



Multilevel Resilience of Fishing Communities of Coastal Bangladesh Against Covid-19 Pandemic and 65-Day Fishing Ban

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The unusual situation that arose due to the COVID-19 pandemic and the 65-day fishing ban (national policy to boost depleted fish stocks) affected the lower-income fishing communities in coastal Bangladesh. Shocks and stresses were posed, and community people adopted strategies to adapt to the changes. In the process of adaptation, social-ecological systems resilience at different levels plays a crucial role. Though resilience is acknowledged as multilevel feature, studies on the interaction between the levels while understanding communities' responses to shock and stress are limited. Thus, in this study, we explored the shocks and stresses the fishing community faced and their views on the resilience feature at different levels (i.e., individual, household, and community level) in coastal Bangladesh during the COVID-19 pandemic and 65-day fishing ban period. The study found that the most resilience promoting features (e.g., diversified livelihood, friendship, and network of supports) were adopted at the individual and household levels. However, positive and negative interactions were explored between resilience features at all levels. Low community-level resilience was not translated into a lack of household-level resilience, and strong individual-level resilience did not mean high household-level resilience. It was noted that the increased resilience of a particular individual or household could negatively affect community resilience. Resilience features showed inconsistent interactions within or among the three levels' resilience features. The study also revealed that multilevel resilience features stressed the importance of combining persistence (i.e., keeping fishing as the main livelihood) and adaptation process (e.g., livelihood diversification). The study showcases the importance of considering multilevel resilience that offers insight into crucial resilience factors which would not be evident if only one level were studied. The overall finding of this study will contribute to framing governance strategies to ensure sustainable coastal management even in the time of any abrupt or expected changes, such as the COVID-19 pandemic and the fishing ban policy.

Keywords: Bay of Bengal, multilevel resilience, shock and stress, small-scale fisheries, social-ecological system

INTRODUCTION

The marine fisheries sector constitutes a critical element of socio-economic support for the people in Bangladesh (Al Arif, 2017), as this country stands 12th in finfish production from marine and coastal aquaculture (FAO, 2020a). More than 17 million people work in the fisheries sector, comprising about 11% of Bangladesh's population and contributes 3.5% to the national GDP and 25.72% to the agricultural GDP (DoF, 2016, 2020). Marine fisheries thus play an essential role by providing support for food, poverty alleviation, and job creation in improving the trajectory of socio-economic conditions (Billah et al., 2018).

Small-scale fishers, an integral part of maritime fisheries, typically live in coastal communities and catch fish mainly using conventional techniques and facilities (Alam et al., 2021). They depend on knowledge passed on to their local communities through generations (Rahman, 2017). Small-scale fishing communities are regarded as one of the most vulnerable groups in the fishing industry unless the legal and institutional system allows adequate protection (Alam et al., 2021). Many drivers of changes, such as climate change, habitat alteration, and national policies, affect the livelihoods of the small-scale fishing community (Jentoft and Chuenpagdee, 2015; Berkes and Ross, 2016; Nayak and Berkes, 2019; Lazzari et al., 2021; Selim et al., 2021). Recent examples of such drivers of change in Bangladesh include the COVID-19 pandemic and the 65-day fishing ban — a national policy action to boost depleted fish stocks.

After the first confirmed COVID-19 case on March 7, 2020, the Government of Bangladesh deployed armed forces on March 24 to ensure social distancing and disease prevention and imposed a nationwide lockdown on all educational institutes, government and private offices, and industries from 26 March (Anwar et al., 2020). The rapid dissemination of the COVID-19 and its effects worldwide led to anxiety, uncertainty, concern, and fear (Ahorsu et al., 2020; Sultana and Alam, 2020). This unexpected situation dramatically affected lower-income people in developing countries like Bangladesh (Shammi et al., 2020). In coastal Bangladesh, fishing in the sea, fish farming and tourism are the primary economic activities (Ahmed et al., 2021). According to Sunny et al. (2021), small-scale marine fisheries, like other labor-intensive sectors, had also been affected by the pandemic. During the COVID-19 lockdown, fishing was restricted on the Bay of Bengal, and the market and the distribution system were interrupted due to restrictions on the movement (Sunny et al., 2021).

Amidst this crisis, a 65-day fishing ban on marine fishing was imposed from May 20 to July 23, 2020 (United News of Bangladesh, 2020). Ministry of Fisheries and Livestock of Bangladesh first applied such a fishing ban in 2015 through a gazette notification to ensure proper breeding of fish in the economic marine region as the marine ecosystem was facing pressure from overexploitation (Hussain, 2019; Islam et al., 2020b). Later, a writ petition was filed with the High Court questioning the validity of such a ban; the Court reaffirmed the order on May 15, 2017 (Hussain, 2019). Initially, the ban was on industrial trawlers and since 2019, the ban had been imposed on

all types of fishing in the Bay of Bengal to conserve spawning fish and crustacean species (Rahman et al., 2017; Islam et al., 2020b; Arafat et al., 2021). While Bangladesh is reportedly reaping the benefit of the fishing ban in terms of higher fish production, this restriction is also causing income loss and posing threats to the resilience of the small-scale fishing communities of coastal Bangladesh (Islam et al., 2020b).

Small-scale fisheries are considered as a social-ecological system (SES) that is understood as coevolutionary, integrated, and dynamic adaptive structures of social and ecological dimensions that continuously interact on varying scales (Ostrom, 2009; Blythe et al., 2014; Salgueiro-Otero and Ojea, 2020). In SES research, the concept of resilience is central to managing human-nature relations (Glaeser and Glaser, 2010). Commonly, resilience is defined as “*the ability to successfully deal with change, and it is a characteristic that can be applied to individuals, communities, states, ecosystems or linked SESs, tightly coupled systems of people and environment*” (Brown, 2015, p. 2). Resilience is also described in SES research as the ability to deal with shocks and stresses to maintain the same fundamental identity, structures, functions, and feedback (Walker et al., 2004; Folke, 2006) and the capacity to adapt or transform with changes that support human well-being against unexpected changes (Chapin et al., 2010; Biggs et al., 2015). In the present article, we view resilience through this SES lens. Shocks can be defined as sudden and sometimes unpredictable events, typically beyond the range of anticipated variability (e.g., income shock), and stresses (e.g., illegal fishing and fish scarcity) can be defined by continuous pressure (Turner et al., 2003; Marschke and Berkes, 2006).

