Access to markets for small-scale fisheries: challenges and opportunities during and after the COVID-19 pandemic

By

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Abstract

This study views markets as social institutions and examines whether they enable or hinder access for small-scale fisheries, especially in the context of the COVID-19 pandemic at a global and a national scale (Bangladesh), with a local case study in the Bangladesh Sundarbans. On a global scale, the study reveals that the COVID-19 pandemic has disrupted the supply chains of fish and fisheries products worldwide, with serious consequences for small-scale fishers' livelihoods and socio-economic conditions. However, the pandemic has also brought new opportunities for small-scale fisheries, including product and income diversification, alternative market arrangements, and flexibility in direct sales. At a country level in Bangladesh, similar effects are found in the production, distribution and supply, processing, markets, and food and nutritional security for small-scale fisheries. Finally, a case study was conducted in the Bangladesh Sundarbans to investigate the market structure and the governance of access to markets for the small-scale mud crab (*Scylla serrata*) fishery. The findings show that local traders or depo owners are the main actors governing both the domestic and the export mud crab supply chains, while small-scale fishers are invisible due to weak market arrangements and the absence of government policy to support them. The study recommends modifying the market governance structure based on the social dynamics of the stakeholders, institutional capacity, and interactions between the key actors to enhance the small-scale fisheries' access to markets. Overall, the COVID-19 pandemic has created an opportunity for countries around the world, especially for developing countries like Bangladesh, to

build back the market structure better and stronger, also by addressing the pre-pandemic distortions made by the powerful players in the supply chains. Governing bodies and the stakeholders of the fisheries supply chains around the world could also learn from the present situation and use it as a basis for building viable and resilient small-scale fisheries when facing future crises.

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List of Abbreviations

BFDC	Bangladesh Fisheries Development Corporation
BFRI	Bangladesh Fisheries Research Institute
BFTI	Bangladesh Foreign Trade Institute
BLCFEA	Bangladesh Live and Chilled Food Exporters' Association
DoF	Department of Fisheries
EC	European Commission
ECOFISH	Enhanced Coastal Fisheries in Bangladesh
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FLAG	Fisheries Local Action Group
FRSS	Fisheries Resources Survey System
GAA	Global Aquaculture Alliance
GDP	Gross Domestic Product
GFCM	General Fisheries Commission for the Mediterranean
HDI	Human Development Index
ICES	International Council for the Exploration of the Sea
ICSF	International Collective in Support of Fisheries
IEDCR	Institute of Epidemiology, Disease Control and Research
ILO	International Labour Organization
IUU	Illegal, Unreported and Unregulated
LGA	Local Government Administration
MoFL	Ministry of Fisheries and Livestock
MPA	Marine Protected Areas
NOC	No Objection Certificate
OFI	Ocean Frontier Institute

SDCTAL	Satkhira District Crab Traders Association Limited
SDGs	Sustainable Development Goals
SSF	Small-Scale Fisheries
TBTI	Too Big To Ignore Global Partnership for Small-Scale Fisheries Research
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNO	Upazila Executive Officer
WHO	World Health Organization

Chapter 1 Introduction

This chapter provides an overview of the study and the rationale for the research by describing the problem related to access to markets for small-scale fisheries (SSF), highlighting the involvement of women within the market chains and the general effect of COVID-19 on small-scale fisheries. The chapter then provides the aim and approach of the study, the study objectives, research questions, a thesis statement, and the thesis outline. This chapter also presents contextual information regarding small-scale fisheries in Bangladesh as well as the mud crab fishery in the Sundarbans areas of the country, which is the focus of the empirical case study.

1.1 Describing the problem

1.1.1 Fish trade and small-scale fisheries

Fish and fish-related products are the most traded food commodity globally (Smith et al., 2010; FAO, 2014; Crona et al., 2016). According to the Food and Agricultural Organization of the United Nations (FAO), the global export value of fish and fishery products has increased from $7.8 billion in 1976 to over $164 billion in 2018 (FAO, 2020a). A significant portion of the trade of fish and fish-related products comes from small-scale fisheries (Chuenpagdee, 2011; Crona et al., 2015, 2016). Small-scale fisheries are gaining increased importance both in the domestic and international markets with

their ability to broadly connect traders, distributors, and consumers (Dicken, 2011), while the fish and fisheries products of small-scale fisheries are still growing in the global markets. The growth of small-scale fisheries trade has the potential to increase income, alleviate poverty, and provide more employment opportunities for local fish harvesters, processors and traders (Steenbergen et al., 2019), but still there are many impediments to their full, sustainable and equitable participation in the markets that are needed to explore.

There is no single definition for small-scale fisheries. According to FAO (2015a), small-scale fisheries differ in their characteristics depending on the geographical location and the ecosystems where they operate, although they tend to be strongly anchored in local communities, reflect historical links to adjacent fishery resources, traditions and values, and support social cohesion. FAO (2015b) defines "small-scale or artisanal fisheries" as "traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption." Small-scale fisheries comprise all the activities related to pre-harvest, harvest, and post-harvest parts of the value chain, conduct full-time, part-time, or seasonal activities by men and women; and often target supplying fish and fishery products to local and domestic markets (Staples et al., 2004; FAO, 2015a). Approximately 120 million people are involved in fisheries globally, where small-scale fisheries employ more than 90 percent of them (Zelasney et al., 2020). Because a good portion of fish from small-scale

fisheries is consumed in households and locally, they contribute significantly to food and nutritional security worldwide.

Recognizing the importance of small-scale fisheries, FAO member states endorsed the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (SSF Guidelines) in 2014 to protect and enhance the impact of small-scale fisheries around the world (FAO, 2015a). The United Nations Sustainable Development Goals (SDGs) have also included in SDG 14 (Life below Water) Target 14b, which speaks to securing access for the small-scale, artisanal fishers to marine resources and markets. While this is encouraging, many institutional hurdles and other challenges that small-scale fisheries face in accessing resources and markets still remain. Small-scale fisheries' access to fishery resources has been marginalized for several decades due to non-participatory and often centralized fisheries management systems, rapid technology developments and demographic changes (FAO, 2015a). In terms of market access, many barriers exist that prevent small-scale fisheries from receiving full benefits. Some of the barriers include unfair pricing of the products, limited direct sales (Frangoudes et al., 2008; Song and Chuenpagdee, 2015), pre-determined prices set by middlemen, and lack of bargaining opportunities between buyers and sellers (O'Neill and Crona, 2017; Rodrigues and Villasante, 2016). These barriers create a disconnect between fishers and consumers (DesRivières et al., 2017), as well as constitute a threat to local food sovereignty and economic development (McCormack, 2010; Bodwitch, 2017). Decision-making and policies about access to

markets for small-scale fisheries need to be carefully analyzed or researched first in recognition of these conditions.

1.1.2 Women in small-scale fisheries and trade

While the majority of fishers are men, an increasing workforce in the fish supply chain consists of women. This is particularly the case in small-scale fisheries, where almost half of the fish workers are women, mostly engaged in marketing and processing (FAO, 2020a). A report by the FAO states that women comprise 70-80% of post-harvest processing activities (Zelasney et al., 2020). It also shows that in Asia and Africa, women represent 60% of seafood traders and retailers.

Although women contribute to the entire seafood supply chain (e.g., professional organizations, small-scale fishing, administration, and processing), a majority of them occupy low-revenue jobs (Briceño-Lagos and Monfort, 2020). Research indicates that women retailers receive less benefit from fish trade in terms of sales volume and gross profit compared to men (Ndanga et al., 2013; Kruijssen et al., 2018). Further, the lack of support and unpaid workload at the household level impede women's ability to generate income (Murphy et al., 2020). Research also points to different gender-based constraints for women involved in fisheries supply chains, including a lack of personal safety for women retailers (Hendy, 2015), limited freedom of mobility (El-Hamidi, 2011), and unequal distribution of family income (ILO, 2013). The outbreak of the COVID-19

pandemic has increased women's unpaid workload in the household due to the school closures and extra work to care for older people (UN, 2020). On the whole, women involved in the small-scale fisheries value chains are highly marginalized and vulnerable. Given that women's participation in small-scale fisheries organizations can bring new perspectives to the fisheries value chains (Frangoudes, 2013), issues and concerns that impede women's potential contribution to the market institutions and economy need to be investigated. That is the rationale for including this topic in the fabric of this thesis.

1.1.3 COVID-19 and small-scale fisheries

In December 2019, the first case of the COVID-19 virus was reported in China. Since then, the virus has spread rapidly throughout the world. On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic (WHO, 2020). As of May 03, 2021, the total number of confirmed COVID-19 cases globally was 153,187,889, with confirmed deaths of 3,198,515 (Figure 1.1) (WHO, 2021a). The pandemic is not only deadly to human life, but it also has a devastating effect on all sectors of society, including fisheries.

The outbreak of COVID-19 has complicated market access for the small-scale fisheries, and to a lesser extent, access to fisheries resources. Since the WHO declared COVID-19 as a global pandemic, countries have been implementing various measures to minimize transmissions, such as lockdowns, domestic and international travel restrictions,

maintenance of physical and social distancing, and closure of export markets, tourism, restaurants, cruise ships, and casinos (FAO, 2020b; ICES, 2020). Concerns have been raised about how these measures may have impacts on the fish supply chains by changing consumer demand, restricting access to markets, and creating logistical problems related to transportation and border crossings (FAO, 2020b). Reports show, for instance, that the household cash income for small-scale fishers in rural areas has been disrupted due to the need for isolation and home quarantines (FAO, 2020c; FAO, 2020d). A comprehensive understanding of how COVID-19 has affected small-scale fisheries generally, and their access to markets, in particular, can help identify what needs to be done to address them. A study that analyzes and compares the impacts and subsequent responses related to the COVID-19 pandemic between different regions of the world can contribute to enhancing knowledge and finding better responses to crises like COVID-19, should they occur in the future.

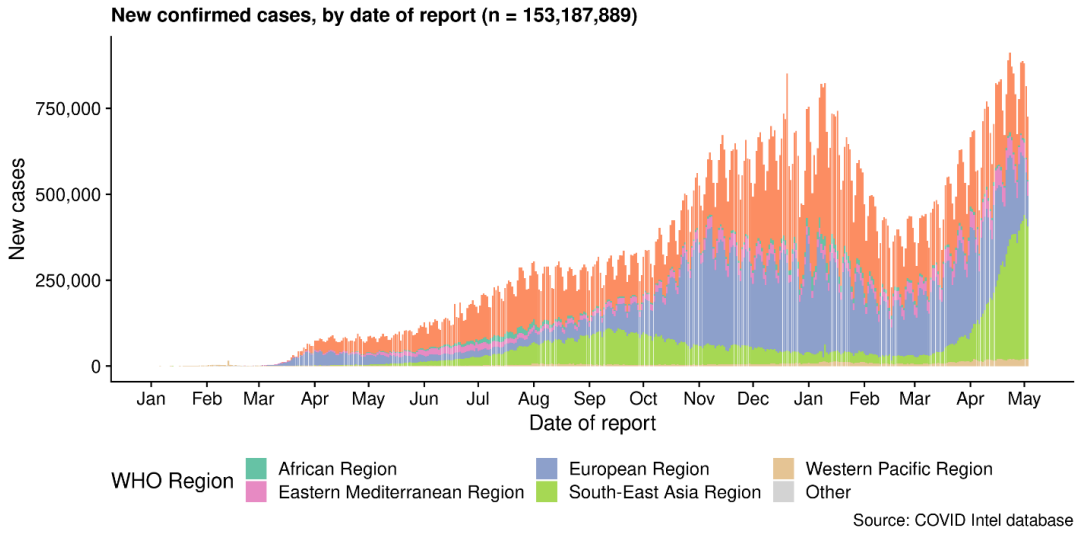

Figure 1.1 The COVID-19 case numbers by region (*Source: FAO, 2021*).

1.2 Study aim and approach

Small-scale fisheries are facing many barriers in accessing markets, which ultimately negatively impacts them in numerous ways, including by lowering their potential to strive as small-scale fisheries. Especially, the existing market institutions' structure raises barriers for small-scale fisheries and prevents them from receiving the full benefits that are normally associated with participation in markets. Small-scale fishers, including both men and women involved in the supply chains of market institutions, are not recognized or are overlooked in national, regional and global decision- and policy-making processes. Moreover, they are not able to get united or organized and raise up the issues and concerns that they are struggling with due to social, different ethnic backgrounds and political intervention, and thus, they are most of the time forced to keep going with the flow. The outbreak of the COVID-19 pandemic has further put pressure on small-scale fisheries, especially in their access to markets due to lockdown measures, mobility restrictions, and ultimate market channel disruptions. The following section highlights small-scale fisheries' issues and concerns in accessing markets, as informed from the theoretical perspective of the study.

1.2.1 Theoretical perspective

The study draws on interactive governance (Kooiman et al., 2005) as the theoretical framework to help define the research questions. Interactive governance theory proceeds

with the assumption that societal systems are governed by a set of governing efforts (Kooiman, 2003), which are 'answers' to ever-growing societal diversity, dynamics and complexity, and responses to major societal issues such as poverty and climate change (Kooiman et al., 2005; Kooiman et al., 2008). Interactive governance theory highlights the relationships between actors as crucial in order to examine barriers and create opportunities to resolve issues (Song et al., 2013). It helps identify the possible malfunctions systematically among the diversity of the system components and their complex connections (Jentoft and Chuenpagdee, 2013). In the context of the study, this is related, first and foremost, to the "wickedness" in securing access to the market for small-scale fisheries. Wicked problems inherently arise from the complexity of the issue; they are difficult to define and delineate from the bigger problems, and when they are not solved once and for all but tend to reappear (Jentoft and Chuenpagdee, 2009). This research contributes to understandings about governance changes, especially as they relate to access to market institutions and issues around them. Further, it identifies market governance priorities, options and outcomes to develop resilience by anticipating and responding to change.

Interactive governance considers markets as social institutions - an outcome of human experience, foresight and ingenuity, structured by human relations and interactions (Jentoft, 2005). This is similar to how Pedroza-Gutiérrez and Hernández (2017) define the market, i.e., as a social network formed by a set of links among a group of individuals. These links present the relationships developed by the actors participating in

the market's supply chains through transactions, acquaintance, friendship or kinship (Pedroza-Gutiérrez and Hernández, 2017). The social relationships developed among the participants in the markets are part of the social capital that enables participants to have access to different types of resources (Granovetter, 1973). According to Jentoft and Chuenpagdee (2009), access to markets for small-scale fisheries is a complex governance problem that requires a broad understanding and careful assessment of the natural, social and governing conditions. Given the highly connected nature of fish and fisheries market chains, the governance of the market institutions requires an understanding of interactions within and between different actor groups of the market chains. Further, formal and informal organizations exert influences, either directly or indirectly, over the market chains and their governance (O'Neill and Crona, 2017; Pascual-Fernández et al., 2018).

1.2.2 Study aim and objectives

Based on the problems identified and the theoretical perspective presented above, this study aims to examine markets as social institutions and see whether they enable or hinder access for small-scale fisheries, especially in the context of the COVID-19 pandemic, at a global and a national scale (Bangladesh), and with a local case study in the Sundarbans areas to illustrate. More specifically, the study looks at the existing marketing structure and how the markets for fish and seafood function, and the governance interactions at structural and actor levels in markets during and after the COVID-19 pandemic, to identify any trends which might be useful to develop and implement

successful market institutions policies. The study is comprised of four objectives to fulfill the aim of this study.

The first objective is to provide a comprehensive understanding of the impacts of COVID-19 on the access to markets for small-scale fisheries globally. It assesses how COVID-19 has globally disrupted the major supply chains of fisheries, including small-scale fisheries. It also explores the coping strategies of the small-scale fisheries, considering the emerging challenges caused by COVID-19, with modified/emerging market policies, recognizing as it does the gender differences and the context-specific dynamics. The analysis includes the present situation in various locations around the world, the immediate and long-term responses, and the emerging gaps, issues, challenges and opportunities, and lessons learned.

The second objective is to provide an overview of small-scale fisheries governance and their access to markets on a national level in Bangladesh, looking at the present COVID-19 situation, the social dynamics, governing systems, as well as the interactions that take place between small-scale fisheries and their governing actors. As a developing country with important small-scale fisheries affected by COVID-19, Bangladesh serves as a good illustration of the small-scale fisheries governing needs and capacities during and after the COVID-19 pandemic.

On a local scale, the third objective is to provide an in-depth understanding of how the Bangladesh markets for small-scale mud crab (*S. serrata*) fishery in the Sundarbans are structured, function, and are governed, as well as of the interactions at the structural and actors levels in the markets. As will be later presented, the mud crab fishery in the Sundarbans is part of a major seafood export trade; thus, it is important to reveal whether the existing market governance mechanisms facilitate or inhibit access to the market for the small-scale mud crab fishery.

The final objective is to examine the extent to which women are involved in the small-scale fisheries in general, as well as in the Bangladesh mud crab fishery's supply chain, and the measure in which they are included in decision-making. The study also looks into the challenges and opportunities brought by the COVID-19 pandemic for women involved in market operations.

To summarize, the research aims to address the following questions:

1. What are the impacts of COVID-19 on small-scale fisheries and their access to markets globally? What challenges and opportunities have been brought by the COVID-19 pandemic for small-scale fisheries and their access to markets?
2. How are small-scale fisheries in Bangladesh governed, and how has the COVID-19 pandemic affected them and their access to markets?

3. How are the markets for small-scale mud crab fishery in Bangladesh structured and governed, how do they function, and what challenges exist in the supply chain both from the fishers' and from the governing bodies' perspectives?
4. To what extent are the equity issues regarding gender and small-scale fishers considered in decision-making for market governance in Bangladesh?

This study shows that the challenges and opportunities facing small-scale fisheries in their efforts to get access to markets are mostly related to the market structure, governance, and interactions among the relevant governing bodies. The COVID-19 pandemic revealed numerous challenges concerning small-scale fisheries' access to markets, but these challenges can also be seen as opportunities to produce meaningful changes, which will enhance small-scale fisheries' access.

