

## Food aid programme during restricted hilsa fishing period: effectiveness and management perspective

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### Abstract

Hilsa (*Tenualosa ilisha*) is geographically and economically important species in Bangladesh. To conserve hilsa, the government of Bangladesh has introduced fishing ban for certain periods of the year and also provides food assistance to hilsa fishers during the restriction period. Inadequate management often pushes real fishers out of the assistance programme and therefore, this study focused on assessing the effectiveness of the programme with a view to proposing a better management practice. A total of 202 randomly selected fishermen, living in the villages adjacent to Andharmanik River of Patuakhali district of Bangladesh, were interviewed. The Andharmanik River is famous for the natural breeding of hilsa. Results suggest that the amount of food provided and its distribution pattern were not that effective for the fishermen. Effectiveness was significantly related to the number of earning able family member, income difference between peak and restricted season and loan facility during the restriction period. This study also explained income difference

by the state intervention. More awareness programme and research are needed in this regard.

**Keywords:** Fishing restriction period; fishing ban; food assistance; hilsa fisher; livelihood; hilsa conservation

### 1 | INTRODUCTION

Hilsa fish (*Tenualosa ilisha*) locally known as 'ilish', has a prestigious cultural value in Bangladesh. In respect of its population hilsa is the biggest single fish species in Bangladesh (Islam *et al.* 2016a). Bangladesh contributes about

75% of the world's hilsa production (Miah 2015). As a single product, hilsa contributes 1% to national GDP (Sunny *et al.* 2017) and represents 12% of the total fish production of Bangladesh (Miah 2015). The total hilsa production in Bangladesh is 496,417 tons including 217,469

tons (43.8%) from inland waters and 278,948 tons (56.2%) from marine catches (DoF 2017). Around 287,000 fishers depend directly on hilsa fishing for their livelihood, and an estimated 2 to 2.5 million people are involved in activities throughout the hilsa supply chain including transportation, marketing, processing, and other post-harvest activities (Islam *et al.* 2016b; Hossain *et al.* 2019). In 2001–2003, a significant production loss of hilsa made the authority to be concerned with it (Islam *et al.* 2016a). Most of the observation and survey identified that overfishing is the main reason for production loss (Hossain *et al.* 2019). To protect the hilsa from the growing overfishing, the Government of Bangladesh (GoB) has established six sanctuaries in the Meghna-Padma rivers and other associated tributaries covering an area of nearly 433 km.

In Andharmanik sanctuary, the duration of gap between brood conservation period and sanctuary conservation period (November – January) is only nine days whereas this gap between brood hilsa conservation period and sanctuary conservation period is four months for other sanctuaries of the country. Over this four-month period the fishers can catch hilsa below 25 cm in size (locally known as 'jatka'). Being a unique sanctuary, Andharmanik River dependent fishers cannot catch hilsa from Octobers to January which makes them economically vulnerable as this increased their exposure and decreased resistance to idiosyncratic or covariant shocks in their living conditions (Downing 1991; Béné 2009;). Since the year 2003, the Government has taken some measures to increase hilsa production as well as to improve the socioeconomic condition of hilsa fishers. Currently, several restrictions are being implemented which includes 22-day long ban on brood hilsa catch, sanctuary conservation, ban on jatka fishing, restriction on fishing gears and supplementary food programme for vulnerable fishers (Hossain *et al.* 2019). As a part of the support programme 40 kg rice supplement was supplied to each of the 248,674 vulnerable jatka fisher households (HHs) in 85 upazilas (*i.e.* sub-district) of 17 districts of the country by the government in 2017–18 to support them during jatka fishing restriction period (February to May; DDM 2019). Assistance for conservation of the environment aims to change behaviour in a way that potentially increases social well-being (Persson and Alpizar 2013).

In Bangladesh, food assistance programme for the fishermen during the restriction period was started in 2004. The process involves 13 separate steps from food allocation to distribution, and each level consists of transaction and administration costs, which are about 3% of the total price (Haldar and Ali 2014). However, in the food assistance programme, the vulnerable fishers were not well defined. Various study identified the coastal poverty, the inadequate and improper distribution of incentives, insufficient logistic support, limited alternative occupation,

political interference and a lack of awareness regarding fishery regulation as the significant limitations of insensitive-based hilsa management programme in Bangladesh (Bladon *et al.* 2014; Islam *et al.* 2017; Shamsuzzaman and Islam 2018a) but no study has been conducted to assess the effectiveness of the existing food aid system for hilsa fishermen in Bangladesh. Therefore, this study was undertaken to evaluate the effectiveness of food aid programme with a view to proposing an effective management measure.

