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Institutional constraints to fishers resilience: community based fishery management in Bangladesh

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Abstract: Community based fishery management (CBFM) formulates various formal and informal institutions (developing community organizations, decision-making, and traditional fishing rules) for sustainable fishery management in Bangladesh. Although these rules are intended to managing fisheries for a long-term use, constraints to enforcing these rules or absence of mechanisms to address these constraints hamper fishers' resilience. This paper aims to examine such constraints to fishers' resilience in Langalkata Ozur Beel (local name of the fishery), Sunamganj, Bangladesh. Based on key informant interviews, this paper finds that non-participatory community based organizations and weak coordination among stakeholders appear to be enduring constraints to developing fishers' resilience. Fishers' resilience is largely constrained by power relations that mostly exclude fishers from the fishery management. Conflict between fishery users or with the community and the absence of interactive learning are also important constraints to fishers' resilience. It seems that rules-in-practice fail to develop fishers' capacity to cope and adapt to these constraints and continue their activities to maintaining the fishery.

Keywords: Community based fishery management, formal and informal institutions, institutional constraints, fishers' livelihood, and fishers' resilience

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I. Introduction

The fishing right of fishers in inland fisheries is not yet established in Bangladesh. More recent studies reveal that fishers' rights in inland fisheries is largely restricted by the conventional leasing procedures designed to handover inland fisheries to the top rent payers through an auction for a three-year period (Khan et al. 2016; Mamun et al. 2016). Such procedures allow well-off and powerful leaseholders to capture fisheries, and then to employ professional fishers for fishing (Thompson et al. 2003; Islam et al. 2014). Although the government has changed this policy to transfer the right of fishing to fishers associations since the 1980s, this attempt fails because powerful leaseholders tended to organize those associations and bear expenses to acquire fisheries (Thompson et al. 2003). The changes in the leasing procedure therefore fail to ascertain fishers' access to inland fisheries (Thompson et al. 2003). Fishers are usually recognized as professional fishers who are usually poor, landless and whose occupation is fishing; part-time fishers who possess some assets and occasionally catch fish for earnings and eating; and subsistence fishers who fish only for eating (Thompson et al. 2003). Community based fisheries management (CBFM) project-1 (1996–1999) devolves the right of fishing to fisher communities (Thompson et al. 2003). CBFM formulates new norms and institutions to build fishers capacity to manage fisheries and their livelihood (Sultana and Thompson 2010).

CBFM outlines various formal and informal institutions to promoting sustainable use of fisheries in Bangladesh (Thompson et al. 2003; Mamun et al. 2016). Formal institutions comprise the formation of community organizations and decision-making procedures set by the state-run entities such as the Department of Fisheries (DOF), Local Government and Engineering Department (LGED), and other local government administrative units (Thompson et al. 2003; Sultana and Thompson 2010). Informal institutions, in contrast, comprise unity among fishers, traditional fishing practices, relations of power, and social procedures for conflict mitigation in the management of a fishery (Thompson et al. 2003; Sultana and Thompson 2010). Collaborations between institutions – rules-in-use – relative to social-ecological settings can serve as a means to improve users' capacity to manage their resources for a long-term use (Becker and Ostrom 1995; McGinnis and Ostrom 2014).

The absence of such collaborations or lack of institutions often leads to difference and disarray between in-practice institutions in fisheries management (Allison et al. 2012; Bennett and Dearden 2014). They continue to sustain as the major constraints to an effective fishery management. These constraints include heterogeneous and hierarchical relationships between stakeholders (government officials, fishery management groups and committees, and individual fishers), unequal relations of power, lack of rules for conflict management, decreasing fish production, and slow recovery of the fishery (Thompson et al. 2003; Sultana and Thompson 2010). Such constraints limit fishers' access to fisheries and intensify the difference between stakeholders (Khan et al. 2016; Mamun et al. 2016).

In other words, many fishers are excluded from decision-making (Mamun et al. 2016) and powerful persons tend to capture the fishery (Khan et al. 2016). This paper mentions these constraints to implementing in-practice institutions as institutional constraints. Although many studies refer to these constraints (Allison et al. 2012; Bennett and Dearden 2014; Islam et al. 2014; Khan et al. 2016), a coherent analysis is still missing to understand how institutional constraints influence fishers' resilience¹ in a community based fishery management. It is also important to address these constraints to enhancing fishery and fishers' resilience in Bangladesh (Khan et al. 2016; Mamun et al. 2016). This paper, therefore, aims to examine such constraints to fishers' resilience in the context of Langalkata Ozur Beel.

2. Background

Institutions denote a set of rules designed to control human actions in making and enforcing decisions for better outcomes in a social ecological system (SES) (Ostrom 2011). Pahl-Wostl (2009), however, argues that disparity between institutions – formal and informal – leads to disturbances in natural resource management. While resilient institutions – enduring, flexible, and closely connected set of rules – are conducive to responding and adapting to social-ecological disturbances (Berkes et al. 2002), less resilient institutions – rigid, inflexible, and disconnected rules – are vulnerable to responding and adapting to such disturbances (Adger 2000). Resilience, in this paper, implies building capacity of an SES to cope and adapt to disturbances and maintaining similar functions (Berkes et al. 2002; Walker et al. 2004; Folke 2006; Folke et al. 2010; Anderies et al. 2013). Scholars cited in the parenthesis identify the basic components of resilience: adaptability refers to actors' capacity to building resilience in an SES; self-organization means building capacity of actors and institutions to reorganize at different stages of disturbances, and similarly emphasizing rights and responsibilities for outcomes in an SES; and transformation means building capacity to continuing the functions of an SES against disturbances, and replacing the current unsustainable SES with a new sustainable one.

