



E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2019; 7(3): 27-32

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www.fisheriesjournal.com

Received: 13-03-2019

Accepted: 15-04-2019

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An approach to analyzing small-scale fisheries using participatory tools in Moheshkhali coastal area, Bangladesh

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Abstract

It is progressively recognized that participatory rural appraisal (PRA) is an informative tool to analyze the suitability of community based fisheries management (CBFM) of small-scale fisheries. A questionnaire survey was conducted as a prime way for primary data collection in a 1-year period (January-December, 2016) in Moheshkhali Island, Bangladesh. The targeted fishers were participated in PRA and four methods: participatory resource mapping, seasonal calendar, time line and problem ranking were used. The research findings showed that the fish stock is declining by using risky fishing techniques in this area. Key problems and constraints of the coastal fisheries found in this study were climate change and environmental degradation, piracy during fishing in the sea, lack of social safety, lack of insurance, competition between users, poor boat and net facilities, low level of education, habitat destruction, unclear and poor credit policy, poor market access, high percentage of dependency on fishing, trawl fishing, ineffective regulatory mechanisms, top-down management structures and absence of strong fishers' organizations. The results suggest that the representation and participation of small-scale fishers are necessary to minimize conflicts with better improvement of fisheries management for the viable employments of small-scale fisher folks.

Keywords: Suitability, community based fisheries management, participatory rural appraisal, small-scale fisheries, sustainable livelihood

1. Introduction

Participatory approaches are classical management tools for small-scale fisheries analysis that includes a diversity of strategies. Participatory tools are developed and implemented by community fisher folks, leaders, stakeholder groups, and institutions at field level [1, 5, 7].

Participatory and people-led fisheries management approach can assist long-term sustainable interests of small-scale fisheries (SSF) [6, 29]. It is known that sustainable resource use requires training and education of all levels of society: indigenous experience significantly influence the fisheries management [28]. For example, active involvement of local fisher folks in management may contribute meaningfully in creating awareness to continue their livelihood and economy [2, 3, 9-11].

Community based fisheries management (CBFM) is suitable in order to save the biodiversity and coastal habitats from the influences of SSF activities for viable fisheries capitals [10, 12, 19, 21]. Usually, it is believed that without management, the reimbursements that most fisheries yield will reduce while the clashes among stakeholders will rise [8, 15].

Insights into the suitability of community based fisheries management emphasizes establishing fishing rights for the local poor community and people participation is being said to be a crucial process in the fisheries management in order to achieve the sustainable development in this sector [27]. The uses of participatory rural appraisal (PRA) along with fishers' local ecological knowledge (LEK) were suggested in this new direction. In the context of small-scale fisheries in Moheshkhali island, community based fisheries management is suitable to address all the issues to produce both social and ecological benefits which are neglected in the present top-down and centralized government management systems. The study was aimed: (1) to reveal the current status and conflicts of the small-scale fisheries through indigenous knowledge of the community by people participation and (2) to demonstrate the general constraints and potentials related to the management of fisheries in the Moheshkhali coast.

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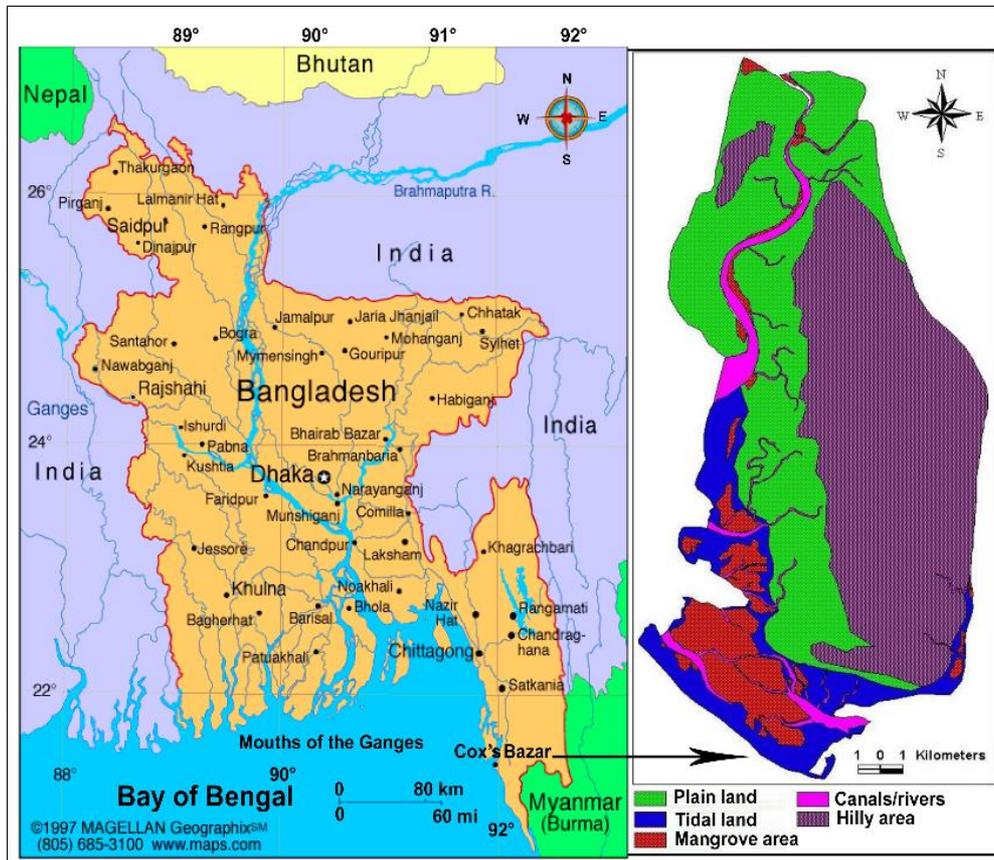