Alternative livelihood programme is equally important to protect the fishing dependent people (Mome 2007). The coverage of visible alternative livelihood generating programme is shallow as compared to risk involves in fishing livelihood (Ben-Yami 2000; Haldar and Ali 2014). They work independently and struggle against the bitter cold, hot sun, strong current, heavy rains and violent storms (Deb 2018). The present alternative livelihood generating programmes include training on fish farming, toy making, providing para-veterinary service and rising duck and goats (Alam 2012). Conservation investment meets both social and ecological objective. But these programmes often fail to reach to right individuals because of ill motive and political influence in the distribution process (Bladon *et al.* 2018a).

Fishermen occupy a lower position in the traditional society of Bangladesh due to their weak economic capability (Siddique 2009). They have limited skills and options for living. Although a large number of research have been conducted to evaluate socio-economic or livelihoods of the fishermen in Bangladesh (*e.g.* Flowra *et al.* 2009; Islam *et al.* 2013; Galib *et al.* 2016) but analysis of critical issues like living patterns and associated issues during the fishing bans have not been focused adequately. Restricting the ecosystem for a certain period is not considered a sustainable solution for conserving resources which limits the entry of new fishermen and may results in long-term negative impacts whenever a significant number of people rely on natural resources (Bavinck *et al.* 2014; Mozumder *et al.* 2018). However, assisting hilsa fishers only may also attract a vast number of non-fishermen to get involved in hilsa fishing in order to qualify for assistance programme (Islam *et al.* 2016a). Identification of true vulnerable hilsa fishers is required with an exact definition. Therefore, this study also aims to know the income and expenditure pattern of hilsa fishers in the study area in order to identify the effectiveness of government assistance programme during jatka restriction period.

## 2 | METHODOLOGY

The study was conducted in six villages (Sudhirpur, Sirajpur, Nizampur, Yousoufpur, Lotifpur and Njibpur) adjacent to Andharmanik River of Patuakhali district, Bangladesh. The Andharmanik River (21.9861°N and 90.2422°E)

is a unique hilsa sanctuary in Bangladesh, described earlier. In study areas there were approximately 800 HHs who directly depend on hilsa fishing. However, a total of 202 HHs were selected by random sampling method. Household surveys involved structured interviews. The interview schedule was pretested in the field and was adjusted accordingly. The final data were collected during the period from April to August 2018.

A scoring system was developed (Table 1) to measure the demographic characteristics and these were considered independent variables. Effectiveness of food assistance was considered the dependent variables. Effectiveness of food assistance programme was measured by a five-point scale ranging from totally agree to strongly disagree with a corresponding score 4 to 0 for those who received food assistance ( $N = 158$ ). Efficiency was further rated in five dimensions, which were the quantity of food, quality of food, time of distribution, compliance to restriction and fairness of management. Therefore, the effectiveness score of an individual ranged from 0 to 20. In addition, seven Focus Group Discussions (FGDs) were carried out to gather qualitative information on coping strategies during crises period. Furthermore, five Key Informant Interviews (KIIs) were also accommodated to achieve triangulation in results and discussion. The key informants were influential fishermen, relevant NGO workers, net makers and sellers. The Pearson product-moment correlation was employed to analyse and describe the quantitative data. Computer software SPSS (version 21) was used to run those analytical models. Qualitative data were used according to the need of description and placed according to the theme discussed.

### 3 | RESULTS AND DISCUSSION

#### 3.1 The vulnerable fishermen in the study area

In Bangladesh, fishers face seasonal restrictions on hilsa fishing. Hilsa fishers are exploited during the ordinary period because arotders (commission agent in fish markets) claims 2 kg commission for every 37.5 kg hilsa catch. In addition, they borrow money from moneylender who charges 7% monthly interest of loan per month. Moreover, fishers are also being exploited by the local political leaders as they take bribe to include the name in the VGF (Vulnerable Group Feeding) list. The government impose restrictions on fishing without arranging alternative livelihood for the fishermen (Islam *et al.* 2016b) and as a result fishers suffer badly (Figure 1). Three types of fishers were recorded in the study area, revealed through FGDs.