1.2.3 Methods

The study employed a mixed method of data collection, including a desk study, review of secondary sources and archives, semi-structured interviews, informal interviews with key informants, and direct observation. Given the restrictions on field research due to the COVID-19 pandemic, the research relies on a desk study coupled with phone/Internet interviews. A global scan was conducted through a desk study to assess the impact of the COVID-19 pandemic on small-scale fisheries and their access to markets. The desk study

involved secondary data collection and analysis of peer-reviewed literature, newspaper articles, online materials, and documents available on websites.

The study on the small-scale fisheries in Bangladesh and the mud crab fishery in the Sundarbans areas of the country was conducted remotely, using data available on Internet, informal discussions, personal observation, and remote key informant interviews (by phone or Internet) with fishers, fish traders, processors, fishers' organization representatives, government officials and environmental organizations. Questions were asked to the key informants based on semi-structured questionnaires (see appendix I). Virtual interviews were conducted using Zoom, Skype, Webex, or phone calls. The research instruments were developed according to the Memorial University of Newfoundland ethical policy requirements for research involving human respondents and were approved by the Interdisciplinary Committee on Ethics in Human Research.

1.3 Small-scale fisheries in Bangladesh

Bangladesh has rich fisheries resources because of its large flooded wetlands, rivers, coastal and marine waters and high aquatic biodiversity. The fisheries resources in Bangladesh are largely categorized into inland and marine fisheries. The inland fisheries sector covers 4,712,205 hectares (ha) and consists of capture and culture fisheries (FRSS, 2017) (Figure 1.2). The marine fisheries resources cover a large area of about 11,881,300 ha along with 200 nautical miles of Exclusive Economic Zone (EEZ) from the baseline

(DoF, 2017) (Figure 1.3). The fisheries sector in Bangladesh is one of the most productive industries, which has a large contribution to society and the agrarian economy. The sector contributes 3.61% to the GDP and 24.41% to the agriculture sector (Shamsuzzaman et al., 2020b).

For the last decade, the average GDP growth of Bangladesh has been 4.5%, which has been driven by readymade garments, remittances and domestic agricultural goods (BBS, 2021). The key export sectors include textiles, shipbuilding, jute, leather goods, and fish and seafood. The fisheries sector contributes 1.51% of export earnings (Shamsuzzaman et al., 2020b). Bangladesh produces and exports diverse fish and fisheries products to more than 60 countries around the world, including the European Union, the USA, China, and Japan (Ferdous and Hossain, 2015). Bangladesh is recognized as one of the world's biggest fish producer countries and does not rely on importing fish and fisheries products. In recent studies, the country has ranked globally 3rd in capture fisheries and 4th in aquaculture (FRSS, 2017; FAO, 2018).

Fish and fisheries have always been an inextricable part of millions of Bangladeshi's life and livelihoods. Fish is the main animal protein source for more than 60% of the people in Bangladesh (Shamsuzzaman et al., 2020a). The persons involved in fishing are mostly small-scale fishers. Although small-scale fisheries have no standard definition in Bangladesh, almost all the inland fisheries are known as small-scale or artisanal (Shamsuzzaman, 2020b). Small-scale fishers are the majority in terms of employment

and minority in terms of production. In coastal and marine areas, fishing taking place in water less than 40-meter depth is considered small-scale. The small-scale fisheries sector contributes 83% of the total landings in Bangladesh (Shamsuzzaman et al., 2020b). Small-scale fisheries are an important source of employment, income, food and nutritional security for millions of people of Bangladesh. About 18 million people are directly or indirectly involved in small-scale fisheries (FRSS, 2017), including 1.4 million women who participate in fishing, aquaculture, fish handling and processing (BFTI, 2016). The marine fisheries sector alone provides direct and indirect livelihood options for 270,000 fishing households (Shamsuzzaman et al., 2020a).

The Bangladesh government has enacted and implemented twelve fisheries regulations to regulate and manage the fisheries resources in Bangladesh (Shamsuzzaman et al., 2016). Among them, the Marine Fisheries Act 2020, the Coastal Zone Policy 2005, the National Fisheries Policy 1998, the Bangladesh Merchant Shipping Ordinance 1983, and the Protection and Conservation of Fish Act 1950 have specific rules and regulations for small-scale fisheries (Shamsuzzaman et al., 2020b). However, Shamsuzzaman et al. (2016) argue that the implementation of these regulations has had limited success due to a lack of clear policy guidelines and strategy, non-enforcement of legislation and jurisdictional conflicts, inadequacy of the existing regulatory framework, and the absence of regular law review and updating mechanisms. The general fishery laws and policies are not appropriately enforced due to many factors, such as a lack of appropriate specific regulations, ignorance and unawareness regarding existing regulations, political

interference, poverty, inadequate incentives, non-participation of key stakeholders in management programs, and the weak structure of the governing institutions and their mechanisms, which results in non-compliance by the stakeholders (Islam et al., 2017; Shamsuzzaman and Islam, 2018). The consequences of non-compliance with rules and regulations are many, including degradation of fisheries resources, destructive fishing practices, and reduced human well-being (Islam, 2012; Jahan et al., 2014; Islam et al., 2017).

The outbreak of the COVID-19 pandemic has put additional pressure on the fisheries in Bangladesh, especially on the small-scale fisheries, given the closure of domestic and export markets and subsequent income loss for small-scale fishers (Islam et al., 2021; Sunny et al., 2021). Similar to other countries around the world, how the government and the market institutions have responded to the COVID-19 pandemic, especially in terms of support for small-scale fisheries, is not explicit. An analysis of the COVID-19 impact in small-scale fisheries in places like Bangladesh, the responses that have taken place thus far, along with an understanding of the social dynamics of fishing communities, may point to ways to improve the effectiveness of both the governing and the market systems when faced with change, and a crisis.

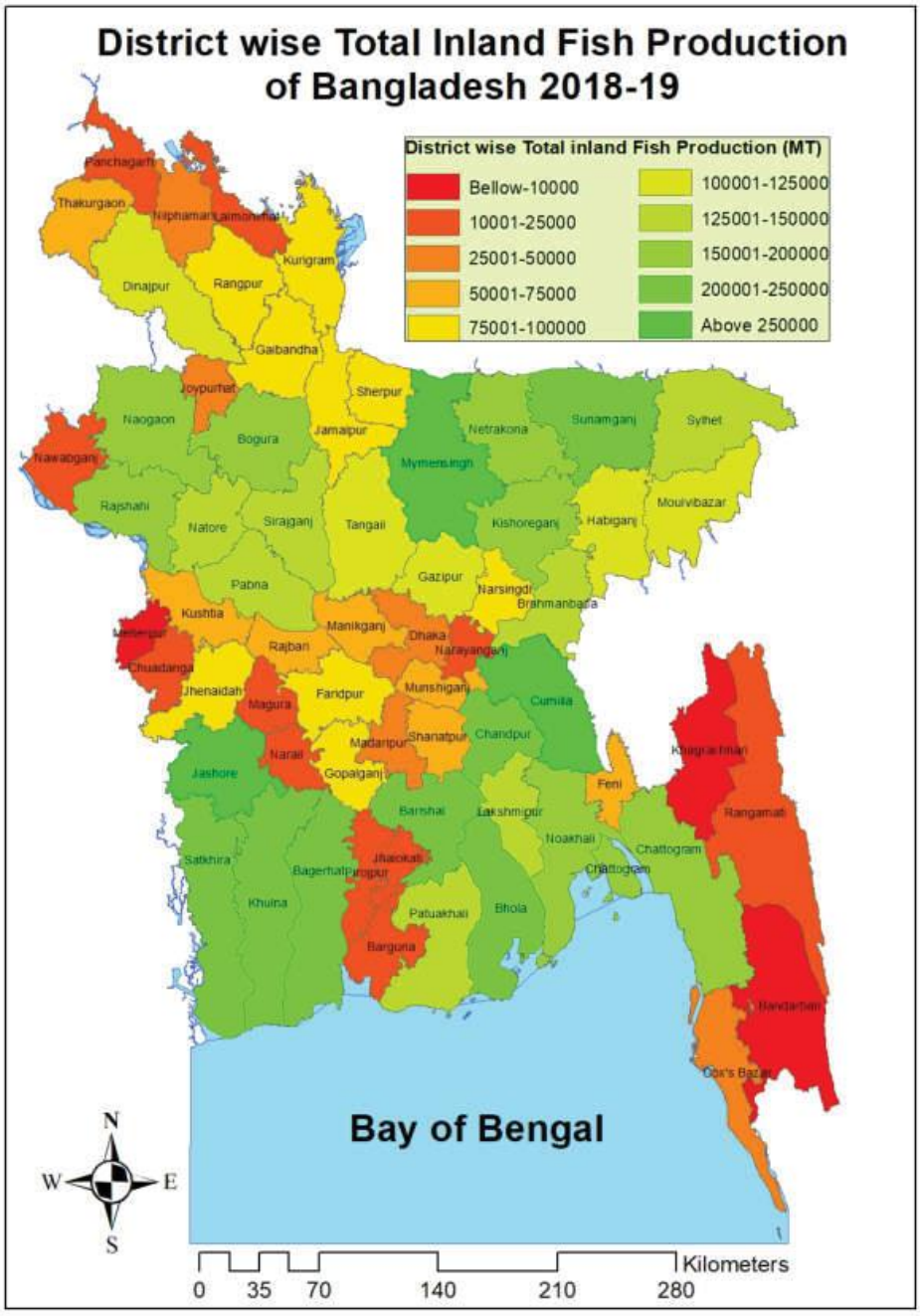

Figure 1.2 District-wise total inland fish productions (*Source: DoF, 2019*).

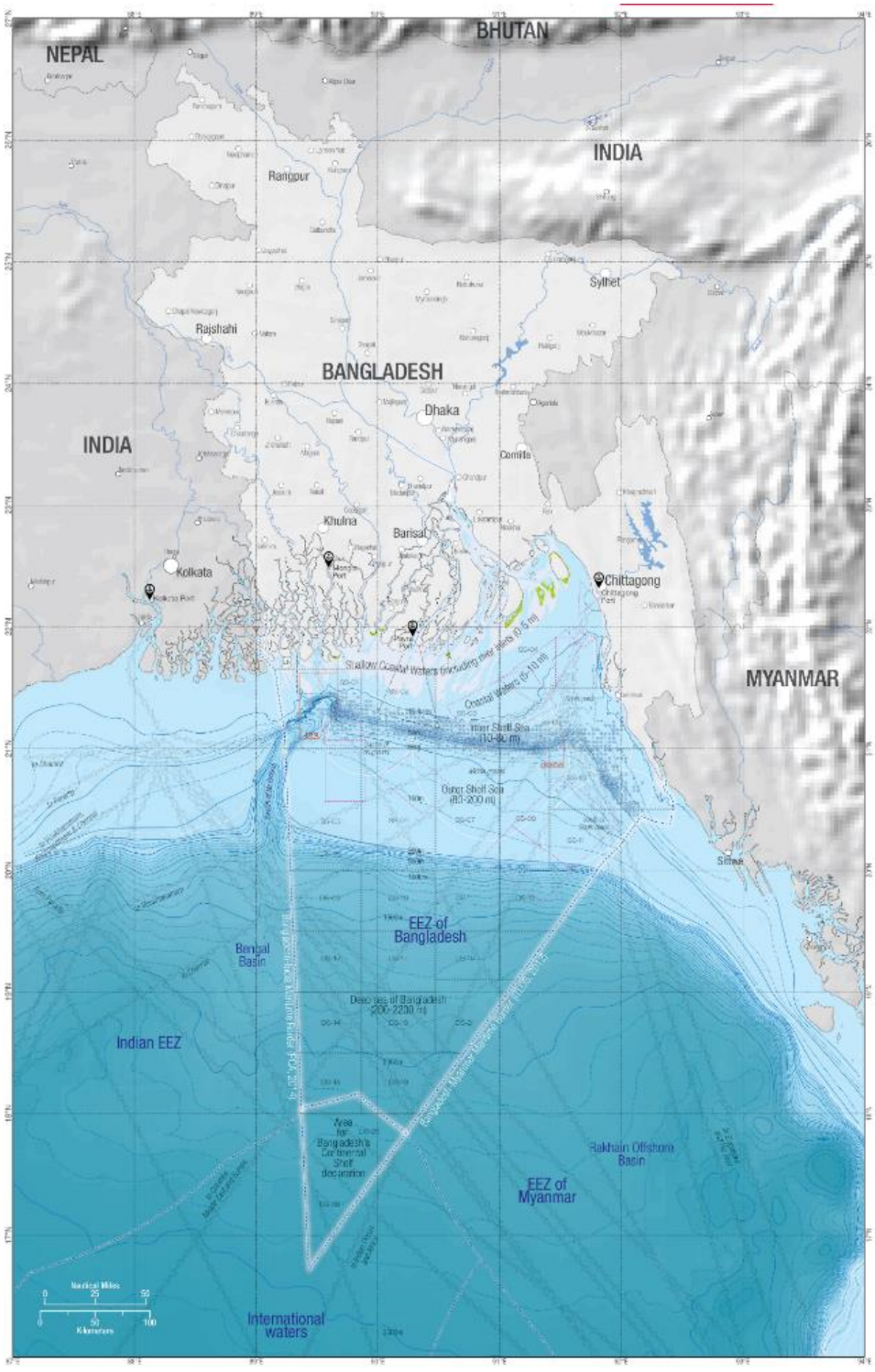

Figure 1.3 Maritime areas of Bangladesh (*Source; Chowdhury, 2017*).

1.4 The mud crab fishery in the Sundarbans areas of Bangladesh

The world's largest single continuous mangrove forest, i.e., the Sundarbans, is situated in the southwestern coastal part of Bangladesh. The Sundarbans provide suitable feeding, breeding, and nursery grounds for a diverse variety of aquatic and terrestrial organisms, for instance, Hilsa (*Tenualosa ilisha*), Seabass (*Lates calcarifer*), White grunter (*Haemulon plumierii*), Silver jewfish (*Johnius argentatus*), Fatty catfish (*Clarias batrachus)*, Estuarine catfish (*Mystus gulio*), Freshwater prawn (*Macrobrachium rosenbergii*), Giant tiger prawn (*Penaeus monodon*), and Mud crab (Rahman et al., 2017; Islam, 2018; Mozumder et al., 2018). Among them, the mud crab holds much importance as a source of food and income. There are four species of mud crabs, i.e., *Scylla serrata, S. olivacea, S. tranquebarica and S. paramamosain*, which are considered economically valuable in different parts of the world (Allan and Fielder, 2003), with *S. serrata* being the most valuable in Bangladesh (Rahman et al. 2017, 2020). This fishery provides the third most exportable frozen product from Bangladesh, after Shrimp and Hilsa (Islam, 2018), earning increasing amounts of foreign currency. The fishery was valued at about US$ 21.1 million in 2013-14 (DoF, 2015), US$ 26 million in 2014-15 (FRSS, 2017), and U$ $42.93 million in 2018-19 (BBS, 2018).

Small-scale fisheries mostly catch mud crab, and small-scale fishers are the only source of crab seed suppliers for mud crab aquaculture. More than 5,000 small-scale fishing families are involved in mud crab fishing and aquaculture for their livelihoods in the

Sundarbans areas (Rahman et al., 2017). Women are directly involved in mud crab harvesting, along with men, which is exceptional compared to other fisheries in Bangladesh, in which women are generally not involved in fishing (Rahman et al., 2020). Women also work as day labourers in the agricultural field, crab hatchery, and shrimp *gher* for supplementary wages (Mozumder et al., 2018). However, the income and contribution of women to society and the country are mostly unrecognized (Rahman et al., 2017).

A diverse group of people is involved in post-harvest activities of the mud crab fishery, including harvesters (both men and women), farmers/fatteners, middlemen, depo owners, suppliers, transporters, exporters and service providers (Rahman et al., 2020). The domestic demand for mud crab is not high due to religious and cultural restrictions. The international markets for the mud crab fishery are much bigger, with exports going to China, Thailand, Singapore, Australia, the Netherlands, Germany, the USA, and the UK (Rahman et al., 2018).

Despite the importance of the mud crab fishery to the economy of Bangladesh, some issues and challenges hinder market access for the small-scale capture and farming of mud crab fishers. Similar to other fisheries resources, the issues include high dependency on export markets, low demand in domestic markets, lack of access to financial capital for fishers, lack of appropriate policies, and a lack of coordination among relevant government agencies (Chandra et al. 2012; Ferdoushi and Xiang-Guo 2013; Chakraborty

et al., 2018; Rahman et al., 2020). The flow and fairness of the mud crab trade in Bangladesh are disrupted due to the unstructured market chain and virtually no government involvement (Zafar and Ahsan, 2006; Rahman et al., 2017). Moreover, there is no proper policy to guide the mud crab fishery except the "Bangladesh Mud Crab Export Policy 1998," which is often criticized as a 'barrier' by the traders and academia for restricting the development of the crab fishery (Mahmud, 2017; Istiak, 2018). An in-depth case study related to market access for the small-scale mud crab fishery in Bangladesh would reveal issues and challenges facing this sector and offer suggestions about improving the governing and marketing systems.

How the existing market-related policies and other changes in markets affect or modify the access of small-scale fisheries to local, national and international markets is a key research question. Specifically, it is crucial to examine the challenges of the existing market governance and how the women and men working in the small-scale mud crab fishery value chains interact, given the existing fisheries-related policies. As Kooiman et al. (2005) recommended, the relationships and dynamics between actors, including those related to power, are crucial in examining barriers and opportunities to resolve problems. Knowing about these interactions can also help determine how to motivate and incentivize different stakeholders to engage in pathways to improve market access for small-scale fisheries (Song et al., 2013).

1.5 Thesis outline

The thesis consists of seven chapters. Chapter 1 introduces the problems around market access for small-scale fisheries, the connection of small-scale fisheries to the local, national and international fish and seafood trade, gender issues in small-scale fisheries, aim and approach of the study, study objectives and research questions. This chapter also presents contextual information regarding small-scale fisheries in Bangladesh as well as the mud crab fishery in the Sundarbans areas of the country.

Chapter 2 provides an overview of the interactive governance theory on which the study is based. It presents the review of pertinent literature and explores the topics, including market structure, governance, function, as well as interaction at the structural and actor levels in the markets. It also explores the gender roles in the post-harvest supply chains and their participation in management decision-making. This chapter identifies the knowledge gaps in terms of access to markets for small-scale fisheries and the importance of exploring the study gaps.