Fig 1: Map of Bangladesh showing the study area in Moheshkhali Island

2. Materials and Methods

Data was collected following the procedure mentioned by Berkes^[5-9] from Moheshkhali coastal area, Bangladesh.

Before starting the research, an interview instrument was developed for face-to-face interview^[9, 24-25], pre-tested it to a small group of respondents, and field research activities were conducted during a 1-year period (2016). Community volunteers with either previous experience in the coastal community, as long-time residents, members of fishing families, or extended involvement in community stewardship programs, were engaged to form a survey team who have practical research experience in interviewing or social data collection and analysis. PRA tools (e. g. participatory mapping, seasonal calendar, problem ranking and time line) were used for collecting, plotting and documenting the dataset on occurrence, distribution, access and use of resources within the economic and cultural domain of fisher communities. The collected were presented in textual, tabular and graphical form for easy understanding.

To analyze the community based approach for managing small-scale fisheries in Moheshkhali Island some secondary data, for example, patterns in time and patterns in space of the main habitat and some marine fishes were used in problem analysis and time line study.

3. Results and Discussion

The present survey used local participant's perceptions and behaviors regarding ocean use, enforcement and levels of care for managing small-scale fishery resources through time during PRA workshop.

3.1 Participatory resource mapping

The participants were asked to draw the resource maps of their island. The maps drawn by the fisher folks were

collected and used for analyzing the pattern in space and time in order to get the practical ideas about the fish catching area, important habitats, spawning zone, common fishing grounds, fish drying area, common nets and gears of the study area. Finally, the results were combined to analyze the main drivers and constraints in the Moheshkhali island for the sustainable use of coastal resources (Figure-2; Table-1).

3.2 Seasonal calendar of fishing period

The fishermen were asked questions regarding rainy and dry season's duration, environmental condition and their activities. The results were adjusted and triangulated and finally a seasonal calendar of livelihood activities surrounding the coastal area of Moheshkhali Island was formulated^[2, 3]. The seasonal calendar of fishing periods indicates that fishers were idle (at least less income from fishing) in the months of February and March. It is the most difficult and hardship period for the fishers community. Furthermore, not all the fishing communities are engaged in fishing in all the three fishing periods. The fishers community of Hoanak and Charpara go for fishing in two periods. It suggests that non-fishing period is lengthy and thus they need to search alternative livelihood activities in idle period. Sarker^[26] also recorded similar findings.

It was found from various discussions with the fishers community that they are marginalized over the years which is persistent with the findings of Sugiyama^[26] and Pollnac^[23]. For example, it was noticed from the FGD (Focus group discussion) that fishing is the main source of livelihood of the fishers community in the Moheshkhali coast. The fishers were not able to increase living standard with the demand for household need^[24]. It is perhaps one of the overt behaviors of the household economy^[22]. On the other hand, the price of catch is determined by aratdars. The fisher never knows the

price of his labor and share he will receive from the catch.