##### 3.1.1 Work on monthly basis for commission agents

This type of fishermen earns BDT 5,000 – 10,000 per month for fishing (1 US\$ = approximately 80 BDT). The duration of fishing trips is usually 8 to 15 days depending on the availability of fish. They enjoy 2 to 3 days interval

between trips. In each group, there will be 7 to 10 fishermen depending on the boat size. The commission agent is responsible for all the management and expenditure and will get the catch.

##### 3.1.2 Fishermen with rented equipment

This type of fishers borrows money and rent fishing equipment from the commission agents. In each fishing group there will be 8 to 10 permanent members and an additional 2 – 3 fishermen join during the peak hilsa fishing periods. The commission agent takes 50% to 62.5% of the total catch and the rest amount is divided into equal portions among the group members. However, the boatman gets two additional shares and the engine mechanic gets one additional shares. The average cost for each trip is BDT 100,000 to 150,000 including costs of 400-litre fuel and required amount of ice and food. This group of fishermen is vulnerable under circumstances when they get insufficient catch. To meet up the cost of a trip sometimes they sell their own land or household assets. The duration of a trip usually varies from 10 to 15 days depending on fish availability. Fishers are bound to sell their catch to the fixed commission agents at a low price even though the market price may be higher. Moreover, the commission agent charges 2 kg of extra fish for each 37.5-kg. Without active participation in fishing, the commission agents get more than 50% of the total share.



FIGURE 1 Plights of a fisherman in the study area.

##### 3.1.3 Small-scale fishermen

This type of fishermen usually owns a small fishing boat (locally known as 'dingi-nowka') or miniature size net equipment. They catch fish every day and sell in the markets. The average catch amount varies from 8 to 12 kg hilsa but sometimes they get nothing. They borrow money from the moneylenders or commission agents with an agreement to sell the whole catch to them. They operate their fishing operation in the nearby river only. Among the three types of hilsa fishers recorded in this study both fishermen with rented equipment and small-scale fishermen groups are highly vulnerable and dependent on the nature. These two groups seek social safety net programme during jatka restriction period. A similar result

was also reported by Sarker *et al.* (2016) in Greater Noakhali regions of Bangladesh.

Payment for ecosystem services has attracted attention for its potential to support enhanced ecosystem services and provide financial assistance to "suppliers" of ecosystem services who, in turn, can actively participate by conserving target species (Gauvin *et al.* 2009). To include the name in safety net programme, VGF for example, some non-fisher enlisted their name with the help of corrupted local leaders and therefore genuine fishermen remain out of the list which is quite common in the country (Hossain *et al.* 2018). During crises period small-scale fishermen borrow money from moneylenders and return the money during peak fishing season. During the restriction fishing period, a large number of unemployed people enter the working markets (van Brakel *et al.* 2018). However, lacks in livelihood options sometimes results in low labour price (Islam *et al.* 2014).

### 3.2 Demographic profile of fishermen

Income and expenditure pattern were studied to know the living condition of hilsa fishermen (Table 1). About two-thirds (64.4%) of the respondents were middle-aged (36–45 years) and about 35% fishers were illiterate. Average family member size is six, whereas the national average is 4.4 members (BBS 2011). The majority (89.1%) of the HHs was with 5 to 7 members and 66.8% of the HHs had one earning member (Table 1).

About 95% of fishers have fishermen identity card (ID), issued by the government. However, fishermen below 18 years of age or those who do not have national IDs did not get fisherman ID. Only 5% respondents had fishing nets and 90.60% had no fishing boat. Only 4.45% of respondents invest their own investment in fishing. Over two-third (71.8%) of the respondents were highly dissatisfied to existing credit facilities. In the peak season, the income of 3.46% fisher was found less than BDT 5,000. Average food cost was less than BDT 6,000 for majority (55.9%) HHs. Average expenditure of non-food items for each HH was BDT 5,764.7 whereas 60.89% spent BDT 5,000 – 7,500. Almost half (49.5%) of the respondent had no alternative livelihood option during the restriction period. The monthly income of the respondents was quite low (Table 1).