Chapter 3 outlines the research methodology, including a desk study, a case study, and the key research instruments (phone and Internet interviews), the style and process description. The research instruments were developed according to the Memorial University of Newfoundland ethical policy requirements for research involving human respondents.

Chapter 4 presents the results from a desk study that provides a comprehensive understanding of the impacts of COVID-19 on small-scale fisheries and their access to markets in different locations around the world. The chapter describes the present situation of small-scale fisheries trade, immediate and long terms responses, and the emergence of gaps, issues, opportunities, and challenges that have come to light in this pandemic.

Chapter 5 begins with the description of the Bangladesh fisheries system, including its natural and socio-economic aspects. The chapter then provides an overview of the COVID-19 situation in Bangladesh and its impacts on small-scale fisheries. It presents the governing system of small-scale fisheries in Bangladesh and the responses that have taken place to support small-scale fisheries and their supply chains. The chapter ends by presenting the challenges in dealing with the COVID-19 pandemic for small-scale fisheries.

Chapter 6 is a case study analysis regarding access to markets for the small-scale mud crab fishery in the Sundarbans areas, Bangladesh. The chapter begins with an overview of the small-scale mud crab fishery in the Sundarbans areas, including the description of geographical location, the Sundarbans mangrove forest, and a brief history. An in-depth case study related to market access for the small-scale mud crab fishery in Bangladesh was conducted to reveal issues and challenges facing this sector and offer suggestions about improving the governing and marketing systems.

Chapter 7 includes the conclusion and policy recommendations. It presents key lessons from the pandemic on the global scale, at the national level, i.e., in Bangladesh, and the local level (Sundarbans areas), in terms of access to markets. The policy recommendations were provided based on the findings of the study, along with future research scope.

Chapter 2 Theory and Literature Review

This chapter provides an overview of the interactive governance theory on which the study is based. It presents the review of pertinent literature and explores the topics, including market structure, governance, function, as well as interactions at the structural and actor levels in the markets. The literature review includes peer-reviewed literature, government policy documents, newspaper articles, online materials, and documents available on websites covering from 2006 to 2021. It also explores the gender roles in the post-harvest supply chains and their participation in management decision-making. This chapter identifies knowledge gaps in terms of access to markets for small-scale fisheries (SSF) and why they need to be filled.

2.1 Interactive governance theory

As a concept, governance is broader than management and involves not only governments but other actors, including non-governmental organizations, markets, and civil society (Stoker, 1998; Kooiman et al., 2005). Given that no single actor holds the knowledge and resource capacity to tackle the problems unilaterally (Kooiman, 1993), the idea of governance came up as an interactive process.

The interactive governance theory takes into account these ideas and provides a unique perspective on how fisheries governance can be deemed and tackled under the given

difficulties, such as globalization, ecosystem health, social justice, livelihood, food security and food safety, facing the fisheries (Kooiman et al., 2005; Chuenpagdee et al., 2005), and aiming to address them and provide societal opportunities. The premise of interactive governance is that ecological-socio-political systems imply interactions, and interactions are the fundamental conditions for the existence of those systems (Kooiman, 2008). The definition of interactive governance is:

> the whole of public as well private interactions taken to solve societal problems and create societal opportunities. It includes the formulation and application of principles guiding those interactions and care for institutions that enable them (Kooiman et al., 2005, p. 17).

Based on the definition, interactive governance recognizes that fisheries are diverse, complex, dynamic and operative at various scales. These characteristics become fundamental building blocks of the governance structure and must be carefully studied in assessing the governance potential (Jentoft, 2007). As shown in Figure 2.1, from the perspective of the interactive governance theory, a fishery system consists of three sub-systems: *system-to-be-governed*, *governing system*, and *governing interactions*. This systemic approach allows a thorough inspection of fisheries management-related complexities (Kooiman et al., 2005). The interactive governance theory explores each system component individually and in their interactions. Interactive governance theory argues that the features of a system-to-be-governed, i.e., diversity, complexity, and dynamics, intensify under the influence of external forces, such as globalization and

extension of value chains for fish and fisheries products (Kooiman et al., 2008). At the same time, the aquatic resource systems are becoming more diverse, more complex, and more dynamic all the time at various temporal and spatial scales, creating thus a variety of challenges to governance.

The examination of the system-to-be-governed involves looking into the societal and natural systems related to fisheries, focusing on management, control, and regulations (Figure 2.1). The governing system comprises different governing institutions (e.g., the state, market, and civil society), their day-to-day activities and organizational values. The governing system itself can be an object of governance or a system-to-be-governed. Interactive governance argues that governing systems bring about, organize, and carry out interactions in the face of diversity, complexity, and dynamics (Kooiman et al., 2008). Governing interactions involve interactions and exchanges between these systems in the form of interplay, relationships, and mechanisms. From the actors' perspective, interactive governance theory categorizes the enormous variety of societal governance interactions into a few major groups: participatory, collaborative and policy or management interactions (Kooiman et al., 2008). At the structural level, the theory explains the interactions in terms of self-governance, co-governance, and hierarchical governance.

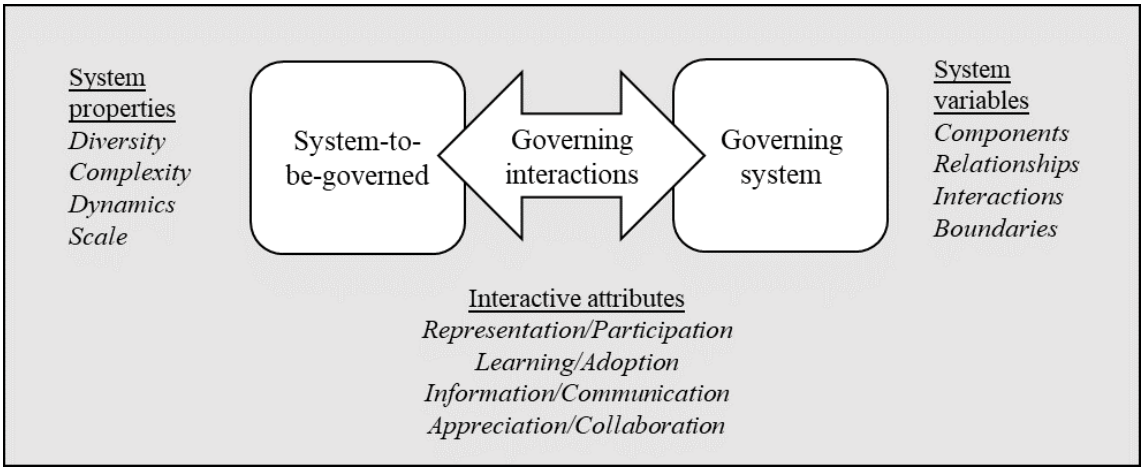

Figure 2.1 A fishery system is made up of the system-to-be-governed, governing system, and governing interactions (*Adapted from Chuenpagdee and Jentoft, 2009*).

Interactive governance emphasizes that governance is multi-dimensional and both analytic and normative. There are three sets of governance attributes, i.e., *elements*, *modes*, and *order* (Figure 2.2). First, governing elements are the images, instruments, and actions used in governance. For example, the statement "women undervalued in fisheries supply chains" is an *image* of a problem in fisheries. The inclusion of women in the decision-making related to the supply chains can be an *instrument* to promote gender equity by enforcing specific strategies or *actions*, for instance, the implementation of the SSF Guidelines (FAO, 2015a) at all levels of the supply chains. Second, the modes of governance can be self, hierarchical, and co-governance, which concern the structural form of governance. Self-governance means the minimal intervention of central government over the governed (e.g., selling fish to the local consumer through a bargaining process), and the opposite is found in hierarchical governance, where governments take control of the central planning and operation (e.g., mandatory trade

license for fish traders and fish processors). Co-governance is the sharing of governance between the governors and the governed (as in community-based fisheries management). Finally, there are three orders of governance, which occur in all governance modes and shape the governing elements. The first-order governance deals with day-to-day operations and management, e.g., fishers' daily sale of fish to domestic markets; the second-order refers to the institutional design that enables the first-order processes, e.g., price setting of fish; and the meta-order deals with the underlying values and principles of the first and second orders, e.g., the SSF Guidelines (FAO, 2015a).

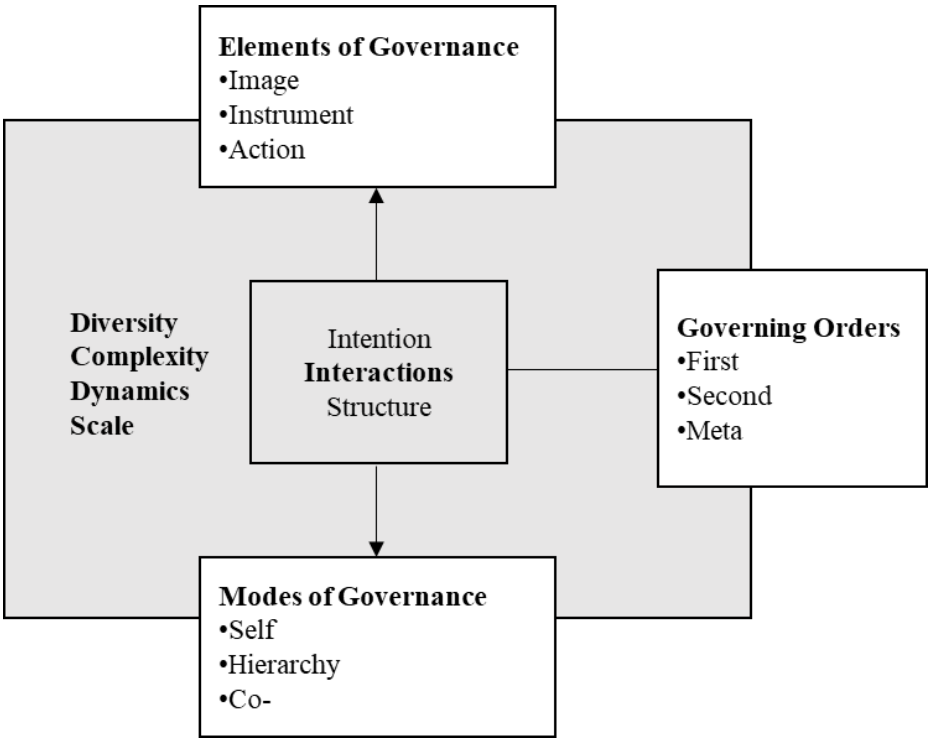

Figure 2.2 Components of the interactive governance model involved in governing a fisheries system (*Source: Kooiman et al., 2008*).

Further, the societal, natural and governing systems related to fisheries are fundamentally complex, diverse, and dynamic (Jentoft and Chuenpagdee, 2009). The problems that arise in fisheries and coastal resources governance are characterized as "wicked" based on their need for constant re-evaluation and resolutions (Jentoft and Chuenpagdee, 2009). Interactive governance highlights the issues and relationships between/within actors to examine the barriers and create opportunities to resolve the issues (Song et al., 2013). In the case of the market, the fish and seafood trade growth is dramatically expanding both at the domestic and international market levels. Small-scale fisheries are rapidly connecting traders, distributors, and consumers throughout the world and are getting connected tightly into the global systems (Dicken, 2011). As a result, the number of actors involved, the diversity of their interactions, and the complexity of market chains are increasing (Crona et al., 2015). Although the expansion of markets for small-scale fisheries offers significant economic growth, it also exerts pressure on the governing system in terms of resource exploitation and equitable distribution of benefits (Berkes et al., 2006; Béné et al., 2010; Steenbergen et al., 2019).

The diverse nature of these challenges related to the global fisheries governance regime needs further insight to tackle these problems. Although the challenges facing fisheries, including small-scale fisheries, from social, economic, and environmental causes can be daunting, examining the structure, governance, and function of the markets can contribute to inform how the existing governing system impacts small-scale fisheries and their access to markets.

2.2 Difficulty of governing markets

Similar to other aspects of fisheries, issues around market access are multi-dimensional. The market is a social institution (Jentoft, 2005) that involves intricate interactions between members of the society in the form of transactions (Lindblom, 2001) and voluntary exchanges. Market failure is a crucial issue since most of the markets are not perfect institutions; that is why they need to be managed or regulated through price controls or competition policies (Ostrom et al., 2012). Social relations and obligations play a crucial role in structuring the markets of small-scale fisheries (O'Neill and Crona, 2017; O'Neill et al., 2018). For social obligations, some fishers are connected to the same buyers for years because they are friends, relatives, neighbours, or people they have been trading with. There are also different interactions both at the actor level (e.g., fishers' participation in decision-making and opportunities to interact with governing bodies) and at the structural level (e.g., how the members of a formal or informal organization interact with each other in accessing markets) (Kooiman and Bavinck, 2013).

Another example of multi-dimensional issues is related to how the functioning of markets is directly or indirectly influenced by private organizations both at the domestic and international market levels. On a global scale, a few companies control the majority of the world's seafood trade and governance (Österblom et al., 2015; Pascual-Fernández et al., 2018). Even in this COVID-19 pandemic, corporate food systems have made small-scale fisheries more vulnerable by preventing the diversification of fisheries products at

domestic markets. For example, Bello (2020) and Ecotrust Canada (2020) have found that big fishing companies had privatized the small-scale fisheries, controlled the market chains and hindered market access for diversified fish and fisheries products during the COVID-19 pandemic. Markets work differently at a local scale, but in many instances, they are structured in a way that makes small-scale fishers dependent on the merchants to sell their products at lower than the prevailing market price, leading to a corresponding loss of autonomy and freedom (Willmann et al., 2017).

The involvement of women in small-scale fisheries is best known in the processing and marketing of fish and other fishery products, though women play a crucial role throughout the small-scale fisheries value chain (Lentisco and Lee, 2015; Zelasney, 2020). Men are often recognized as fishers and women as processing workers or marketers of fishery products (Lentisco and Lee, 2015). Thus, this kind of generalized approach makes fisheries governance blind to women's other valuable contributions to the sector. However, within the post-harvest supply chains, women face many challenges, such as gender-based discrimination, social exclusion, poor working conditions, and unpaid household workload (Manyungwa et al., 2019). The knowledge and contributions of women to the fisheries sector, especially in small-scale fisheries, are often overlooked and unrecognized in decision-making and public policies (Kleiber et al., 2017; WSI, 2019; Zelasney et al., 2020). At the same time, women's own lack of awareness of their potential and rights and a lack of knowledge and experience about interventions that have

shown themselves to actually work further marginalize women in decision-making (Lentisco and Lee, 2015).

There is an increasing debate among scholars and practitioners about challenges and opportunities associated with how the fish and fisheries products are traded (Crona et al., 2015; Marschke and Betcherman, 2015; Béné et al., 2016). The intensification of trade across the borders brings high revenues for the country and is therefore favoured by governments. At the same time, it can create complexities for the governance system, with the globalization of fisheries products and the expansion of markets putting pressure on the existing infrastructure and generating new demands (De Vivero et al., 2005; Campling et al., 2012; Stevens et al., 2014). Such diversity and complexities affect the capacity of the market institutions to perform their functions and have consequences for how the markets as a whole are governed (Kooiman et al., 2008). The COVID-19 pandemic has added to the governance challenge, as it has caused changes in the market structure of small-scale fisheries and thus affected its governance (ICES, 2020; FAO, 2020d).

Until recently, access to markets has received less attention by researchers than access to resources (Crona et al., 2016; Kerezi et al., 2016; Pascual-Fernández et al., 2018). Further, when market-related issues are studied, only a handful of research focuses on small-scale fisheries (see, for example, Campling et al., 2012; Crona et al., 2015, 2016; Béné et al., 2016; DesRivières et al., 2017; Sabau and Boksh, 2017; Foley and Hawkings,

2018; Bannett and Basurto, 2018; Steenbergen et al., 2019; Daly and Chuenpagdee, 2020). Little is known about factors that influence the dynamics in market access and the interactions between the market and the governance system.

Although the COVID-19 evolved as a global pandemic, challenges for small-scale fisheries and their access to markets have been more pressing in developing countries, where the majority of small-scale fisheries operate than in developed countries due to existing stressors and pressures. In Bangladesh, for instance, small-scale fisheries face a wide range of social problems, including poverty, lack of livelihood options, weak governance and under-representation of local stakeholders in the decision-making process (Islam, 2011). In terms of fish and other fishery products trade, the traders, including retailers and wholesalers, most likely take control over the domestic market governance since they deal with the larger volume of fish and fisheries products compared to other stakeholders. For example, the private sector and traders mainly control the market for tilapia, pangasius (Uddin et al., 2019), and mud crab (Bhuiyan et al., 2021). The involvement of the government agencies, for instance, the Department of Fisheries, is less significant (Sarker et al., 2017). A few government regulations, such as the Fish and Fish Product (Inspection and quality control) Ordinance, 1983, and the National Fisheries Policy, 1998, provide guidance to the processing sector and the export markets for fish and fisheries products from Bangladesh. No policy, however, yet has been formed to specifically guide the domestic markets for small-scale fisheries products (Uddin et al., 2019).

Although the pandemic has had multi-pronged impacts on many fisheries, the disruption of domestic and export markets of key commercially exploited species on which the majority of the small-scale fisheries depend has made them particularly vulnerable. For instance, the COVID-19 pandemic has worsened their conditions by disrupting the domestic and export market chains, posing thus further threats to their income, food, and nutritional security (Sunny et al., 2021). This is the case of the mud crab fishery in Sundarbans areas, Bangladesh (Sunny et al., 2021). Although the number of large-scale crab farms is increasing rapidly, the small-scale fishers are the only source to harvest and supply crab seeds to the farms. However, small-scale fishers are not powerful; they are not organized and are bound to middlemen. The effects of the pandemic started with the closure of the Chinese markets, which import about 90% of the mud crab production from Bangladesh (Rahman et al., 2018). However, other barriers for small-scale mud crab fishers to access markets include unstructured domestic markets, lack of appropriate policies, and a lack of coordination among relevant government agencies (Chandra et al. 2012; Ferdoushi and Xiang-Guo 2013; Chakraborty et al., 2018; Rahman et al., 2020), which have further accelerated the effect of the COVID-19 pandemic.

