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Resilience of small-scale marine fishers of Bangladesh against the COVID-19 pandemic and the 65-day fishing ban

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ABSTRACT

In 2020, the COVID-19 pandemic-induced nationwide lockdown (March-May) and the conservation-related 65-day fishing ban (May-July) in Bangladesh restricted its small-scale fishing folks from fishing for an unprecedented 130 days. This study assessed the resilience of two small-scale fishing communities in Barguna and Cox's Bazar districts against these subsequent disturbances. The research developed a conceptual framework based on Zurich Flood Resilience Alliance's '5 C-4R Framework', which considers the relationships among a wide range of sources of resilience with livelihood capitals and resilience properties. By analyzing 100 interviews with marine fishers, this paper showed how weakened livelihood capitals affected the resilience of fishing communities. Dependency on a single income source, inadequate access to aid and financial and natural resources, lack of skills and knowledge on alternative livelihood options, absence of strong social protection and social networks, social inequalities, institutional incompetence, and lack of community leadership and cooperation severely affected fishers' resilience. This study revealed that financial capital is directly linked with all resilience properties that require special attention to ensure fishers' well-being. The paper recommended drastic investments in small-scale marine fishers through long-term livelihood improvement and asset creation, skills and knowledge development on natural-resource-based alternative income generation activities, and an exclusive social safety net program for these fisherfolks. The approach and findings of this study can guide other emerging economies who enjoy significant contributions from the marine fisheries sector to understand the resilience of their fishers and to address the prevailing challenges owing to the pandemic and other natural calamities.

1. Introduction

In Bangladesh, 17 million people, including 1.4 million women, solely depend on inland and marine fisheries through fishing, farm management, and fish processing [55,58]. The contribution of marine fisheries to the country's total fish production is 19.4% [25]. Access to nearby coastal area, which is about 118,813 square kilometers, creates coastal fishing opportunities for a large number of coastal dwellers [25]. While engagement of fisherfolks increased the marine and coastal fish production in the recent decade, putting Bangladesh at the 12th position in the world [14], over-exploitation of marine fisheries imposes a major threat to the biodiversity, and ecosystems' integrity [24]. In 2015, the Government of Bangladesh imposed a 65-day ban (20 May-23 July) each year on marine fishing by commercial trawlers to revert the declining

trends of fish and crustacean species [24,52]. Since 2019, the ban has been imposed on all types of fishing boats engaged in fishing on the Bay of Bengal. This fishing ban creates stress among fisherfolks as most of them are poor, have limited alternative livelihood opportunities, and are victims of inadequate and improper distribution of incentives during the ban period [45]. The restriction causes further stress upon these fishers as many remain workless for the whole ban period and are solely dependent on high interest loans from local money lenders [47].

Since early 2020, like many other groups and sectors which were highly affected by the COVID-19 pandemic, the small-scale marine fisherfolks of Bangladesh got severely affected due to their pre-existing social vulnerabilities. High health risks of and mortality from the COVID-19 forced the Government of Bangladesh to announce a countrywide lockdown from 18 March to 31 May 2020 [54], just two months

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before the 65-day fishing ban. As a result, the fisher folks were forced to stop fishing [50]. The COVID-19 pandemic-related lockdown essentially extended the total fishing ban period from 65 days to about 130 days (18 March–23 July 2020). Thus, the fishers started losing their income 65 days before the regular fishing ban, and eventually reduced their ability to support their families and maintain their basic needs. Moreover, they did not receive any additional relief from the government during the COVID-19 lockdown, as they usually receive during the 65-day fishing ban, due to unavailable social assistance facilities [19,20]. Therefore, for the small-scale marine fishers, the countrywide lockdown due to the COVID-19 pandemic can be identified as a shock and the conservation-related 65-day fishing ban can be recognized as a stress [8], which took place subsequently and undermined the stability of fishers' lives and increased their vulnerability.

Shock and stress are classified in regard to their sources or types which are known as natural (e.g., droughts, floods, cyclones, and epidemics) or man-made (e.g., market, conflict, and technological shocks) [26]. Shock is defined as short-term detachment from regular trends that has negative effects on people's livelihoods, assets, safety, current state of well-being, and their ability to tackle future shocks [66]. On the other hand, stress is a long-term pressure (e.g., diminishing social capital and degradation of natural resources) that creates tension to different capitals (e.g., social, economic, and environmental) of households or systems [6]. In this context, resilience is a characteristic of people or communities that exhibit the capacity to prepare for and withstand shock and stress from a range of different hazards, whether environmental, social or economic, and maintain functionality [28,31]. A social or ecological system becomes fragile when it loses capacity to prepare and unable to absorb changes that could have been done previously [61]. Understanding resilience, however, requires empirical evidence of interaction of different capacities of a community, such as a small-scale marine fishing community. Such interactions among different functionalities build resilience of a community through increased robustness and redundancy [30]. Moreover, consideration of a set of capacities indicates the multifunctionality of a community that develops a resilient community.

In the marine fisheries sector, small-scale fisherfolks have to sustain their livelihoods by mitigating negative impacts from a wide range of shocks and stresses. Since resilience indicates the ability to tackle the changes imposed by shocks and stresses effectively, it could be a valuable lens to understand the response of small-scale marine fishers [16, 32]. Knowledge of resilience helps us to identify the scope of improvement to any sudden or long-term changes by balancing social and economic costs [36]. Resilience of small-scale marine fishing communities was explored in different parts of the world – by investigating the threats to social-ecological resilience in India and Brazil [48], showcasing resilience of marine fisherfolks of the Pacific Islands through cooperative management [18], revealing the changes in potential indicators of resilience due to seasonal variability in Mexico [51], and understanding multi-level resilience among fishing communities in Brazil [32].