In the “panarchy concept,” SES is described as a composition of nested levels and cross-scale interaction (Gunderson and Holling, 2002). Berkes and Ross (2016) used the panarchy concept to explain resilience and suggested that the relationship between the levels (i.e., individual, household, and community) is not homogenous; each level interacted more strongly with the adjacent one. However, vertical leaps can be directed from local to global, sidestepping other levels in certain situations, such as pandemics (Berkes and Ross, 2016). So, the interactions will influence the adaptation of different levels to the shocks and stresses caused by the changes (Leite et al., 2019), such as the COVID-19 pandemic and the 65-day fishing ban. In the present study, we will consider individual, household and community levels to understand resilience.

Previously, there have been several attempts to explore adaptation to changes (e.g., climatic stress, disasters, and new fishing rules) in small-scale fishing communities of coastal Bangladesh from a resilience point of view (Ahmed et al., 2013; Islam et al., 2014; Hasan and Nursey-Bray, 2018; Sharifuzzaman et al., 2018; Uddin et al., 2020). However, studies focusing on small-scale fishing communities through an SES lens are limited (exceptions Adams et al., 2018; Sharifuzzaman et al., 2018; Mozumder et al., 2019). In the study by Mozumder et al. (2019), for example, social resilience at the community level was explored qualitatively in the Gangetic river system of Bangladesh. Studying resilience from a single level neglects the resilience that other levels might have (Leite et al., 2019). The study by Buikstra et al. (2010) on Australian rural community explored

resilience at individual and community levels and identified eleven factors common to promote resilience at both levels. On the other hand, Leite et al. (2019) explored resilience at the individual, household, and community levels, and found resilience interacts at multiple levels in a south-eastern rural Brazilian fishing community. They reported dissimilarities in resilience features at different levels and demonstrated the need for empirical study in understanding SES resilience from multiple levels.

The main objective of this present study was to investigate the multilevel resilience of the small-scale fishing community of coastal Bangladesh at the individual, household, and community levels and their interactions under the shocks and stresses caused by the changes (i.e., the COVID-19 pandemic and the 65-day fishing ban). By doing so, we highlight the need for SES research to explicitly consider multilevel resilience to develop a richer understanding of inclusive, sustainable strategies for the small-scale fishing community's well-being. The specific research questions based on the above research objective were:

- a) What kinds of shock and stress were faced by the small-scale fishing communities of coastal Bangladesh due to the changes from the COVID-19 pandemic and the 65-day fishing ban?
- b) What were the main features of individual, household, and community level resilience among these fishing communities?
- c) How did these resilience features interact with each other at different levels?

CONCEPTUAL FRAMEWORK OF THE STUDY

The importance of interactions among different societal levels is well recognized and theorized in SES research (Gunderson and Holling, 2002; Berkes and Ross, 2016; Leite et al., 2019). Our study situates itself in line with these existing theories and builds on the understanding they established in SES resilience research through an empirical study on the small-scale fishing communities of coastal Bangladesh during the COVID-19 pandemic and the 65-day fishing ban.

The conceptual framework (Figure 1) used in this study attempts to capture multilevel resilience under the shocks and stresses posed by the changes (i.e., the COVID-19 pandemic and the 65-day fishing ban). Multilevel resilience includes individual, household, and community levels and differentiated features. These features are connected, disjunctive or neutral among different levels. Moreover, the resilience features in different levels mostly interact with the adjacent levels (Leite et al., 2019). However, in certain cases interaction bypassing the adjacent levels can also happen. We went through different literature across disciplines that captured individual, household or community level resilience to define resilience at different levels for the present study.

Individual resilience refers to the capacity (the ability to cope up) of a person to conquer challenges and trajectories

of a positive life while being subjected to adversities and difficulties (Luthar, 2006; Buikstra et al., 2010; Verger et al., 2021). In literature, individual resilience was often viewed from a psychological perspective (Buikstra et al., 2010; Berkes and Ross, 2013). According to Verger et al. (2021), important features of this level of resilience include skills to regulate oneself, flexibility and positive appraisal. In some domains, some individuals may show resilience, but they may not in others, thus, resilience features might show different challenges and capacities based on individuals' backgrounds (such as gender).

Household resilience, a less common term in the literature, is mainly limited to access to resources, food security, assets, public services, and social safety net (Alinovi et al., 2009, 2010; Anuradha et al., 2021; Melketo et al., 2021). For instance, Anuradha et al. (2021) analyzed household resilience based on social and human capital. While they mentioned two dimensions of human capital to understand resilience, namely, skills related to livelihood and economic activities and involvement with financial assets, noted three dimensions of social capital, namely inclusion in the network of support through bonding, bridging kinship ties with neighbors and relatives, and building trust among people from different gradients and power.

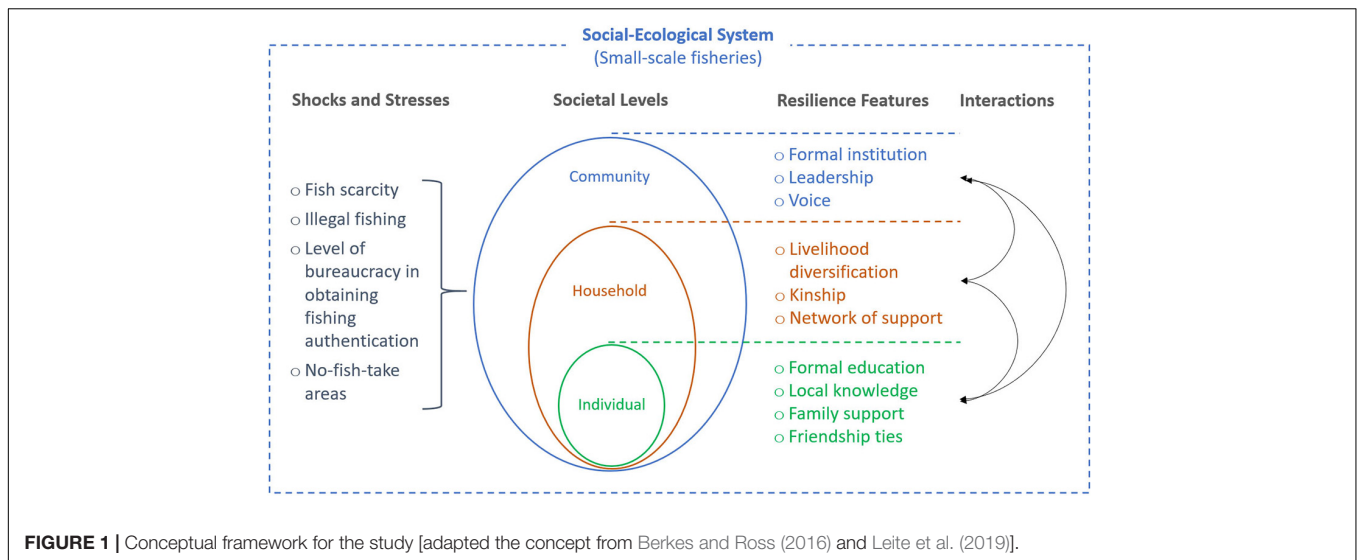
Community resilience can be defined as the “*existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise*” (Magis, 2010, p. 401). Community level resilience features include a well-functioning social justice system, social experience and memory sharing, involvement in shared responsibility, thinking collectively, inclusivity, social coordination, leadership (Robertson et al., 2021; Verger et al., 2021). Community resilience can be promoted by considering it as a process or as a state of becoming, but not looking at it straightforwardly (Robertson et al., 2021).