Chapter 3 Methodology

This chapter begins by describing the general research design of the mixed-method data collection. It explains the reason for the selection of the small-scale mud crab fishery in the Sundarbans areas of Bangladesh as a case study on the ground of theoretical sampling. It then outlines the five methods of data collection used in the study. The research instruments were developed according to the Memorial University of Newfoundland ethical policy requirements for research involving human participants.

3.1 Mixed method data collection

The research employs a mixed method of data collection that offers more advantages in collecting data than using a single method. The mixed-method allows capitalizing on the strength of one method to counterbalance the weaknesses of another one. It may offer the researcher the flexibility necessary to generate new insights into the object of study, for instance, people (Axinn and Pearce, 2006). The use of multiple methods can produce more comprehensive empirical results about a topic than either qualitative or quantitative alone and can minimize the non-sampling error that can arise by providing unnecessary information from diverse sources (Creswell and Plan Clark, 2007). In this research, five types of methods were utilized, including a desk study, review of secondary sources and archives, semi-structured interviews, informal interviews with key informants, and direct observation. The results from one method can feed into the other, providing

supplementary information and facilitating the interpretation of the research findings. For example, the results from the desk study and key informant interviews can help formulate context-specific and sensitive survey questions.

3.2 Selection of case study

The case study of this research was selected following the purposive sampling approach. Because this approach allows a researcher to choose a case that illustrates some features or processes in which the researcher is interested, according to some theories the research subscribes to (Silverman, 2005). Here, it is assumed that if a case is chosen based on what the theory demands, the case would be more applicable to a wide population who is interested in the same theory. The theoretical context of this study is access to markets for small-scale fisheries.

I have been researching small-scale fisheries in Bangladesh for the last three years. In 2019, I researched different sustainability aspects (i.e., social, biological, and economic) of the small-scale mud crab fishery in the Sundarbans areas of Bangladesh. I found that the fishery plays a crucial role in securing income and livelihoods for small-scale fishers and earning revenue for the country. Given this, the possibility of further research on the mud crab fishery in the Sundarbans areas was raised, especially to explore knowledge gaps related to market structures and access. The market for the mud crab fishery is mostly unstructured, and government involvement in the supply chains is rare. The

traders mainly control the domestic markets for mud crab. The outbreak of the COVID-19 pandemic has brought additional challenges by disrupting domestic and export supply chains. Furthermore, the mud crab fishing villages around the Sundarbans mangrove forest are associated with poverty and low income, making them unable to bring positive changes. These conditions make the mud crab fishery in the Sundarbans areas an appropriate case study. The insights from this study can likely be applicable to fisheries with similar status in other jurisdictions. Further, an analysis of the small-scale fisheries governance in Bangladesh may produce fresh knowledge about the governing needs and opportunities during and after the COVID-19 pandemic.

3.2.1 Study areas

The study has been carried out on the Southwestern part of the Khulna Division in Bangladesh. The local or regional government administration (LGA) in Bangladesh has four tiers. The division is the first tier of the LGA, where the Divisional Commissioner is the administrative head of a division. The second tier of the LGA is district administration (or *Zila Parishad*), and the administrative head is the Deputy Commissioner. Each district consists of several sub-districts or Upazila, which is the third tier of the LGA. The head of the sub-district is Upazila Nirbahi Officer (UNO or Upazila Executive Officer). Each Upazila administers several Union councils (or Union Parishad or Unions). Unions are the smallest and the lowest units of the LGA in Bangladesh. Each union is made up of nine wards. Usually, one village is designated as a ward. The study

focuses on three unions, namely Munshiganj, Burigoalini and Gabura of the Shyamnagar Upazila (sub-district), in the Satkhira district. These unions are located in the Northwestern part of the Sundarbans mangrove forest (Figure 3.1). The majority of the community members of these unions are directly or indirectly involved in the crab supply chains. As the demand for mud crab fishery products in the international markets is rapidly expanding, the number of crab fishers is also increasing. Women are exceptionally involved in direct crab harvesting, together with men, more so than in other fisheries in Bangladesh (Rahman et al., 2020). The export trade of the mud crab fishery is growing faster than for other fisheries in this region. The maximum annual production and income related to the mud crab fishery come from these unions (DoF, 2019). Based on these reasons, Munshiganj, Burigoalini and Gabura were chosen as the main study area of the study.

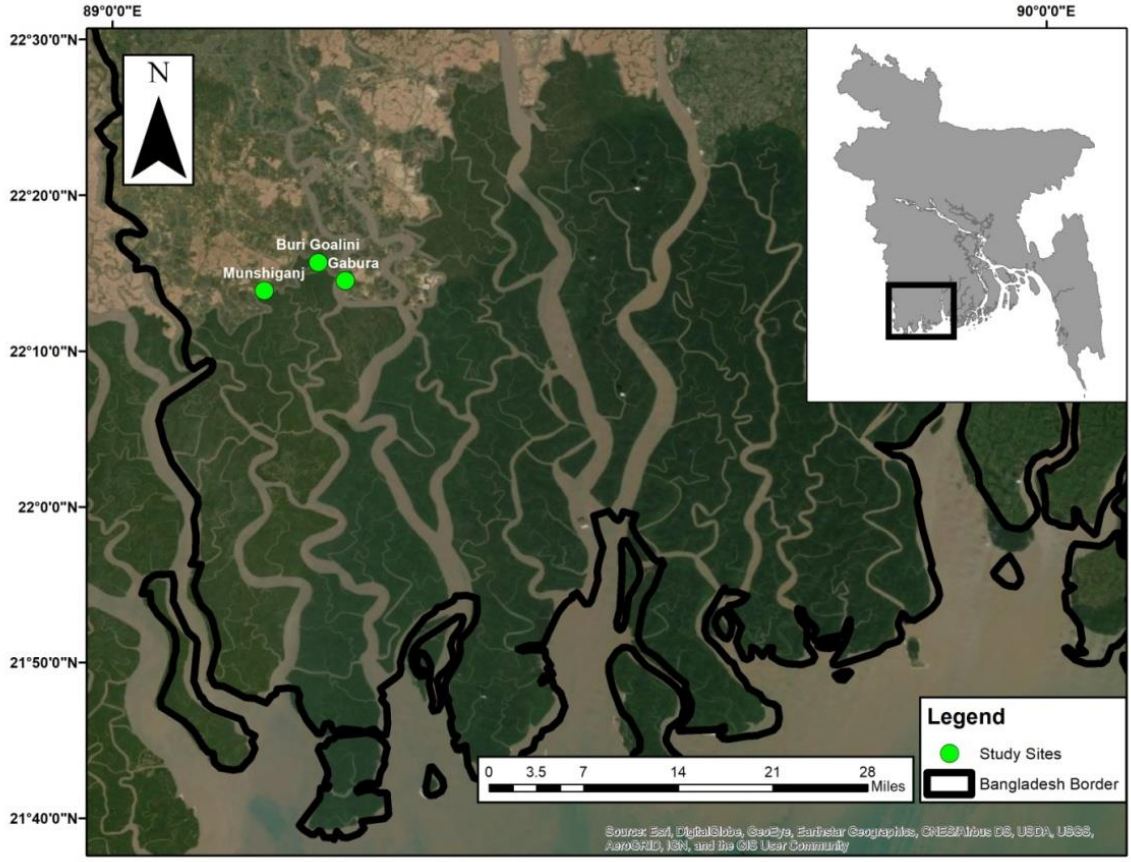

Figure 3.1 Map of the study areas (i.e., Munshiganj, Burigoalini, and Gabura) in Shyamnagar Upazila, Satkhira district.

3.3 Desk study

The term “Desk Study” refers to the research that is carried out without in-field investigations; thus, it can be done remotely (DBW, 2021). A desk study can be a preliminary study carried out before the field investigation, or it can be standalone research. It can provide an initial understanding of the research topic, identify potential risks and inform the details, scope and subsequent actions to be taken. Given the COVID-

19 restrictions related to in-person research activities, a standalone desk study was carried out to fulfill the first objective of this research. A global scan has been carried out involving a desk study method to identify the impacts of the COVID-19 pandemic on small-scale fisheries and their access to markets.

The global scan involved reviews of newspaper articles, online materials, and documents available on websites from February 2020 to May 2021. Different strategies were used to collect the materials, including Google search, direct search in fisheries-related organizations' websites, and subscriptions to relevant online newspapers, alerts and Listserv. Only the articles published, posted or circulated by established fisheries-related websites were selected. These include FAO (Information on COVID-19 and small-scale fisheries), ICSF (International Collective in Support of Fisheries), United Nations Family Farming Knowledge Platform, SeafoodSource, TBTI (Too Big To Ignore: Global Partnership for Small-Scale Fisheries Research) and OFI (Ocean Frontier Institute) Governance. As of May 2021, a total of 254 articles were collected related to 47 countries, covering Africa (32), Asia and Oceania (73), Europe (39), North America (43), Latin America and the Caribbean (32), with 35 articles not specific to a region (See Table 3.1).

Table 3.1 Collection of data from different regions with sources (*Source: desk study*).

Collected data			**Sources of Data**
Regions	**Number of records**	**Total**	
Africa	32	254	• Online newspaper articles • Fisheries related websites • Fisheries related UN websites • Subscription to listserv and alerts • Direct Google search
Asia and Oceania	73		
Europe	39		
North America	43		
Latin America and the Caribbean	32		
Others	35		

The collected materials were organized in an Excel spreadsheet under different categories following the content analysis rules presented by Graneheim and Lundman (2004) and Erlingsson and Brysiewicz (2017). The content analysis began with the identification of meaning units (condensed), codes, sub-categories, categories, and themes. Each condensed meaning unit consisted of one or two sentences covering the main message of the news item. When stories covered more than one message, several meaning units were documented under the news item. Codes were assigned to best describe each meaning unit, usually in one or two words, and sub-categories were used to group closely related codes. Sub-categories were further organized under categories based on similarities and dissimilarities. Finally, all the categories were grouped into three main themes related to the study, i.e., (i) vulnerability to COVID-19, (ii) responses and adaptation to COVID-19, and (iii) challenges and emerging issues. Further, different charts and graphs of each theme were developed based on the frequency and time scales of similar news. The validity of the data was partially cross-checked by participating in many virtual seminars

and webinars. Besides, the existing scientific articles on these themes were reviewed to support the findings.

3.4 Review of secondary sources and archives

For the mud crab fishery, I reviewed literature from 2006 to 2021 that focuses on small-scale fisheries, their governance, and the socio-economic status of fishing communities in Bangladesh. Globally, the mud crab fishery is a relatively well-researched topic, with numerous studies having been conducted on social, natural, and biological aspects, while a few studies have been conducted in Bangladesh on this fishery. The data I reviewed included book chapters, journal articles, grey literature, government reports, proceedings of a regional symposium, and online news materials. I reviewed the key literature relevant to the topic of this study under the different categories, including small-scale fisheries (e.g., Jentoft and Chuenpagdee, 2015; Béné et al., 2010), market governance (e.g., Crona et al., 2015; 2016; Coronado et al., 2020), gender issues (e.g., Kleiber et al., 2015, 2017; Lentisco and Lee, 2015), COVID-19 and small-scale fisheries (e.g., Belton et al., 2021; Bennett et al., 2020), small-scale fisheries in Bangladesh (e.g., DoF, 2019; Mozumder et al., 2018) and the mud crab fishery (Rahman et al., 2020; Zafar and Ahsan, 2006).

3.5 Semi-structured interviews

Semi-structured interviews are one of the most used methods for data collection through conversation with one person at a time (Adams, 2015). This method allows probing and follow-up questions and enables respondents to provide their perspectives, experiences, and reflections in their own words (Mason, 2004). The optimum time for the interviews is considered an hour to minimize fatigue for both interviewer and respondent. This study employed semi-structured interviews that covered a wide range of topics related to small-scale mud crab fishery and its access to the market (see appendix I).

As presented in Table (3.2), a total of 20 semi-structured interviews were carried out with key informants, including representatives from crab harvesters, farmers, middlemen, local depo owners, exporters, early career researchers, academia and government officials from the Forest Department and Department of Fisheries, in order to collect information for the mud crab fishery case study. The participants were selected based on previous research networks and suggestions made by the interviewed participants, as in snowball sampling (Patton, 1990). Given the COVID-19 restrictions on in-person fieldwork activities, the interviews were conducted using the Internet or phone calls. Each interview lasted between 40-70 minutes. The interviews comprised questions in which participants outlined their roles and relationships in the crab supply chains.

Table 3.2 Key informant interviews using the semi-structured questionnaire; the location held.

Key informant	**Role in market institutions**	**Interview location**
Four crab harvesters-men	Crab harvest and selling to local markets	Satkhira, Khulna, Bangladesh
Three crab harvesters-women	Crab harvest, selling to local markets, sorting and grading and day labour	
One *Faria* (commission agent)	Collecting crab from harvesters and selling it to depo owners	
Two depo owners	Collecting crab from harvesters and selling it to exporters	
Three exporters	Collecting crab from the local market and export it	Uttara, Dhaka, Bangladesh
One officer-Department of Fisheries	Monitor and regulate crab harvesting in the Satkhira region	Satkhira, Khulna, Bangladesh
One officer-Forest Department	Monitor and control harvesters' access to the Sundarbans mangrove forest	
One researcher	Conduct research on different aspects of the mud crab fishery and its supply chain	Khulna, Bangladesh
One researcher	Conduct research on different aspects of the mud crab fishery and its supply chain	Sylhet, Bangladesh
One Professor-Sylhet Agricultural University	Conduct research and provide policy recommendations for small-scale fisheries in Bangladesh, including mud crab fishery and its supply chain	
One Professor-Bangladesh Agricultural University	Conduct research and make policy recommendations for small-scale fisheries' supply chain, including for the mud crab fishery	Mymensingh, Bangladesh
One Professor- Hajee Mohammad Danesh Science and Technology University	Conduct research and make policy recommendations for fisherwomen related issues	Dinajpur, Bangladesh

The interview data were analyzed thematically based on the categories outlined by the interactive governance framework. The gathered data were complemented by an analysis

of secondary data, including academic and grey literature (e.g., news articles, podcasts, and documentaries) to provide a social, cultural, economic and historical context to the interview data. Besides, the relevant policy documents issued by the government and institutions related to small-scale fisheries governance, the Sundarbans mangrove forest, and export trade were examined to identify potential opportunities and barriers for the mud crab fishery access to markets.

3.6 Informal discussions with key informants

In addition to the semi-structured interviews, informal virtual discussions were carried out with key informants about small-scale fisheries and their access to markets in Bangladesh, in the context of the COVID-19 pandemic, to supplement and validate the gathered web-based data (See appendix II). The key informants provided additional qualitative contextual information for the study. This method was also useful in identifying the key processes and issues, interpreting data, and verifying the results from semi-structured interviews. In Bangladesh, fourteen informal discussions with key informants were conducted from December 2020 to March 2021 to capture the overview of small-scale fisheries, their governance, impacts of COVID-19 and responses provided to support small-scale fisheries (Table 3.3). The participants were selected based on their experiences and knowledge. Then a list of participants was prepared from the previous research network and the suggestions made by the participants involved in the semi-structured interviews. The contacts were made over the phone/Internet (email) due to the

COVID-19 related restrictions on in-person meetings. Depending on the key informants' background, different themes were focused on. For example, small-scale fisheries and the challenges facing this sector were discussed with academia. The discussion about the governing system of small-scale fisheries and their access to markets was carried with representatives from different government agencies, small-scale fishers, and domestic and export fish traders. A common discussion with all the participants was about the impacts of the COVID-19 on small-scale fisheries and the responses. The informal discussion with key informants was also made after the semi-structured interviews for further information needed to fill in some gaps learned after the interview. The list of informal key informant discussions and respective themes are presented in Table 3.3.

Table 3.3 Informal interviews with key informants; main theme(s) explored; and location held.

Key informant	**Theme**	**Interview location**
Two professors, Sylhet Agricultural University, Bangladesh	• General topics on fisheries • Small-scale fisheries governing system • COVID-19 pandemic: impacts and responses	Sylhet, Bangladesh
Additional Director-general, Department of Fisheries, Bangladesh	• Responses to COVID-19 pandemic	Dhaka, Bangladesh
One researcher, Bangladesh Fisheries Development Corporation	• General topics on fisheries • COVID-19 pandemic: impacts and responses	Dhaka, Bangladesh
One scientific officer, Bangladesh Fisheries Research Institute	• Responses to COVID-19 pandemic	Mymensingh, Bangladesh
One researcher, WorldFish, Bangladesh	• General topic on fisheries • Impact of COVID-19 on small-scale fisheries	Dhaka, Bangladesh

One project coordinator, ECOFISH project	• COVID-19 pandemic: impacts and responses	Barisal, Bangladesh
Five representatives of small-scale fishers	• Small-scale fisheries governing system • COVID-19 pandemic: impacts and responses	Sylhet, Sunamganj, Rajshahi, and Khulna, Bangladesh
Two representatives of fish traders	• Supply chain governing system • COVID-19 pandemic: impacts and responses	Khulna and Rajshahi, Bangladesh

3.7 Direct observation

The study partially relied on the researcher's seven months of direct observation for qualitative data collection. This method helps complete the analysis and fill the information gaps left by the above-mentioned study methods. Direct observation is an established research method that allows the researcher to participate in daily activities at the local level and learn about socio-cultural processes, patterns, relationships among people, and the organization of institutions (DeWalt and DeWalt 2002; Jorgensen 1989). The main activities as part of this direct observation included walking, participating in fishing activities, visiting fish markets, attending social events, and 'hanging out' with fisherfolks and village members.

The field observation of this study was partly from previous research during March-July, 2019 and my last visit to Bangladesh during January-February 2021. Being familiar with the small-scale fisheries in Bangladesh since childhood (because this is where I am from)

was useful for interacting closely with fishermen and the fishing community. During my undergraduate studies, I was privileged to visit the major fisheries resources-enriched areas of Bangladesh, including Bagerhat, the Sundarbans, Khulna, Mymensingh, Cox's Bazar, Chittagong and Sunamganj as part of practical courses. Apart from this, I visited Khuakata, Patuakhali, Sathkira, and St. Martin Island for previous research purposes. Further, my stay in Bangladesh for six weeks at the beginning of 2021 allowed me to look closely at how small-scale fisheries in Bangladesh are affected by the COVID-19 pandemic and what support they got from different sources.