A number of studies discussed the resilience of fishing communities of Bangladesh on the basis of conservation strategy and understanding the prevailing challenges [23,44,53]. On the other hand, studies on the impact of the COVID-19 pandemic on the fisheries sector of Bangladesh have so far focused on the seafood system, finfish aquaculture industry, fish consumption, and food security [34,59], and also on small-scale fishing communities [20]. Mangubhai et al. [35] has recently studied the vulnerability of Fijian small-scale fishing communities due to dual events, namely the COVID-19 pandemic and Cyclone Harold. The resilience of small-scale fishing communities against dual events has, however, remained largely unexplored. To address this gap in our knowledge, the present study explores the resilience conditions of two Bangladeshi small-scale marine fishing communities against consecutive shock and stress, namely the COVID-19 pandemic and the 65-day fishing ban, respectively. The objective of this study is to assess the impacts of a sudden shock and identify the interlinked stimuli from shock and stress

that influence resilience of small-scale marine fisherfolks. To examine this, we set out to answer the following questions by using a conceptual framework of resilience:

1. What impact did the COVID-19 pandemic have in 2020 on the livelihoods of the small-scale marine fishing communities of Bangladesh who subsequently faced a 65-day fishing ban?
2. How did the pandemic and the fishing ban together affect these marine fisherfolks' resilience in the long run?
3. What specific actions could the government and other stakeholders take to improve the resilience of small-scale marine fisherfolks of Bangladesh?

2. Conceptual framework of the state of resilience

The state of resilience of two small-scale marine fishing communities was analyzed and documented in this study through a conceptual framework (Fig. 1) adopted from the '5 C-4R Framework' [27,67,68]. Here '5 C-4R' refers to the five livelihood capitals (5Cs) and four resilience properties (4Rs). According to Chambers and Conway [7] "a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living." If people can cope with or recover from hazards through a proper maintenance and boost of assets and capabilities, both now and the future, then we can say it as sustainable livelihoods; lack of those assets make people vulnerable [7].

In the proposed conceptual framework, the five livelihood capitals (5Cs) are human capital (e.g., education, skills, and health), social capital (e.g., social relationships, bonds, and networks), physical capital (e.g., infrastructure, improved genetic resources, and equipment), natural capital (e.g., productivity of land, water, and fisheries), and financial capital (e.g., income, savings, and loan) [67]. Livelihood capitals give insight into peoples' ability to adopt livelihood strategies with available assets to cope with specific hazards [29]. These also indicate the institutional processes that assist people in adopting such strategies. Moreover, stable livelihood capitals denote the better situation of resilience that helps to mitigate peoples' vulnerability from hazards [3].

The four resilience properties (4Rs), on the other hand, are robustness, resourcefulness, redundancy, and rapidity, which are strongly related to one or more livelihood capitals [68]. Analyzing these 4Rs helps to understand the weakness of the resilience properties that represents the vulnerability of communities which create disastrous situations [5,27]. Robustness refers to the strength of an entity that is related to human, social, physical, and financial capitals (Fig. 1) and indicates the ability to withstand any thresholds or tipping points without any loss. Resourcefulness refers to the ability of an entity to identify problems, take proper actions, and mobilize resources when affected by a disturbance. This is related to human, social, and financial capitals. Redundancy refers to the availability of alternative measures. This is related to physical, natural, and financial capitals and underlines the functioning of an entity through alternative routes. Finally, rapidity, related to financial capital only, refers to the capacity of an entity to restrain losses, recover timely, and also be able to avoid future disturbance.

Changes in 5Cs affect a community's resilience capacity and the community could respond to the disturbance by recovering in three possible ways. In the recovery phase, the community either may bounce back better with stronger livelihood capitals and enhanced capacity or get back to the original situation or recover to a level which is worse than the pre-disturbance state with reduced capacities and more vulnerability [12]. The worst response of a system denotes the total collapse of livelihood capitals with extreme reduced capacities.

The conceptual framework in Fig. 1, prepared based on Irfanullah [22], captures the resilience conditions of studied small-scale fishing communities before the COVID-19 pandemic (until March 2020), during the pandemic-related lockdown (March–May 2020), and the subsequent