Through the components — that is, SES, small-scale fishing community, shock, stress, and multilevel resilience — of the conceptual framework, we explored how shocks and stresses affected the resilience features at different levels and how these levels were interacting with each other positively, negatively or neutrally.

METHODOLOGY

Study Area

The study was conducted in two coastal fishing communities of Bangladesh, which had a homogenous population and the majority of whom were small-scale fishers or had a livelihood that was dependent on fishing. These two communities were located in Moheshkhali upazila (sub-district) (21°28' to 21°46' north latitude; 91°51' to 91°59' east longitude) of Cox's Bazar district and Patharghata upazila (22°14' to 22°58' north latitude; 89°53' to 90°05' east longitude) of Barguna district. Both upazilas were under government-initiated COVID-19-related lockdown (March to May 2020) and a government-imposed 65-day fishing ban (May to July 2020) (United News of Bangladesh, 2020; Ahmed et al., 2021; Sunny et al., 2021).



Data Collection

The data were collected during July and August 2020. A total of 100 households were selected with support from Bangladesh Institute of Labour Studies (BILS) and Coastal Association for Social Transformation Trust (COAST Trust) — local NGOs primarily work in the coastal areas of Bangladesh and partners of Manusher Jonno Foundation (MJF). The households were selected using homogenous purposive sampling (Palinkas et al., 2015) based on their livelihood options (i.e., small-scale fishing). In-depth interview was selected as the most appropriate method to collect data in the light of the research objective and research questions and the complexity associated with the SES and the resilience of small-scale fisheries. The fishing community members were interviewed through mobile phones, which was the most suitable option for collecting information as physical access was restricted due to the COVID-19 pandemic (Campbell et al., 2021). The interviews were recorded on mobile phones. It was ensured that these households exclusively relied on fishing for their main income, and households of recreational or occasional fishers were excluded. Since the fishing households were the focus of the study, the interviews were conducted either with the fishermen themselves or their wives as we intended to collect information on different levels: individual, household, and community, within the fishing communities. One pilot interview was conducted from each site to check the understandability of the interview questions before finalizing them. Among 100 interviewees, 60 were men, and 40 were women; 44 of the interviewees were from Moheshkhali and 56 were from Patharghata. The in-depth interview questions were mainly focused on the shock and stress caused by the COVID-19 pandemic and 65-day fishing ban, adaptation responses, and resilience.

Data Analysis

The inductive content analysis method (Elo and Kyngäs, 2008; Kyngäs, 2020) was used to analyze the data related to

shocks, stresses and multilevel resilience features. The recorded telephone interviews were transcribed into text. The textual data were then interpreted and coded to elicit meaningful information over different themes addressing the components (i.e., shock, stress, and resilience) of the conceptual framework (Figure 1). In the preparation phase, the analysis units (i.e., shocks, stresses, and resilience levels) were selected and data were closely viewed to understand the overall scenario of the study sites and the communities. Later, in the organization phase, the actual analysis started. Texts were coded into emerging themes and then categorized to describe the themes.

The interactions between different resilience levels (i.e., individual, household, and community) were analyzed based on the conceptual framework (Figure 1). The transcribed texts were used to explore respondents' opinions on the different resilience features and interactions between the features. When respondents were talking about a single resilience feature, other resilience features often came up in groups, and they expressed the interaction by showing expressions, such as anger and sadness (negative interactions), happiness and a feeling of relief (positive interactions), and some features emerged as separate (neutral interactions). By analyzing this type of data, multilevel interactions were reported.

RESULTS

Shocks and Stresses

Respondents experienced many shocks and stresses during the COVID-19 pandemic and the 65-day fishing ban period. Although some of the stressors were not directly associated with fisheries (e.g., early marriage and dowry system), we only highlighted the shocks and stresses related to fishing.

Table 1 presents the shocks and stresses reported by the respondents, and the level that were mainly affected. Shocks and stresses usually did not affect a single level. For instance, shocks or stresses that impacted individuals were very likely to

affect respective households (e.g., the male fisher not having an identity card may influence his whole household). Besides, shocks and stresses that impacted most respondents were considered to affect the community.

The fishing ban is a regular event for the respondents, but in 2020, this event was different because of the COVID-19 pandemic posing additional shock and stress, such as fishing restriction before the actual ban and income shocks. In some cases, stresses turned into shocks (**Table 1**). The fishing restriction during the ban period, for example, was a stress to the respondents who expected not to fish from late May. However, the unexpected lockdown restricted them from fishing since the end of March. As a result, they faced reduced income as a shock. Similarly, some respondents were already in debt before the pandemic, and even when the fishing ban started, and they usually face debt as stress. But some were forced to take additional loans from money lenders, neighbors or relatives only due to the changes caused by the pandemic, and debt became a shock to them.

Almost all respondents (95%) reported that they did not go fishing during the restrictions, and thus they (88%) faced severe income shocks. However, the government usually provides relief to the fishers with a fishing identification card during the fishing ban period. Some fishers (15%) complained about difficulties and level of bureaucracy in receiving the fishing identification cards. Additionally, fishers (25%) with an identification card complained about unequal access to the relief materials.