### 3.3 Effectiveness of food assistance programme

Effectiveness of the food assistance programme was analysed on a five-point rating scale with a corresponding score 0 to 4 of a specific range 0 to 20. Mean ( $\pm$  SD) effectiveness was observed  $5.08 \pm 3.11$  with a minimum value of zero and a maximum value of 13. Effectiveness was categorised into three groups as low, medium and high based on the possible score (*i.e.* 0 – 20). The majority of the respondents (72.8%) rated this programme as less

useful. About a quarter of them (27.2%) found it moderately effective (*i.e.* medium) whereas nobody found it highly effective. Five facts were identified for the measurement of food assistance programme (Table 2).

**TABLE 1** Socioeconomic and demographic conditions of the respondents ( $N = 202$ ) in the Andharmanik hilsa sanctuary.

Considerations	Category	N (%)	Mean $\pm$ SD (range)
Age (years)	Young (18–35)	32.2	37.7 $\pm$ 8.1 (18–60)
	Middle aged (36–45)	64.4	
	Aged (>45)	3.5	
Educational Qualification (level of schooling)	Illiterate	35.7	5.0 $\pm$ 2.4 (0–9)
	< Class 3	15.8	
	Class 4 to 7	47.5	
	Above class 7	1.0	
Family member (No.)	Less than 5	1.5	6.0 $\pm$ 1.2 (3–11)
	5 to 7	89.10	
	Above 7	9.40	
Earning able member (No.)	One	66.8	1.0 $\pm$ 0.5 (1–3)
	Two	30.2	
	Three	3.0	
Fishermen ID (No.)	With ID	95	1.0 $\pm$ 0.2 (0–1)
	Without ID	5	
Fishing net (No.)	With net	5	0.1 $\pm$ 0.2 (0–1)
	Without net	95	
Fishing boat (No.)	With boat	9.4	0.1 $\pm$ 0.3 (0–1)
	Without boat	90.6	
Own investment (No.)	Yes	4.5	0.04 $\pm$ 0.2 (0–1)
	No	95.5	
Satisfaction to loan (scale 0–4)	Highly dissatisfied (0)	71.8	0.29 $\pm$ 0.5 (0–2)
	Dissatisfied (1)	27.2	
	Not satisfied (2)	1	
Income (Jul – Sep; BDT)	1 – 5000	3.5	9881 $\pm$ 4924 (3000–260000)
	5001 – 10000	62.4	
	10001 – 15000	16.8	
	15001 – 20000	13.4	
	> 20001	4.0	
Food cost (BDT)	3000 to 6000	55.9	6114 $\pm$ 1183 (4090–11110)
	6001 to 9000	42.6	
	9001 to 12000	1.5	
Non-food cost (BDT)	2500 to 5000	29.7	5765 $\pm$ 1493 (2700–16130)
	5001 to 7500	60.9	
	Above 7501	9.4	
Supplementary income during restriction (BDT)	0	49.5	2854 $\pm$ 3198 (0–14000)
	1 to 3000	6.4	
	3001 to 6000	25.3	
	Above 6001	38.8	

### 3.3.1 Amount of rice provided

Fishing ban affected HHs are entitled to get 40 kg of rice per month during the restricted fishing periods but respondents of this study reported that they usually receive less (30 kg). Most of the fishermen reported that they received 90 kg of rice in two instalments for three months in the previous year where the government allocated 160 kg via four instalments. This amount received was not considered sufficient to maintain the whole family as sometimes they had no extra earning option during the ban. However, about half of the respondents remained neutral regarding the quality of rice. Nazrul Farazi, a boatman of Mohipurghat village, said

*“Though there is a provision of four months subsidy during hilsa fishing ban, I received only three months’ subsidy this year.”*

**TABLE 2** Dimension specific effectiveness of food assistance programme, based on 158 respondents who received aids. Response categories are TA, totally agree; A, agree; N, neutral; D, disagree; and SD, strongly disagree.

Statements	Response types					Mean Rank score
	TA	A	N	D	SD	
Amount of rice is adequate	0	0	0	20	138	0.10 5
Quality of the rice is good	0	56	91	11	0	1.78 2
Timing of assistance is appropriate	0	1	1	29	127	0.17 4
Fisherman comply the restriction	34	73	45	6	0	2.23 1
Food management is fair	8	9	3	105	33	0.84 3

### 3.3.2 Timing of assistance

Timing of food assistance was ranked 4th on the effectiveness scale because most of the respondent profoundly disagreed with the programme schedule. Food assistance was provided in the middle of the fishing ban which results in fishers to face food insecurity for a long period. Some of the fishermen became unable to pay the interest of the loan and get involved in illegal fishing.