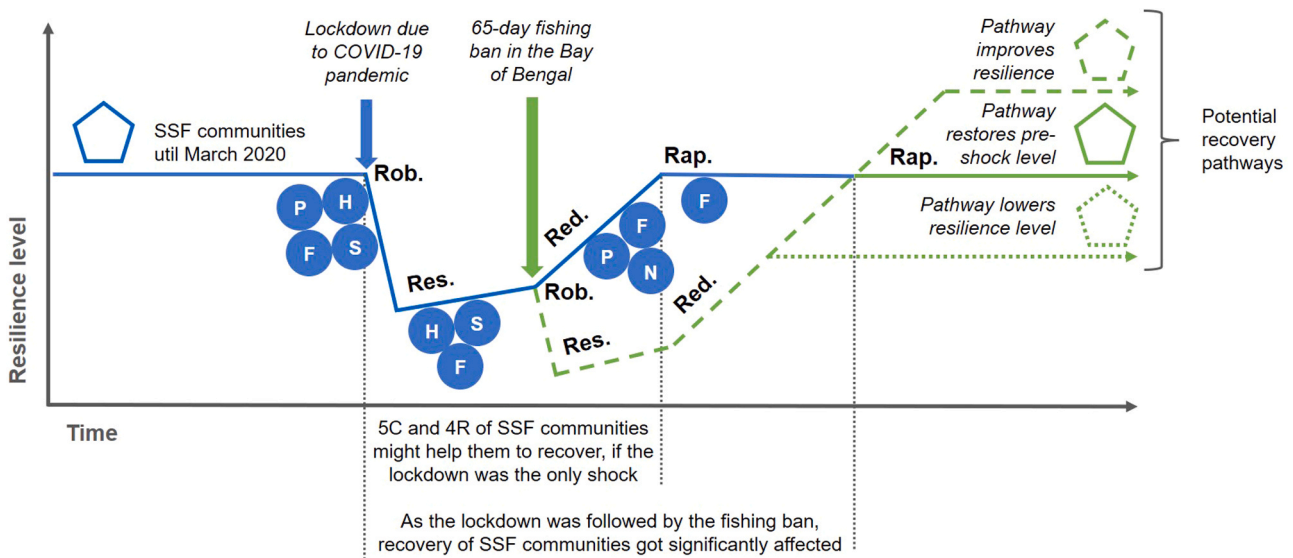


Fig. 1. This conceptual framework explains the state of resilience of two small-scale marine fishing (SSF) communities of Bangladesh reported in this paper. Resilience of these communities can be described by the ‘5 C-4R Framework’ originally developed to measure flood resilience of vulnerable communities [27,67,68]. The pentagons and filled circles represent five livelihood capitals (5Cs) of a community which interact with four properties of resilience (4Rs, boldfaced text) and help the community to cope with and recover from a disturbance. This diagram, based on Irfanullah [22], shows how SSF communities of Bangladesh got affected by the COVID-19 pandemic-related lockdown (March-May 2020) and the subsequent 65-day fishing ban (May-July). It also shows how interactions among 5Cs and 4Rs could lead to three possible recovery pathways [12]. Here, 5Cs includes H = Human capital, S = Social capital, P = Physical capital, N = Natural capital, and F = Financial capital and 4Rs includes Rob. = Robustness, Res. = Resourcefulness, Red. = Redundancy, and Rap. = Rapidity. Details of this conceptual framework are given in the text.

Location Map of the Study Areas

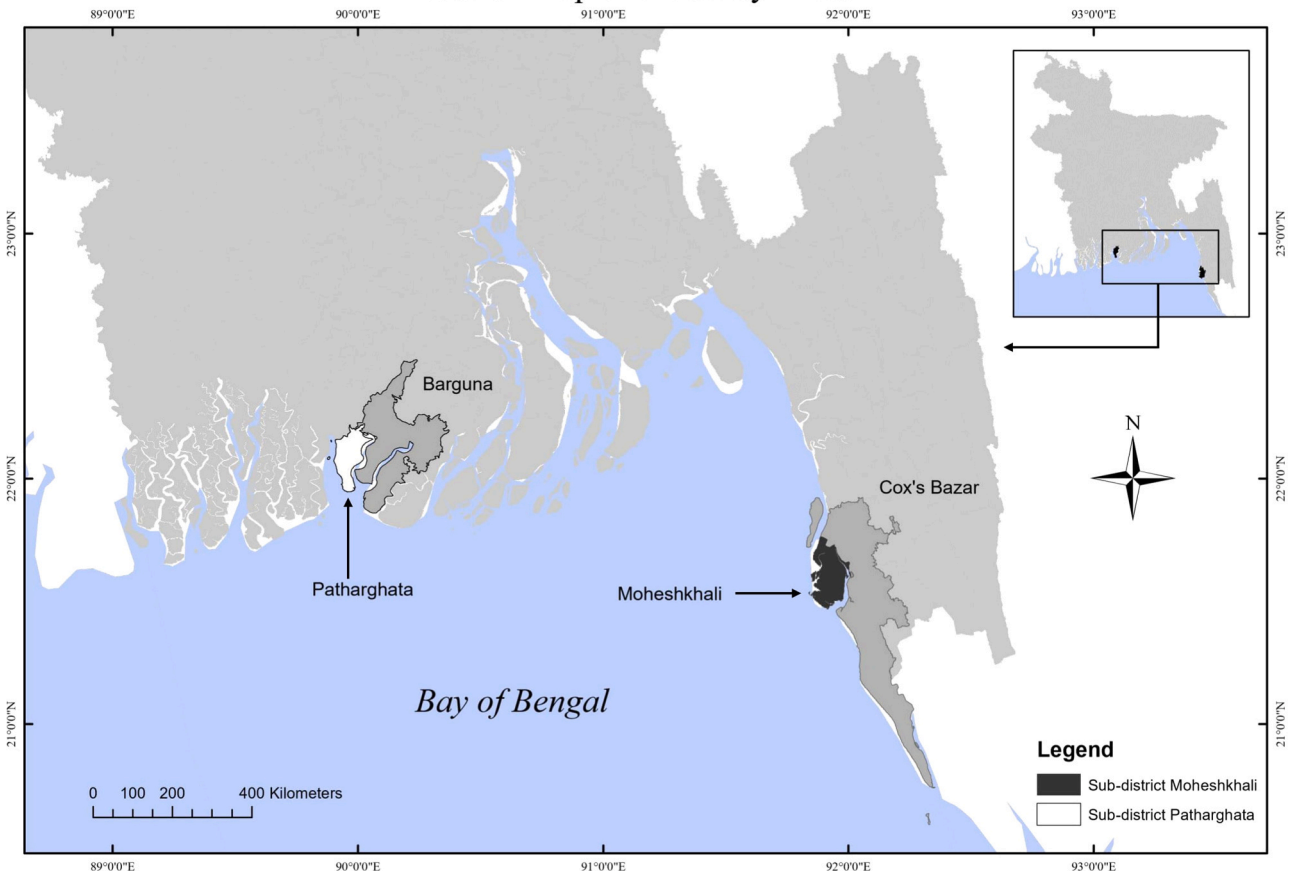


Fig. 2. A map of Bangladesh showing the two study locations in Moheshkhali (Cox’s Bazar district) and Patharghata (Barguna district).

