



Lecture notes Green Mussel Farming



CMFRI



NFDB

CMFRI, NFDB

Training on
GREEN MUSSEL FARMING

LECTURE NOTES

Compiled and Edited by

Dr.P.K.Asokan

Senior Scientist, Calicut Research Centre of
Central Marine Fisheries Research Institute (CMFRI)
West Hill, P.O. Calicut – 673 005, Kerala
Coordinator, NFDB Training on Green Mussel Farming
10-19 January 2011

Experimental and participatory Mussel farming activity in Karnataka

Geetha Sasikumar

Molluscan Fisheries Division, Research Centre of Central Marine Fisheries Research Institute, Mangalore,
Post Box No. 244, Karnataka-575 001

Commercial mussel farming gained rapid strides since 1996 in India and in the recent years, the farmed mussel production of the country crossed 18,432 t (2009). This leap in mussel production was observed mainly in the State of Kerala, though efforts to popularize the technology were undertaken in the States of Karnataka, Goa, Maharashtra and Tamil Nadu. Karnataka State is endowed with several estuaries along its 300 km coastline that offers natural productive sheltered environment suitable for the development of mariculture. Though shrimp farming practices are in vogue in tidal areas along the coastal areas, presently many environmental issues impede its progress in the region. The technology for farming filter-feeding bivalves in suspended farming facilities, presented encouraging results at several coastal and estuarine areas of this State.

Characteristics of the coastal area:

The Karnataka coastal areas have extensive natural mussel beds in the lower intertidal and upper subtidal zones along the rocky shores. The northern coastal areas are rocky with few semi-enclosed bays especially in Uttara Kannada Districts, while the southern coastal area has long linear beaches intercepted by few rocky patches. More than a dozen rivers originating in the Western Ghats flow westward and join the Arabian Sea. The river mouths in most cases are found to be the confluence of two or more rivers especially in the southern region. The west coast is influenced by the seasonal monsoon when the coastal areas of Karnataka receives 88% of the annual run-off during June - September. The reduced river flow following monsoons progressively increases the salinity in the estuarine areas. The estuarine and coastal areas of Karnataka offer optimal hydrographic conditions for mussel farming during the high saline phase for a period of six to eight months from October to May.

Farming areas:

Bivalves filter the water to feed efficiently on suspended particles comprising of phytoplankton, detritus and other organic matter. The growth rates are hence subjected to site-specific variations. Further, farming activities of green mussel in estuarine waters are restricted to the availability of

>25 psu in farming site. Sheltered pollution-free productive areas offering protection from strong wave action are ideal for mussel farming. Such areas demarcated along the coastal region of Karnataka are shown in Table 1.

Table 1. Farming areas identified for mussel mariculture in Karnataka

| District | Suitable farming areas | Mussel seed-source |
|---------------------------------------|------------------------|--------------------|
| Dakshina Kannada | Nethravati | Someshwara |
| | Mulki* | Surathkal, Kaup |
| Udupi | Udyavara* | Malpe |
| | Hangarkatta* | Gangolli |
| | Kundapur* | Gangolli |
| | Trasi | Maravanthe |
| | Upunda* | Upunda |
| | Byndoor* | Byndoor |
| Uttara Kannada | Bhatkal | Bhatkal |
| | Honavar | Murudeshwar |
| | Kumta | Gokarna |
| | Karwar* | Karwar |
| * Bivalve demonstration/ farming site | | |

Mussel seed availability:

Farming depends on the availability of mussel seeds in the coastal areas near the culture site. The spat-fall in mussel beds commences from October to December along the Karnataka coast progressing from the southern coastal areas to the northern region. Mussel fishery is carried out during low-tide by handpicking from the natural mussel beds from October to May. In the process, large aggregations of mussel spats settled in mussel beds are unintentionally dislodged or destroyed due to habitat disturbances. Further, losses of mussel spat also occur due to competition for space, desiccation, predation and exposure to extreme environmental conditions. In Karnataka, there is scope for increasing the mussel production by controlled and extensive exploitation of this natural resource by farming.

Quantitative assessment of mussel seed resources along the three coastal districts of Karnataka including the islands identified nearly 40 subtidal and/or intertidal zones with extensive mussel seed settlement. *Perna viridis* was the only species recorded and the mussel biomass in these beds was estimated as ~2,747 t, spread over an area of 8,77,695 m² (4700 g/ m²). Islands off Malpe, Gangolli Light House, Kodiyeeri, Uppunda, Shiroor are the important sites identified for the spat collection in the Dakshina Kannada and Udupi coast of Karnataka. Along the Uttara Kannada coast mussel beds off Bhatkal, Murudeshwara, Kumta, Benakkal and Belekeri are the areas suitable for the mussel-spat collection.

