Traditional fishing methods and gears utilized in edible bivalve fishery at Bhatye estuary, Ratnagiri, (M.S.)

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Locally available devices were utilized by fishers for bivalve fishery at Bhatye estuary, Ratnagiri coast. Fishers of Bhatye estuary were performing three kinds of bivalve fishing activities like clam fishing, oyster fishing and mussel fishing. In these fishing activities, the fishers were implemented the old age fishing techniques and locally developed fishing gears for harvesting the clams, oysters and mussel resource from fishing ground. The traditional based fishing practices will maintain the natural stock and it help in sustainable utilization of bivalve resource without damaging the ecosystem.

[Keywords: Traditional fishing method, Fishing devices, Bivalve fishery, Bhatye estuary.]

Introduction

Natural resources has ecological, commercial, medicinal and social value, for that reason human have been targeted the natural resource for their need. Since, antiquity the animals are used in human food and medicine1,2. From old age human performing various traditional based practices and developing certain own made devices, equipment using traditional knowledge to target the animals.

The community based information, where passed by generation to generation over many centuries and knowledge about traditional crafts and gears reflect their native life style like social, technical, cultural and organisational3. Besides, the design and choice of craft and gears for fishing are different according to topography, habitat and ecology. For livelihood the fishers have been used different types of crafts and gears in fishing4.

Along the Ratnagiri district coast of Maharashtra, the Bhatye estuary is highly potential, productive and dynamic for the molluscan species5. The fishers of this estuary are mainly engaged in varieties of bivalves fishing practices like clams, oyster and mussels. However, the gastropod species were received least attention by fishers over generation periods.

Bhatye estuary is formed by union of Kajali river to Arebain Sea at South Ratnagiri near Bhatye village. The communities which are placed in the vicinity of estuary are principle engaged in fishing practices particularly of finfishes and shellfishes. Most of the families livelihood is solely depend on their daily net catch. All fishers of adjoining villages of Bhtaye estuary are fishing the edible bivalve resources (clams, oyster and mussel). Fishing methods, crafts and gears used by fishers during fishing are purely traditional based and indigenous made.

There is no any documentation or database pertinent to bivalve fishing practices, devices or equipment (particularly indigenous made and eco-friendly) utilized by fishers of West coast of Ratnagiri district, Maharashtra. Hence, the present attempt has been undertaken to highlight the traditional based bivalve fishing practices i.e. types of fishing methods, functional aspects of gears and craft utilized by fisheries of Bhatye estuary. This work would help in explore the knowledge of native craft, gears being utilized in bivalve fishery and different fishing methods adopted by fishers of Bhatye estuary.

Materials and Methods

Bhatye estuary is located along the West coast of Ratnagiri district. Geographical it is placed between latitude 73° 15'E and 16° 51’N longitude. It extended interiorly up to 10 km from mouth region. Along the vicinity of estuary, villages like Bhatye, Rajiwada, Karala, Juve, Navanagar, Phansop and Navaphansop are situated. Fishers of these villages are well acquainted for bivalve fishery.
In the present study, often survey was made in estuary during low tide when intertidal zone get exposed and fishers were gathered on fishing ground for bivalve fishing. Survey was conducted during January, 2009 to December 2009. Several visits were performed to fishing ground and households of villages (mouth to interior up to Navaphansop) i.e. 4 visits in a month. During visits, the information like fishing practices, techniques, crafts and gears were collected from four different fishers groups. Such as, i) old age male fishers, ii) old age female fishers, iii) young age male fishers and iv) young age female fishers. Detailed information was collected through field survey and direct individual and group interviews through questioners.

Results

In this study, surveys revealed that in Bhatye estuary the fishers executing traditional based bivalve fishery. This bivalve fishing activity was classified in to three groups i.e. clam fishery, oyster fishery and mussel fishery. These kinds of bivalve fishery were based on type of bivalve species was fished, operation methods and devices or tools were used during fishing. 

In Bhatye estuary, totally 5 clam species were fished such as Katelysia opima, Meretrix meretrix, Meretrix casta, Paphia laterisulca and Paphia malbarica belong to order Veneride. Genus Katelysia and Paphia found where habitat with less sand and more mud-flats (4-5 inch deep), while Paphia species at less and more mud with dead shells habitat. Fishers preferred the minimum sized clams during clam fishing Katelysia opima (26-32mm), Meretrix meretrix (30-36mm), Meretrix casta (32-38mm), Paphia laterisulca (26-32mm) and Paphia malbarica (24-30mm) respectively.

During low tide, the intertidal zone was exposed and sub tidal region become shallow water. In exposed area and shallow water zone the fishers massively gather for clam fishing. (Plate I, Fig. 1). There were 53 fishers families identified in the vicinity of estuary, out of them only 63 fishers were participated (male fisher 36 and female fisher 27) in clam fishery. These fishers were fished clams by two techniques i.e. handpicking and digging method and net fishing method.