65-day fishing ban (May–July 2020). It also shows how five livelihood capitals (5Cs) interact with four resilience properties (4Rs). It further highlights three possible pathways small-scale fishing communities may follow as they recover from successive shock and stress. This conceptual framework is also used as an analytical framework to assess the resilience of studied small-scale fishing communities based on data collected from the field.

3. Materials and methods

The study was conducted in two small-scale marine fishing communities in Moheshkhali upazila (sub-district) (21.5500°N 91.9500°E) of Cox’s Bazar district and Patharghata upazila (22.0458°N 89.9689°E) of Barguna district (Fig. 2). These two locations are situated beside the Bay of Bengal and the surveyed fisherfolks have been living there for generations.

To fulfill the research objective and find answers to the research questions, in-depth interviews were conducted using structured and semi-structured questions in both study locations with people who were either directly involved in small-scale marine fishing or were wives of the fishers. These interviews aimed to capture the demographic information of the respondents and their households; their awareness of the COVID-19 pandemic; their perceptions of the impact of the previous years’ 65-day fishing ban; impacts of the pandemic, lockdown, and fishing ban in 2020; and their coping strategies and adaptive measures against these shock and stress. A total of 100 randomly selected individuals (40 women and 60 men) were interviewed through mobile phone to avoid the risk of COVID-19 infection. Bangladesh Institute of Labor Studies (BILS), a local NGO, assisted the research team in selecting 50 individuals (20 women and 30 men) in Patharghata, while another NGO (COAST Trust) helped to select the remaining individuals from Moheshkhali with the same women-men ratio. The interviewed individuals, however, were not the beneficiaries of these NGOs. Before selecting the respondents, the research team arranged an online training in random sampling process for the field staff of the NGOs to ensure each member of the population had an equal chance to get selected as an interviewee [56]. One pilot interview was conducted in each location. Based on the feedback, the interview questions were finalized and all interviews were conducted. Before each interview, the interviewer clearly explained to the interviewee the purpose of this study and possible use of the collected information, and received their consent. During the interviews, the interviewers took notes on paper and used a phone recorder to record the conversation.

The authors transcribed all the interviews into text to begin the data analysis. Content analysis method was used to analyze the qualitative data. The Zurich’s ‘Flood Resilience Measurement for Communities’ (FRMC) consists of 44 sources of community resilience, which are related to five livelihood capitals and four resilience properties [27,68]. The collected data was clustered under different livelihood capitals in relation to relevant sources of resilience. The state of resilience due to the COVID-19 pandemic and the 65-day fishing ban was described on the basis of the conceptual framework (Section 2). While presenting the primary data in the Results section, the names of the respondents were not disclosed to protect their privacy.

4. Results

4.1. Sources of resilience related to the livelihood capitals and the resilience properties

After analyzing 100 interviews, we found information on 17 sources of community resilience out of 44 listed in the FRMC (Table 1). We use these 17 sources to describe the state of resilience of two small-scale fishing communities. Identification of the suitable sources of resilience to understand a community’s condition of resilience is a key step towards their disaster risk reduction. Flood, the basis of the FRMC, is a

Table 1

Seventeen sources of resilience, out of 44 proposed in [68]’s ‘Flood Resilience Measurement for Communities (FRMC)’, are listed along with corresponding five capitals (5Cs), four resilience properties (4Rs), and seven themes as identified in the present study on two small-scale marine fishing communities of Bangladesh.

Sl. no.	Source of resilience	Capital	Resilience property	Theme
1	Risk reduction investment	Financial	Robustness	Asset
2	Household income continuation strategy	Financial	Redundancy	Livelihood
3	Community disaster fund	Financial	Resourcefulness	Governance
4	Hazards response budget	Financial	Rapidity	Governance
5	Household asset recovery	Financial	Redundancy	Asset
6	Education commitment during hazards	Human	Resourcefulness	Livelihood
7	Hazard exposure awareness	Human	Resourcefulness	Asset
8	Asset protection knowledge	Human	Robustness	Asset
9	Natural capital condition during hazard	Natural	Redundancy	Natural environment
10	Emergency food supply	Physical	Robustness	Lifelines
11	Transportation interruption	Physical	Redundancy	Lifelines
12	Community participation in hazard related activities	Social	Resourcefulness	Life and health
13	Community safety	Social	Robustness	Life and health
14	Community representative bodies	Social	Resourcefulness	Governance
15	Local leadership	Social	Resourcefulness	Governance
16	Community structures for mutual assistance	Social	Resourcefulness	Social norms
17	Social inclusiveness	Social	Resourcefulness	Social norms

well-known climate-induced extreme event, like cyclones and storm surges, which the small-scale marine fisherfolks of Bangladesh are very much familiar with. The COVID-19 pandemic, on the other hand, was a totally unknown shock for these fisherfolks, while the 65-day fishing ban was a known stress to them. Hence, the identified 17 sources of resilience are mostly related to these two consecutive shock and stress and the related livelihood capitals.