Although the government had allocated 40 kg rice as relief per fisher, I did not receive it. I was at sea then, and my wife was also not at home. Moreover, they even do not give the rice to the female family members; they want us to be present. They sometimes give us relief later, if we fight for it. But we do not even get the time to fight for the relief – A fisher from Patharghata.

Moreover, at the study sites, households often include several generations of family members or if the parents are not alive, brothers live in the same household together with families, and often eat separately. Since the relief is only 40kg rice (staple food of Bangladesh) per month for a registered fisher family, a recipient family often are not willing to share it with other families in the same household. This resulting in a weak family bonding. A fisher's wife said *“My brother-in-law received the relief, but he did not share it with us nor with our children. I felt very helpless and did not want to continue relationship with his family.”*

Due to the COVID-19-related restrictions, most respondents faced difficulties in earning livelihoods. Fishing community members had very limited access to any other income-generating activities other than fishing and often they mentioned their limited skill for that. Some fishers who used to migrate to the nearby towns or big cities during the fishing bans failed to migrate and do labor works this time due to travel restrictions and lack of work options. Some fishers were engaged in labor work inside the study sites, but they also faced lower wage rates and limited work opportunities during the pandemic.

Some fishers preferred to fish in the nearby rivers when fishing was prohibited in the sea. A fisher's wife from Patharghata said, *“When my husband cannot go to the sea, he goes to the nearby river with a fishing net and catches fish. He can catch fish worth*

two to three hundred taka a day in this way.” Nevertheless, this kind of fishing activity was insufficient to address shocks and stresses. As a result, fishers and their wives were anxious and sometimes frustrated.

Although fishers restarted fishing after the fishing ban period in late July, they complained about not receiving the expected price. The reduction in the fish price was linked with less demand for fish, a lack of drivers and transporters to run the transport system, restrictions in long-distance or inter-district traveling. Moreover, some complained about the decreased amount of fish when lockdown and fishing ban were over and opined that it might be linked with illegal fishing by intruders or improper implementation of the ban rules and lockdown initiatives.

Multilevel Resilience Features

The respondents showed certain resilience features by adopting strategies and utilizing their capacities when abrupt changes caused diverse shocks and stresses. **Table 2** presents resilience features at individual, household and community levels, and **Table 3** shows challenges and capacities affecting individuals' resilience.

Individual Level

Different shocks and stresses influenced individual resilience features differently. Fishers experienced restrictions in fishing and fish scarcity, while fishers' wives experienced internal shocks and stresses, such as reduced meals and domestic violence from their partners, for example. The responses of fishers and fishers' wives to the adversities arose due to the changes caused by the pandemic and the fishing ban were: (1) using local knowledge to solve personal and household problems, (2) receiving support from family members, (3) seeking help from friends, and 4) seeking psychological counseling.

Respondents in the study areas adjusted meals during the crisis by minimizing fish consumption (the most consumed food after rice) and maximizing rice, lentil soup, and vegetables intake. In terms of using local knowledge, the respondents, especially women, knew where they could extract vegetables from without any cost, such as ponds or roadside vegetated areas. This local knowledge helped to increase mental resilience. Additionally, some were involved in homestead vegetables gardening.

Women were socially placed to adjust more to the changes because of the extra burden from household chores and found it challenging to arrange meals even in the normal pre pandemic times. As a result, women were under continuous pressure to manage meals while dealing with additional adversities.

We faced problems managing our regular meals. If we could manage our meal for one day, then we faced hardship for the other days – A fisher's wife from Moheshkhali.

Respondents with communication skills were able to address any changes (e.g., income shock) by communicating with organizations (e.g., local administration and NGOs) to solve the problem. Communication skills provided respondents with a feeling of having someone beside them to address shocks and stresses. However, during the fishing ban, fishers sometimes were forced to fish illegally to repay the loan installments from

TABLE 1 | Shocks and stresses mentioned by the respondents.

Shock and stress		Description	Main level affected		
			I	H	C
Shock	Fishing restriction*	Fishing was prohibited during the COVID-19-related lockdown and 65-day fishing ban			x
	Income reduction	Fishers' income reduced, and they experienced income shock		x	
	Fish market disruption	Fish market was disrupted due to the COVID-19-related restrictions			x
	Debt*	Fisher families borrowed money from relatives, neighbors, nearby shopkeepers, or NGOs. Respondents mentioned being in debt		x	
	Unequal access to relief*	Relief (e.g., rice) was not equally accessible to all the fishers		x	
	Reduced fish price	Fish price decreased due to the restriction in traveling and transportation			x
	Decreased amount of fish	In 2020, the amount of fish caught decreased after the fishing ban period. However, in 2019, it increased			x
Stress	Fishers' authenticity	Fishers need identification cards to get government relief during the fishing ban period. However, receiving this card needs paper works; thus, some fishers did not have that card	x		
	Illegal fish catch by intruders	Illegal fish catch by intruders from other countries during the fishing ban period			x
	Lack of skill	Fishers and their family members lack income-generating skills other than fishing. In most cases, they solely depend on fishing to earn a livelihood		x	
	Mental stress	Respondents faced frustration, anxiety, and reduced sleep due to the changes caused by the pandemic and fishing ban	x		

Cross signs (x) in the columns indicate the main level affected; I, individual; H, household; C, community. Stresses turned into shocks in the present scenario are marked with asterisk signs.

mohajan (a boat owner, also an informal money lender). Illegal fishing bypassing the law enforcement agencies created negative power dynamics and fear.

On the other hand, strong family bonding and supports helped fishers and their family members to remain resilient during a crisis. For example, a fisher's son lived abroad as a laborer. He used to send money to his fisher parents to reduce their pressure from searching for alternative livelihoods during the crisis. This kind of family support helped to increase the psychological resilience of the individuals.

Fishers' wives sought psychological counseling from relatives or neighbors as they faced domestic violence whenever fishers faced income shocks or the extra burden of managing household chores while fishers' were not at home (i.e., went for fishing or labor work). Nevertheless, friendship provided the fisher wives with a window to relieve stress. Additionally, many respondents relied on religion as a reprieve from the stress. Finding a more profound meaning or imagining that they were part of a grand plan gave them solace, which otherwise might simply have manifested as despair.

We were sad and tensed in that period. We prayed to Allah that if He has the will to take us to Him, then He takes us with our belief intact upon Him – A fisher's wife from Patharghata.