According to the Institutional Analysis and Development (IAD) framework, interactions between three types of rules-in-use are hierarchically organized: operational choice rules suggest everyday decision-making and assigning roles

¹ Resilience indicates fishers' working capacity to endure and adapt to social-ecological disturbances and continues to perform their activities to manage the fishery. It also indicates fishers' capacity to make decisions at different levels of the disturbances and obtain their livelihood from the fishery. Resilience is partly determined by various rules and livelihood options that develop fishers' skills to alternate their plans and procedures to adapt to their disturbances and ensure their livelihood. Social disturbances include non-representation of fishers in community organizations, power relations, heterogeneity among fishers, lack of rules for managing conflict between fishers or with officials, and the absence of shared knowledge to manage the fishery. Ecological disturbances are decreasing fish production, damaging fish habitat, slow recovery of fishery ecosystem, and insufficient level of water in the fishery.

for individual or organizational actors determined by collective choice rules; collective choice rules suggest devising institutional settings recognized by the constitutional choice rules to implement operational choice rules; and constitutional choice rules suggest assigning person(s) to make decisions at both operational and collective choice levels. While interactions between rule levels can influence the outcomes in an SES (McGinnis and Ostrom 2014), formal constitutional choice rules (formal rules) usually deny informal constitutional choice rules (informal rules) in underdeveloped societies (Rahman et al. 2017). Long-practiced informal institutions of resource management also receive little or no attention to massive and imposed government policies in less developed countries (Ostrom 2009). It can be noted that government entities mostly influence rule-making and enforcing processes that often ignore socially and culturally developed local rules for resource management. According to Folke (2006), to develop institutions combining various views, motives, and learning arises as a lasting problem to developing stakeholders' adaptability and transformability in an SES.

Elinor Ostrom (2008) argues that institutional arrangements in common-pool resource management may not ensure resource users rights because the rich and powerful tend to manipulate the rules and resources. Conflicting institutions in fisheries management constrain fishers to adapt to their disturbances and transform their lives in many developing societies, mostly characterized by inequity, ambiguity, and irresponsibility (Ratner and Allison 2012). In such a problematic situation, contradictions between formal and informal institutions appear to be a significant drawback to managing fisheries, livelihood diversity and economic benefits (Jones et al. 2013; Bennett and Dearden 2014; Ho et al. 2015). Uneasy relations between institutions weaken mutuality and accountability between actors to integrate different views, frameworks, and uncertainties to adapt to social-ecological changes (Huntjens et al. 2012; Perret and Yuerlita 2014; Trimble and Berkes 2015). Diverse learning, perspectives, and practices may also interrupt the enforcement of institutions in SESs (Nayak et al. 2016). Such institutional settings constrain fishers to build their capacity to cope and adapt to their disturbances.

CBFM projects deploy diverse formal and informal institutions for fisheries management in Bangladesh, often reflect on inequity and conflict between stakeholders (Thompson et al. 2003; Sultana and Thompson 2010). Local power relations and incompetent leadership are mainly responsible for not building fishers' capacity to adapt to their threats and challenges (Mamun et al. 2016). Fishers exclusion from decision making, unequal distribution of benefits, scarce livelihood alternatives, subsistence-level earnings, and inadequate technical learning, as a whole, restrict fishers capacity to recover from social-ecological disturbances in Bangladesh (Mamun et al. 2016; Mazumder et al. 2016). Violating formal and informal fishing rules (e.g. over or unlawful harvesting) is another hurdle to managing fisheries (Perret and Yuerlita 2014; Nunan et al. 2015; Khan et al. 2016; Mazumder et al. 2016). The absence of incentives to support fishers during the lean period forces many fishers to overexploit the fisheries. Similarly, Khan et al. (2016) notice inconsistent leasing and harvesting rules allow powerful persons to capture fisheries as major challenges to fisheries management in Bangladesh.

Collaborations between government officials, local fishers, and community organizations to exploit the fishery often exclude fishers from management processes.

This paper conceptualizes institutional constraints as the outcomes of CBFM in Bangladesh through the resilience lens. It articulates major constraints in formulating and enforcing formal and informal institutions for inland fisheries management. It then outlines how these constraints structure fishers' capacity to respond these constraints and transform their lives. This paper addresses these constraints by exploring the connections between institutions at different stages of the fishery management.

3. Methods

This paper drew on key informant interviews to examine institutional constraints to fishers' resilience. It considered nine legal fishery users as key informants for their knowledge about the fishery. Key informants were purposefully selected – five from previous *Beel Beboharkari Songhoton* (Fishery Users Association) and four from *Motshozibi Somiti*² (Fishers' Cooperative Association). Four informants were members of both associations. The selection of these informants preceded twenty elementary discussions with fishery users – ten from fishery users association and others from fishers' cooperative. Informants supplied detailed information about their livelihood, socioeconomic, and ecological constraints in managing the fishery. Individual fishery users were considered the unit of analysis. Fieldwork spanned from November 2016 to February 2017. Interviews were conducted with the prior permission of the respondents. All interviews were recorded and transcribed during and after the field work using semi-structured and unstructured questionnaires. Each interview lasted nearly one hour.

This paper compiled comments, notes, and anecdotes of the fishery users in written forms. Secrecy of data and the identities of respondents were strictly maintained. None possessed access to confidential responses and data were discarded once the final report was compiled. Research questionnaires and collected data underwent constant revision and reformulation to ensure the suitability of questions and the quality of data. This paper attempted to connect main themes regarding institutional constraints and fishers' resilience into a logical framework. The main drawbacks of this method included selecting key informants, collecting rich data from heterogeneous interviewees, and referring results to other fisher communities based on a small number of informants.