Out of the 44 sources of resilience, the FRMC framework contained 9 sources of human, 11 sources of social, 12 sources of physical, 5 sources of natural, and 7 sources of financial capitals. Out of 17 sources of resilience, on the other hand, we found 3 sources under human, 6 sources under social, 2 sources under physical, 1 source under natural, and 5 sources under financial capitals. Therefore, sources of resilience related to financial capital were the most important ones (71% of available sources were selected) for the two studied communities, followed by those related to social capital (55% of available sources were selected). The lowest number (17%) of selected sources of resilience belonged to physical capital. Regarding the resilience properties, each of four properties were related to one (rapidity) to four (robustness) capitals (Table 1). Resourcefulness came out as the strongest resilience property with eight sources of resilience out of 17, followed by robustness and redundancy with four each.

In the following sub-sections, the resilience conditions of the small-scale marine fishing communities of Moheshkhali and Patharghata are described against four resilience properties and pertinent capitals and sources of resilience.

4.2. Robustness

The studied fishing communities had limited overall capability of addressing shocks and stresses. Most of the respondents were struggling to cope with the COVID-19 pandemic situation and a couple of month-long lockdown restrictions, and were also unprepared to face the subsequent 65-day fishing ban. In terms of financial capital, many fishermen were not capable of maintaining their families and living expenses properly in the normal period due to insufficient income. Such low financial capability also made them unable to invest in any risk reduction measures, including unexpected events, like the pandemic. Moreover, they did not have any other skills or knowledge of other jobs as human capital, except fishing, which they were destined to take as their sole profession due to family tradition. As a result, during the suspension of fishing, owing to lockdown or fishing ban, most fishers remained jobless. This is how their livelihood remained insecure during March to July 2020. A fisherman from Moheshkhali mentioned,

The COVID-19 lockdown period was similar to the 65-day fishing ban period to us. Due to a lack of skill and knowledge of other work, we actually remained jobless for a longer time. Moreover, a few fishermen were lucky to manage a job as day laborers, but the earning was not significant as income from physical labor is very low.

Insufficient financial capacity further affected fisher families' food intake. They had to reduce food expenses by consuming more vegetables, instead of fish or meat, which led to an imbalanced diet. They also hardly received emergency food supplies from anyone outside of their community. As a result, three meals a day in regular time changed into two or one meal a day. Lastly, many fishers always felt unsafe because of uncertainties associated with their livelihoods. Such uncertainties affected their personal and social lives and even led them to show antisocial behavior. These also affected other family members tremendously, especially children, old people, and disable members. These fisher families were also forced to avoid social and religious occasions and events, instead providing necessary additional support to the family members in need. As a result, these small-scale fishing communities as a whole felt less secure before, during, and after any shock or stress events as they believed that they would suffer anyway. They thought of themselves as the most helpless group in the wider community who did not have any other way to get rid of or avoid such uncertainties.

4.3. Resourcefulness

The respondents in general did not show any capacity to identify problems, prioritize actions, and utilize external resources, which indicated insufficient resourcefulness in these fishing communities. In regard to the pertinent sources of resilience (Table 1), we noted that education level among the fisherfolks was very low as most of them did not receive any formal education. However, they wanted to send their children to school, since they were now conscious about the importance of education in human life, and it is useful to get involved in other professions. On the other hand, owing to the COVID-19 lockdown and other restrictions, all the educational institutions were closed in Bangladesh. So, the respondents were upset about the lack of their children's education for the past several months and for an unforeseeable future.

The culture of community-led actions in response to shocks or stresses was inadequate among the studied communities. Moreover, community representative bodies (e.g., fishers association) and local leadership were missing in these fishing communities. One fisherman from Patharghata pointed out that although they did not have any fishers union, it might help them in times of disturbance. The respondents in general showed reluctance to have local leadership who might uphold their rights, perhaps due to a lack of trust in or awareness

of the function of a leader or local representative. We also found that many fishers in the study areas were excluded from receiving relief support from the government. Such concerns of the fishing households were not considered sufficiently by the appropriate authorities showing a poor level of social inclusiveness. According to the respondents, some government representatives were involved in corruption, therefore, distribution of aid from the local government emergency funds was not transparent. A respondent from Moheshkhali said,

I have a government-provided fisher identity card. I received this card four years ago, but I did not get any rice [as aid] these years. This year the Upazila Nirbahi Officer [the chief executive officer of a sub-district] came for inspection, and I reported my situation to him. He then filled up a form, and I got rice one week later. Previously when we went to claim rice they did not give rice to me. They only favored those whom they were familiar with, or gave them bribes.

In Bangladesh, NGOs work as a part of social networks that help rural communities to strengthen their capacities and at the same time create an environment of mutual benefits. But, both in Moheshkhali and Patharghata, a few NGOs were present, which provided loans (micro-credit) only, thus fishers did not receive any information and support through the social networks that were needed at times of crisis. Moreover, many fisherfolks did not take any loan from these NGOs as they were afraid of the harassment they might have to face if they failed to return the loan.

Kinship, bonding, and mutual understanding among neighbors and relatives is another source of community structure for mutual assistance, which might be helpful to get support during shocks or stresses. We observed that some of the fisherfolks could take loans from their neighbors and relatives as they did not have any specific time-frame to repay, unlike formal loans from NGOs. A fisherman from Patharghata mentioned,

I seek help from my relatives and some neighbors who are close to us. If I borrow money from them, I return the money when I can earn. But this time, I did not borrow money as they were also not in a good situation to lend money.

Many of the respondents, however, did not have these options to get help from others. Additionally, there was no emergency fund in the community from which fishermen could take support to make them feel safe. Lastly, most of the respondents showed little understanding of the COVID-19 pandemic, that is why they had limited awareness about its impacts which severely affected their coping strategy against it.