### 3.3.3 Fairness in management

More than 50% of the fishermen disagreed, and 16% of them strongly disagreed that the existing assistance programme management was fair. It was ranked 3rd on the effectiveness scale. Inclusion of seasonal fishers, non-fishermen and relatives of local leaders to the programme as participants were identified as the major reasons of dissatisfaction. However, in Bangladesh fishers or farmers have no bargaining power against these unfair distributions (Pervez *et al.* 2017, 2018; Porras *et al.* 2017) and are usually selected by the local political leaders for assistance programmes (Haldar and Ali 2014). Therefore, local leader prefers partisan people for aid distribution.

### 3.4 Relationships between socio-demographic characteristics (SDC) of hilsa fishers and the effectiveness of the assistance programme

Results, obtained through Pearson's correlation coefficients analysis, showed that age of the fishermen, number of family member, number of earning member, income during peak season, income difference during peak and restriction period, monthly food cost, loan during restriction period and food assistance programme revealed significant relationships with effective assistance programme (Table 3). Considering the interaction between the combinations showed a positive significant relationship, which means that the parameters were interrelated and may derive from the same sources in the study area, and negative correlation occurred when the variables are inverted (Mukaka 2012).

On the other hand, education status, and income during the restriction period were negatively correlated and showed no significant relationship with effective assistance programme. However, monthly non-food items expenditure and supplementary livelihood options showed a positive insignificant relationship (Table 3).

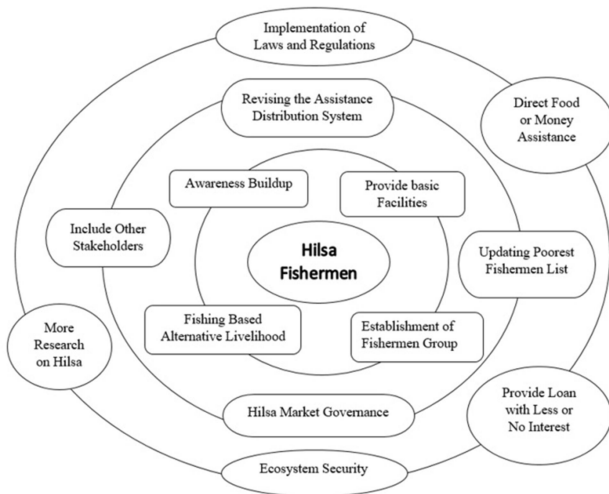
**TABLE 4** Relationships between socio-demographic characteristics (SDC) of hilsa fishers and the effectiveness of the assistance programme.

SDC of the respondents	The correlation coefficient (r)
Age of fishermen	0.252**
Educational status	-0.126
Number of family member	-0.203**
Earning able family member	-0.278**
Satisfaction to interest of loan	-0.107
Income during peak season	-0.231**
Income during jatka restriction period	-0.073
The income difference between peak and restriction period	-0.235**
Monthly food cost	-0.206**
Monthly non-food cost	0.027
Supplementary Livelihood	0.027
Loan of individuals	0.215**
Supplementary food assistance	0.889**

\*\* , P < 0.01

## 4 | THE PROPOSED MANAGEMENT SYSTEM

On the basis of the findings of this study we propose a three-layer management plan that may ensure effective aid distribution and habitat restoration for hilsa (Figure 2).



**FIGURE 2** Proposed food assistance management plan for hilsa fishing restriction period for better livelihoods of fishermen.

#### 4.1 Management issues related to basic needs

The inner layer of the proposed management model depicts the crucial management issues, which include four components including rise of awareness, fishing-based alternative livelihood, ensuring necessary facilities and establishment of fishermen group.

