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WORKSHOP ON

# MUSSEL FARMING

25 - 27 SEPTEMBER, 1980

MADRAS



CENTRE OF ADVANCED STUDIES IN MARICULTURE

**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE**

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TECHNICAL SESSION VI POST HARVEST TECHNOLOGY AND MARKETING | CMFRI-CAS/MF/80/BP-2C

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TECHNOLOGY OF PROCESSING MUSSEL MEAT

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INTRODUCTION

Green mussel (*Perna viridis*) and brown mussel (*P. indica*) are available in substantial quantities from their natural beds along the south-east and south-west coasts of India respectively. Mussel is locally collected for its meat which is consumed in the nearby areas. Mussel meat normally finds favour with people of low income group and that too when the fish is scarce or costly, which often results in poor economic returns to the collector. There are quite a large number of people engaged in its collection and, they together with the middlemen and the actual vendors in the market and their dependents constitute a large number of people earning a living from mussel. Any poor response from the market directly affects the economic and social status of these people and in turn their region as a whole.

Why product development is necessary?

Even in the absence of accurate statistical information about the availability of wild cultured mussel, it is well known that there is the potential for a very large sustainable quantity available from the

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natural beds, the present rate of exploitation being far less than the potential availability. The recent tempo in its culture stands a sure guarantee for continued abundant availability. Capture along with culture promises a greater quantity flooding the markets which, if not met with ready demand from the consumers, will result in a further fall in its value as also wastage.

Mussel meat, like fish, is a highly perishable commodity. One of the ways of ensuring reasonable returns to the producer is to convert the mussel meat into stable processed products and market them in far off areas from the collection centres.

#### Popular processed products from mussel meat

There are several processed products known to be popular in several overseas countries, particularly Europe. Canned, frozen, marinated and light smoked and dried are some of the most popular processed mussel products. Mussel meat canned in oil or brine and pickled either in brine or vinegar with or without heat processing are widely used. If products conforming to the requirements of overseas markets can be processed, mussel meat can even find ready demand from such markets. Prospects of transportation of fresh mussel or meat to distant areas can be given a fair trial. We have recently developed processes for converting mussel meat into stable processed products. Adoption of these for prolonged preservation and wider distribution, coupled with transportation of fresh mussel or meat are sure ways of ensuring adequate returns to those engaged in the trade and thus enhancing their economic status.

### STUDIES ON PRODUCT DEVELOPMENT

#### 1. Purification

Mussel is a sedentary animal found in the littoral and sublittoral zones where they are attached to rocks by means of byssus threads. They feed by the mechanism of filtration of microscopic food materials suspen-

ded in the surrounding water. At any given time their stomach will contain a lot of sand and other gritty materials which, if allowed to remain, will impart grittiness to the end product. Besides, the coastal waters are likely to be polluted by sewage water, industrial effluents as well as human faeces. Contamination of the water and hence the mussel with faecal and pathogenic bacteria, and to a lesser extent with heavy metals cannot be ruled out. Paralytic shell fish poisoning, though not frequent, is known to occur in bivalves in Atlantic waters. However, this is not considered so significant in waters of tropical regions. One of the most important prerequisites of any type of processing is to purify the mussel.

If the mussel is bacteriologically polluted its purification is rather simple since the mussels cleanse themselves of all polluting bacteria if they are kept in clean sea water for a number of hours. In some places mussels are kept in clean sea water in tanks over two nights with a change of water on the second day (Waterman). The same treatment can also free the mussel of most of the sand from their stomach. It has been experimentally proved that mussel kept alive in sea water for 24 hours followed by chlorination at 5 ppm level brings down the sand content to 0.02% on dry weight basis of the meat (Balachandran and Nair, 1975). No faecal or pathogenic bacteria have been detected in so purified mussels. However a continuous monitoring of the quality of meat and water in the surroundings with respect to incidence of pathogenic and faecal bacteria as well as contamination with heavy metals is absolutely necessary. The practice of keeping them in cleaning tanks on the shore or of keeping them in cages or net bags on platforms left under water in clean areas for few days appear recommendable processes for cleaning mussels. It will be ideal for greater safety to check all batches of mussels so cleaned for any probable incidence of paralytic shellfish poisoning before releasing for processing.