Chapter 4 Impacts of COVID-19 on small-scale fisheries and their access to markets: a global scan

The chapter presents results from a desk study that provides a comprehensive understanding of the impacts of COVID-19 on small-scale fisheries and their access to markets in different locations around the world. The desk study took place from February 2020 to May 2021. The reported results are based on a review of about 241 news articles and web-based blogs available on the Internet (hereafter referred to as online-based reports), supplemented by 13 recently published peer-reviewed scientific articles. The regional breakdown of the data sources is as follows: 13% Africa, 29% Asia and Oceania, 15% Europe, 17% North America, 13% Latin America and Caribbean, and 14% others not related to any particular region. The chapter first describes how COVID-19 affected small-scale fisheries trade and the immediate and long-term responses from various actors, followed by the presentation of gaps, issues, opportunities, and challenges that came to light during the pandemic.

4.1 Overall impacts of COVID-19

While the pandemic outbreak has a deadly effect on human life and all the sectors of society, the fisheries sector has been hit hard by the pandemic, especially small-scale fisheries. The analysis of the majority of the online-based reports suggests that access to markets for small-scale fisheries has affected more than access to resources. The analysis

also shows that countries have focused on minimizing the impact of COVID-19 on human life rather than economy, trade, or commerce at the beginning of the pandemic. Thus, countries have started shutting down the borders, i.e., air, water, or land travel, to prevent the spread of the virus. Consequently, other complications have started to arise, for instance, the absence of buyers in the markets.

As presented in Table 4.1, the domestic and export markets closure has led to the overall disruption of market channels. The domestic markets are affected due to the logistical problems related to transportation. This situation has led to reduced demand for fish, the absence of buyers, and limited operations of processing industries. As a result, small-scale fisheries have got affected since small-scale fisheries usually sell their daily catch to the domestic markets. To a small extent, small-scale fishers, in many cases, have continued their fishing activities. Still, the absence of buyers in the markets and limited sell to the processing industry have caused unsold fish and seized income for small-scale fishers.

Furthermore, the government-imposed lockdown and mobility restrictions have raised social tension within the fishing communities. The analysis of the online-based reports suggests that limited gathering at markets, wharves, or fish landing centres has caused stress or depression for fishermen. As a result, domestic violence, the unpaid workload for women and fishermen-government conflicts have increased within the fishing communities. However, the pandemic also has some positive impacts on small-scale

fisheries that have mostly come based on strategies have taken at different levels to minimize the effect of the pandemic on small-scale fisheries, which are presented in Table 4.1 and discussed in section 4.3.

Table 4.1 The impacts of COVID-19 on small-scale fisheries, their access to markets, and the responses that have been taken at different levels (Source: *desk study*).

Impacts	**Causes**	**Responsive measures**	**Level of responses**
Disruption of market channels	• Domestic market closure • Export market closure • Reduced fish demand • Absence of buyers	- alternative market settings - innovative marketing strategies (retail, local, and social media-based online sale)	Individual and community level
		- re-arrange markets - changes in government strategies - online marketing system	Organizations level
Impact on income and livelihoods	• Price dropped • Loss of tourism • Decreased sale • Loss of income	- reduce fishing activities - use of more fish for household consumption - agricultural activities and home gardening - youth volunteer support - fish donation - support by local elites	Individual and community level
		- processing unsold fish - fish bought by the government - keeping local markets open	Organizations level
Impact on social life	• Reduced gathering at the market, wharf, and landing centres • Fear of virus contamination • Maintaining lockdown and social distancing	- food and financial support - provide health safety measures - fish released back into the water	Organizations level

4.1.1 Disruption of market channels

While the causes for supply channel disruptions are many, about 43% of online-based reports suggested that the majority of supply channels were disrupted due to the closure of export markets (Figure 4.1). Things came to an abrupt halt due to the lockdowns and restrictions in many countries since the first outbreak in 2020 in fresh fish markets and landing places that were normally lively and active. For example, people reduced gathering in landing and auction centres in Ghana and the Philippines due to the lockdown or stay-at-home orders (Crawford, 2020). The Norwegian seafood trade faced a continued decline since the pandemic began (Holland, 2021). The domestic markets and tourism industry have also been directly affected by the restrictive health measures, for example, in Brazil and India (Cavalcante, 2020; Narasimhan, 2020). The closure of hotels, restaurants, cruise ships, and casinos, and the fall of tourism, further led to poor buy and sell volumes in the domestic markets for fish and fisheries products (Orlowski, 2020), as reported in Kenya and Egypt (Amayo, 2020; WorldFish, 2020c) as well as in the US and Canada. In Europe, there was an overflowing of fresh fish as consumers started to buy frozen or canned fish due to the perception that it was safer than fresh fish (GFCM, 2020).

As shown in Figure 4.2, the worldwide disruption of market channels was high during March-May, 2020, where Asia and Oceania were on top during March-May and July 2020. The supply chain disruptions started to recover after that period, until April 2021,

when the number of COVID-related deaths spiked in some Asian countries, for instance, in India, and subsequent travel restrictions were imposed. The early outbreak in China took place during the Chinese New Year (January 2020), closing down crab export from India and Bangladesh and Pangasius from Vietnam (Roy, 2020; Kumar, 2020; Harkell, 2020). The export of shrimp from three companies in Ecuador to China was suspended due to the evidence of COVID-19 presence in the shipment, causing major job losses (Molinari, 2020). In Atlantic Canada and Newfoundland and Labrador, the closure of the export markets has had a direct impact on snow crab and lobster fisheries, suggested by a few reports.

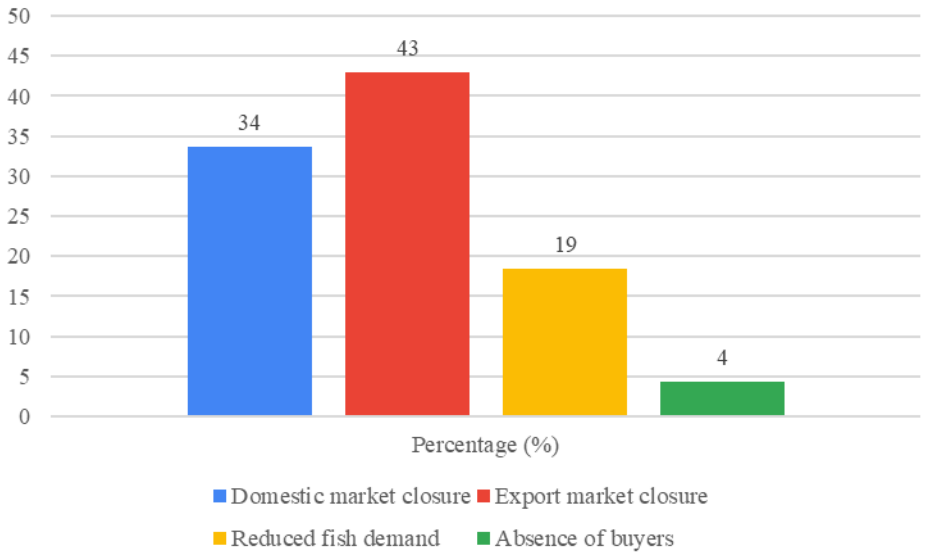

Figure 4.1 The causes of market channel disruption

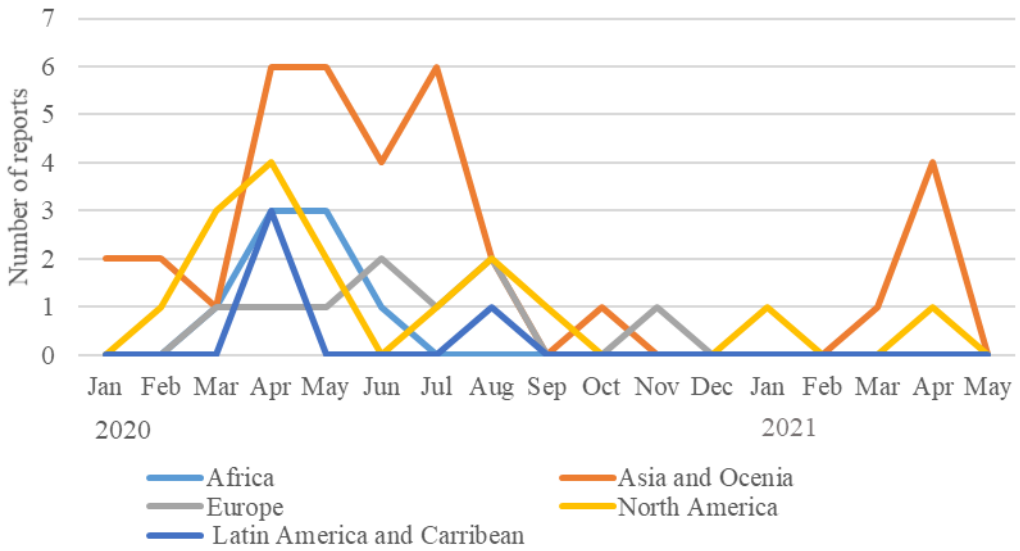

Figure 4.2 Market channel disruption trend in different regions from January 2020 to May 2021.

A similar slowdown was noted in the processing sectors, with plants closing due to concern of virus spread or contamination (Kumar, 2020). For example, in Ghana, one plant worker was reported to infect 533 others at a fish processing factory (Akorlie and Ross, 2020). Some reports from Australia and the Solomon Islands showed that the processing industries reduced the amount of fish they bought from the fish harvesters because of an increase in production cost and reduced market demand (Graham, 2020).

4.1.2 Impact on income and livelihoods

About half of the online-based reports showed a loss of fishers' income due to the disruption of market channels (Figure 4.3). The second highest reported impact is the

drop in the price of fish and fisheries products. Since the majority of small-scale fisheries catch in developing countries is sold directly at local markets, usually by women in fishing households, the impact of the COVID-19 pandemic on the income and livelihoods of fishers' households is substantial. Many of the fish sales at events and festivals were also suspended, limiting, therefore, the additional household incomes that small-scale fishers normally could count on.

With the decrease in the overall demand for fish, associated with both the market closures and travel restrictions, their sale started to drop, affecting, therefore, the income of small-scale fishing families (Figure 4.3). This was reported in many locations of the world, including Bangladesh (WorldFish, 2020a), South Africa (America et al., 2020), Timor-Leste (Massinga, 2020), Solomon Islands, Vanuatu (Eriksson et al., 2020) and Indonesia (Our Daily Planet, 2020). In most regions, the severity of the pandemic's impact on small-scale fishers' income and livelihoods had continued from March 2020 to September 2020 (Figure 4.4). Because small-scale fishers depend on fish for food, and income from the daily catch, the lack of buyers can push them into poverty and food insecurity. Furthermore, the physical and financial access to food had disrupted in low and middle-income countries (Béné et al., 2021), where the number of small-scale fishers is high. This circumstance has forced many small-scale fishers in several African countries, as well as in Venezuela, to continue to fish, despite the pandemic and the restrictions (La Guaira, 2020).

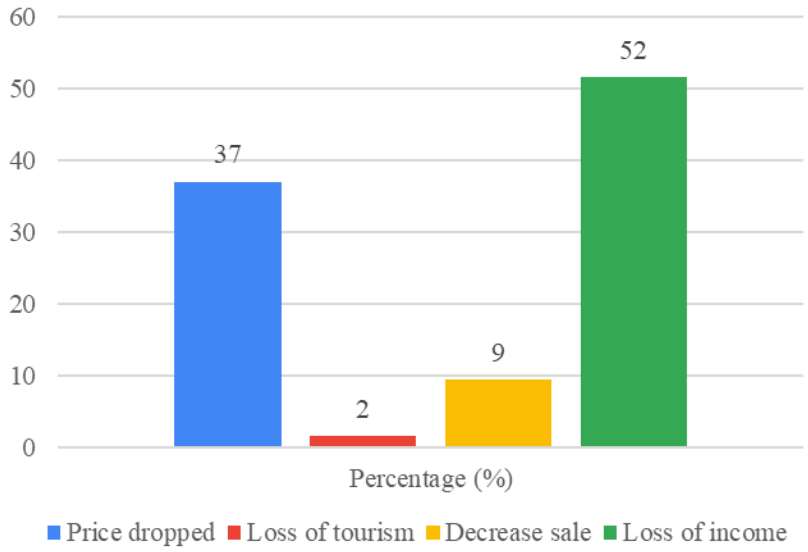

Figure 4.3 Impacts of COVID-19 on small-scale fisheries.

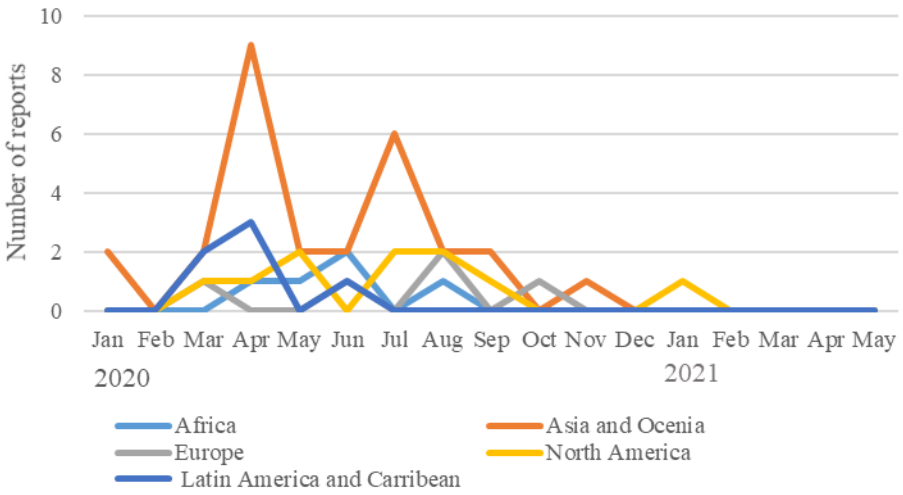

Figure 4.4 Effects on small-scale fishers' income and livelihoods from January 2020 to May 2021.

In some cases, this disadvantaged situation of lower demand exposed fishers to the exploitation of middlemen who insisted on buying fish and fisheries products at low

prices, which further affected the income of small-scale fishers. This situation was reported, for instance, in Uganda (Wafula, 2020). In British Columbia, Canada and in Alaska, large-scale fishing companies did take stronger control of the market chains, hindering small-scale fisheries' access to markets (Ecotrust Canada, 2020).

4.1.3 Impact on social life

Fishing is a highly interactive and social activity embedded closely in the communities (Jentoft, 2000). Fishers share stories about their fishing trips, exchange information about buyers and price trends, and discuss politics at wharves, landing places and auction centers. The COVID-19 pandemic had hurt these social interactions, with fisherfolks limiting their gathering in these places (Table 4.1). About 47% of the online-based reports suggested that small-scale fishers reduced social gatherings mainly for fear of virus contamination (Figure 4.5). In almost all the regions of the world, social tension among the fishing communities still continued since the pandemic began, while the tension was high from March to June 2020 (Figure 4.6). The social tensions had occurred mostly because of the fear of getting infected by the virus, reduced social gathering, and lockdown and social distancing. In many cases, conflicts occurred between fishers and the governing agencies due to the unequal distribution of government benefits. For example, unhappy with the unequal distribution of government aids, fisherfolks in Brazil started a movement to get fair benefits and better government support (Anonymous, 2020).

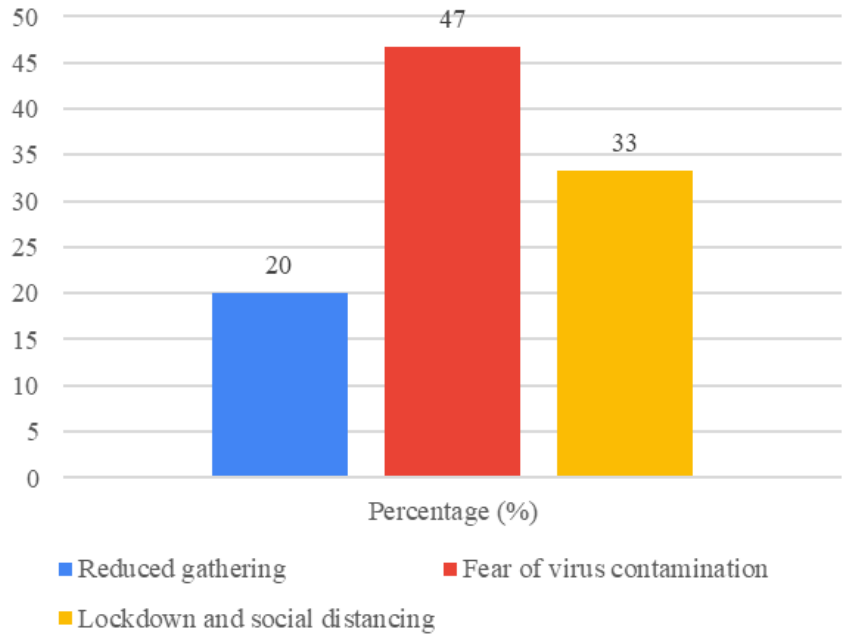

Figure 4.5 The major causes of impact on social life.

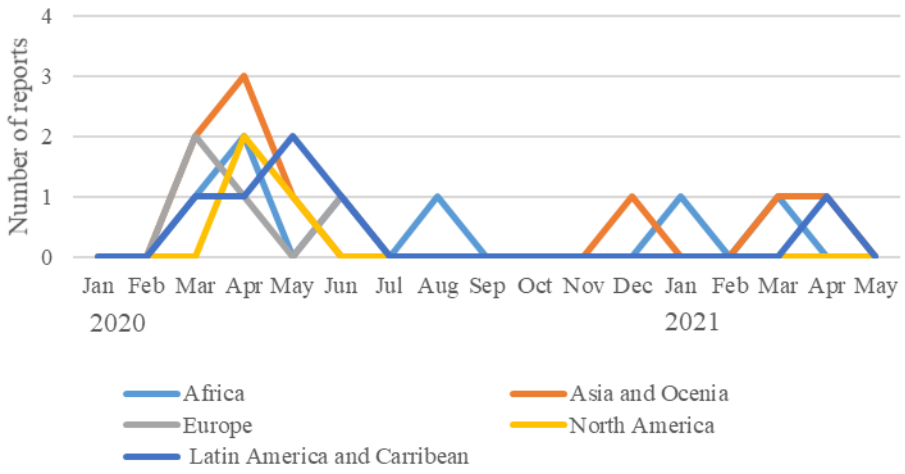

Figure 4.6 The intensity of the pandemic's impact on social life from January 2020 to May 2021.