3.3 Seasonal calendar of monthly income

Fishing is an important economic activity in the Moheshkhali Island, as it generates employment and income. According to the survey, the maximum monthly income of the fishers varied from Tk. 6500 to Tk. 12000, moderate income varied from Tk. 5000 to Tk. 6500 and low income varied from Tk. 4000 to Tk. 5000. Increasing population pressure may aggravate the problem of meager incomes of the fishermen. According to Johnson *et al.* [14, 18] poor fishers pass their hardship when no activities available for them: the fishers hardship starts from lean income period and later income effect is reflected to household needs and food security. For example, the present study indicates that the fishers income varies with fishing season, use of gear and the market price of the catch. The ‘lean’ income period was February and March - a part of the dry season. According to the fishermen, a few years ago they earned more money than they earn now. They also claimed that their income had decreased over the last few years, which they attributed to due to high fishing pressure. Due to the scarcity of employment opportunity in these two months, more than 80% fishermen borrow money from the local moneylenders with high interest. The borrower

need to pay back in kind-fish catch in fishing season, and it was observed in some of the villages had to pay all the value of his harvest to the moneylenders. The fishers felt that they earn less than average income in the months of November and December - the winter period. The majority fishers spent for fishing in winter, while catch was found to be higher in early rainy months. Only a few Government Organizations and local NGOs have been working with them to improve their conditions by providing loans, support, training and technical assistance to the fishing community.

3.4 Problem analysis

The participants were suggested to explain the possible criteria for ranking the problem and analyze each problem to identify and rank problems in order of priority by assessing their relative importance during PRA. *Paired ranking variation methods were used to analyze the problems.* After having all the problems from the workshop written on the small cards by all coastal fishers, the related problems were grouped together. Finally, the following problems (Figure-2; Table-1) were recorded. The last output, received from “paired ranking variation method”, was the matrix of ranked problems.

Declining of fish stock									
Trawl fishing	Declining of fish stock								
Severe stress on the coastal fisheries	Declining of fish stock	Trawl fishing							
Fry collection	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries						
Destructive fishing practice	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection					
Habitat destruction	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection	Destructive fishing practice				
Climate change	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection	Destructive fishing practice	Habitat destruction			
Competition between users	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection	Destructive fishing practice	Habitat destruction	Climate change		
Population growth	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection	Destructive fishing practice	Habitat destruction	Climate change	Competition between users	
Problems	Declining of fish stock	Trawl fishing	Severe stress on the coastal fisheries	Fry collection	Destructive fishing practice	Habitat destruction	Climate change	Competition between users	Population growth

Fig 2: Pair-wise problems ranking in the Moheshkhali Island

There are different problems affecting fisheries resources in this island with the increase of population density and increased demand of the national and world fisheries, people are 'violating existing fisheries laws and damaging several species of fish larvae during shrimp fry collection. The major problem in this island is fish stock declining. This fish stock declining was it ranked as the most serious problem because fishers worried about their children who may not find any jobs and cannot get legal rights for coastal fishing in the future when they grow up. The second most serious problem of fishers was trawl fishing. Trawl fishing is done throughout

the night and they come back home in the morning. They make haul every half an hour. They fished all sizes of fish by this and the maximum catch occurred during trawling. The third problem was the fishing pressure. Fishers claimed that now they can get the catch amount lower than before. The fourth serious problem was the fry catching. It is also known as poor men’s income source and livelihood. A large number of men, women and children were catching shrimp fry for livelihoods. Destructive fishing method was ranked as the next. Mangrove destruction was ranked as the sixth serious problem. The fishers felt that mangrove is the nursing habitat

of fishes. Mangrove is also a breeding ground during spawning period. The last problem was the water deterioration, which possibly came from the waste

discharging of shrimp ponds and oil spill from the merchant ship, and agricultural waste products. These findings are opined with FAO [17] and Bennett [16].

Table 1: Problem ranking in the Moheshkhali coast

Problems	Score	Rank
Declining of fish stock	8	1
Trawl fishing	7	2
Severe stress on the coastal fisheries	6	3
Fry collection	5	4
Destructive fishing practice	4	5
Habitat destruction	3	6
Climate change	2	7
Competition between users	1	8
Population growth	0	9

3.5 Time line analysis

The present research showed that fishing is the traditional occupation in Moheshkhali Island. Most of the people live in the government Khash land as they don't have their own land. At present the number of fishermen has increased than that of

earlier 1990's. A large number of fishermen agreed that the competition regarding fishing boat, gear, catches, fishing methods etc are the key changes than that of earlier periods. Table-2 shows the major changes based of age-old experiences.