4. Study area

Including a sanctuary and a grove, the study area, as shown in Figure 1, Langalkata Ozur Beel (size is 14.55 acres) is located in Niamatpur village under Gourarang Union, Sadar Upazila (a sub-district) of Sunamganj, Bangladesh.

² The fishery was leased to fishery users association from 2005 to 2015. It was then leased to fishers' cooperative in 2016 for three years.

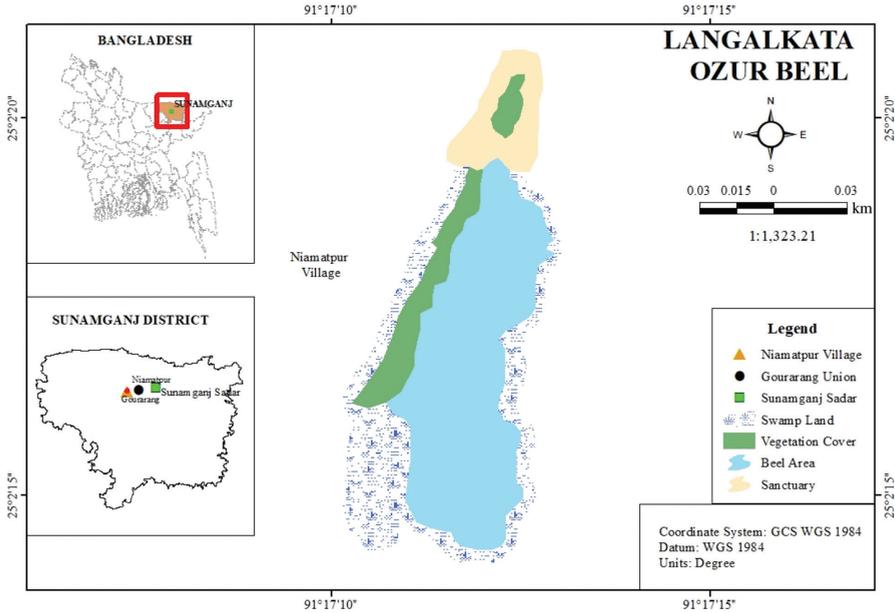


Figure 1: Study Area (Base Map Source: Arc Bangladesh Ltd.; Image Source: LP DAAC; Prepared By: Author).

The fishery and the sanctuary physically connect to a larger water body during the rainy monsoon season (May through October) when water level is high; however, they can be physically identifiable in the dry season (November through April) when water level recedes. While fishers foster fishes throughout the year, they usually harvest fishes during the dry season.

5. Results and discussion

5.1. Institutional constraints to the fishery management

To achieve resilience, CBFM deploys diversified institutions to enable fishers to cope and adapt to their challenges and threats to managing the fishery and their livelihood, often leading to conflicting situations where a few users run the fishery and take the most benefits.

5.1.1. Formation of community based organizations

CBFM devolves the right of fishing in inland fisheries to poor, landless traditional fishers living permanently around the fishery. The management of the fisheries requires the formation of a Beel (fishery) user group (BUG) – fishery users association – and a Beel management committee (BMC), a nine-member

decision-making body for two years. To manage fisheries, CBFM introduces various rules regarding organization of BUG and BMC meetings, conflict management, involvement of fishers in catching and selling fish, distribution of benefits, and conservation of sanctuaries. BMC is the formal body to enforce such rules. Formal rules force fishers to work together, while informal interactions between BUG and BMC members bring them closer to negotiate with other stakeholders and community members to administer the fishery. BMC is likely to encourage participatory decision-making in the management of a fishery.

In Langalkata Ozur Beel,³ CBFM approved a nine-member BMC out of a 29-member BUG from 2005 to 2014, and then HILIP (Haor Infrastructure and Livelihood Improvement Project), a concern of LGED, permitted the same BMC to operate the fishery for 2015. The fishery was thereafter excluded from the list of CBFM, and then local administration (Upazila Nirbahi (executive) Officer-UNO) leased it to a 25-member fisher's cooperative in 2016 for three years.⁴ In these cases, informants noticed the inclusion of better-off, non-professional fishers, and non-fishers in the BUG and BMC. In collaboration with government officials, locally organized better-off people unlawfully obtained the lease with fishers. In such situations, fishers experienced almost exclusion from the decision-making process and their desired benefits.

CBFM enforces formal rules for equal distribution of benefits and fishers' participation in decision-making. Fishers also consider participation in decision-making and an achievement of benefits from the fishery as their customary rights, while some BUG members tend to take the maximum benefits. Fishers' exclusion from their entitlements reveals that formal constitutional choice rules frequently ignore informal constitutional choice rules. It appears that CBFM's formal and fishers' informal rules for managing the fishery are quite different and contradictory. DOF and LGED officials often interfere with fishers' customary rules for managing the fishery. Government entities also fail to address such contradictions between CBFM's formal and fishers' informal constitutional choice rules for an effective fishery management. Fishers cannot participate in decision-making process to combat their livelihood and ecological uncertainties. A 50-year old member of both the previous and present committee shared his views:

³ According to community based resource management project (CBRMP) in Bangladesh, landless, poor fishers living permanently around the fishery were eligible to be members of Beel user group (BUG) for this fishery from 2005 to 2014. Later, HILIP, a concern of LGED, operated the same BUG in this fishery for 2015. Many fishers were in BUG and used to participate in Beel administration, although a dominant non-professional fisher and non-fisher group would control the fishery.