During low tide, those clams were superficial buried in mudflat that picked by hand. In other instance, the fishers digging the mud-flats with the help of knife and picked deeply buried clams. (Plate I, Fig. 2). In this method, only female fishers were greatly participated.

During low tide, the sub tidal water mark goes down and become shallow water. In this shallow water fishers were actively participated in clam fishing by using clam net. (Plate I, Fig. 3).

Fishers enter in shallow water at depth of 3-4 feet along with dinge. Fisher holds the clam net by its one foot while other feet busy in searching the clam bed (Plate I, Fig. 4). After identification of bed, fisher started to push the clam bed in to net by feet along with sediments and dead shell. After, that fisher shakes the net frequently by hands so that sand or mud particles get released. Collected clams were stored in the clam collecting bag which was tied around the wrist while some fishers store directly in dinge (wooden)or small fibre boat (Plate I, Fig. 5-6). Collected clams were further separated from dead shells, sand particles and other materials. (Plate I, Fig. 7-8).

In this method both male and female fishers were participated but male fishers were more participated than female about 80-90%.

In clam fishing, the small non-mechanised boat i.e. dinge or fibre boat was used by fishers and it is propelled by means of oar and outrigger. Locally this dinge called as ‘Hodi’ and it made from Jackfruit wood. The length of boat was ranged in between 9.0-12.0 feet, breadth 1.5-2.0 feet and depth 1.5-2.0 feet. (Plate I, Fig. 9).

For fishing the clams fishers used special type of fishing gear i.e clam fishing net. Clam fishing net is semi-circular shaped; the outer frame may be metallic or wooden. The mesh size of net is about 30mm and it made by nylon threads. Length of this net was between 0.5-0.6m and height from 0.7-0.8m. (Plate I, Fig. 10). Locally, this clam fishing net called as ‘Yend’. Both male and female fishers are expertized in handling the clam net.

Fishers also used clam collecting bag for storing the harvested clam which made by nylon threads. Length of this bag was ranged from 0.8-0.7 feet, height 1-1.5 feet. At the mouth region bag with a not, it used in the closing and opening of bag. Clam collecting bag is tied around the wrist of fisher (Plate I, Fig. 11).

In the present study, two oyster species i.e. Saccostrea cucullatta and Crassostrea cattuckensis has been harvested from estuary. These two oyster
Plate I (Figs 1-11) — (1) Clam habitat in shallow water; (2) Handpicking method in exposed mud-flat; (3) Female fisher during clam net fishing; (4) Male fisher during clam net fishing; (5) Fishers with gears; (6) Harvested clams store in boat; (7) Separation of clams from sands and other materials during fishing; (8) Separation of clams from dead shells; (9) Clam fishing craft; (10) Clam fishing net and (11) Clam collecting bag.
species mainly belongs to order Osteridae. Fishers fished oyster *Saccostrea cucullatta* (28-34mm) and *Crassostrea cattuckensis* (38-44mm).

Oyster species spread over the mud-flats of intertidal zone, while some of oysters are attached with substratum (Plate II, Fig. 1). The *C. cattuckensis* is attached with substratum at sub-tidal region of estuary (Fig. Plate II, Fig. 2). There were 27 fishers actively engaged in oyster fishing. They are fishing the oyster species by following way,

During low tide, *S. cucullatta* oysters were spread over the mud-flats. The female fishers collect oysters by handpicking method and store in basket (made by bamboo stripe) (Plate II, Fig. 3). Attached oysters were dislodged by knife or some fishers used the chisel. (Plate II, Fig. 4). In case of *C. cattuckensis*, the fishers wear shoes and enter in the shallow water, by foot they recognized the oyster habitat after that with the help of knife it dislodged from substratum. In oyster fishing, more female fishers were participated than male fishers about 75-85%. (Plate II, Fig. 5).

Collected oysters were separated according to sizes and removing the flesh from shells. (Plate II, Fig. 6).

In oyster fishing, no specialized craft and gears were used, however few males (04) fishers where used small boat i.e. dinge. The other devices like bamboo basket, knife, and chisel are utilized. (Plate II, Fig. 7).

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**Plate II**

*Oyster Fishery*

1. Oyster habitat in exposed mud-flat; 2. Oyster habitat in shallow water; 3. During low tide oyster collected by hand picking method; 4-5. Female fishers dislodged oysters from substratum; 6. Separation of oysters and 7. Collected oyster store in bucket and knife.
In this study, one species of mussel i.e. *Perna viridis* belongs to order Mytilidae was harvested. Minimum sized (36-42mm) mussel was harvested during fishing.

In Bhatye estuary, the mussel bed is extended up to 1½ km interior from mouth. Mussels are distributed at sub-tidal region at a depth of 10-12 feet. (Plate III, Fig. 1). These mussels are attached with hard substratum by byssus threads.