4.4. Redundancy

Household income continuation is a source of resilience to measure redundancy within a community, which was, however, not reported by most of the respondents as they could not go fishing due to the lockdown and the 65-day fishing ban. There were limited alternative sources of income for the fishers who could make a living during such fishing disruptions. Even those who got a chance to do another job had to struggle to make ends meet. Very few fishers used to move to other cities to get temporary work, but during the lockdown, that was not possible as transportation was not available. Asset recovery policy was also not reported by the respondents, except borrowing money as loans, as described below. No respondents had any insurance and many even did not have any savings.

During the 65-day fishing ban period in the previous years, most of the fishers took loans to meet their daily needs. Sometimes, they take loans from a *mohajan*/company (a local businessman who is involved in fishing business, owns boats, and gives money to fishers in advance). They provide the fishers with all expenses and supplies, like boats, nets, and fuel for fishing. After that, the fishers need to work either in *mohajan*'s boat at a lower wage or sell fish to them at a price fixed by the

mohajan, which is lower than the regular price, until the fishers fully repay *mohajan*'s loan. Moreover, for that time period, fishers neither can work anywhere else nor can sell fish to other *mohajans*/companies.

In 2020, many fishers were forced to take more loans than usual due to longer restrictions on fishing, thus aggravating the regular year's vulnerability. Additionally, during the lockdown period, some fishers borrowed money by mortgaging their jewelry. When asked, they did not have any idea when they would be able to repay the loan and bring it back since fishing was off for a long time. As a result, loans as part of asset recovery policy did not support them much to tackle disturbances.

In respect to natural capital, most of the fishers did not have any land, pond, or livestock as their livelihoods depended solely on fishing. As a result, they could not capitalize on these resources as alternative livelihood options during a crisis period. Very few fishers who did have such resources also could not take proper advantage of those due to a lack of money to invest in.

4.5. Rapidity

We identified 'shock or stress response budget' as the only relevant source of resilience under financial capital that could recover the functionality of the fishing communities in a timely manner following a shock or stress. The study revealed that the government did not have any robust response budget. Although the government provides food aid to the fisher families during the 65-day fishing ban period (around 80 kg of rice per registered fisher), it is a temporary measure and cannot help to avoid future disruptions in fishers' livelihoods. As a result, practices of maladaptive (e.g., taking loans) and erosive coping strategies (e.g., selling assets, minimizing daily household food consumption, and working in informal sectors) were very much visible in both the study locations. These strategies increased in 2020 as the fisherfolks were banned from fishing for a longer time. Furthermore, damage to other sources of resilience and an absence of proper response budget to improve their livelihood capitals might force them to bear losses for a longer time with no respite to get out of this situation quickly. Thus, if two or more severe events happen in the lives of fishers at the same time or subsequently, then their condition will be more deplorable as it will take more time to recover.

5. Discussion

According to Zurich Flood Resilience Alliance [68], a source of resilience is not only linked with one of five livelihood capitals (5Cs) and one of four resilience properties (4Rs), it can also be put in one of seven themes (Table 1) based on its core feature and purpose. If we consider the five capitals as the basis of defining resilience properties by using sources of resilience (Fig. 1), the associated themes could help us to consolidate our understanding of small-scale fishing communities' resilience and formulate possible actionable recommendations to improve these capitals for enhanced resilience.

Financial capital indicates the ability of households to respond, recover, and transform their livelihoods to tackle the impacts of shocks or stresses [63]. In the present study, financial capital of the small-scale fishers in both the study locations were closely related to all four resilience properties. It was also noted that the five sources of resilience associated with the financial capital belonged to assets, livelihoods, and governance themes (Table 1). With the help of assets or cash, a system can overcome crises well and start new opportunities to cope with the changes [46]. The fishers of the present study did not have any risk reduction investments or any family emergency plans as a means of preparedness against disturbances. They also did not have cash savings which could be converted into resources to use after a shock. In absence of financial and other assets, the fishers failed to minimize loss from shocks and were unable to apply alternative livelihood strategies to achieve desirable livelihood impacts. Zhou et al. [65] noted that livelihood strategies of rural communities are dynamic and constantly get

modified with the help of policies, systems, and support from external environments. Similarly, modifying traditional theories of governance and overcoming bureaucratic procedures can also help a system to provide better livelihood strategies [13]. Insufficient governance structure in both the study locations, however, failed to facilitate small-scale fisherfolks to adopt different livelihood strategies in response to the shock and stress in 2020, which were also observed by Hoque et al. [20] in several locations of coastal Bangladesh. To support the resilient livelihoods of small-scale fishing communities to enhance their ability to face risks, it is therefore crucial to ensure good quality of assets, well-structured policy, and efficient livelihoods [65].

In the present study, three sources of resilience associated with human capital belonged to livelihoods and assets themes (Table 1). Knowledge, technical, and intellectual skills, personal abilities, creativeness, power, and behaviors which make up human capital are helpful for improving livelihood and assets and can be achieved through proper education for individual development (Mzid et al., 2018; [9]). Moreover, educated households were found to be keener to diversify their livelihoods than less educated ones [15]. Since most of the respondents in both the study locations were less educated, their limited knowledge of risk failed them to adopt self-insure against unprecedented events. Commitment to education confirms the economic success of rural households and brings benefit in the livelihood strategies [33]. Moreover, non-formal human capital that individuals own in the form of soft skills, ideas, and experiences helps to increase an individual's self-confidence. Almost all small-scale fishers participated in the present study did not have any previous relevant experiences, soft skills, or ideas to engage themselves in alternative income generating options or save their livelihoods during one or more consecutive disturbances, thus were jobless for a long time during the closure of fishing in 2020 and earlier. In this context, investing in fisherfolks' knowledge, abilities, and technical skills can ensure their economic growth and may have long-term impact on their socio-economic status [64].