## 2. Product development

### i) Products for sophisticated markets

a) Canning Mussel meat has been found to render itself well for canning. The purified mussel is either heated in open vats or steamed in an autoclave and the meat is shucked out. The shucked meat is washed in water and blanched in 5% boiling brine for 5 minutes. Blanched meat is packed in cans, filled with either hot brine or oil, exhausted, seamed and heat processed followed by cooling. This method has been found to yield a products with good organoleptic and keeping qualities (Balachandran and Nair, 1975).

Under the conditions obtaining in South India the availability of mussel meat being at places far away from the probable centres of canning, processing always involves an element of transportation over a considerable distance. Though transportation of live mussel appears ideal, it involves the transportation of the bulk of shell which is a waste material and thus adding to the cost. Therefore some studies have been undertaken on the shelf life of mussel, whole or meat, and transportation of whole mussel and meat in ice under different conditions subsequently to be used for canning. These studies have proved that canned products prepared out of whole mussel or fresh shucked meat yielded canned products with good organoleptic characteristics when iced and stored upto 2 days. These products had better colour, flavour and juiciness of the meat compared to canned meat prepared out of similarly iced, stored, boiled and shucked meat (Balachandran and Prabhu, 1980).

### b) Freezing

Relatively little work has been carried out in the field of freezing mussel meat. Chinnamma George (1974) working on the frozen storage characteristics of mussel meat reported that frozen meat prepared out of whole mussel iced stored for 8 days remained in acceptable condition only upto 15 weeks whereas fresh frozen meat remained in acceptable condition for 40 weeks.

ii) Importance of mussel meat in human nutrition and product development involving low cost technology for the local markets.

Meat of green mussel (P. viridis) has the following proximate composition

Moisture %	78.24 - 80.28
Protein %	11.08 - 12.61
Fat %	2.38 - 3.02
Glycogen %	5.36 - 7.91
Ash %	3.06 - 4.21

The sweet flavour of mussel meat, owing particularly to its relatively high content of glycogen, is comparable to that of prawns, crab etc. That is much cheaper compared to the price one has to pay for the above commodities at the same time meeting same or similar nutritional requirements makes mussel meat poor man's delicacy. Wider distribution of mussel meat into areas where there is deficiency of protein in the diet of people, can go a long way in bridging the protein gap particularly of animal protein. This requires the development of low cost technology for preparation of inexpensive stable processed products. This aspect is engaging the attention of scientists and technologists and a number of such products have already been developed.

a) Dried mussel meat

The cheapest method of preservation applicable to mussel meat to yield a stable product with reasonable shelf life is drying. Meat shucked from fresh purified mussel after blanching in 5% boiling brine for 5 minutes is dried by spreading in trays either in sun or in an artificial dryer until the moisture level reaches 10% or below. After allowing the moisture to equilibrate by keeping in a closed container for a day or two it can be packed and distributed. The storage life of this product has been estimated to be around six months. After reconstituting by soaking in water for 30 minutes this can be used for any culinary preparation as is done with fresh meat (Anon, 1980).

b) Smoked and dried mussel meat

A product for which there already exists demand from overseas markets and also can have demand from the domestic consumers is light smoked and dried mussel meat. Method of preparation involves drying of blanched mussel meat in the sun or artificial dryer for an hour (until the moisture level comes to 40-45%) followed by smoking in a kiln for half an hour and further drying to a moisture level of 10% or below. After equilibration of the moisture in the dried product as is done for dried mussel meat, the product can be packed for distribution. Light smoked and dried mussel meat tastes better compared to heavy smoked one. Hence cold smoking for a shorter period is ideal for this. Coconut husk and saw dust can be employed as source for generating smoke (Muraleedharan, Nair and Joseph, 1979).

c) Mussel meat pickle

Another product involving low cost technology for processing and which can meet with ready demand from the consuming public is mussel meat pickle. There are several pickles made with vegetables, fish, prawns etc. already popular in the market. Demand for diverse type of pickles is ever increasing, particularly from the urban population. Method has been worked out for preparing mussel meat pickle having a shelf life upto six months. A recipe for the pickle now being popularised is as follows:

1. Blanched mussel meat (of which the stomach is cut out) - 1 Kg
2. Refined salt - 80 g (dissolved in 400 ml boiled and cooled water)
3. Green chilly (cut into small pieces) - 80 g
4. Ginger (skinned and chopped) - 70 g
5. Garlic (skinned and mashed) - 50 g
6. Chilly powder - 75 g
7. Turmeric - 2 g
8. Mustard seeds (Powdered) - 15 g

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| 9. Sesame oil   | - 250 g       |
| 10. Vinegar (3-4 ml of food grade acetic acid in 100 ml boiled and cooled water | - 250 g       |
| 11. Curry leaves  | - as required |

#### Method of preparation

Blanched meat after cutting off the stokach portion is made into three or four small pices and is fried in oil in low flame until the colour turns brown. Green chilly, ginger, curry leaves and garlic are fried in the oil remaining in the pan after removing the fried meat. Then are added chilly powder, turmeric powder and mustard powder and the contents stirred well. Salt solution is added to the mixture and brought to boiling. The fried meat is added to this mixture, the pan is removed from the flame and when sufficiently cool is mixed with vinegar. The pickle is stirred well to make it uniform, cooled and packed in dry clean glass bottles. Care should be taken to see that no solid portion is left exposed. A layer of oil should be present at the top in the finally packed samples, (Muraleedharan, George Joseph and Devadasan 1980).

#### d) Mussel meat 'Chutney' powder

A delicious product which can be consumed as appetizer along with the South Indian preparation of 'dosai', 'iddli' and the like, mussel meat chutney powder, is easy to prepare, handle and store. The method of preparation employing the following recipe is as follows:

#### Recipe

Dried mussel meat	- 500 g
Skinned black gram	- 500 g
Red chilly	- 75 g
Coriander	- 50 g
Asafoetida	- 5 g
Refined Salt	- to taste



Dried meat is fried well in a pan until the colour turns brown. Other ingredients except salt are separately fried in order to render them ready for powdering. All the ingredients are powdered well by pounding and mixed together with sufficient quantity of salt. The chutney powder so prepared should be packed in dry polythene bags or dry air tight bottles for safe storage. Mixed well with little warm coconut oil at the time of use this yields a delicious chutney. (Anon, 1980).

e) Marinated mussel meat

A product which involves low cost technology in processing and is already popular in overseas markets is mussel meat marinated. A method of processing marinated mussel meat reported from U.K. is as follows. Live mussel is held in boiling brine for 4-6 minutes depending on size. Meat after shucking is held in weak brine containing 2-3% salt for 2-3 hrs, drained and then packed in containers, typically glass jars, and covered with vinegar containing 4-6% acetic acid. The vinegar for covering mussels is often spiced before being added (R.McLay).

Studies are underway at the Central Institute of Fisheries Technology to work out a suitable process of marinating mussel meat having desirable organoleptic characteristics and good storage life.

NEED FOR EXTENSION WORK IN POPULARISATION OF MUSSEL PRODUCTS

Presently mussel meat is consumed fresh only in areas at or around the collection centres. People in other areas, more often than not, are not aware of this commodity as a nutritious food material, nor has any attempt since been made in popularising it in such areas. It is only recently that some attempts have been made to preserve mussel meat into stable processed products by the application of low cost technology so that the commodities will well be within the purchasing capacity of rural population. Any new product coming to the market, particularly

based on raw materials like mussel, clams, oysters etc which are supposed to be low cost food of poorer section of the population, is likely to meet with some consumer resistance. Therefore it calls for an exhaustive extension programme to educate the people of the importance of mussel meat as a protein rich food material and about the ways of consuming it. There should also be a regular system of monitoring feed back information on the consumer's reactions particularly regarding the acceptability of the products and the type of improvements they would desire to have on the product as a whole so that the scientists can devote their attention in improving them without detriment to its nutritional quality and without additional drain on the pocket of the consumer.

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