In mussel fishery only male fishers has actively participated. Those fishers who are well acquainted with deep water, expert in swimming or diving such fishers only participated in fishing. There were 12 mussel fishers were identified from present study. Fishers actively carried out the fishing activity during day time. In turbid water fishers could not sight the mussel bed accurately.

In fishing method, fishers along with their small non-mechanised boat enter in water, they start to surfing the mussels bed with bamboo under water (Plate III, Fig. 2). After identification of mussels, fisher wear mask or goggle over eye and dive by holding a breath. Identified mussels are separated or dislodged from substratum by chisel or knife than fishers slowly ascend and reach the surface along with mussels. (Plate III, Fig. 3). Harvested mussels are stored in the small boat (wooden or fibre). Collected mussels were separated according to sizes and packed in bags. (Plate III, Fig. 4,5,6,7).

In mussel fishery, fishers utilizing the small non-mechanised boat, which is made from jack fruit wood (Plate III, Fig. 8). Recently few fishers using fibre made boat, some them are mechanised (engine operated). (Plate III, Fig. 4). The size of boat is

![Plate III (Figs 1-9) — (1) Mussel habitat at sub-tidal region; (2) Surfing of mussel; (3) Harvesting of mussel; (4) Non-mechanised fiber boat with harvested mussels; (5-6) Separation of mussels (7) Packing of mussels; (8) Dinge with mussels and (9) Mask.](image-url)
somewhat larger than those boat utilized in clam fishery. The length of boat was ranged between 12-14 feet, breadth 2.5-3 feet and depth was between 2.5-3.5 feet. Bottom surface of boat is painted by antifouling paint, which protect the boat from fouling and desiccation. In fishing, fishers mainly used bamboo for surfing the mussel beds. The length of bamboo is 15-18 feet long. (Plate III, Fig. 2). Fishers also used mask or goggle for eye to sight the mussel bed properly and protection from saline water. (Plate III, Fig. 9). Mussels are unable to separate from substratum therefore some fishers were used knife for separation the mussel bed. Whereas as few fishers collect mussel along with substratum outside the water and separate the mussel from substratum.

Discussion
Coastal humankind fishing the bivalve resources for their livelihood, out of total fished aquatic resources for consumption the bivalve contributes the 10% of animal food 6. The bivalve resources like clams, oysters and mussels are mainly fished by coastal community due to their high edibility and commercial value 7.

The main purpose of this study is to highlight the traditional fishing techniques, crafts, and gears utilized by fishers during bivalve fishing. Our observations revealed that, the three types of bivalve fishery were carried out by fishers of Bhatye estuary through using ancient knowledge of fishing operation and using crafts and gears those acquired during ancient time.

In the present study, clam fishery was made by two methods, in first method fishers harvesting clams by hand picking and digging method. In this method, female fishers were gathered during low tide and searching the clams in exposed mudflats. Fishers used knife for digging the mudflats to collect buried clams. Collected clams were kept in bamboo stripe basket. In second method fishers using nylon made net for clam fishing. In this type, fishers enter in shallow water and harvesting the clams. Both this methods are based on traditional knowledge which is ideal, safe and non-destructive as point of sustainable utilization of resources.

According to literature, the fishers of Asthanmudi backwater were performing handpicking and digging and clam net fishing for clam harvesting. Besides they also used mechanical dredging method to excavate the clams9,10.

In oyster fishing, fishers usually applied handpicking method for oyster harvesting. During low tide, those oyster speared over mudflats were collected by hands, while attached oyster was separated by knife. Some of fishers used chisel (channi) and hammer (hatoda) for separation. In other method, the sub-tidal oysters are collected by surfing. From ancient time the fishers are implementing handpicking method for oyster harvesting. Harvested oysters are kept in bamboo basket. Comparatively, female fisher shows majority in oyster fishing about 85%, while male only about 15%. Literature reported that, the oyster fishing is the main source of livelihood of coastal community of west coast particularly from Bombay coast near to Worli and Bandra10. Similarly, the oyster fishery was documented from east coast of India11.

In this study, one type of mussel species (Perna viridis) is mainly harvested. Fishers of Bhatye estuary are adopting old age fishing technique to harvest the mussel. In mussel fishing operation only young male fishers are actively participated while female, child and old age fishers are taking part in segregation, cleaning and packaging of harvested mussels. Earlier mussel fishers were not used the mask or goggle while at present 75% of mussel fishers are using mask during diving. Recently 25% of fishers are using fibre boat while 75% of fishers used traditional made wooden dinge (made from jackfruit) in mussel fishing.

Conclusion
Fishers of the Bhatye estuary are purely implementing the traditional based fishing methods and old base made crafts and gears in bivalve fishing. Materials which have been used in preparation of crafts and gears are natural made, locally available and cheapest so that it can affordable to all. Traditional fishing methods are easy to carry out and fishing gears are very comfortable to operate. Such traditional based knowledge of bivalve fishing and devices are helpful in sustainable utilization of bivalve resource without damaging to natural resource and ecosystem.

References
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