4.2 Impacts on vulnerable groups

While the impact of the pandemic is felt in almost all actors in the fisheries supply chains, almost all the online-based reports indicated small-scale fishers as the most vulnerable group. Yet, among small-scale fishers, some populations are particularly vulnerable due to their existing vulnerable conditions. At least half of the online-based reports showed that women were most vulnerable to the pandemic among the fisheries supply chain stakeholders (Figure 4.7), which could be because many of them work in processing plants, where health and safety may be an issue. An Ivory Coast's story, for example, highlighted how women were working in poor and unhygienic processing environments, risking their health and safety during the COVID-19 pandemic (Philippe, 2020). More than 20,000 women were out of work in Bangladesh due to the closure of frozen shrimp and dried fish production (WorldFish, 2020a). The majority of the women fish vendors in India were unable to continue their usual door-to-door fish selling activities (WorldFish, 2020b). With family members spending more time at home, women also had to shoulder additional domestic workloads, including homeschooling and extra caretaking work for older people. In some cases, gender-based violence also increased (Harper et al., 2020; UN, 2020). For example, the women fish vendors in India faced harassment from local authorities in selling fish to different states during the pandemic (Guttal, 2020).

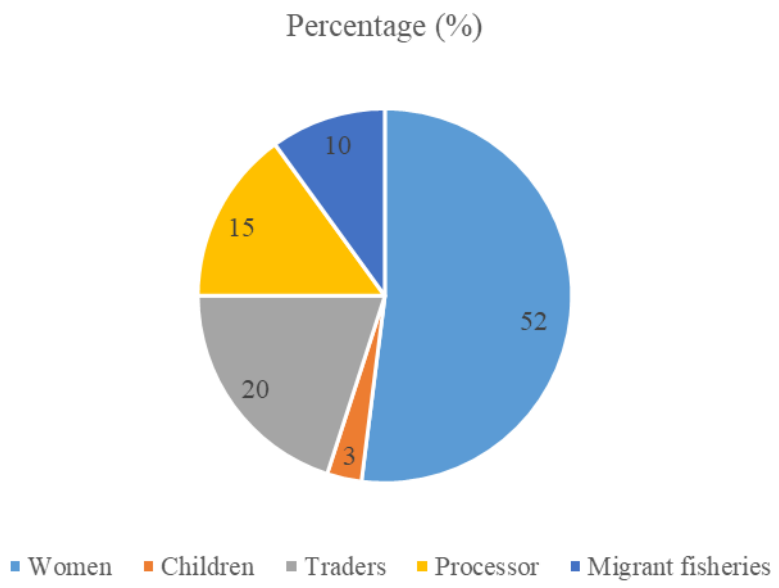

Figure 4.7 The supply chain actors vulnerable to the pandemic.

As suggested by 20% of the online-based materials, the next vulnerable group in the supply chain was local traders (Figure 4.7), who directly buy fish from fishers and sell to large-scale traders, retailers, or wholesalers. The reduction of price, and of demand for fish in the markets, along with the closure of processing plants, significantly reduced income for this microenterprise group. For example, in Myanmar, the majority of the traders had little or no income at the beginning of the pandemic due to the lockdown restrictions (Griffiths and de Lange, 2020), which led to increased indebtedness like in India and Bangladesh (Pandey, 2020; Pincus et al., 2020). A similar situation was observed for processing plants as 15% of the collected data show that processors were also affected due to the disruption of supply channels. The effects of COVID-19 in Asian coastal countries were distinct from other regions because of the high number of migrant

fishers, and about 10% of the online-based reports identified migrant fishers as one of the vulnerable groups. This was the case for small-scale migrant fishers in India and Malaysia, who faced border closures and restrictions on transportation, which prevented them from participating in the fisheries (Pandey, 2020; SciDev.Net, 2021).

4.3 Responses to the pandemic

As shown in Table 4.1, different types of supports have been observed at various levels, such as individual or household, community, and organizations, which enable the continuation of the fisheries supply chains. The responses from the organization level, including government organizations, non-government organizations, cooperative or non-profit organizations, were more visible (in both the online-based media articles and the published reports) than individual and community responses. The responses from these organizations were mostly observed in April 2020, when the COVID-19 crisis was at its peak (Figure 4.8). Compared to other regions, North America has been very active in supporting seafood supply chains, followed by Asia and Oceania and Africa. Yet, since the majority of the small-scale fisheries operate in Asia and Oceania (Chuenpagdee et al., 2006), an ongoing response has been observed in that region to support small-scale fishing households and to facilitate their market access.

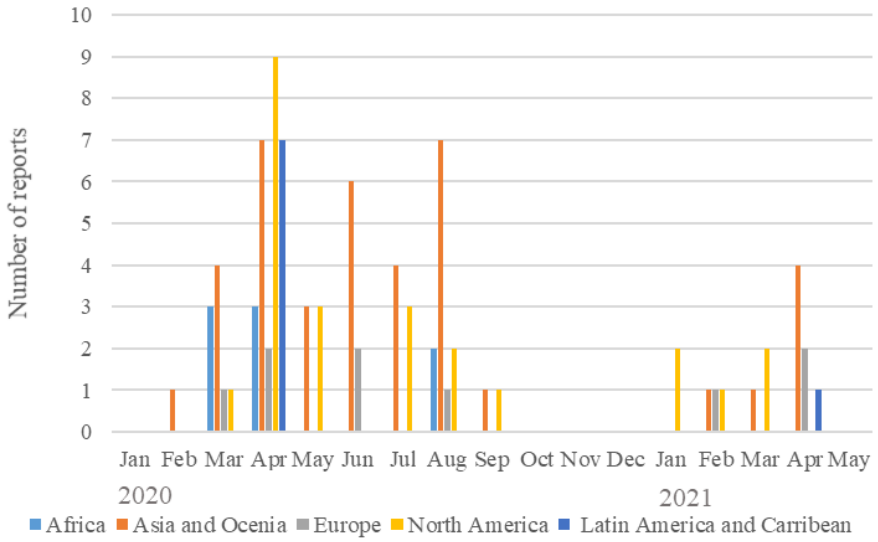

Figure 4.8 The pattern of responses at different levels to support small-scale fisheries and supply chain actors in different regions of the world from January 2020 to May 2021.

4.3.1 Individual and community responses

The COVID-19 has brought new opportunities in some cases with the way individuals and communities responded to the pandemic. Several responses have been taken at the individual and community levels, with innovative marketing strategies being the most common (Figure 4.9). Many reports suggested that in the USA, Canada, the UK, Scotland and Brazil, the COVID-19 pandemic has led to more direct sales of seafood, with fishers using social media and information technology to sell or initiate contactless door-to-door delivery. The sale of live fish in retail markets has even increased in some cases, such as in the Atlantic Provinces of Canada (Robinson, 2020).

About 19% of fishing communities arranged alternative fishing facilities. For example, local fishers' organizations in Kerala, India, set up an alternative market in an open area for people to buy and sell fish while maintaining physical distancing and adhering to mask-wearing rules (Nayak et al., 2020). In this market, local small-scale fishers could bargain with buyers to set the price of fish, which is often higher than what they normally receive when selling to the middlemen. In England, South Africa, and also India, fishers began to process unsold fresh fish for future sale (Gladwell, 2020; America et al., 2020; Ananth, 2020).

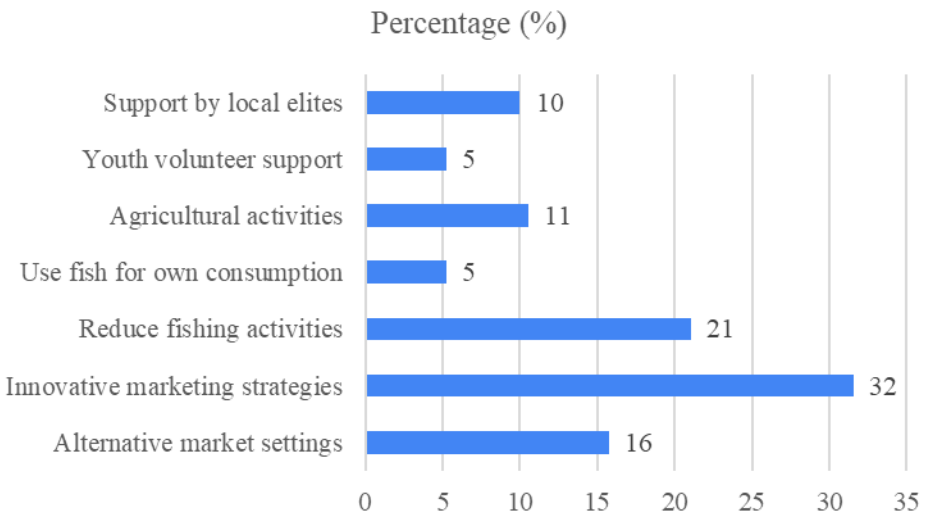

Figure 4.9 The common responses taken at the household and community levels to stay afloat during the COVID-19 pandemic.

At the household level, small-scale fishers have taken different response strategies during the lockdown similar to their fishing off-season in order to fulfill their food and nutritional requirements. For example, in the Solomon Islands, small-scale fishers were able to engage in agricultural activities and home gardening as alternatives to

fishing(Eriksson et al., 2020). Being at home during the lockdown, some fishers in Mexico spent time in different activities, such as motor repairs, making and selling face masks, and communicating with the community using Facebook, WhatsApp or Zoom (COBI, 2020).

At the community level, food and financial supports came from different youth and volunteer groups and local organizations. For example, students in Brazil started a campaign to provide financial support to small-scale fishers (Diario de Pernambuco, 2020); the local elite persons in Bangladesh helped vulnerable fishers through the donation of food and grocery items (Rosen, 2020). In Kerala, India, a church has donated money to support fishers and their families (Daiji World, 2020). A small group of people in British Columbia, Canada, developed an emergency COVID-19 Active Fishermen's Committee to tackle the most pressing issues raised by the pandemic (Ecotrust Canada, 2020; Bello, 2020).

4.3.2 Organizational responses

Governments around the world have taken several initiatives to minimize the effect of the pandemic and to maintain the domestic and export fisheries supply chains. Providing food and financial supports has been the most common response, according to 43% of the online-based reports (Figure 4.10). For example, the Cyprus government provided US$1174.69 for each professional fisher for April 2020 (Chrysostomou, 2020). The

Government of Canada increased the overall quota for snow crab for the Newfoundland and Labrador region by 10% and provided $62.5M to support the processing industries and another $469.4M to support fish harvesters (Dean-Simmons, 2020; Patel, 2020).

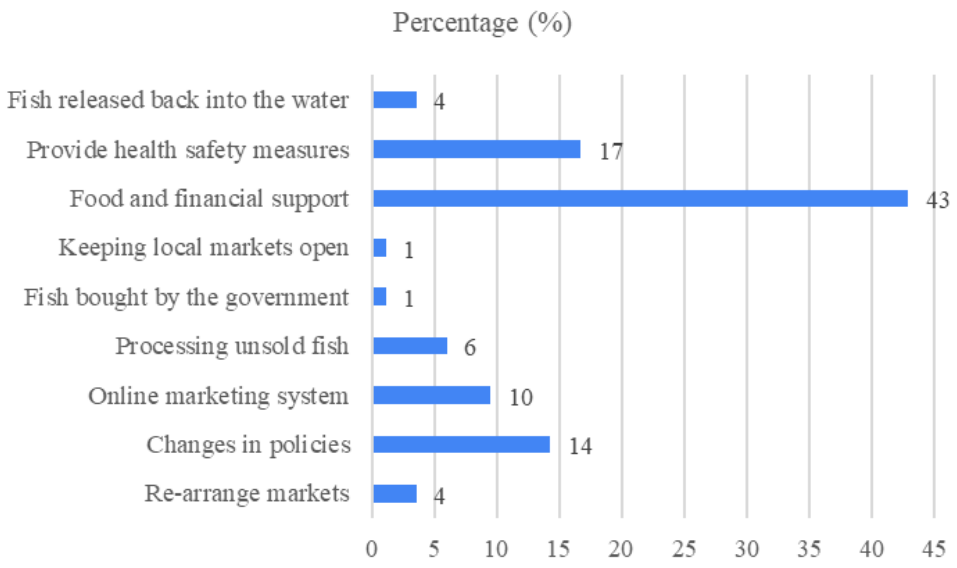

Figure 4.10 Various types of support provided by different organizations for the fisheries sector, including small-scale fisheries.

Governments in developing countries also provided support to people involved in small-scale fisheries. For instance, the government of West Bengal in India launched a mobile application to help fishers sell fish online (Mint, 2020). In Myanmar, the government relocated the fish markets from the regular confined places to a more open area to control COVID-19 transmission (Griffiths and de Lange, 2020).

The pandemic was also an opportunity for change in governance. This was the case in Australia, India, and New Zealand, where governments encouraged fishers to release

harvested fish back into the water to enhance catch in the next season (Taunton and Cropp, 2020). In Rhode Island, USA, the regulation about direct fish sales has been relaxed to enable fishers to earn income during the pandemic (Gnarly Bay, 2020). The Seychelles government bought fish from the fishers and distributed it to the people hit hard by the pandemic (Karapetyan, 2020). As the gathering of people at landing and auction centers was restricted, the Oman government organized an online auction and e-commerce system to keep functioning the seafood supply chain (FAO, 2020e). The Fisheries Local Action Group (FLAG) in Spain provided personal protective equipment for fishers, including small-scale fishers, and the Gargano FLAG in Italy helped develop the *Pesca Mia* app that connects fisherfolks with local restaurants and consumers (EU, 2020).

Finally, several non-governmental organizations, international and intergovernmental organizations have come forward to support small-scale fisheries in this pandemic. The Global Aquaculture Alliance (GAA) prepared health safety guidelines for fish processing workers' safety and created a decent working environment (Hill, 2020). Another example was the Seafood Nutrition Partnership and the Seafood4Health Coalition, which started a nationwide campaign in the US, entitled "Eat Seafood America!" to promote seafood sales and help Americans stay healthy COVID-19 (Blank, 2020a). Lastly, the World Bank initiated insurance facilities for small-scale fisheries, especially in developing countries in South and Southeast Asia, to face future crises like COVID-19 (Knight et al., 2020).

4.4 Implications and key lessons

The findings of the global scan presented above are based on what is reported in the online-based reports and scientific literature, which may not reflect the full spectrum of reality on the ground. Nonetheless, one of the key lessons is that the problems related to accessing fisheries resources due to the COVID-19 pandemic are abrupt; it has a lasting impact on the logistics of the fisheries supply chains in terms of processing, handling, and exporting fish and fisheries products. In some cases, specific guidelines have been set for importing or exporting fish and fisheries products in order to prevent further COVID-19 spread. Small-scale fishers are more vulnerable to the pandemic than any other actors in fisheries supply chains due to their poor socio-economic conditions and a high dependency on the fisheries supply chain for income and livelihoods. Small-scale fishers hardly have savings to spend during a crisis, like COVID-19, which further tied them up with the moneylender. Women have not contributed to their family income due to the closure/limited post-harvest processing of fish and loaded up with extra-unpaid work at the household level.

The impacts of the pandemic on seafood trade and markets have been far-reaching and seemingly long-lasting, while the responses are short-term. According to FAO (2020f), the weakened markets throughout the world, as well as logistical problems caused by the pandemic, will result in a reduction of the world's three percent seafood traded value. The COVID-19 pandemic has imposed challenges to the fisheries and market governing

system (Haas et al., 2020). Further, the pandemic has exposed power imbalances in the seafood supply system (Love et al., 2020). As revealed in this study, corporate control over fish and seafood supply chains creates barriers for small-scale fisheries in accessing and diversifying markets. The consequences of such barriers might create a disconnection between fishers and consumers (DesRivières et al., 2017) and a threat to local food sovereignty and economic development (McCormack, 2010; Bodwitch, 2017).

The effects on small-scale fisheries are likely higher than large-scale fisheries due to their vulnerability, as suggested in recent studies, such as Love et al. (2020), Campbell et al. (2020), Giannakis et al. (2020). A large number of fishing people, the high dependency on fish as food and income, the lack of organization and poor infrastructure for the supply chain, contribute to making small-scale fisheries vulnerable to the COVID-19 pandemic, with high risk reported in some African countries and the Small-Island States (Stokes et al., 2020; Aura et al., 2020; Kaewnuratchadasorn et al., 2020). The consequences of this may make small-scale fishers susceptible to 'poverty traps' (Allison and Seeley, 2004), which is the main concern expressed by FAO (2020c). Even though the pandemic's impact is not limited to small-scale fisheries in developing countries, however those in Europe and North America do receive financial support from their governments, that provided a buffer during the pandemic (EC, 2020; Patel, 2020; Blank, 2020b; White et al., 2020).

Apart from all the negative impacts of the pandemic on small-scale fisheries supply chains, some positive impacts have also been observed. For instance, the countries that have been importing fish from other countries started utilizing their own fishery due to the closure of borders, shipping, and air travel. This allows small-scale fishers to sell comparatively more fish in domestic markets, increase income, and improve food and nutritional security, given the COVID-19 situation. Furthermore, the long-term practices of such seafood trade can be a source of income for developing countries and improve the wealth of coastal communities (Bjørndal et al., 2014; Purcell et al., 2017). This study also shows how the COVID-19 pandemic has created an opportunity to diversify markets and reduce dependency on specific supply channels. In some cases, the alternative market, for instance, setting up a market in an open place outside of regular confined places by the local fisheries organization, has enabled small-scale fishers to increase income, get better prices for their products during the pandemic, and take part in the decision-making process.

