl landings consist of a large number of different fish species which are extremely variable in size and chemical composition. Nevertheless, these are iced or salted and sold at the market at a throwaway price. Though it is being wasted, the volume of such waste has not been quantified. But it is certainly large enough to pose a significant challenge to fish technologists to convert such fish into acceptable food by-products which can be preserved for long periods without involving complicated procedures for human consumption.

The pattern of utilization of fish in India vary significantly and certain coastal communities depend heavily on fish for their diet. Although half of the quantity of fish landed is marketed afresh, the remaining quantity is being marketed in frozen and dried form. Fish utilization is also characterised by greater production of a wide range of value added products. Significant research have been done on this subject during the last three decades and several innovations made for the profitable utilization of low cost fish and their techno-economic feasibilities by R&D organisations.

RESULTS

Information on the yield of meat is important for producers in the context of processing and marketing and consumers acceptability as well. The increased catch of fish envisaged from the extended EEZ needs some advanced techniques for utilizing them without waste. In general, the white meat in most fish species accounts for about 30-60% of total body weight but often varies considerably depending on size and shape of the species.
The percentage of yield was calculated from the total weight of fish as under:

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\text{Percentage of yield} = \frac{\text{Weight of minced meat}}{\text{Total weight of fish}} \times 100
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The yield estimated in *P. maculatum* was in the range of 33.2 to 39.4% with an average of 37.4%. This appears to be almost in equal range when compared to the yield of same size group of other low value fishes in Indian waters which have got more popularity among the fish eating community in India. Nair et al; (1990) studied the yield of minced meat from some species viz. catfish (34%), ribbon fish (50%), sciaenids (51%), silver belly (40%), horse mackeral (43%), thread fin breams (46%), white fish (59%) and lizard fish (50%). Paulpandian (1998) recorded an average of 44.65% yield of minced meat in *Ariomma indica*. Though the saddle grunt *P. maculatum* is comparatively small in size and shape, the percentage of its white meat yield is significant. Therefore it is worth studying its body composition for further utilisation into different products for domestic consumption.

**UTILIZATION**

**INTRODUCTION**

Although several thousands of species of fish are caught annually throughout the world, all of them are equally important for processing from a commercial point of view. The world fish consumption can be substantially improved by proper utilization of uneconomical fish as well as the shrimp by-catches. The increased catch of fish particularly from the trawl landings will naturally call for some advanced techniques for utilizing the fish without waste. Smallness of size, unattractive shape and colour, spines, tough texture of skin as well as meat and such other features stand in the way of consumer acceptance of many unconventional species. However, the fish flesh of the very same species in the minced form finds better acceptance. “Minced Fish” of single species or multispecies origin of white meat varieties has solved such problems more effectively and economically.
Pomadasyids are commercially important food fishes throughout its range wherever it is available. Gutierrez (1976) studied the chemical, physical and organoleptic changes at temperature 0° and 18°C for preparation of fish pulp from the species, *Orthopristis ruber* belonging to the family Haemulidae. Raveloson (1990) studied the processing aspects of *Pomadasys hasta* for making fish flour. Often bigger specimen are marketed locally in fresh condition. The smaller specimen are salt cured and sundried as there is good demand in view of its excellent taste. The Integrated Fisheries Project of the Government of India being the nodal agency for fishery product development and popularisation, processed and produced fishery by-products from the Pomadasyids, one among the dominant species of perch and have successfully test marketed the products for domestic consumption.

**Integrated Fisheries Project (IFP)**

The Integrated Fisheries Project (IFP) functioning under the administrative control of the Ministry of Agriculture, Government of India has its head quarters in Cochin and an unit in Visakhapatnam. The IFP is mainly responsible for developing fishery product from non-conventional fish and test marketing for popularising the products. Thus the IFP has significantly contributed towards the following:

(i) Development of fishery products and by-products:

- Development of shrimp products. Processing and packaging of cuttlefish in various forms as early as 1973-74 and deep sea lobster for export in 1967. Processing of fin fish such as perch, barracuda, sardine, mackerel, tuna, horse mackerel, ribbon fish, lizard fish, etc. Developing dried fish products by salting and drying in electrical tunnel driers from common and uncommon varieties of fishes such as shark, mackerel, pink perch, anchovies, sciaenids, caranx, silver bellies, small size pomadasyids, etc. Packing in small packets at prices affordable to the consumers.
- Smoked and canned products such as cultured oysters and mussels, canned products like tuna, marlin, mackerel and sardine and canned fish balls from minced fish meat obtained from uncommon and low value white fish.