**Rise of awareness:** Rise of awareness plays a vital role in jatka conservation. To increase social mobilisation of community's different awareness-raising activities such as folk dramas, leafletting, posters and rallies were used to reduce illegal fishing practices in coastal areas which are not adequate at the moment (Murshed-e-Jahan *et al.* 2014). Most of the fishermen were illiterate and live in remote rural villages. They were not well-aware about the benefit of jatka conservation and need to be aware of the size and length of jatka fish in order to make the ban successful. According to Md. Baccu, a WorldFish employee in Mohipur of Kolapara region,

*“About 570 families of Nijampur, Shudhirpur, west Katakata, Khajura and Mohipur villages were trained by WorldFish under Alternative Livelihood and Income Generation project, but it only covers one-third of the total area. Many fishers are landless and not interested in alternative livelihood options. However, on some occasions, the coast guard and police failed to measure the size of jatka correctly and results in harassment of the fishermen.”*

**Fishing-based alternative livelihood:** Fishermen are the poorest of the poor and 'fishing is the last resort' practice, both of which strongly express the concept of chronic systemic poverty in fishing communities (Wright 1990; World Bank 1992; Payne 2000). Poverty is identified as a social driver of change in hilsa fishery (Cinner 2009; Bladon *et al.* 2018b). Various factors including temperature and rain affect fish catch and livelihoods of marine

fishers (Malakar *et al.* 2018). As most of the fishermen are middle-aged with little education and they were not interested in changing their profession in the study area. In Bangladesh, majority of the fishermen comes into this profession after their fathers or ancestors (Islam *et al.* 2018). As they have practical knowledge of fishing based alternative livelihood options like cage culture may have potentials in improving socio-economic status (Brugere *et al.* 2001; Hossain *et al.* 2018). However, they may also get involved in mud crab fishery which is considered to be a promising alternate livelihood option for the climate vulnerable coastal communities in recent times in Bangladesh (Rahman *et al.* 2020).

**Ensuring necessary facilities:** Most of the fishermen villages are located in remote rural areas and do not have adequate transport, education and medical facilities. Free access to basic facilities to fisherman holding a fisherman ID may improve the livelihood conditions during ban period. As extreme weather conditions such as rough seas and frequent cyclone forces force fishermen to stay jobless made them prone to poverty (Islam 2012). Natural disasters became quite common in coastal Bangladesh and therefore incentives or aids should be provided as early as possible. As Md. Jalal, 35, a fisherman said

*“When my family suffer from hunger then it is more pleasing to me to take a suicidal decision such as going for hilsa fishing during the fishing ban.”*

**Establishment of fishermen group:** There were no established fishermen group or committee recorded in the study area and as a result overcoming an obstacle was found difficult. Local leaders were found not that cooperative and visited them mostly during the election. It is well-established that the community interrelationship helps any group to overcome a crisis situation (Ahmed *et al.* 1997; Kabir *et al.* 2013). Establishment of such a group may help to identify bona fide fishermen as well as suggesting them for assistance programmes (e.g. VGF membership).

#### 4.2 Stakeholders and market management

**Revising the assistance distribution pattern:** As local leaders were found politically-biased, fishers deserve involvement of government officials (e.g. Upazilla Fisheries Officers; UFOs) of the government in the assistance programmes. Chairman of Fisheries Management Committee, Sudhirpur described

*‘There is no opportunity for sharing our opinion with UFO during the VGF card registration as he is not involved in the process. They are being exploited by the local political leaders through nepotism, partisan prejudice and financial abuse. Moreover, boat owner and commission agents came to us with ill motive and try to encourage for fishing during the ban. We suffered badly when we get caught by the police.’*

**Inclusion of other stakeholders:** As per rule only genuine fishermen are eligible for the management programme and both commission agents and boat owners were excluded. However, boat owners and commission agents are not interested in stopping fishing, even during the restricted fishing time, for financial benefits (Shamsuzzaman and Islam 2018) and encourage fishermen to get involved in illegal fishing.

**Hilsa market governance:** There was a huge difference between the price at which a commission agent procures catch from the fishermen and ultimate retail price in the study area. Commission agents were reported to create artificial crises in retail markets by storing hilsa in storage. Fishers did not get a standard price as majority of them were bound to sell their catch at a low cost due to prior agreement with the commission agents. This is a common scenario in Bangladesh (Porrás *et al.* 2017). Therefore good governance is required in the fish landing centres and retail markets. In addition, number of intermediaries involved in the marketing chain should be reduced in order to ensure a better profit for the fishermen.

**Updating the most impoverished fishermen list:** At present local political leaders prepare fishermen's list by their own for any government subsidy programme in the study area. A transparent procedure is needed in this and therefore preparing such a list in presence of fishermen, local leaders and UFO may be more acceptable and effective.