Unlike what Béné (2020) said, this study suggests that the diversification of markets can minimize or reduce the COVID-19 effects on small-scale fisheries and other actors in the supply chain, including traders, processors, and retailers. Still, the question remains whether the opportunities brought up by the pandemic will continue in the future? While most of the policy responses to COVID-19 have been contextualized based on national governments' short-term political interests (Shamsuddoha et al., 2020), this study suggests that these opportunities, including the regulation allowing direct fish sale in

North America, be made more permanent, even after the pandemic ends. A better understanding of the market structure and local level governance is required to strengthen small-scale fisheries organization and capacity to participate in the supply chain. This includes careful examination of the characteristics and conditions of women involving in the fisheries, given their important contribution (Crona et al., 2010; Jimenez et al., 2020).

The differences in the vulnerabilities and challenges that small-scale fisheries face worldwide due to COVID-19 suggest that there is no one response that will fit all. A good response will require an understanding of the context where small-scale fisheries operate and how the markets are structured and governed in the case of access to markets. The COVID-19 pandemic has created an opportunity to build back the market structure, better and stronger. It might also be an opportunity for governing bodies and stakeholders of fisheries supply chains to learn from the present situation and use it as a reference to build a viable resilience in future crises. The responses for resilience should be taken highlighting the SSF Guidelines, and be beyond narrowly focused short-term political interests and act as united to save the global seafood supply chains and save humankind. Although the COVID-19 pandemic has created new challenges for countries to achieve SDG 14b, the opportunities discussed above may ease small-scale fisheries' access to markets if implemented and thus help in achieving SDG 14b and other SDGs, including poverty reduction and gender equity.

Chapter 5 Small-scale fisheries in Bangladesh in the context of COVID-19

The chapter begins with the description of the fisheries system in Bangladesh with a focus on small-scale fisheries since the country produces the majority of the fish from small-scale fisheries. The chapter then provides an overview of the COVID-19 situation in Bangladesh and its impacts on small-scale fisheries and their access to markets. It presents the governing system of small-scale fisheries in Bangladesh and the responses that have taken place thus far to support small-scale fisheries and their supply chain during the COVID-19 pandemic. The chapter ends by presenting the challenges in dealing with the COVID-19 pandemic for small-scale fisheries.

5.1 Fisheries system

5.1.1 Capture and culture fisheries

Bangladesh is endowed with rich and diverse fisheries resources, which largely consist of inland and marine fisheries. Inland fisheries are subdivided into capture and culture fisheries. The inland capture fisheries comprise rivers, estuaries, the Sundarbans mangrove forest, and floodplains, which are home to more than 260 freshwater species. According to the Department of Fisheries (DoF), the inland capture fisheries cover an area of 3,890,282 hectares (ha) and produce yearly 1,235,709 Metric Ton (MT) of fish, accounting for about 28 % of the total fish production in the country in 2018-19 (DoF,

2019) (Table 5.1). On the other hand, inland culture fisheries cover a much smaller area (about 821,923 ha) but produce yearly 2,488,601 MT of fish, which is 57% of the total fish production in 2018-19 (DoF, 2019). Inland aquaculture includes both indigenous species, for example, Climbing perch (*Anabas testudineus*), Stinging catfish (*Heteropneustes fossilis*), Walking catfish (*Clarias batrachus*), Indian catfish (*Ompok pabda*), and Mola carplet (*Amblypharyngodon mola*), and exotic species such as Common carp (*Cyprinus carpio*), Bighead carp (*Aristichthys nobilis)*, Pangasius (*Pangasius pangasius*), and Tilapia (*Oreochromis niloticus*). According to FAO (2018), Bangladesh ranked 3rd in inland capture fisheries and 5th in the world aquaculture production. Bangladesh also ranked 4th in the world and 3rd in Asia for tilapia production.

Since 2007, Bangladesh has recorded a steady average fisheries growth of 5% and consistent average aquaculture growth of around 9% (DoF, 2019). The overall production increased from 2000-01 to 2012-13 but had a sudden drop recently due to the decline of capture fisheries habitat (Shamsuzzaman et al., 2020a). As a result, the production of the key commercial species has declined, for instance, for the catfish group, such as Giant river catfish (*Sperata aor*), Wallago (*Wallago attu*), Dwarf goonch (*Bagarius* bagarius), Yellowtail catfish (*Pangasius pangasius*), Stinging catfish, and Rita (*Rita rita*). The culture of these species has increased, however, since fish farms started to adopt Good Aquaculture Practice (GAP), and with the rising in demand for the farmed, from about 1 million MT in 2008-09 to about 2.5 million MT in 2018-19 (DoF, 2019). At present, the most available cultured fishes in the markets are Indian carp (*Catla catla*), Rohu (*Labeo*

rohita), Mrigal (*Cirrhinus mrigala*) and Orangefin labeo (*Labeo calbasu*), along with exotic carp, such as Silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Ctenopharyngodon idella*), and Common carp (DoF, 2019).

Table 5.1 Fisheries area and production by sector (*Source:* DoF, 2019).

Sub-sector of fisheries	Area (Hectare)	Production (Metric Ton)
Inland Capture	**3,890,282**	**1,235,709**
River and Estuary	853,863	325,478
Sundarbans	177,700	18,282
Large depressions (*Beel*)	114,161	99,890
Kaptai Lake	68,800	10,578
Floodplain	2,675,758	781,481
Inland Culture	**821,923**	**2,488,601**
Pond	397,775	1,974,632
Seasonal Cultured	144,217	217,340
Waterbody	5,671	10,343
Oxbow Lake (*Baor*)	258,553	258,039
Shrimp/Prawn Farm	9,377	12,084
Crab Production	6,330	12,361
Pen Culture	176,213 m^3	3,802
Cage culture		
Marine Fisheries	**11,881,300**	**659,911**
Industrial		107,236
Artisanal or small-scale		552,675

In the marine sector, the current production of marine fisheries is 659,911 MT, or about 15% of the total fish production in Bangladesh (DoF, 2019). The marine fisheries include both industrial and small-scale fisheries. Industrial fisheries, mainly trawlers, operate in the deep sea, i.e., beyond the 40-meter (m) depth of water. Fishing taking place in water less than 40-m depth is considered small-scale. The marine small-scale fisheries sector contributes 83% of the total marine fisheries landings and 13% of the overall fish

production in Bangladesh (DoF, 2019). The marine fishing practice involves a wide variety of gears, including estuarine set bag nets, dragnets, push nets, gill nets, longline, seine nets, cast nets, trammel nets, and trawl nets. The key commercial species harvested by marine fisheries are Shrimp (*Penaeus monodon*), Prawn (*Macrobrachium rosenbergii*), Hilsa (*Tenualosa ilisha*), Sardine (*Sardina pilchardus*), Bombay duck (*Harpadon nehereus*), Indian salmon (*Eleutheronema tetradactylum*), and Pomfret (*Pampus argenteus*). Among the key commercial fish species, the contribution of small-scale hilsa fishery is considerable. The landings of the hilsa fishery in 2018-19 were 12.15% of the annual fish production, and the fishery contributed around 1% to the GDP (DoF, 2019).

When combining the small-scale and industrial fisheries, the fisheries sector contributes 3.50% to the national GDP (DoF, 2019). Bangladesh is self-sufficient in producing fish to supplement 60% of the animal protein intake for the people of the country (with a per capita intake of 62.58 g/day against targeted 60 g/day). The current export earnings for Bangladesh are US $5022 by exporting around 73,170 MT of fish and fishery products. The trade of fish and fisheries products in Bangladesh plays an essential role in boosting fish consumption and achieving food security. Trade of fish and fisheries products both at the domestic and export level significantly contributes to the country's economic growth and development (Dutta, 2017).

While the annual fish production is encouraging, studies show that the fisheries sector in Bangladesh is confronted with challenges, including climate change, natural disasters, unbalanced urbanization and industrialization, overfishing and environmental pollution (Table 5.2). Islam et al. (2020) reveal, for instance, that the biophysical conditions of the Bangladesh marine water bodies are likely to be aggravated in the future, which may cause more frequent extreme natural disasters, like tropical cyclones, compared to the past decades. They also show that the hilsa fishery is more vulnerable to climate change than other fisheries due to alteration of fish migration patterns as well as breeding and growth performance. Furthermore, the fish stocks have declined for many reasons, such as seasonal flooding, causing rivers to continually change course, creating further complications, including soil erosion and over-siltation of waterways (Hossain, 2014).

Fisheries enriched waterbodies in Bangladesh are situated in low-lying land, which makes them extremely vulnerable to sea-level rise (Harmeling, 2010). The country is also prone to natural disasters because nearly 80% of the total area in Bangladesh is floodplains, and the country is in a precarious geographical position. Climate change and its consequences influence the fisheries' stocks and have devastating impacts on fishery-based livelihoods and domestic food supply (Ghose, 2014). Climate shocks like cyclones, floods, droughts, sea-level rise, land erosion, and temperature and rainfall fluctuations have great impacts on small-scale fisheries, especially in developing countries like Bangladesh (IPCC, 2007).

Table 5.2 Challenges in the fisheries sector of Bangladesh and implications (*Source: Islam et al., 2020; DoF, 2019; and Ghose, 2014; Hossain, 2014)*).

Challenges	**Implications**
Natural disasters	• Alter fish migration pattern • Reduce fish supply and income for fishers • Destruction of fishing boats and gear
Sea-level rise	• Excessive flooding • Changes in river direction • Excessive siltation or soil erosion
Overfishing	• Fish stock decline • Reduce capture fisheries • Extinction of fish species

5.1.2 Socio-economic system

About 12% of the 160 million people in Bangladesh depend on aquaculture and capture fisheries-related activities full-time and part-time for their livelihoods and income (DoF, 2019). Of these, about 18 million people are directly and indirectly involved in small-scale fisheries (FRSS, 2017), including 1.4 million women in fishing, farming, aquaculture, fish handling and processing (BFTI, 2016). The marine fisheries sector alone provides direct and indirect livelihood options for 270,000 fishing households, involving at least 67,000 small-scale vessels and 200 industrial trawlers (Shamsuzzaman et al., 2020a).

Although the fisheries sector has grown in terms of production, small-scale fishers are facing many challenges (Table 5.3). For example, most of the small-scale fishers in Bangladesh experience poor socio-economic conditions, with almost half of them are

illiterate (Islam and Jentoft, 2019). Around 20% of the small-scale fishers do not own their own house; thus, they rely on government-provided houses or lands. There is also a strong patron-client relationship between fishers and middlemen/moneylenders (Islam, 2011). Fishers borrow money from the middlemen (e.g., the local traders), especially during natural or disease-related crises. In return, the middlemen buy all the fish from the fishers at less than the market prices.

Despite the decline of fish stocks, the number of fishers is increasing both for inland and marine capture fisheries. With the loss of agricultural land due to the ongoing land erosion, more people have chosen fisheries as a viable option, which ultimately has intensified the competition over fishing grounds, driving down the overall fisheries production (Amin et al., 2002; Nabi and Ullah, 2012).

Table 5.3 Major challenges for small-scale fisheries, causes and implications (*Source: Islam, 2011; DoF, 2019*).

Challenges	**Causes**	**Implications**
Poor socio-economic conditions	• Illiteracy • Lack of savings • Lack of awareness about their rights	• Rely on moneylender for monetary support during a crisis • Sell fish for less than prevailing market prices • Increased vulnerability to poverty
Overexploitation of stocks	• Increased fishing pressure • Increased number of fishers • Closure of fish migratory routes • Siltation and river erosion	• Reduced income for small-scale fishers • Increased illegal fishing practices • Increased conflicts among the fisheries stakeholders

Social exclusion	• Treating fishing as a lower-class profession • Lack of housing • Political marginalization • Poor living conditions	• Exclusion from getting social services • Sexual harassment of fisherwomen • Migration to cities or other countries
Natural disasters	• Climate change • Living close to the seas or rivers • Unplanned infrastructure development	• Loss of house and important properties • Decreased income and increased vulnerability poverty
Women's invisibility	• Religious antagonism • Poverty • Lack of education • Family teaching • Lack of supportive institutions • Fear of loss of societal patronage	• Increased women's vulnerability, marginalization, and gender-based violence

Challenges are also related to the perceptions of fishing as a lower-class profession, which still exist in many areas of Bangladesh (Rahman et al., 2002; Islam and Chuenpagdee, 2018). Many fishers feel embarrassed and socially disadvantaged within their communities when they are introduced as fishers (Table 5.3). A continuous experience of social exclusion is bitter and has motivated small-scale fishers to look for an alternative job outside their community (Islam and Herbeck, 2013). The social exclusion and the adverse living conditions (e.g., congested settlements at the riverside, mainly on government-held *khas* (or reserved) land and on coastal embankments) in different areas have motivated small-scale fishers to migrate towards cities or to other countries (Islam and Herbeck, 2013). Mozumder et al. (2018) found that many small-

scale fishers illegally migrate to Malaysia or other neighbouring countries using fishing boats and paying human traffickers.

Furthermore, the fishing communities living in the coastal areas are vulnerable to extreme climate events given the geographical location (Islam et al., 2020). Fishers in these communities live close to the coast for ease of access to fishing grounds. The dependency of small-scale fishers on climate-sensitive fisheries resources and their social position can often be defined as underprivileged (Jahan et al., 2017) (Table 5.3). Many fishers living near the banks of rivers have already been displaced more than three/four times in their lives due to the ongoing soil erosion process (Islam and Herbeck, 2013).

In responding to a crisis, vulnerable fishing families allow their sons or daughters to find alternative jobs and encourage their wives to engage in homestead income-generating activities, such as gardening, net mending, and sewing clothes, to avoid taking outside credit support. Such job diversification by family members helps compensate one family member's income by another's contribution and ultimately reduces their vulnerability (Islam, 2011). However, as presented in Table 5.3, a number of factors undermine women's visibility in the fisheries sector, such as deep-rooted socio-cultural constructions of the motherly myth, religious antagonism, poverty, lack of education, lack of supportive institutions, and fear of loss of societal patronage (Deb et al., 2015).

Bangladesh is taking initiatives to address some of the challenges, focusing mostly on minimizing the effect of natural hazards. Through a capacity-building framework, the country has broadened its disaster management emphasis from one of response and relief to one of risk reduction by focusing on the poor and disadvantaged (Islam and Jentoft, 2019). Furthermore, Bangladesh has adopted good relevant policies, legal and institutional frameworks to deal with the impacts of climate change and disaster risks. For example, the government has developed a Seventh Five Year Plan (2016-21) on climate change and disaster risk reduction. The focus of this plan is to build the resilience of the poor and marginalized population, including small-scale coastal fishers, by reducing their exposure and vulnerability to environmental shocks, geo-hydrometeorological hazards, human-induced disasters, emerging hazards and climate-related extreme events (Ministry of Planning, 2016).

5.2 COVID-19 and small-scale fisheries

5.2.1 Overview of COVID-19 cases in Bangladesh

Bangladesh is likely one of the most vulnerable countries to the COVID-19 pandemic due to its huge population of around 160 million and high-density areas, such as in the capital city, Dhaka, where 46,000 people are living on each square kilometre area (BBS, 2015). The country's Human Development Index is low (HDI: 0.632), which reflects social exclusion, poor health conditions, low income, poverty and illiteracy of the people

of the country. The first COVID-19 case in Bangladesh was confirmed on March 7, 2020, and the first death occurred on March 18, 2020. As of May 21, 2021, the total confirmed COVID-19 cases in Bangladesh were 785,194, with 12,284 total deaths (WHO, 2021b) (Figure 5.1). However, many more cases are left undetected in the country due to reasons that include a lack of adequate testing kits and many people's reluctance to go to the testing centers.

In response to the pandemic, the country has taken several measures, including reduced international flights, installing thermal scanners at the major sea and airports, and closing down schools and educational institutions. In the first attempt, on March 15, 2020, the country banned all flights from Europe except the United Kingdom; however, the enforcement of this ban was not strict (Javed, 2020). On April 5, 2020, the country imposed another ban on all international flights, with an exemption for China that lasted until April 14 (Garda World, 2020). Although the Institute of Epidemiology, Disease Control and Research (IEDCR) tried to test everyone who entered the country, intense criticisms arose due to poor testing facilities at the port of entry (The New Age, 2020; Sujan and Hasan, 2020).

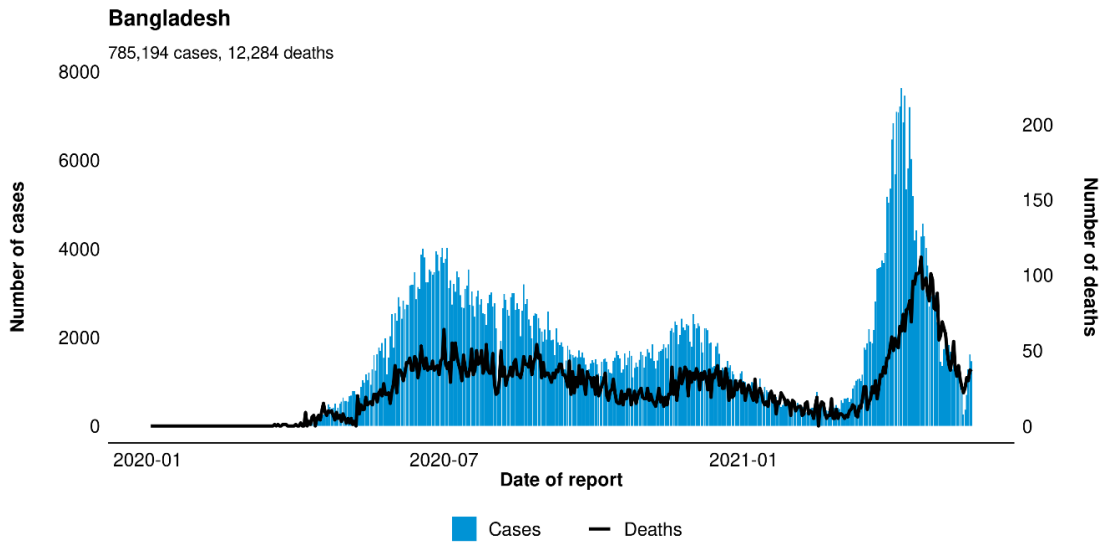

Figure 5.1 The COVID-19 cases in Bangladesh from January 01, 2020, to May 21, 2021 (*Source: WHO, 2021b*).