Table 2: Time-line analysis based on age-old experiences

1965-1980	1980-1995	1995-Present
Total fishermen: 5000-10000 (Approximately)	Total Fishermen: 10000-20000 (Approximately)	Total Fishermen: Up to 50000 (Approximately)
Less number of boats was engaged in fishing and number of each effort, high abundance of commercial species and caught were relatively big in size.	Gradually increased the number of boats and catches were gradually becoming low for each effort	Small size of fish caught due to increase of number of boats
Less competition for fishing	Less/medium competition for fishing	High competition
Fishing was done by traditional non-mechanized boats	Fishing was done by traditional non-mechanized and mechanized boats	A large no of mechanized and non mechanized boats was used for fishing
Active fishing period was limited to 3-6 months	Active fishing period was 6 months	Year round fishing
Fishing was done within 5-10 km from the coast	Fishing was done up to 50 km from the coast	Fishing is done in onshore and offshore 200-300 km from coast
Prevalence of mangrove in all along the coast.	Mangrove was started to decrease due to anthropogenic and natural causes	Mangrove forest has decreased remarkably
Shrimp fry collection was limited or none	Fry Catching was increased than that of 1965-1980's	Destructive fishing gears are using by the fishermen for fry catching
Fishing gear used by the fishermen was not much harmful	Started to use destructive Fishing gears	Indiscriminate use of harmful fishing gears threatened the Moheshkhali coastal fisheries
Almost all members of family were engaged in fishing	Children's were moved to school	Fishermen are not interested to bring their kids to their traditional occupation
Coastal embankment was not built	Coastal embankment was not built	Embankments in fish ' breeding grounds.

3.6 Analysis of subsidiary occupation

Fishing catchments of the research area has been depleting along with other constraints of coastal fishing. As a result fisher folks are unable to depend only on their primary occupation related to fishery in the seashore and offshore for their livelihoods and survival. Dickson [13] and Ahmed *et al.* [4] indicated that fish-catching area was decreasing day-by-day resulting with the moving forward to optional jobs by the poor fishermen. The study revealed that the extent of engagement and diversity of subsidiary occupations are increasing

significantly. The most common subsidiary occupations of the Moheshkhali island fishers are shown below.

3.6.1 Ranking of subsidiary occupation of Ghorakghata

Subsidiary occupation of Ghorakghata perceived by the fisher folks are agriculture (8%), retail trading (6%), fish trading (4%) and gardening (2%). The most common subsidiary occupation in the Ghorakghata region along with ranking is shown below in table-3.

Table 3: Ranking of subsidiary occupation of Ghorakghata as perceived by the fishers

Subsidiary occupation	Agriculture (%)	Retail trading (%)	Fish trading (%)	Gardening (%)
% of fishers	8	6	4	2
Ranking	1 st	2 nd	3 rd	4 th

3.6.2 Ranking of subsidiary occupation of Charpara

Subsidiary occupations of Charpara identified by the fishers are fish trading (12%), agriculture (4%) and retail trading

(4%). The most common subsidiary occupation in the Charpara region along with ranking is shown below in table-4.

Table 4: Ranking of subsidiary occupation of Charpara as perceived by the fishers

Subsidiary occupation	Fish trading (%)	Agriculture (%)	Retail trading (%)
% of fishers	12	4	4
Ranking	1 st	2 nd	2 nd

Table 5: Ranking of subsidiary occupation of Gotibhanga as perceived by the fishers

Subsidiary occupation	Fish trading (%)	Agriculture (%)	Gardening (%)	Others (i.e. Poultry, net waiving) (%)
% of fishers	12	8	4	4
Ranking	1 st	2 nd	3 rd	3 rd

3.6.4 Ranking of subsidiary occupation of Hoanak

Subsidiary occupations of Hoanak identified by the fishers are fish trading (16%), agriculture (12%) and retail trading (12%).

Table 6: Ranking of subsidiary occupation of Hoanak as perceived by the fishers

Subsidiary occupation	Fish trading (%)	Agriculture (%)	Retail trading (%)
% of fishers	16	12	12
Ranking	1 st	2 nd	2 nd

4. Conclusion

The research was concluded to analyze the small scale fisheries of Moheshkhali island through participatory tools emphasizing on participatory resource mapping of the island, seasonal calendar of fishing period, trend analysis and alternative livelihoods. The perception of the community people on some events and changes is not satisfactory. The fisher folks opined that the stock of the coastal fishery resources are declining due to environmental and manmade activities such as overfishing, deposition of silt, lack of alternative income generating activities suitable for their skills and resources, long time fishing, destructive fishing practice, trawl fishing etc. According to the respondents, GO and NGOs should come up to take the proper initiatives to solve the socioeconomic constraints related with coastal fishing. In this regard community based fisheries management might be a best option to analyze the coastal small scale fisheries in the Moheshkhali island.

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3.6.3 Ranking of subsidiary occupation of Gotibhanga

Subsidiary occupations of Gotibhanga recognized by the communities are fish trading (12%), agriculture (8%), fish trading (4%) and gardening (2%). The most common subsidiary occupation in the Gotibhanga region along with ranking is shown below in table-5.

The most common subsidiary occupation in the Hoanak region along with ranking is shown below in table-6.

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