- Ready to eat products such as fish cutlets, fish burgers and fish wafers. Fish pickles from fin fish, shrimp and bivalve meat and also development and test marketing of fish curry in retortable pouches.

- Products from shark fin, extraction of shark fin rays, fish products such as fish powder and fish silage for cattle and poultry feeds.

(ii) Pilot scale export of processed fish products:

- Export of processed deep sea lobster tails and meat, frozen cuttle fish, shark fin rays, fish mince, fish cutlets, fish fingers and clam meat.

(iii) Popularisation of processed fish products in the domestic market:

- All types of products like frozen fish, dried fish, canned fish and speciality products.

(iv) R & D training and consultancy:

- Standardisation of fish curry products in retortable pouches. Studies on ship-board processing of Antarctic krill and product development and test marketing in domestic sector during 1997. Standardisation of fish, prawn and bivalve pickles and packaging in bottles and sachets, etc.

Minced fish

Pomadasyids are used as a raw material for the production of single or multi-species minced fish in the IFP. Minced fish is nothing but the flesh separated in a comminuted form from the skin, bones, scales and fins of fish (Grantham, 1981).
The flesh is made into very fine particles and the original texture of the fish flesh is completely changed. The product is versatile from the point of view of its application in a variety of food items that can be made out of minced fish. The minced fish has become the most accepted way of utilizing many low priced fish.

Raw materials

The raw materials required for marketing minced fish can be conveniently categorised as three groups:

I Group - Commercially important species (perches, mackerels, sardines, tunas, etc).

II Group - Under utilized species (lizard fish, silver bellies, priacanthids, Indian drift fish, etc).

III Group - By-catches from shrimp trawlers (anchovies, crockers, ribbon fish, carangids, etc).

Technology of production

The minced fish preparation is based on physical squeezing out the flesh from bones, skin and scales by means of mechanical flesh separator. Whole fish of *P. maculatum* are cleaned, beheaded, gutted and splitted before feeding into the mechanical flesh separator for the production of high quality minces. The minced fish/kheema making machine `Baadar 694` was used in this study. The separated minces are pressed into 500 g blocks and put in cartons and frozen at -40°C and then stored at -20°C or below for ready marketing.

The different stages of preparation of minced fish from *P. maculatum* in Integrated Fisheries Project, Visakhapatnam unit are presented in plates IV – VII. Generally the 500 g carton of multispecies minced fish / Kheema is being sold at the cost of Rs. 10 for domestic consumption.
Fish cutlets

Battered and breaded marine products are one of the most important class of value added foods very much relished by the consumers as a convenient food. The process of coating with batter and bread crumbs increases the bulk of the product and thereby reduce the cost element. The pick up of coating can be increased either by adjusting the viscosity of batter or by repeating the process of battering and breading (Sunderman and Cunningham, 1983).

The IFP is making cutlets from minced fish of *P. maculatum*. Minced fish accounts for over 65% of the total weight of cutlet mix. The production of cutlet is a viable technology to utilize low priced uneconomical varieties. Minced fish can be conveniently used for the preparation of fish cutlets. Cutlets have become a delicacy among the fish eating community in India. The minced fish meat is cooked to remove excess water and to get a firm and fibrous texture. The important ingredients are potato, onion, green chilli, garam masala, ginger, pepper, cloves, cinnamam, turmeric and salt. The cutlets are dipped in a batter of egg-white and rolled over bread powder. Four pieces of cutlets each weighing approximately 40 g are packed in the consumer polythene pack and marketed at the cost of Rs. 9 for domestic consumption (Plate VIII). At \(-20^\circ\text{C}\) the cutlets remained in edible condition up to 22 weeks. The consumer acceptability of the product seems to be very good.