### 4.3 Enacting law and conducting more research

**Ensure direct food supply or money assistance:** In the study area aids are being distributed through local leaders and thus, the timing of aid distribution depends on the local leaders. To ease this problem fishermen wish to receive financial assistance through their banks to avoid giving bribe and save time (Hossain *et al.* 2018). We recommend that any assistance during restricted fishing period should be distributed among fishermen at least seven days in advanced.

**Ensure credit facilities at less or no interest rate:** Repairing equipment is a significant task before each fishing trip that cost a lot of money. In the study area fishermen borrow money from moneylender, like other parts of the country, at a very high interest rate (about 84%). In many cases they failed to return the money in time or had to sell household assets. Special loan allocation to fishermen group at no or low interest rate can help fishermen in this regard. This would also allow fishermen to sell their catch at a profitable price.

**Ecosystem security:** Rumour profoundly influences fishers during the restriction period in the study area. In this regard, a fisherman named Zoynal Gazi (39) said

*“Although we try to conserve fish in our water bodies by*

*enforcing a ban, but the fishermen from India and Myanmar come with their mechanised fishing vessels and catch fish in the protected fishing zones.”*

This type of incidence also made respondents less considerate to obey fishing bans. Under this circumstance foreign ministry should liaison with neighbouring countries if fishing bans can be declared over a common time period (Mohammed 2013; Mohammed and Wahab 2013). In addition, rising awareness is also necessary to make the community understand the importance of conservation.

**Implementation of rules and regulation:** Jatka is mainly caught by illegal monofilament gill net which is popularly known as 'current jal' in Bangladesh. Despite declared illegal by the government this net is available in Bangladesh market (Islam *et al.* 2016a). Although much government effort is paid on seizing the net during fishing but less effort is paid on surveillance in markets and manufacturing industries. Bangladesh navy and coast guard should be more active in monitoring the river during the restriction period.

**More research on hilsa:** The present conservation policy of hilsa aimed at reducing the overexploitation. However, many factors including physiochemical properties of water (water depth, current and tide, turbidity, light intensity, and temperature, salinity alkalinity, dissolved gases, pollutants etc.) affect hilsa migration and breeding (Ahsan *et al.* 2014). Some biological factors such as sexual development, food availability, endocrine state etc. also play an important role in this regard (Morrill *et al.* 2004). For instance, hilsa eggs are deposited in freshwater and hatching takes place within 23–26 hours at an average temperature of 23°C (Haroon 1998). However, many issues of hilsa breeding environment and biology are still unknown (Hossain *et al.* 2018). Therefore, research may discover a new approach to conservation and production of this highly tasty fish.

## 5 | CONCLUSIONS

Bangladesh is known to others as a harbour of delicious hilsa fish. To conserve this species in Bangladesh and to enhance its production, the restriction or ban on hilsa fishing is needed for a certain period especially during the breeding seasons. Most of the hilsa fishermen are economically vulnerable and therefore, to support them, the Government has introduced the food assistance programme. Our results showed that the current food assistance programme is not that effective due to political involvement, nepotism and corruption in the process and demands revision. Credit at high interest rate from the local moneylenders aggravates the plight of poor fishers. Therefore, low-interest institutional loans to vulnerable fishermen may be help and the Government should take necessary steps regarding this issue. We also found that the existing food disbursing system is problematic and

hence, we propose a new management plan to improve the effectiveness of the food management programme. Along with some other the establishment of fishermen group, induction of market governance and preparation of the list of vulnerable fishermen were suggested in the proposed management plan and we seek attention of the responsible organisations (*e.g.* Department of Fisheries of the Bangladesh government) in this regard. Fishing-based alternative livelihood options are also suggested to rehabilitate the vulnerable fishermen during the restricted fishing period. A community-based management system for greater effectiveness and conservation is also recommended. From the correlation result, we found that several socio-demographic factors are significantly related to the effectiveness of food assistance programme and therefore, government may consider these factors to improve acceptance level by the fishermen as well as to make assistance programmes effective.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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**MMHM, MEU, FY & ABA** research design; **MMHM, MEU, FY & ABA** fieldworks; **MMHM, MEU & AKMKP** data analysis; **MMHM & MEU** manuscript preparation; **AKMKP** critical review of the manuscript.




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