⁴ The local government now calls for open tender for the Beel under 20 acres. Upazila (a sub-district) Nirbahi (executive) Officer (UNO) has leased out the fishery to the poor fishers association the Motshozibi Somiti in 2016 for three years. Locally organized people in the name of poor fishers unlawfully obtain the lease by convincing local government bodies. Some fishers work for their benefactors with minimum benefit.

We were 29 members in *Beel Beboharkari Songhoton* (Fishery Users Association) and only 14 were fishers by profession. The rule is to select real fishers from the nearby locality to form BUG. The officers and even foreigners questioned us the inclusion of 15 non-fishers in this association. There were four/five fishers out of nine members in the BMC. Most non-fisher members had more than 2.5 acres of cultivable land. We (4/5 rich members) directly or indirectly controlled BUG and BMC because we spent money and negotiated with the authorities to acquire the fishery by competing with other groups. We (non-fisher members) organized the BUG and BMC to take benefits for our efforts and personal investment. He argued that fishers would get nothing from the fishery as thieves would consume all fishes. We are now managing *Motshozibi Somiti* (Fisher's Cooperative) by our own people. There are 25 members in the association and most of them are from five distant villages. We persuaded officers, powerful persons and spent money to get the fishery again. We must take back the invested money, leasing value, other costs and profits for our investment first, and then we can distribute the rest of the money to other members. (Interviewed on 5th of January, 2017)

Fishers who lack opportunities to take part in decision-making and receive due benefits may be constrained to develop skills to manage the fishery and their livelihood. CBFM is, therefore, unlikely to develop fishers' capacity to respond to their social-ecological disturbances.

Informants perceived an unfair, irresponsible, and inflexible leadership undermined their participation in decision-making and rights from the fishery. In the decision-making process, fishers had participation in BMC during the CBFM project period whereas new leaders (rich, powerful non-fisher) of fishers' cooperative tended to consolidate their power and benefits one-sidedly. Fishers could not exercise their collective choices for electing leadership in both cases. Formal rules for electing leadership through voting were completely bypassed. Such unaccountable leadership resulted in inequitable distribution of benefits and conflict between fishery users. While fishers were only entitled to administer the fishery, better-off had the leading role in decision-making and organizing BUG and BMC meetings. Sometimes BMC leaders exposed personal clashes in making decisions. They consistently maintained good relations with government officials. Leaders in some way tried to sidestep fishers' collective decisions and capitalize their benefits. They failed to represent the fishers' community. Another 47-year old member of the previous and present committee shared his views:

We know it is our right to control the fishery. Only fishers are eligible to be members of BUG. But it is not possible for us to get the lease without the help of rich and powerful persons. Every group competing for the lease includes some rich and powerful members. These members, in fact, control the fishery. They want everything from the fishery and do not want to follow any rules. They make all decisions. We feel that all should have equal participation in the decision-making. But we can't give our choices in decision-making or electing leadership.

We wanted to elect our own committee, but we failed. Although the rule is to distribute benefits equally, leaders take the maximum benefits. They manage government officials. In all regards our choices are ignored. For this type of leadership we are not benefiting from the fishery. CBFM gave us some benefits but now we get almost nothing. Now we have almost no participation in decision-making and distribution of benefits. (Interviewed on 2nd of February 2017)

Although fishers are legally recognized to manage the fishery, rich and non-fisher members mostly control it to exploit resources. Fishers' collective decisions are fully neglected in the fishery management that results in the consolidation of power and benefits to a few.

5.1.2. Coordination

Coordination between actors and stakeholders to implement rules may improve the outcomes of co-management; in particular, similar and active responses from all sides to address social-ecological issues facilitate better outcomes. Informants informed that co-management facilitated the arrangements of community organizations (BUG, BMC) and enforcement of various rules for managing Langalkata Ozur Beel, but it failed to develop fishers' skills in coordinating newly built organizations to develop strategies and steps for managing the fishery. Fishers' conflicting relations with DOF and LGED officials, BMC, other fishers, and local interest groups adversely influenced their capacity to coordinate. Notably, the failure to coordinate government offices was a setback to building capacity of the community organizations for an effective management. The 53-year old president of the fishers' cooperative association explained:

We formed BUG and BMC to get the lease. No respective authorities or persons (DOF and UNO offices or responsible officers) helped us maintain the fishery. No officer or leaseholder wants to follow rules but expects a benefit. We sought help from DOF officials at different times to learn how to increase fish production and unity among BUG members, but they did not help us. Officials just made their routine visits in the fishery, but they were reluctant to assist us without benefits. We had a distance with officials. We also have problems in our BUG. Some people from the community also disturb us. It is hard for fishers to get and manage the fishery. I personally managed the money for rent and other expenses, communicated with offices and prepared documents to drop the tender. I did everything for acquiring the Beel. The whole process is very tough and expensive and poor fishers are not able to obtain it. So, it is not possible to maintain rules and regulations from leasing to harvesting. Somehow we have to make a profit from the fishery. Fishers cannot manage it because other greedy community members will exploit all fishes. (Interviewed on 15th of January, 2017)

Loose coordination among fishers and organizations (BUG, BMC, and government offices) serves as a constraint to implement formal and informal rules for

managing the fishery. While fishers lack skills to coordinate between actors and rules, some of them plan to profit from the fishery ignoring formal and informal organizing bodies.