Apart from fish cutlets, other by-products such as fish wafer, fish finger, fish soup powder, fish cakes, fish protein concentrate (FPC), fish ensilage etc. can also be prepared using Pomadasysids as raw material.

Dried fish

The technology of curing and drying has undergone considerable changes and as a result of that the quality of the products has improved substantially.
Since the consumers have become more and more aware of quality, the producers are forced to improve the drying conditions so as to produce good quality products. Maintenance of quality of raw material is very important to obtain high quality finished products. The practice of spreading material on the sea shore is now being discouraged since it can yield only poor quality dried material. Raised platforms and rack drying systems are advocated for quality upgradation of dried products.

Hygienic salted and dried products from common and uncommon varieties of fishes in small packets at prices affordable to the consumer was introduced for the first time in India by IFP. Hygienically dried fish in raised platforms of some of varieties such as shark, ray, mackerel, pink perch, anchovies, ribbon fish, upenoids, etc. found very good acceptance especially in land locked areas.

The IFP, Visakhapatnam unit produce dried fish of *P. maculatum* along with the other mixed varieties such as silver bellies, carangids, upenoids, sciaenids, etc. and selling in 500 g consumer polythene pack at the cost of Rs. 20 for domestic consumption. The method of drying and the final products are shown in plates IX & X. This product has got more popularity among the fish eating community in India.

**DISCUSSION**

The quantum of human consumption of fish can be substantially improved by increased use of low priced fish / shrimp by-catch. Effective utilization of by-catch from shrimp trawlers is a matter of serious concern in many parts of the world. *P. maculatum* is being caught abundantly along with other varieties by bottom trawls in Indian coast. Though it is being considered as a poor quality fish, it has got more popularity among the fish eating community especially the lower income group both in east and west coasts of India. Generally it is being consumed in fresh, salted and sun dried forms in India.
Kheema / Mincedmeat is being prepared by squeezing the meat of *P. maculatum* electrically through a meat separator, "Baadar 694" for making several other value added products using this as a base material. Though very limited acceptance for such product is prevailing in Indian market, these products have already got more popularity in foreign countries like Singapore, Hongkong and Japan and therefore there is a vast scope for export for these products.

The Integrated Fisheries Project (IFP) functioning under the administrative control of Ministry of Agriculture, Govt. of India, has already started preparing the minced meat and other value added products, commercially from this species, *P. maculatum* and the consumer's acceptability is also seems to be good. The quality and texture of the meat as well as its biochemical properties indicates the scope for utilization of this species for production of many value added products such as fish cutlets, fish finger, fish wafer etc. Therefore, sincere efforts have to be made for developing value added products to enhance further utilization and the industry has also to be adequately geared and equipped to handle and export them in value added packagings so as to enhance the economic returns from this fishery.
Plate IV. a) Cleaned, beheaded and gutted fish, *P. maculatum* on processing table

b) Splitting of *P. maculatum*
Plate V.  

a) Splitted fish, *P. maculatum* fed in 'BAADAR - 694' 

b) 'BAADAR - 694' in Operation – Separation of minced fish of *P. maculatum* and its waste
Plate VI. a) Yield of minced meat of *P. maculatum* and its waste

b) Minced meat of *P. maculatum* – ready for packing and freezing
Plate VII. Frozen minced fish meat / fish kheema of *P. maculatum* in 500 g consumer pack ready for marketing.
Plate VIII. a) Commercially produced fish cutlets prepared from minced meat of *P. maculatum*

b) Heat and eat fish cutlets in consumer pack.
Plate IX. a) Hygienic sun drying of *P. maculatum* in raised platform.

b. Hygienic sun drying of mixed varieties of low cost fishes along with *P. maculatum*
Plate X.  
a) Dried fish of *P. maculatum* in 500 g consumer pack-ready for sale

b) Dried fish of *P. maculatum* along with mixed varieties.