Household Level

Several responses were found at the household level that helped to address shocks and stresses: (1) seeking help from neighbors or relatives, (2) taking government aid allocated for the fishers, (3) using alternate income sources during the fishing ban, (4) food sharing practices with neighbors, (5) borrowing fixed interest loan from NGOs (micro-credit), (6) migrating to nearby towns and cities, and (7) selling household assets.

The average monthly household income in the study areas was approximately Bangladeshi Taka 12,000 (US\$ 1 = Taka 85), with a range of Taka 2,000 to Taka 25,000. Having an alternative source of income was vital in increasing household resilience by providing financial security during the crisis and helping fishers to invest time and money in fishing-related activities. Households involved in pond fish farming side by side regular sea fishing reported their ability to tackle shocks and stresses during the pandemic and the fishing-ban period. However, a

TABLE 2 | Multilevel resilience features as revealed by the study on fishing communities in Bangladesh.

Level of resilience	Resilience features	Description
Individual	Local Knowledge	Fishing community members knew adjusting dietary needs by maximizing extracted vegetable consumption under shocks and stresses
	Communication skill	Greater communication with community members and institutions helped overcome shocks and stresses
	Family support	Family support enhanced adaptability to the shocks and stresses posed by the pandemic and fishing ban
	Formal education	Community members with formal education were updated with the country situation (i.e., pandemic and fishing ban) through social media (e.g., Facebook)
	Psychological counseling	Respondents sought psychological counseling from their friends and relatives to relieve mental stress
	Friendship	Friendship with neighbors helped to borrow money during financial stress
Household	Livelihood diversification	Income-generating skills other than fishing, such as labor work, farming, and livestock rearing, ensured money flow
	Access to materialistic resources	Community members' access to ponds, farms and land provided financial security
	Relationship with informal money lenders	Receiving loans from <i>mohajan</i> (boat owner) or <i>dadon</i> (money lenders) provided financial support
	Women's role in income generation	Women engaged in income-generating activities (e.g., home farming, sewing, and cattle rearing) contributed to household expenditure
	Women's role in adjusting consumption	Women played a role in adjusting meals and other sorts of consumption (e.g., buying clothes) within households to limit expenses
	Network of support	Households received support from the person with same religion and/or relative or neighbors
	Access to fisher identification card	Fishers with identification cards only received government support during the fishing ban period
	Access to financial institutions	Community members' access to formal financial institutions (e.g., bank account and deposits)
Community	Kinships	Bonding with neighbors and relatives and food sharing practice provided food security
	Community cohesion	Networking with community members provided an opportunity to do collective works, such as shared fishing, pond farming, and agriculture
	Formal institution	Fishers involved with <i>Motsho Somiti</i> (fishers association) received advantages in solving local issues (i.e., lower wages)
	Leadership	Community members lacked leadership skills. Thus, they relied on government or NGOs' representatives to help
	Voice	Community members who had power (i.e., strong institutional connections and boat ownership) could only express their needs

householder could only enjoy such livelihood diversification if it was comparatively solvent to own a pond or to get it on lease and buy materials for aquaculture. The respondents unable to afford fish farming invested their time finding work as day labor (e.g., local construction work). Livelihood diversification depended on the household's income and saving as opined by the respondents.

Respondents with fisher identification cards received relief materials (e.g., rice) during the fishing-ban period. However, some (19%) of the respondents complained about the politicization and powerplay in relief distributions. Around 15% mentioned that they did not receive relief as either they did not

have cards or connections with the relief providing authorities. Fishers who somehow managed relief faced fewer difficulties in reducing the risk of livelihood loss than those who did not receive such aid. This issue intensified social stratification and loosened the kinship ties as not all managed to take advantage of aid distribution.

Households with access to financial or materialistic resources could respond to shocks and stresses quickly. Although only 9% of households had savings and one had a bank account, some respondents were involved in micro-credit schemes with local NGOs before the pandemic hit. Under normal circumstances

TABLE 3 | Challenges and capacities affecting individual resilience of the studied fishing communities of Bangladesh.

Challenge	Group	Capacity	Group
Restriction on fishing	Both men and women, especially men	Migrated in search of alternative livelihoods	Men
Fish scarcity	Both, especially men	Involvement in pond fish farming, labor work, and home-based farming	Both
Lack of alternative income sources/skills	Both	Received relief from the government	Men
Limited access to the financial institution	Both, especially women	Borrowed money from relatives, neighbors, and friends	Both, especially women
Increased domestic violence	Women	Friendship ties with neighbors	Women

with steady income, they could pay loan installments regularly, which had to stop during the lockdown and fishing ban. Concerned NGOs, however, paused installment collection after observing the fisherfolks' woes and following government instructions. Therefore, a significant portion of household expenses was reduced for a time being and the families could focus their expenditures on food, for example. According to the respondents, this good gesture by the NGOs garnered loyalty as well. Besides, the fishing community members also mentioned some other forms of materialistic resources, such as rice in their stock which they got from land they took lease earlier or had extra money from selling goats or chickens, supported them to pass the crisis period.

Women played a crucial role in household resilience. In the study areas, some women (15%) were involved in income-generating activities, such as homestead farming and sewing, contributed financially to household expenditure. Most women also rearranged expenditures, such as not buying new clothes, to cope with the shocks and stresses. Strong kinship ensured food security through food sharing practices between neighbors. Besides, respondents preferred to borrow money from neighbors or relatives as they found it quick and flexible to return the money.

I had to take a loan against interest in this (lockdown and fishing ban) period. I had taken loans from three persons this time. They are my neighbors. I will hopefully return their loans within the fishing season. I have taken time till the winter from them – A fisher from Patharghata.

Households included within a network of support increased their ability to respond to shocks and stresses. Such networks are mainly formed with relatives, neighbors, and people from the same religion. Some people from minority religions shared about exclusion from the support network as people (Muslims) who used to go to the mosque for prayers could share their problems with others there and receive support.

Community Level

Community level responses to shocks and stresses were the lowest, since most responses were adopted either by households

or individuals. Nevertheless, we found collective income-generating activities and involvement with formal institutions as the prominent community-level responses.