The only source of resilience associated with natural capital in the present study, falls under the natural environment theme (Table 1). To define a source as the livelihood of a community, the former needs to have capabilities to claim and access resources and activities that can be helpful to earn means of living [2]. As natural capital, marine fisheries are the main source of livelihoods for small-scale fishing communities. When shocks or stresses keep them out of fishing, fishers may capitalize on other natural resources as a safety net to overcome the difficulties in managing food and accessing other assets [37]. Therefore, to understand the resilience of fishing communities in two locations against the pandemic and the fishing ban, this study also explored the role of other natural capitals (e.g., access to agricultural land, fish-farming ponds, and cattle).

We recorded a couple of sources of resilience under the physical capital, which fall in the lifelines theme (Table 1). The lifeline systems, an important element of rural community resilience, consist mainly of food supply, road-transportation networks, and communications [17]. The pandemic lockdown and the 65-day fishing ban severely affected several lifelines of both the study locations, making the lives of fisherfolks stressful. Disruption in food supply due to lockdown-related transportation closure and reduced household income because of a lack of livelihood opportunity minimized food consumption in the fishers' families. Further, many fishers did not receive sufficient food aid during the banning period because of corruption and administrative inefficiency in getting fishers identity cards leading to increased food insecurity. Disturbance of lifelines also increases the recovery time after an incident, since such damages cause livelihood discontinuity [49] and the fishermen alone cannot solve the problem of damage to lifelines. Moreover, as observed in the present study, damages to lifelines, such as interruption in transportation due to pandemic lockdown, reduced the chance of diversifying livelihoods by moving to another place.

Social capital can support preparedness, response, recovery, and risk reduction activities of a community to ensure its resilience, which was

found insufficient among the studied small-scale fisherfolks. It was also reported that, in Bangladesh, the voices and perceptions of the fisherfolks about the time of the availability of fish in the sea were not accepted by the decision makers for imposing a fishing ban [43]. It was also noted that, poor community participation, less attention to community perception, needs and dynamics, including avoidance of local resources and capacities, fail to bring fruitful results by any top-down approaches [1]. Mutual assistance among communities and different social networks, on the other hand, is helpful to recover from the impacts of sudden shocks or longer stress. Formal and informal social networks play an important role to train individuals of the communities through aid, cash support, and training, which might help them to respond well during the shocks and quick recovery after the event [62]. Cooperation and collective actions among different networks and communities build trust and create a good sense of goodwill to each other. This was, however, also missing in the studied small-scale fishing communities that not only weakened their response during the fishing restriction periods, but also affected the recovery after the ban was over.

The above discussion on different livelihood capitals of the small-scale fishing communities indicates that their preparedness for the annual fishing ban was not satisfactory. As a result, when the number of fishing-less days increased due to the pandemic lockdown, the situation became worse. Moreover, the responses during this stress period were also not effective. This in turn negatively affected the recovery. While respondent fisherfolks were familiar with the 65-day fishing ban, the longer restriction during March–July 2020 added a new dimension to their previous experience and their previous knowledge did not help much to reduce the impacts. Moreover, the similar situation happened in 2021, as the Government of Bangladesh enforced countrywide lockdown from 1 July to 10 August 2021 [4], which partially overlapped the 65-day fishing ban period (20 May–23 July 2021). Like previous years, fishers had to depend on government relief. According to the Department of Fisheries [11], during 2021's 65-day fishing ban, the Ministry of Fisheries and Livestock distributed 56,224 metric tons of rice to 74% of small-scale marine fishers out of a total 5,05,787 enlisted fishers. This support was insufficient and unevenly distributed to the fisherfolks, thus bound them to borrow money again from different sources to support their families [60]. As the small-scale fishing communities continued to struggle, their recovery pathway (Fig. 1) apparently was not transformed to a better condition in 2021, rather remained the same as the present study reported for 2020, if not worse.

6. Recommendations

The fisheries sector comprises 3.57% of Bangladesh's GDP [39]. But, limited efforts have been seen to strengthen the livelihood capitals of small-scale fishing communities of the country to address different shocks and stresses they are regularly exposed to. In 2020, the pandemic and subsequent fishing ban further exposed the inherent vulnerability of this section of the society. We propose that to improve the resilience of small-scale marine fishing communities against known and unpredicted future shocks and stresses, drastic investments should be made in their livelihoods improvement, skills development, and creating social safety net provision as a part of the COVID-19 pandemic recovery plan of the country.

First, small-scale marine fisherfolks are sacrificing their livelihoods by respecting the fishing ban and actively playing their part in sustainable marine fisheries management. But, Bangladesh's public support system has so far failed to make a concerted effort towards their livelihoods development. To support alternative income generating activities from the national budget for 2020–2021, for example, the Government of Bangladesh allocated Bangladeshi Taka 25,000 (or US\$ 300) for each of 25 fishers of Barguna [41], although the total number of fishers listed in this district is 45,191. As a crucial first step, the government should increase the budget allocated for small-scale marine fishers significantly matching the demand on the ground and appreciating fisher's

contribution to the national economy. Supported by an efficient, participatory monitoring system, this fund should focus on the fishers' livelihood improvement and asset creation, to address annual stresses, like fishing ban, and to cope with income loss owing to natural hazards, like cyclones, storm surges, and pandemics. Such long-term, large, well-executed investments will also help the fisherfolks to escape the never-ending debt cycle with the *mohajans* and protect them from becoming 'modern slaves'.