Lack of coordination between actors and actions worked as a constraint to managing the fishery. Some BMC members showed a tendency to manage government officials and violate rules in many ways that personally benefit them. In other words, formal constitutional choice rules did not acknowledge informal constitutional choice rules. Fishers association (previous fishery users association or present fishers' cooperative) failed to develop as a community organization to coordinate between diverse rules and actors in managing the fishery. Another 50-aged member of both associations stated:

We needed help in organizing and running committees. There are many rules to manage the fishery. We also have some traditional rules to cultivate and catch fish. We patrolled the fishery, used tree branches and bamboos and feeders (husk) to grow fish, caught and sold fishes periodically. DOF official denied our practices and advised us to use nutritious feeds and lime and fertilizer to keep the fishery clean and suitable for growing fish. There is a distance between formal and local rules. We try to bridge the gap between us. Still some distance remains. Some members have good relations with government officials. They try to benefit from the fishery and share a portion with them. Fishers don't get their benefits. It's a clear violation of distribution rules. Basically, rules are written in the paper, but not in practice. BUG and BMC are captured by some powerful members or their people. (Interviewed on 5th of January, 2017)

When formal and informal constitutional choice rules fail to recognize each other in the fishery management, it is hardly possible for fishers to coordinate between actors and actions for better outcomes.

5.1.3. Relations of power

The power in social relationships endows individuals with better social position that underpins their control over rules and resources. Power relations within the BUG or with community members often pose challenges to fisheries management. It is obvious that control over resources posits some people in a better social position that allows them to influence rules and benefit from them compared to others. In managing a fishery characterized by hierarchical relationships, some tend to take most benefits to the extent of others. Like other common resources, better-off and powerful non-professional fishers penetrate into the BUG and tend to capture the benefits in Langalkata Ozur Beel. They play the leading role in managing the fishery while all members have equal rights in the fishery. A 40-year old professional fisher of the fishers' cooperative explained:

Our rich neighbors include us in the association to maintain the Beel. They help us in many ways (financial, sharecropping or renting cultivable land). We

work in the Beel, nurture it, guard it and harvest fish. We get some benefits, but they receive the most. We are members but we are not decision makers. They are all in all. They consume the earnings. They always concern about their benefits. We are poor and our situation is not changing. Our income is not increasing. Everyone supports them to manage the fishery. (Interviewed on 2nd of February, 2017)

Hierarchical relationships restrain fishers to practice rules independently; hence, they receive the minimum benefit from the fishery. The lack of control over rules and resources weaken their capacity to fight against the obstacles to their resilience.

Fishers cultivate and catch fishes but they are deprived of their profits. While existing rules only permit fishers to manage the fishery, powerful members from the community also try to control the fishery. They tend to interfere with the decision-making. Fishers often fail to perform their roles to implement rules. Since many fishers depend on the rich for many purposes, it is challenging for them to ignore socio-political pressure from powerful community members in managing the fishery. They have already developed uneasy relations with many community members. Unequal relations of power need to be reversed for a sustainable management of the fishery. Formal constitutional choice rules are not recognized by informal constitutional choice rules. The 47-aged member of both associations informed:

We know we are only entitled to use the fishery legally. We try to manage the fishery within rules and regulations. It is very difficult to manage the fishery without negotiating with influential community members. They want benefits. They indirectly want to control our fishery. It is difficult for us to ignore them because we often seek their assistance on different purposes. We cannot freely administer the fishery. These hierarchical relations constrain us to implement rules for better outcomes. We, in fact, face hard time to run the fishery. (Interviewed on 5th of January, 2017)

The denial of fishers' rights by powerful persons is likely to constrain fishers to implement rules for managing the fishery.

5.1.4. Threats and conflicts management

Conflict is intrinsically embedded in the formation of association and committee for managing fisheries; the failure to mitigate conflicts complicates fishers' access to the fishery. Conflicts usually arise when disagreement exists between BUG or BMC members over decisions and powerful community members tend to plunder resources from the fishery. Conflict between BMC and fishers to make decisions and distribute profits was visible in the Langalkata Ozur Beel. Fishers encountered troubles to be members of the BUG and BMC. Powerful community members or groups (landowners or previous leaseholders) also attempted to capture the fishery. Conflict between fishers or with the community limited the success

of CBFM. Such situation indicated the disjuncture between formal and informal constitutional choice rules. A 47-year old member of previous and present committee explained the causes and consequences of conflicts:

Conflicts arise because of illegal fishing, blocking part of the Beel, bordering the cultivable land, committee formation, distribution of benefits and interference from the larger community. CBFM united us to minimize disagreements by discussion and prevent external interruption in the fisheries. We have contradictions in selecting members for committee, distributing benefits, and developing the Beel. Sometimes BUG or BMC members fail to make unanimous decisions on reforming committees, addressing issues with other members or community members, catching and selling fishes and distributing benefits. We often face a situation: either people excluding BUG members from the locality try to catch fishes, or they form a false BUG with non-fisher members to occupy the fishery. They caught fishes from the fishery at least twice and tried to displace us from the fishery several times in the last few months. We mostly try to solve the problem socially. If we fail then we seek help from law enforcing agencies to solve conflicts. Sometimes the situation goes beyond our ability to manage conflicts. (Interviewed on 2nd of February 2017)

Conflict diverts fishers' attention from developing the fishery to protecting the fishery.