The majority of the respondents opined about differentiated engagement to respond to the pandemic and fishing ban-related changes. For instance, a group of fishers who did not own a boat and personal fishing equipment worked under a *mohajan* (boat owner) or a fishing company and earned a daily income percentage. Working under a *mohajan* helped fishers receive loans informally or receive necessary supplies, such as food for the households against a mortgage, before they leave for fishing in the Bay of Bengal. This support helped them to overcome the financial and food crises in short term. However, fishers often failed to bring profit to repay the support they already received. In this way, they became bound to work under that *mohajan* until the loan was returned, with very poor or sometimes no salary, even sometimes they are exploited and forced to do illegal fishing. This bonded laborship sometimes lasts across generations.

We cannot do any other work. We are bound to the boat owner, and we have to go to the boat every day. Moreover, we do not know any other work, but fishing. If we face a problem anytime, our owner helps us. If I want money from him, he gives me the amount I need. – A fisher from Patharghata.

Community level coordination among fishers was revealed as they shared information about the fishing grounds in the sea. However, they rarely shared information about good catch areas or government aids with community members other than friends and families. Additionally, wealthier fishers maintained community relationships by farming the pond fish or crops collaboratively. It helped to reduce the income shock they faced during the pandemic and the fishing ban.

Most of the fishers (95%) had no involvement with any fishers organization. However, some fishers (5%) talked about “*Jele Shomity*” or “*Motsho Shomity*” (fishers or fisheries association), where they bonded with other fishers in terms of protecting their rights with no financial activity. Fishers mentioned such association as a place to get a voice and gain knowledge.

When the respondents were asked to tell about where they sought help in the community to address shocks and stresses,

one fisher mentioned “*Who will help me? Are they my friends, relatives? No one helps.*” Some respondents could not get involved in a community network, and all of them either have no friends and kindships or good communication with organizations, such as local government institutions and NGOs.

Interactions Between Multilevel Resilience Features

In most cases, individual and household resilience features showed positive interactions (Figure 2). While respondents talked about the network of support, for example, they shared their personal friendship and kinship ties with neighbors and relatives. Whenever respondents need external support to respond to a shock or stress, they often sought support from these people. Another important positive interaction was seen between psychological counseling and women’s roles. Community and household levels resilience features mostly showed either negative or neutral interactions, except the positive interaction between livelihood diversification and community cohesion. According to the respondents, livelihood diversification, such as fish farming, were often done in collaboration with community members.

Respondents shared their feeling of social stratification while discussing the support system, especially the respondents from religious minorities. Moreover, the respondents’ relationships with informal money lenders (*mohajan or dadon*) were often seen as unfavorable to maintain community cohesion. Furthermore, this relationship negatively influenced their ability to raise their voice and often limit their access to formal institutions. Some respondents who did not have relatives or a favorable neighborhood, also talked about their challenge to enjoy community cohesion, indicating a negative interaction.

DISCUSSION

The findings of this study indicate that although resilience manifests itself differently at individual, household and community levels, there are some positive, negative and neutral interactions between resilience features at these levels. The boundaries between the three levels were difficult to identify as individual beings made households and households made the community. Nevertheless, previously it was reported that dealing with a single level might cause simplification of the diverse scenario (Leite et al., 2019). In this study, understanding resilience at three levels allowed a fuller understanding of the impacts of different drivers at different levels within small-scale fishing communities of Bangladesh.

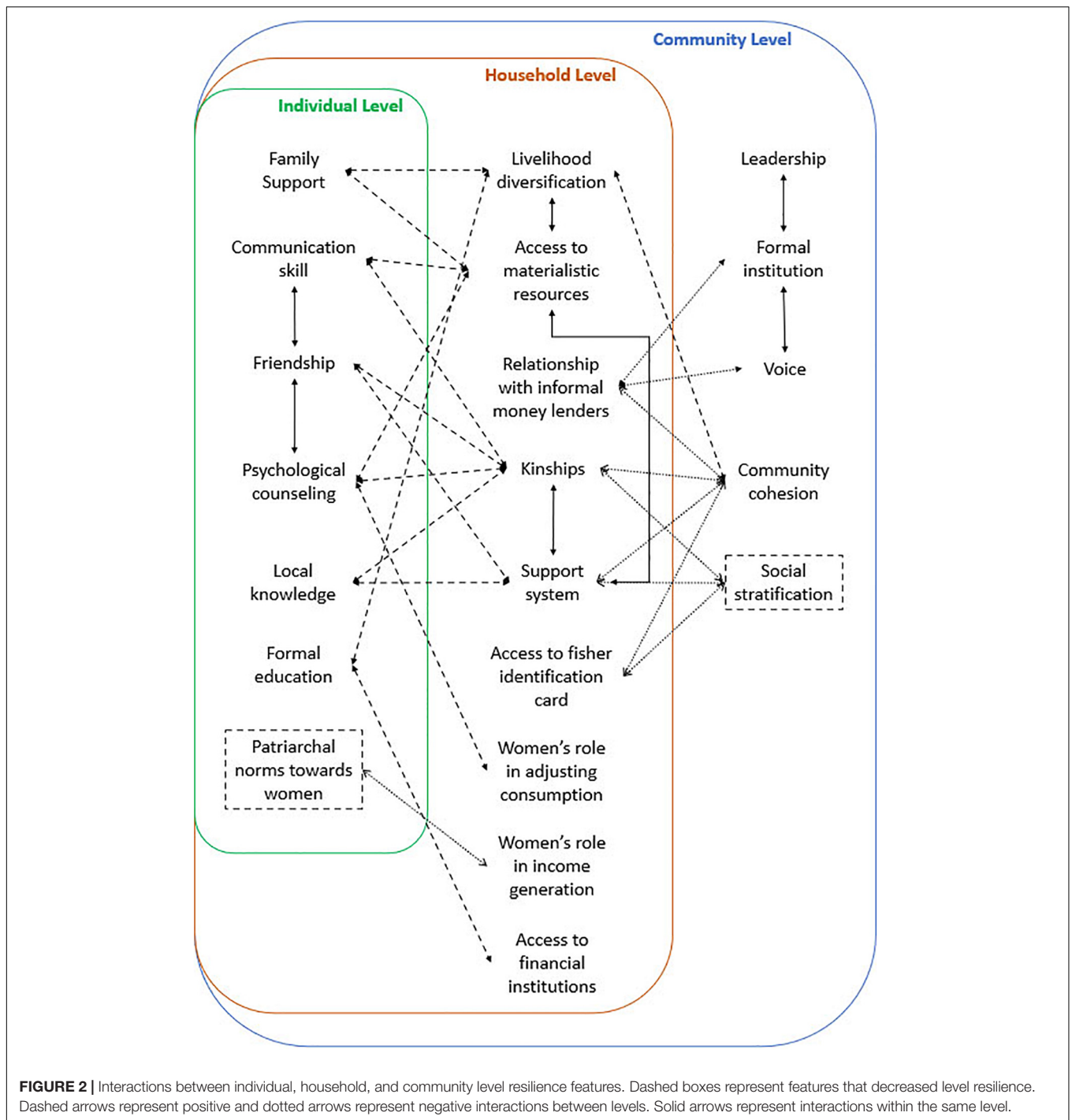
Some shocks and stresses, such as restriction on fishing and decreased fish catch affected the community as well as affected the households and individuals. Islam et al. (2016) explored several stresses experienced by the Bangladeshi fishing community due to fishing ban. These stresses include the improper implication of the baning, illegal fishing, inadequate amount of incentives, exclusion from the incentive program, a lack of alternative income sources, and limited financial support. Porras et al. (2017a), on the other hand, highlighted the technical inefficiencies, limited access to the banking system, lack of