Farming demonstrations in Karnataka:

In Karnataka, the mussel farming technology was tested in different estuarine and open sea areas since late 90s (Table 2). Estuarine farming trials in Mulki and Kali estuaries and open sea farming off Surathkal, Kaup, Byndoor and Baithkol Bay yielded encouraging results.

Long-line method: Open sea mussel farming using long-line method was demonstrated along the southern part of the State at Surathkal and Kaup in 1996. Though the attempt did not give demonstrable yields due to loss of farm structure, the demonstration captured the attention of the media as well as entrepreneurs. This led to the adoption of this farming practice by a fisherman from Byndoor. With the technical support from CMFRI a 10 m long-line was set and moored at 6m depth off Dhombae, Byndoor in 1996. The total production from this single long-line was 400 kg.

Rack method: Estuarine mussel farming was demonstrated in 1996 at Mulki estuary along the southern coastal district of Karnataka. The rack method of farming suited for shallow and estuarine areas were attempted in sites having an average water depth of 2 m. About 400 kg of shell-on mussels were produced in 208 days from the estuarine racks using ropes. Encouraged by this result, the Brackishwater Fish Farmers Development Agency (BFFDA) extended financial support to a group of five beneficiaries from Mulki for mussel farming in 1997. The farming was initiated with the direct participation of the beneficiaries from seeding to harvesting. The total production from this venture was 1,500 kg in a period of 171 days. The estuarine farming involving the local fishers were continued in different part of Mulki estuary during 1998-1999.

Raft method: Mussel farming in floating raft was demonstrated in open sea off Byndoor yielding growth rates of 7.35 mm/ month with the active participation of the local fishers.

Table 2. Results of green mussel culture in various farming systems in Karnataka

| Culture period | Farming Environment | Farming system | Mean seed size (mm) | Seeding rate (g/m) | Seeding time | Duration of culture (days) | Monthly growth rate (mm) |
|----------------|---------------------|----------------|---------------------|--------------------|--------------|----------------------------|--------------------------|
| 1996-97 | Open Sea | Long-line | 20 | >2500 | Dec | 158 | 8.07 |
| 1996-97 | Estuarine | Rack & rope | 19.2 | 2000 | Nov | 208 | 7.3 |
| 1996-97 | Estuarine | Rack & cage | 23.9 | 60 kg/cu.m | Nov | 207 | 5.2 |
| 1996-97 | Estuarine | Rack & net bag | 15.7 | 500 g/net | Nov | 186 | 7.4 |
| 1997-98 | Estuarine | Rack & rope | 20 | 750 & 1500 | Dec-Jan | 171 | 9.5 |
| 1998-99 | Estuarine | Rack & rope | 21 | 750 & 1000 | Dec-Jan | 186 | 10.9 |
| 1998-99 | Estuarine | Rack & rope | 21 | 750 & 1000 | Dec-Jan | 145 | 9.03 |
| 1999-00 | Estuarine | Rack & rope | 25 | 1500 | Nov-Dec | 174 | 6.0 |
| 1999-00 | Estuarine | Rack & rope | 28 | 1500 | Nov-Dec | 166 | 5.0 |
| 2000-01 | Open Sea | Raft & rope | 27 | 1500 | Nov-Dec | 151 | 7.35 |
| 2008-09 | Estuarine | Rack & rope | 22 | 750 | Dec | 167 | 8.2 |
| 2009-10 | Estuarine | Rack & rope | 47.5 | 1500 | Oct | 145 | 8.7 |

Commercial farming:

Although the feasibility of mussel culture in the estuaries and in the inshore bays of Karnataka was well established by Central Marine Fisheries Research Institute through location testing, the technology was not widely adopted by the farmers due to low market demand. In 2008, a progressive farmer from Kodi Kanyan (Udupi District), once again demonstrated the immense scope of wider adoption of less capital intensive and simple form of coastal aquaculture by adopting commercial mussel farming practice in estuarine area. About 3,070 kg of shell-on mussels were harvested from mussel racks. The recent demand for green mussel in domestic as well as export market has attracted the attention of fishers to adopt this less capital intensive and simple form of coastal aquaculture in the State since 2008. The participatory approaches in demonstrations as well as increase in demand for the mussels have been instrumental in adoption of this farming method. Though suitable coastal/ estuarine areas are available for mariculture practice in the State, appropriate financial support by various developmental agencies and proper guidelines for leasing water bodies for farming, profoundly influenced the adoption rates and commercialization of these technologies. The availability of large extent of natural mussels beds for seeds along the coastal districts of Karnataka; higher price realized for the produce in neighbouring State of Goa; minimal operational expenditure and short term eco-friendly farming are expected to encourage more farmers to come forward to adopt the practice in coastal Karnataka. Further, the development of coastal and marine areas and their resources for mariculture activities have to balance the mutually competing enterprises like ports, fisheries, tourism, industrial and waste disposal.