While developing livelihood programs, we should not promote alternative income generation options too distant from the fishers' way of life, such as shopkeeping, tailoring, or handicraft, as often observed in community development projects in Bangladesh. Instead, natural-resource-based options should be explored and facilitated, such as, individual or community-based culture of indigenous and non-invasive exotic fish, farming of crustaceans (e.g. prawns and crabs), fish processing and trading, integrated rice-fish cultivation, seaweed farming, and livestock rearing, by providing proper training to the fisherfolk, establishing necessary agricultural service systems and supply chain, and creating equitable market linkages.

Second, education acts as a vital catalyst in socio-economic development, including eradicating poverty and enhancing resilience. Linking with the first recommendation, Fishers Field Schools (FFSs) should be established at different coastal districts as human resource development hubs for small-scale marine fishers as a joint effort of government agencies and NGOs. A similar approach was followed by the Government of Bangladesh with support from the Danish Government, through DANIDA, in the agricultural sector, in different agro-ecological zones of Bangladesh [42]. That project helped the participating farmers to avoid seasonal migration and off-farm day laboring by improving knowledge on agriculture, increased household food security, and contributed to improved health, increased employment and family status as they improved their decision-making skills. Similarly, with the help of FFSs, training in access to credit and marketing, income generation through freshwater fish farming, agricultural crop production, and livestock rearing should be provided to small-scale marine fishing households to improve their livelihood capitals. Additionally, FFSs may improve inter-household relationships, enhance accessibility to local and outside institutions and networks, and encourage collective actions by raising the voice of the marine fisherfolk against inequality and corruption in the sector.

Third, Bangladesh implements more than 130 social safety net (SSN) programs to support a wide range of vulnerable, lower-income groups, which had an annual volume of 2.58% of the national GDP before the pandemic [57]. These programs have significantly contributed to the country's poverty alleviation over the past couple of decades. Despite the vulnerability of small-scale fisherfolks, there had been no specific allocations for the marine fisherfolks under the SSN programs for the year 2016–2021 [40]. In 2021–2022 fiscal year, the SSN allocation stands US\$ 12.7 billion (17.83% of the total budget and 3.11% of the national GDP), including a US\$ 23.5 million allocation to Ilish (hilsa) and other fisheries development [38], but none of the 130 programs focused on small-scale marine fisherfolks. The increased investments in building livelihood capitals, as proposed in the first recommendation, will take time to reach all 5 million people involved in marine fisheries [10] and will also take a while to see results in terms of fisherfolks getting graduated from poverty and showing resilience to disturbances. Therefore, a provision for the SSN program exclusively for small-scale marine fishermen should be created to act as a cushion, especially during the shock periods. As revealed by the present study and others (e.g., [57]), such relief and aid programs suffer from a lack of transparency and accountability, exclusion and harassment of the recipients, delay in support distribution, and gap in coordination among the participating agencies. A new SSN program for small-scale marine fisherfolk should address these limitations through effective planning, execution, and monitoring.

7. Conclusion

Small-scale marine fisherfolks of Bangladesh supply a reliable source of protein to fellow country people and also contribute to their country's journey to becoming an upper-middle-income country by the end of this decade. Fishing at the sea is increasingly becoming risky as climate change is making the sea rough for longer. Unlike many other professions, there is no fixed income from this livelihood option on a daily, weekly, or monthly basis. So, not being able to be on fishing trips on a regular basis due to the fishing bans brings hardship and misery to the fisherfolks. Additionally, the longer fishing restriction in 2020 because of the pandemic lockdown followed by regular 65-day fishing ban severely affected their already weak livelihood capitals.

The present study critically examined the resilience of two small-scale marine fishing communities of Bangladesh with the help of the '5 C-4R Framework' (five livelihood capitals and four resilience properties). This study showed how insufficient financial capacity, limited skills and knowledge on other livelihood options, inadequate financial services, poorly defined rights and representation in decision-making process, inadequate social networks, limited government support, corruption, and poor effort to identify all real fishers affected the resilience of fishing communities. The paper recognized the need for urgent investments in long-term livelihoods development, in skills and social networks to build human and social capitals, and in creation of a designated SSN program for small-scale marine fishers to act as a support during shocks and stresses.

Small-scale marine fisheries and the fishing communities are vital in achieving the Sustainable Development Goals (SDGs) owing to their roles at multiple, interconnected levels – from reducing extreme poverty, generating employment, ensuring food security, supporting social equity, adapting to climate change, to conserving marine biodiversity. It is therefore crucial to understand their resilience conditions by recognizing the sources of resilience in relation to their livelihood capitals and resilience properties to face shocks and stresses and recover from these disturbances. Our present attempt to understand the resilience of Bangladeshi marine fisherfolks against dual disturbances may guide other societies with similar contexts to recognize the challenges of their respective fishing communities, and help them to identify areas for urgent investments, not only to protect the fisherfolks from unprecedented global shocks, such as the COVID-19 pandemic, but also to build their resilience against the fast-changing climate [21].

CRedit authorship Contribution statement

Joy Bhowmik: Conceptualization, Methodology, Validation, Investigation, Writing – original draft, Formal analysis, Visualization **Samiya Ahmed Selim:** Funding acquisition, Project administration, Supervision, Writing – review & editing, **Haseeb Md. Irfanullah:** Conceptualization, Investigation, Writing - review & editing, **Jannat Sancharika Suchi:** Data curation, Formal analysis, **Rumana Sultana:** Methodology, Validation, Investigation, **Shaikh Giasuddin Ahmed:** Funding acquisition, Writing – review & editing, Project administration.

Declaration of Competing Interest

The authors declare that they do not have any competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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