safety protocols, limited access to the weather forecast, and a lack of communication skills as challenges. In line with these studies, we revealed how these stresses intensified and sometimes turned into shock. We further found disruption in the market and distribution system was a prominent shock identified by almost all the respondents. Bennett et al. (2020) also showed that economic stress resulting from market disturbances had further affected small-scale fishers’ ability to survive through ‘twin disasters’ of decreased demand and subsequent price collapse.

In our study, diversifying income sources were found as the most adapted resilience-promoting strategy. Men played a vital role in diversifying income-generating activities either by migrating to nearby towns or doing labor works. In some families, women were also involved in income-generating activities, and it positively influenced overall household resilience. In contrast to our findings, Campbell et al. (2021) found that three-fourth of the surveyed fishers of the Indonesian small-scale fishing community continued fishing without diversifying their income sources during the pandemic. However, the Indonesian fishers mentioned they had very few options to adapt alternative income sources, and thus they considered continuing only fishing as the right way to cope. The reason behind this divergence between the two Asian communities might be the 65-day fishing ban in Bangladesh. As Indonesian fishers dealt with one crisis, the Bangladesh fishers experienced the cascading impact of the pandemic-related lockdown and the fishing ban, and the situation forced the latter to choose diversified income sources. Further, households with severe economic stress were forced to sell off their assets, like livestock, which would grow in value over time. The short-term coping strategy helped these families to face the crisis but crippled their future options for diversifying livelihoods.

Some fisher respondents of our study, on the other hand, were unable to diversify income sources due to low income and a lack of credit to invest in alternative income-generating options. Islam et al. (2014) reported similar findings in Bangladeshi coastal fishing communities who mentioned economic and social barriers challenging livelihood diversification. At the present study sites, respondents also lacked access to financial institutions, such as banks, and formal education, exemplifying socio-economic barriers.

Choudhury et al. (2021) noted that the overall community system often constrains fishers’ capacity. Our findings stand in line with their conclusion as most of the fishers were in an unhealthy relationship with the informal money lenders, which adversely affected community cohesion and indicated a negative interaction between community and household level resilience features. Alam et al. (2021) mentioned another insight into this scenario: they reported small-scale fishers’ need to borrow money without collaterals as they were excluded from the formal banking sector and were with limited access to social safety nets. Our study revealed that some fisher family members received loans from NGOs before the pandemic hit and loan installment collection was suspended during the pandemic following the instruction by Microcredit Regulatory Authority, a government organization (Rahman and Reza, 2021). However, this initiative was not enough for the fishing community members to be self-sufficient and there was a need to borrow money informally.



Leite et al. (2019) revealed that support networks were mainly built on religious beliefs (church cycles) and family support, thus showing a negative interaction between individual and community levels. Our study found the networks occurred mainly through friendships with neighbors and kinship with relatives. We, however, also found the exclusion of some households from the network of support based on religious belief. This perhaps explains why the respondents mentioned

that no one helps if they are not relatives or friends and indicates a weakness in community cohesion. It marks an important negative interaction between individual, household, and community levels.

We found a positive interaction within a single level as respondents who engaged in formal institutions, such as fishers association, also mentioned their ability to voice and lead. However, the number of fishers involved in the association was

very low and previous studies on small-scale fishing communities of Bangladesh also revealed poor participation in management activities (Islam et al., 2014, 2020b; Alam et al., 2021; Choudhury et al., 2021). Berkes and Ross (2013) also demonstrated the need for a community agency and social organization to enhance community resources. Thus, a lack of or limited access to formal institutions in our study areas indicates inadequate community network support translated into a negative influence on overall community resilience. Nevertheless, the positive interactions found between friendship, kinship, and access to materialistic resources were showcased by respondents with greater network support from friends and relatives having greater access to financial and materialistic resources.

The Government of Bangladesh and its Department of Fisheries take initiatives like fishing ban for the benefit of the fisheries sector. However, small-scale fishers, who are impoverished, uneducated, and already in debt, are bearing the burden of these rules. Economic incentives are being provided to them in form of food (i.e., 40 kg rice) or alternative income-generating activities (Islam et al., 2016), but those are inadequate to compensate for the loss that takes place during the ban periods (Porrás et al., 2017b). Moreover, in the pandemic year, fishers tried to adapt to the combined stress from lockdown and ban with this limited available compensation package. Even this relief was only available to fishers with identification cards and access to this card was often complained of as politicized and power dependent. Mozumder et al. (2020) and Haque et al. (2021) also found that the majority of the fishing community members were excluded from the power share and decision-making process. Our study also indicated fishing communities' inability to voice for their rights, which is mostly linked with their limited access to any local-scale fishers-centered formal institution (e.g., fishers union).

Similarly, Mangubhai et al. (2021) showed that social inequity and power play made Indo-Fijian small-scale fishing communities vulnerable to economic stress posed by the COVID-19 pandemic. This issue also negatively influenced Bangladeshi fishing community's social capital as we found all the community members were not included in the compensation package and it not only became the reason for suffering or economic loss for the members who were excluded, but also decreased community cohesion. This results in a decreased overall community resilience by creating a social division between different groups, such as cardholders and non-cardholders, as the non-cardholders lacked access to aid during the 65-day fishing ban. This decreasing community resilience ultimately weakened the bridge between people from different power gradients and challenged the respondents' ability to adapt within the communities' capacity.