5.1.5. Shared learning

Perhaps, the failure of the co-management is attributable to the absence of shared environmental learning. Both scientific and local knowledge may be used to increase fish production and fishery's capacity for long-term use, but indiscriminate harvest of fish resources may deteriorate both earnings and ecology. While CBFM introduces various rules from cultivating fishes to maintaining sanctuaries to increase fish production, fishers chiefly use their own ideas and knowledge to manage the fishery. Fishers lack of knowledge on planting trees in the fishery, smearing small fishes, maintaining a nutrient ecosystem, conserving the sanctuary, and developing mutuality between fishers to protect the fishery. Inadequate technical learning is, therefore, likely to decrease their revenue from the fishery. The output of the fishery and fish variety is also adversely affected by fishers' reluctance to digging and connecting different parts of the fishery and fostering sanctuaries. Formal constitutional choice rules of CBFM and informal constitutional rules (traditional fishing rules) of fishers are different, and they hardly acknowledge each other. A 47-year old member of both associations described:

DOF and LGED officials advised us to take initiatives to plant trees, to give food to the fishes, to release small fishes, and to build up cooperation between us to save the sanctuary. CBFM helped us plant trees but members have a tendency to earn profits without investing. Also, there is no government fund for development. Similarly, current fishers' cooperative association members do

not want to spend any money for developing the Beel. We only put bamboos and branches of trees in the Beel to increase the amount of fish. Members want benefits. They do not even want to preserve the sanctuary for more profits. Sometimes we catch fishes from the sanctuary because of low earnings and insufficient water level. Sometimes, water level drops to 2/3 feet (for inadequate rainfall or inundation) which is not suitable for maintaining the habitat for fishes. But fishers are reluctant to excavate different sections of the Beel and the sanctuary for extra costs and uncertainty over the tenancy. So fish production and our income are on the decline. We could make around 25/30 thousand BDT per year earlier but now we may earn only 10/12 thousand BDT. (Interviewed on 5th of January, 2017)

The absence of mechanism to combine formal and informal fishing rules often leads to a decline in fish production. Similarly, over-profiting through overharvesting slowly turns out a fishery into a resource scarce unit of production.

5.2. Barriers to fishers' resilience

Fishers' resilience refers to developing their capacity to respond to social-ecological disturbances and performing the same functions for managing the fishery. The factors that affect institutional diversity also have simultaneous effects on fishers' resilience; in other words, challenges in the enforcement of institutions often constrain fishers to develop their resilience.

5.2.1. Adaptive capacity

CBFM introduces various rules to enhancing fish production and fishers' livelihood. The success of in-practice rules mostly depends on their capacity to cope and adapt to fishers' social-ecological disturbances. The flexible and consistent rules relative to disturbances are likely to improve fishers' capacity to address these disturbances. The informants, however, reported to their incapacity to address such disturbances. They felt isolated from these rules. There was also a rupture between formal and informal rules to manage the fishery. Some BMC and BUG members had comprehensive control over these rules. They tended to implement these rules in ways that benefited them. Such inflexible, incoherent rules basically excluded fishers from fishery management. A 50-aged member of both associations described:

Fish production in the fishery was decreasing. We could not understand why fish production decreased. Sometimes low water level in the fishery and sanctuary because of drought or insufficient rainfall hampered fish production. We would drain water from adjacent large water bodies. We used to smear fishes and give extra feed, mostly husk. Fishes were not growing well. We had no knowledge of how to grow fish and keep the fishery productive. We asked DOF and LGED officials to assist us to recover from this situation. They instructed us how to solve this problem, but did not give us any training.

People from the community caught fish several times from the fishery. They tended to catch fish during the dry season when we harvest. Some greedy BUG members or community people caught fish many times even from the sanctuary. Fish production was still declining. We could not recover it. We only relied on Nature. Although many of us depended on the fishery for our survival, we failed to address these problems. We could not develop our own capacity to deal with these issues. We failed to unite all members, manage conflict between fishers or with the community, maintain the sanctuary, motivate DOF and LGED officials to help manage the fishery, and attain training on cultivating fish. It was difficult for us to increase fish production and maintain our livelihood. A few BMC members exploited the fishery. They were completely motivated to increase their profit, not maintaining the rules to develop the fishery. (Interviewed on 5th of January, 2017)

The constraints to enforcing rules withheld fishers' capacity to adapt to their social-ecological disturbances in managing the fishery.

Fishers' adaptive capacity can be partly constrained by their livelihood insecurity from the fishery. Informants reported their unequal rights and access to the fishery. The same fisher explained further:

Our income from the fishery is uncertain. We get an amount. It is not sufficient to maintain life. Some members take the profit and it is beyond our capacity to get our benefits. Because of unequal distribution we usually get a nominal amount from the fishery. Uncertainties over income make our survival critical and de-motivate us to develop the fishery. (Interviewed on 5th of January, 2017)

Livelihood insecurity is certainly a barrier to fishers' resilience.

5.2.2. Reorganizing capacity

Fishers' resilience is also associated with the capacity of fishers and in-practice rules to take various steps at different stages of disturbances. When fish production decreases in the fishery or people from the community disturb to harvest fish, fishers need to devise strategies to resolve these issues. Flexible and need-based rules have vital roles in coping with changes. It is imperative to protect fishers' rights and ensure their responsibilities to improve the resilience of a fishery. Informants identified the factors that restricted their capacity to reorganize. A 47-years old member of both associations elucidated:

We have troubles to manage the fishery. We try to solve the problems. When fish production decreased, we could not understand what steps should be taken. We contacted DOF and LGED officials. Fish production steadily decreased. No coordination existed between fishers, officials, and BMC to recover from these problems. BMC did not call meetings or discuss this problem with us. We could not persuade DOF officials to examine the reasons for

declining fish production. It was necessary to dig the sanctuary but members did not agree. Fish cannot grow in a shallow and small area in the dry season. Community members tried to catch fish from the fishery. Community leaders also tried to take the control of the fishery. We failed to solve this problem socially. Local administration did not help us. We had an unwritten pact with community leaders to sell fish to them at a lower price to stop illegal fishing. BMC members maintained a visible distance from other members. There was not solid integration between us to implement rules to manage the fishery. Our rights to make and implement decisions as well as equal benefits were not established. We failed to maintain this fish habitat for a long-term use. This small fishery failed to recover from its ecological problems. (Interviewed on 2nd of February 2017)

The failure to reorganize rules and decisions to address disturbances often constrains fishers' and fishery's resilience.