Previous studies (Dewhurst-Richman et al., 2016; Islam et al., 2016; Deb and Haque, 2017; Porrás et al., 2017b; Mozumder et al., 2020) indicated the need for effective implementation of regulations, providing incentives to encourage alternative livelihoods and income generation, and inclusion in the decision-making process to reform fisheries. Our study further adds that any national and local-scale measures will only be successful if it is inclusive and do not keep any space for social stratification through practicing biased networking, power or politics.

Moreover, receiving compensation by selective households may increase the resilience of those households, but will ultimately negatively influence the over community resilience.

Our study revealed resilience features at the household level showed higher variability than the features at the individual and community levels (**Figure 2**). The reason behind this may be household's intention to adapt to shocks and stresses within the household's ability, by keeping fishing as their primary occupation, as some of the community resilience features (i.e., social stratification) negatively influence household resilience. Moreover, positive interactions between household and individual resilience features indicate that at the present study sites, resilience promoting strategies are mainly adopted within these two levels, and still, community-level resilience lacks enabling features. Thus, there is a need to emphasize reducing the negative interactions to enhance community level resilience. Our findings indicated a combination of persistence and adaptation in the study areas. Although the studies by Islam et al. (2020a, 2021b) on the freshwater and brackishwater fishing communities of Bangladesh found transformative adaption, we did not find any such indication of transformation in our study areas. Respondents persisted in fishing activities and adopted adaptation measures as an alternative option to cope with the shocks and stresses posed by the pandemic and fishing ban. However, the next generation might not persist in this livelihood option as fisher parents now understand the importance of formal education, and about three-fourth of them opined of the next generations' enrollment in the formal educational institutions, although stresses often force fishing community members to take children out of school for child labor (Islam et al., 2021a). Nevertheless, a transformation might happen in the future in the present study areas, but currently, persistence and adaptation were found to allow resilience building against shocks and stresses.

RESEARCH IMPLICATIONS

Our study on the coastal fishing communities of Bangladesh under shock and stress posed by the COVID-19 pandemic and 65-day fishing ban underlined the need for unpacking resilience of the individual, household and community levels. This helps to minimize the fragmented analysis of SES resilience, ignoring the role of each social level and their interactions. We explored both positive and negative interactions between these levels. Lack of community resilience did not mean low household and individual resilience. Instead, householders with high resilience negatively affected the overall community resilience. Moreover, the resilience of some groups contributed to increased social stratification and differentiation, decreasing overall community cohesion. We revealed the parallel continuation of persistence and adaptation to allow resilience while responding to shocks and stresses.

Based on this understanding, we have identified three broad implications of our study. First, viewing resilience through a multilevel lens allowed us to focus on the above-mentioned essential aspects of SES resilience that would be missed, if only

one level were considered. However, resilience features can be changed with the emerging shocks and stresses. The COVID-19 is very likely not the last pandemic, and fishing communities might face new shocks and stresses from new changes in the environment, society, and policy in future and the fishing ban would continue in the coming years. Thus, future studies might consider understanding resilience at multilevel, including national context and external factors on a broader spatial scale, as the present study was limited to individual, household, and community levels of a small geographic extent.

Second, the findings of our study can help the policymakers to include a multilevel perspective in the SES resilience-building strategies to ensure the reduction of negative interactions between levels, and in this way, community resilience will be promoted, and households and individuals will be benefited equally. The other policy implication includes a need for a strong institutional and governance regime and transboundary cooperation to control intruders and illegal fishing during the ban and any kind of fishing restriction periods to make the fishing ban fruitful and to promote SES resilience. National policies and rules also need to make government-provided economic incentives inclusive and sufficient by keeping no space for social stratification. Fishing community members receive very limited or no support from private, non-government and government organizations to cope up with the pandemic (Hoque et al., 2021). Thus, compensation policy implementation needs to consider not only fishing bans, but also any other abrupt changes, such as the COVID-19 pandemic, that may pose shocks and stresses. Incentive distribution policies may involve fishers-led organizations together with the government entities to promote fair distribution avoiding powerplays as it leads to social division.

Third, from an implementation point of view, we suggest a number of adaptive management strategies for small-scale fishing communities. Strategies to increase equitable community access to financial institutions and the social safety nets are needed to help the fishers diversify their livelihoods and escape from the informal money-lending trap. Moreover, the present situation of the unhealthy relationship between fishers and *mohajan* needed to be brought under legal framework and documentation to ensure fishers rights and enhance community resilience. Low or no-interest loans should be provided to the fishers to support them buying own fishing equipment and generating alternative income sources, like small-scale farming and other jobs. These could also increase fishing communities' resilience in times of unpredictable economic shocks affecting local fisheries (Islam et al., 2016; Pomeroy et al., 2020). Collaborative income generation, such as collaborative small business initiatives, can be taken by NGOs to help build community resilience and reconnecting the loosening bond among the fishing community members. Actions should also be taken by private entities to introduce virtual platforms for the fishers to sell fish online when physical access is restricted or physical market space is disrupted. It will help to adapt to the unpredicted income shocks and build households resilience.

Training and counseling are necessary to enhance community members' psychological strength and individual resilience as

individuals constitute households and households constitute the community. Local-scale strategies should also be taken to help fishing community members practicing community coordination and build a strong community network among both male and female fishing community members that can help reduce the negative interaction among different social levels. As government initiatives are often documented as insufficient (Islam et al., 2016; Hoque et al., 2021), communities' skills should be developed with the help of government or private entities to help fishing community members remain resilient using communities' capacities and bonding.

Management strategies should include women empowerment programs as the present study showed less engagement of women in income-generating activities and a negative influence of individual resilience features (i.e., patriarchal norms) on this issue. Women are considered more vulnerable under shock and stress as their percentage is high in the informal workforce, and they often fail to access the financial and social protection offered by the management mechanisms (FAO, 2020b; Campbell et al., 2021). Capacity building initiatives are needed for women to be engaged in income generation and contribute to family income. Thus, the individual resilience among women will be increased by providing both psychological and financial strength and it will positively influence building household resilience.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

RS, HI, SS, JB, and SA designed the research. RS, JB, and SS developed the interview questions and data collection method. RS, JB, SR, and SA collected, managed, and analyzed data. RS and HI prepared the draft manuscript. All authors contributed to finalizing the manuscript.

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