5.2.3. Transformative capacity

Fishers' resilience can be determined by diverse, variable, flexible, and redundant rules and livelihood options. Shared learning to develop their capacity to adapt to disturbances can also enhance their resilience. CBFM puts various rules in use to transform fishers' skills and knowledge to alternate their plans and procedures to adapt to their disturbances and maintain livelihood. The informants, however, identified some factors that restricted their transformative capacity to achieve resilience.

5.2.3.1. Scarce redundancy

Perhaps, the lack of redundancy poses a fundamental barrier to fishers' resilience. Many fishers consider income from the fishery as their main source of livelihood, but the income is usually insufficient or uncertain to sustain their lives. Informants told that most fishers have no other sources of income. Some fishers managed to work as day laborer, agricultural worker, and rickshaw puller. The absence of livelihood diversity constrained fishers' resilience in the region. A 38-year old member of the fishers' cooperative highlighted:

Our main source of income is the fishery from which we earn yearly BDT 10–12 thousand. Basically, we have no other sources of income. It is hard for us to live within this income. We are entitled to receive equal benefit from the fishery. Members who are rich and whose position is good get more benefits. They helped us to get the fishery and also took the maximum benefits. Our small earning is not sufficient to change our condition. We need to earn more to maintain our lives. Most of us have no cultivable land or family properties. Some work as labors in the fishery during the harvest while others work as laborers in agricultural and informal sectors. The opportunities to earn from other sources are very limited in our area. (Interviewed on 15th of February, 2017)

Fishers who have other sources of income are likely to be more resilient than others who lack alternatives to earn. The additional options to earn can allow fishers to alternate their livelihood in case of the loss or failure of any option(s).

5.2.3.2. *Vested interest groups*

Locally powerful persons or groups in some ways (using their social or political connections) try to attain the fishery. Powerful leaseholders mobilize fishers to form fishery user group or committee to take benefits. A 45-year old informant of fishers' cooperative elucidated:

The president of the Fishers' Cooperative hired us to show that there are fishers in the BUG. We formed BUG and BMC to run the fishery. We made him president of the BMC. It is true that we cannot get the fishery because we have no money and connection with government officials. Now we look after the fishery and catch fishes for our financiers. We are also in the committee to support the president. The officers also support him. Local leaders try to capture the Beel. We work hard but obtain a little portion of the benefit. Again, it is not possible for us to possess the fishery. Although it is our own right to get access to the fishery, other non-eligible people take the fishery. We have no opportunities to get the fishery. (Interviewed on 26th of February, 2017)

Although poor fishers are allowed to receive the lease of the fishery, they surrender their right to other influential members. They are literally excluded from the fishery that resists their socioeconomic transformation. A full autonomy, in this context, is required to change their situation.

5.2.3.3. *Heterogeneity of fishers*

The heterogeneity of fishers (from different villages) acts as a challenge to keep their access to fishery. Non-professional or non-fisher members control the association to profit from the fishery. The disunity between fishery users facilitates their accumulation of economic values from the fishery. Cultural difference in terms of diverse learning, perspectives, and practices may interrupt the execution of procedures to maintain common resources. Fishers fail to act collectively to establish their rights in the fishery. A 45-year old interviewee of fishers' cooperative supported the process:

The 25 members of the Fishers' Cooperative are enlisted from five different villages. The fishery is located in our village. Powerful persons recruit their own people in the committee so that they can easily manage the Beel. They intend to take out their benefits. They need a committee to operate the fishery. The whole committee rarely meets together. Therefore, no familiarity and unity develops among members because they are from different social settings. It is not possible for us to work as a unit because our thinking, ideas, and decisions are different. So we work for our patrons. Patrons also take this opportunity to amass benefit. We have no capacity to manage officers and

leaders. It is difficult for us to protect the Beel from grabbers. (Interviewed on 26th of February, 2017)

Powerful leaseholders often form an association collecting fishers from different villages to take the lease of the fishery. They consider the diversity among fishers as a means to manage the fishery without any disturbances. Fishers from different social settings fail to form a unity to obtain their rights. Leaseholders rather exploit the fishery at an ease.

5.2.3.4. *Discontinuity and inconsistency in leasing*

The short-term leasing may discourage leaseholders to develop the fishery. They rather tend to overexploit the fishery. A 50-year old member of the both association articulated:

We thought about the development of the fishery. The condition of the fishery was changing but suddenly lease was cancelled. We stopped development activities and members harmed the fishery in the last year of the lease. Now our lease is for three years. We need to earn from the fishery. In the end, we intend to make more profits. Overharvesting is a very common matter in the fishery. (Interviewed on 5th of January, 2017)

Short-term lease and insecurity to continue the lease provoke leaseholders to make quick profit. The tenants feel averse to improve productivity of the fishery. They live in a dilemma to invest in the fishery – it damages both ecology of fishery and financial security of fishers.

Inconsistencies in leasing and harvesting continue to exist as a recurrent problem of fishers' resilience. Leasing procedures evoke a depressing history of over exploitation of fisheries and discrimination of fishers. Nonprofessional or non-fisher members tend to capture the fishery officially or illegally at a lower fee in association with socially and politically powerful persons and government officials. The procedures continue to remain the same. The vested group overharvests fisheries to maximize their profits instead of conserving them. Many fishers work as a proxy for their renters. A 45-year old member of fishery users association described the leasing procedure:

The rule says that the fishers who are really dependent on fishing may be members of the association and they are eligible to apply for a lease. But the leasing procedure is competitive as many groups apply. We maintained the Beel for ten years (2005–2015) under CBRMP. We sincerely worked to improve the production of fish. We hoped to get the lease for continuous development. It is not possible to improve productivity in a short term. But we failed. Some members from our association conspired with us so that it goes to tender and we lose it. They helped new leaseholders to get the lease. HILIP official intentionally reported against us to cancel the lease. Some rich people achieved the Beel (Interviewed on 15th of January, 2017).

Leasing for a long time may encourage fishers to improve the productivity of the fishery, but non-fisher and rich people take out the lease for their quick benefit. A 40-year old member from Fishers' Cooperative also certified the above statement:

Since 2016 the UNO controls the lease of the fishery. Some powerful persons from district town collect signature of all fishers and drop the tender in the name of a fishers association. They occupy it with the help of government offices. The association exists only in documents because they want to exploit fish resources. The Motshozibi Somiti, a new association, is not known to common people. Most of the members are not from our village or even from the union. They are not fishers, but they employ some professional fishers to manage the Beel and give us a small percentage of the benefit. Their intention is all about making profit. (Interviewed on 2nd of February, 2017)

Inconsistencies in leasing and harvesting procedures allow non-fishers and rich persons to capture the fishery in collaboration with government officials. Leaseholders show a tendency to make a profit shortly instead of developing the fishery.

5.2.3.5. Absence of incentives

Incentives can prevent illegal/over fishing from the fishery. BUG members often overharvest the fishery including sanctuaries. Community members also attempt to catch fish illegally. Another 38-year old member of the Fishers' Cooperative explained:

We put bars in fishing in the month of Vadro (a Bangla month for August). We have some watchmen to maintain the Beel. The community can fish in the open area from Baishak (the first Bangla month for April) to Vadro. There is no monetary, employment, or any other support for fishers from Vadro to next harvesting time. It is necessary to make profit to cover our expenses and maintain life. Sometimes we catch fishes from the sanctuary when income is low. If people disturb we try to manage them socially. When the illegal fish catchers do not listen to us we call for an informal rural Salish (arbitration). If the problem is not solved, we take initiatives according to state law. Some people who want to seize all benefits are difficult to control. (Interviewed on 15th of February, 2017)

It is hardly possible to control illegal fishing or overfishing in the absence of economic and legal incentives. The disturbance from the community impedes fishers from maintaining the fishery as a source of revenues.

The barriers to fishers' resilience are schematically presented in the Figure 2.

The factors shown in Figure 2 mainly constrain fishers' resilience, but the resilience can be achieved through developing fishers' capacity to deal with identified factors.

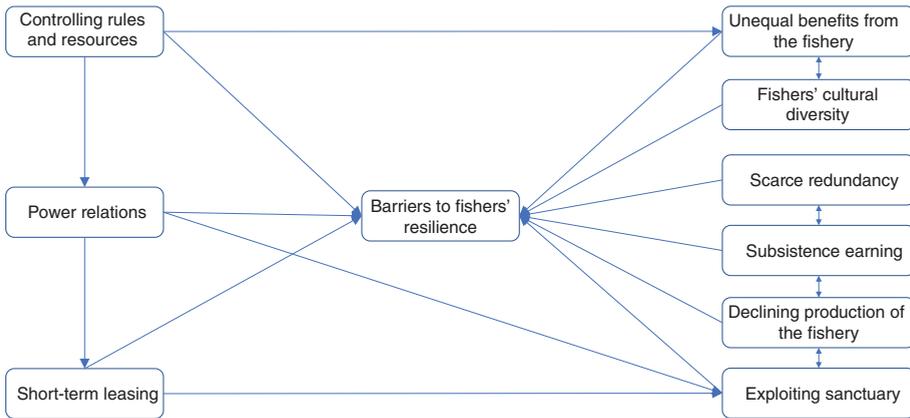


Figure 2: The social-ecological barriers to fishers' resilience (Source: Own).

6. Conclusion

Fishers' institutional constraints to their resilience are the focal point of this paper; specifically, the constraints to enforcing formal and informal rules weaken fishers' adaptive capacity and disrupt their plans and actions to managing the fishery. They also weaken fishers' reorganizing capacity to make necessary decisions at different stages of disturbances: non-participatory BMC, weak coordination between stakeholders, unequal power relations, conflict between fishers and with the community, and the absence of shared knowledge to manage the fishery. Although poor and landless fishers living in the vicinity of the fishery are permitted to use the fishery, well-off people are also included in the BUG or BMC. Powerful fishery users tend to capture the fishery. A few take all benefits at the expense of others. Fishers from diverse social settings are a setback to developing solidarity among them to prevent nonprofessional fishers who consume resources from the fishery. Many powerful persons, at the same time, confront each other to occupy the fishery. Power relations exclude fishers from the management process. Fishers receive no practical education to increase fish production and their livelihood. They, as a result, lose their control over rules and fish resources to build their resilience.

Fishers' livelihood from the fishery is also variable and uncertain. Well-off fishery users having benefits from the fishery and other sources of income are likely to be more resilient than others having no other sources of income. They tend to overlook rules to exploit fish resources. The short period of leasing and overharvesting also degrades the fishery. The absence of economic support during the lean period and legal support to protect the fishery weaken fishers' capacity to manage the fishery. Overall, formal and informal constitutional choice rules often ignore and challenge each other in the management of the fishery. The absence of mechanisms to address such challenges also hampers fishers' resilience.

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