The country further imposed a 14-days obligatory quarantine at facilities near the airport provided by the government for all international travellers, including the citizens of Bangladesh, which come into effect on March 16, 2020, for an unknown time (Maswood and Chowdhury, 2020). However, after two weeks, the rules became flexible, and the international travellers were allowed to leave the airport and do a 14-days home quarantine. The quarantine facilities lack maintenance and have insufficient capacity, and the quarantine program has been criticized for the lack of proper execution and enforcement of rules. Many travellers could leave the airport, avoid the quarantine by indicating that they would self-isolate at home, but it has been reported that these travellers were found in the streets and gatherings, visiting friends and tourist spots (Dhaka Tribune, 2020). As a response, the government deployed the army to monitor two quarantine facilities in Dhaka since March 19, 2020 (bdnews, 2020).

Further, on 17 March 2020, the government imposed a ban on all political, social, cultural and religious gatherings in the country to tackle the rapid increase of confirmed COVID-19 cases. Later, the government declared a 10-days lockdown (general holiday: ordering all public and private offices to be closed, with the exception for emergency services) effective from March 26, 2020, which was extended until May 30, 2020 (Garda World, 2020; The Business Standard, 2020). Except for pharmacies, groceries, and food delivery services, all other non-essential organizations, businesses, and educational institutions were closed from March 26 to May 30. On March 27, the government decided not to extend the lockdown anymore after May 30, 2020, for the shake of lives and livelihoods of people (The Business Standard, 2020). Since May 30, 2020, the lockdown measures were lifted until April 5, 2021. The number of COVID-19 confirmed cases were lowest from December 2020 to February 2021 (Mamun, 2021). Then, a sudden spike of COVID-19 confirmed cases was observed in March 2021. As a result, the government declared another lockdown started from April 5, 2021, and was extended several times until May 23, 2021 (The Pioneer, 2021). However, the efforts made by the country to reduce the number of COVID-19 cases were not properly implemented due to the lack of coordination between different authorities and groups (The Financial Express, 2020). The country has successfully administered a total of 9,641,312 vaccine doses as of May 18, 2021 (WHO, 2021b).

The economy of Bangladesh is dependent on the agriculture sector, which is largely divided into three sub-sectors: crop, livestock and fisheries. The COVID-19 pandemic has had adverse effects on all three sub-sectors by disrupting the poultry, dairy, and agricultural and aquatic food systems. The pandemic has threatened the livelihoods of the communities, directly or indirectly dependent on the three production sectors, and has resulted in subsequent economic loss for the country (Sunny et al., 2021). In the case of fisheries, the pandemic has affected fisheries' supply chains by complicating transportation measures due to several lockdown measures. Small-scale fishers in rural and coastal Bangladesh have been affected most since they rely on fishing for their daily income. As of May 21, 2021, the government has not provided specific support to small-scale fisheries.

5.2.2 Impact of COVID-19 on small-scale fisheries in Bangladesh

Similar to the global situation, the COVID-19 pandemic has brought wide impacts on small-scale fisheries in Bangladesh, including on production, processing, distribution, market, and food security and nutrition. At the same time, sudden shocks both in the production and distribution sectors have affected the governing system of small-scale fisheries.

Production

The production sector of small-scale fisheries in Bangladesh, including both the capture and culture fisheries, has been affected by the pandemic. As presented in Figure 5.2, the inland and marine capture fisheries' production has been disrupted due to the government-imposed lockdowns, mobility restrictions, and lack of logistical supports at the beginning of lockdown measures, e.g. in March and April 2020. As a result, small-scale fishers have been broadly divided into two groups. The first group has reduced their fishing activities for fear of being exposed to the virus and in complying with the government restrictions. The second group has tried to continue fishing, making shorter trips in order to supply their family members with food. The culture fisheries sector faces similar situations. Those who were able to continue producing fish had to reduce their operation due to the lack of fish seeds and the absence of buyers (Sunny et al., 2021).

Distribution and supply

The transportation disruptions have made the situation more challenging for both the small-scale capture and culture fisheries. At the beginning of the pandemic and during subsequent lockdown measures in 2020, the transportation of fish and fisheries products from remote areas to different domestic markets has been reduced due to mobility restrictions (WorldFish, 2020a). Although the government has later allowed the transportation of agricultural and fisheries goods, the restrictions on public and private

transportation have been one of the reasons for the absence of buyers in the domestic markets (Figure 5.2). This has led to the reduced demand for fish in the domestic markets. In addition, the traders from a distance were unable to buy fish from rural markets due to high transportation costs. Moreover, the stakeholders involved in the distribution of fisheries products, for instance, transportation vehicle drivers and labour in the landing centers, were also scared of the COVID-19 virus.

Fish processing and small-scale workers

The reduced production of fish from capture and culture fisheries and distribution problems has lowered raw materials' supply to the processing industry. The export markets for processed fish and fisheries products, such as fish fillets and steaks, breaded shrimp, canned fishery products, and fish meal and fish oils, have been closed due to international travel restrictions. Thus, the fish processing industries in Bangladesh have been negatively affected (WorldFish, 2020a). The processing industries have reduced their hours of operation and processing volume (Figure 5.2). A few industries have been shut down in some cases due to high processing costs and low sales, for instance, in the shrimp and crab processing industries (Moni, 2020; Roy, 2020). Although the operations of processing industries are mostly large-scale, this sector's workforce mainly consists of small-scale workers, mostly women. The processing industry has sent its workers on a forced vacation without payment, and thus, many women were affected (Hodal, 2020).

Market

The transportation difficulties have reduced the amount of fish bought, and the shortage of labour demotivated traders to continue their business. The closure of international markets brought the biggest loss for the market sector. Traders reduced their business operations due to reduced demand for fish in both the domestic and international markets (Rosen, 2020). The domestic markets of small-scale fisheries products in Bangladesh are mainly place-based, with buyers and sellers gathering in a commonplace to buy and sell fish through a bargaining process. The outbreak of the COVID-19 pandemic and subsequent mobility restrictions by the government limited the gathering of people in the markets (Johnson et al., 2020). As a result, the presence of buyers has been reduced gradually in the markets, and small-scale fishers hardly receive fair prices for their products. The closure of both the domestic and export markets has raised food and nutritional security concerns for people involved in small-scale fisheries (Figure 5.2).

Food security and nutrition

In normal circumstances, many small-scale fishers in Bangladesh are struggling with poverty (Islam, 2011). Further, the income loss driven by the COVID-19 pandemic has increased the food and nutritional concern for small-scale fishing communities (WorldFish, 2020a). Fish is the main source of animal protein for the fishers as well as for the majority of the consumers in Bangladesh. Hence, the limited access to markets

and reduced fishing activities has threatened the food and nutritional security of small-scale fishers and their family members (CGIAR, 2020) (Figure 5.2).

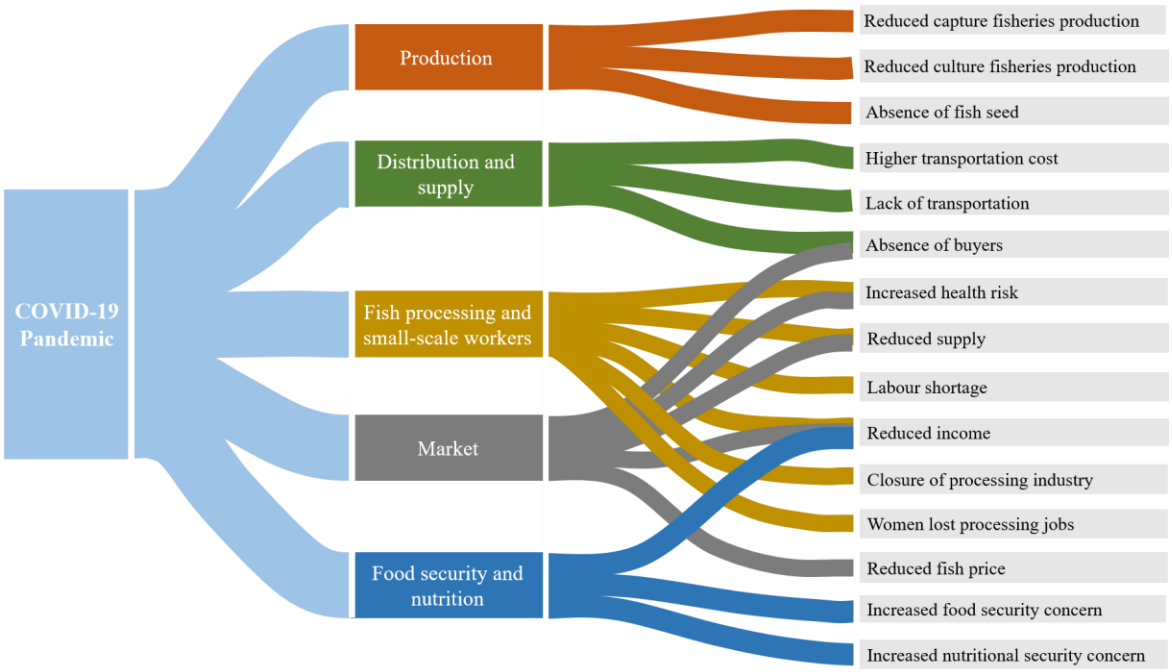

Figure 5.2 The effect of COVID-19 on small-scale fisheries in Bangladesh (*Source: desk study, key informants, and direct observation*).

5.3 Governing system and their responses to COVID-19 pandemic

5.3.1 Governing system

Small-scale fisheries are not defined in the Constitution, Laws or Act. While there is no legal requirement for small-scale fisheries governance, a diverse set of governing institutions at different levels directly or indirectly influences small-scale fisheries governance, as shown in Table 5.4.

Table 5.4 The responsibilities of fisheries, including small-scale fisheries governing actors at different levels in Bangladesh (*Source: Shamsuzzaman et al., 2020; 2016; Shamsuzzaman and Islam, 2018*).

Level	Governing actors	Responsibilities
National	Ministry of Land	Owns and controls the inland open water bodies (locally known as *Jalmahals*), such as *haor*, rivers, their tributaries and seasonal as well as perennial wetlands under the national jurisdiction. It leases out fishing rights in *Jalmahals* to *Ijaradars* (revenue farmers) through auction; the *Ijaradars* then control small-scale fishing in these areas.
	Ministry of Fisheries and Livestock	Controls fisheries production and export of fish and fisheries products, conserve biodiversity, maintains ecological balance, prevents and controls fish diseases, and generates employment.
	Department of Fisheries	Formulates and develops fisheries-related development programs, assists in formulating policies, disseminates improved technologies, provides credit support for fishers, and facilitates income-generating opportunities.
	Bangladesh Fisheries Research Institute	Carries out research and coordinates fisheries, including small-scale fisheries research activities, identifies new product opportunities, develops skilled research manpower, transfers technologies to users, and advises the government in fisheries-related research.
	Bangladesh Fisheries Development Corporation	Develops infrastructure for fish landing and marketing, owns a large portion of seagoing fishing boats and ships and helps harvest fisheries resources and their marketing.
Local	Upazila Parishad (local government authority)	Upazila Development Coordinating Committee considers and approves the lease of government-owned inland water bodies, following the recommendation made by Upazila Nirbahi (executive) Officer and Union Parishad.
	Non-government organizations	Disseminate up-to-date fisheries-related information to fishers, provide credit supports and training facilities, undertake research initiatives, and help in forming co-management groups.
	Parliament members	Represent particular regions at the parliament and present the issues and concerns of that region, including small-scale fisheries, and get funds to solve issues and enhance capacities.

	Village heads (equivalent to major or a social figure defined by the community)	Control and solve the issues or conflicts related to a particular community or village, including small-scale fishers and their families.

In the case of markets, the infrastructure and logistics for small-scale fisheries are poor, for example, hilsa fishery (Shareef et al., 2019). Different governing actors are involved and exert influence over the supply chain of fish and fisheries products in Bangladesh, as presented in Table 5.5. While an effective supply chain of fish can help in supporting the fishers as well as the end consumers (Irani et al., 2018), the existing supply chain of small-scale fisheries in Bangladesh is inefficient for many reasons, such as diverse interests of the governing actors, lack of coordination among the actors, corruption exists within many elements of the supply chain, and presence of illegal and unauthorized trading (Shareef et al., 2019).

Table 5.5 The governing actors of markets for small-scale fisheries with their roles (*Source: Shareef et al., 2019; Uddin et al., 2019*).

Governing actors	Roles
Fishers	Harvest fish from inland and marine fisheries resources as well as culture fish in closed water bodies. The harvested or cultured fish is sold to consumers, middlemen, or money lenders. Fishers are not organized like fish traders or processors. In some regions, small-scale fishers have organizations or unions, but the local elites or politicians lead these.
Women	Women are relatively less involved in fishing, while they are the main workforce in the post-harvest processing. They also work as a day labourer at fish, crab or shrimp farms to supplement their family income.

Aratdar (depo owners)	Provide credit support to small-scale fishers, buy fish from fishers at lower prices than the market standard and sell to wholesalers or processors. They set the prices for small-scale fishers.
Wholesalers	They buy fish from different fishers/farmers and sell to processors or retailers. They also set prices for farmers and fishers.
Processors	Buy fish from fishers/farmers, depo owners and wholesalers and sell to retailers. Depo owners and wholesalers sometimes bargain and set fish prices, while small-scale fishers or farmers rarely get chances to bargain with processors due to advance money lending.
Retailers	Buy fish from *aratdar*, wholesalers, and processors and sell fish to different local markets. They set the fish prices for consumers.
Consumers	End buyers who buy fish from different markets, typically from retailers. The demand of consumers has a strong influence over market chain governance.

The government of Bangladesh has passed a number of acts, ordinances, and rules and regulations for the exploitation, development, management and conservation of fisheries resources, with a few focusing on small-scale fisheries. For example, the National Fisheries Policy 1998 provides exclusive fishing areas or priority access to fishery resources for small-scale fisheries (Shamsuzzman et al. 2020b). In addition, various marine fisheries legislation, such as the Marine Fisheries Act (2020) and the Bangladesh Merchant Shipping Ordinance (1983), set the registration for small-scale fisheries. The Marine Fisheries Ordinance (2010), aiming to deter, prevent and eliminate Illegal, Unreported and Unregulated (IUU) fishing, is applicable to small-scale fisheries. However, only the Coastal Zone Policy (2005) has focused on the issues related to small-scale fisherwomen.

In the context of inland fisheries management, the government has changed the policy to transfer fishing rights to fishers' associations since the 1980s; however, this attempt failed because powerful leaseholders led those associations (Thompson et al., 2003). Small-scale fishers' rights over inland fisheries have not yet been established. The rights for small-scale fishers in inland fisheries are largely restricted by the conventional leasing procedures designed to hand over inland fisheries to the top bidders through an auction procedure (Khan et al., 2016; Mamun et al., 2016). Such a governing strategy allows powerful leaseholders to capture fisheries and employ small-scale fishers for marginal wages (Thompson et al., 2003; Islam et al., 2014). Furthermore, most of the small-scale fishers are entrapped into long-term debt bondage with the middlemen. Through credit and patronage, the middlemen regulate the fishers' behaviour in exploiting fisheries resources (Jentoft et al., 2010; Islam et al., 2016).

In the recent past, several special programs have been implemented to address the current challenges of inland capture fisheries and to increase productivity. Such programs refer to the introduction of ecosystem-based management of open waters, community-based fisheries management, the establishment of sanctuaries, stocking of fingerling and endangered species, expansion of cage and pen culture in open water bodies, adoption of climate-smart technologies, and enforcement of fish conservation acts (DoF, 2019). These strategies, especially the community-based fisheries management, help to develop a strong partnership between government organizations, non-government organizations working in fisheries, local elites and fishers at the implementation level. The

establishment of 432 fish sanctuaries throughout the country in open water bodies and six hilsa sanctuaries in the selected river system has resulted in a substantial increase in fish production, increased the revitalization of endangered species, and contributed to the ultimate enhancement of aquatic biodiversity (DoF, 2019).

In the case of marine fisheries, the government has given much priority to the sustainable management of fisheries resources, undertaking several measures such as the strengthening of the monitoring system, control and surveillance system, and implementing the catch monitoring program. They also have declared the Sundarbans and St. Martin's Island as a sanctuary and designated 69,800 ha area as a marine reserve and another 490,296 ha area as marine protected areas (MPA), including the Swatch of No Ground MPA and the recently established Nijhum Dwip MPA in the Bay of Bengal (DoF, 2019; Lemelin, 2019). The DoF (2019) report also shows that hilsa production has increased from around 199,000 MT in 2002-03 to around 533,000 MT in 2018-19, due to several protection and conservation measures, such as The Hilsa Fisheries Management Action Plan, seasonal fishing ban, and provision of alternative livelihoods for fishers in order to reduce pressure on *Jatka* (immature size hilsa) and the hilsa fishery.

5.3.2 Responses to COVID-19 pandemic

Different governing actors have taken initiatives to support the fisheries sector, including the small-scale fisheries, in response to the pandemic. These initiatives, taken place at both the national and local levels, are summarized in Table 5.6.

At the national level

The Ministry of Fisheries and Livestock (MoFL), along with the Division of Information and Communication Technology, has launched an online fish buy-sell program to help fishers find buyers. The MoFL has set many information booths in different regions to help fishers and fish farmers. They have provided helpline numbers for fishers and fish farmers to call if they faced any difficulties during the pandemic. They have also arranged mobile fish selling facilities (i.e., selling fish in a van) in the cities to continue the fisheries supply chain. The Ministry put the information related to mobile sellers, place, and time in different locations of big cities, for instance, in Dhaka. The effectiveness of these programs has not been satisfactory in some cases, and not many fishers are aware of them. However, many fishers have appreciated such a government's response to continuing the fisheries supply chains. In addition, the central government has launched food and monetary supports for poor rural people, including small-scale fishermen. However, these measures are not sufficient to continue feeding people who have lost their income during the 62 days lockdown in 2020 and the ongoing lockdown in 2021.

The Department of Fisheries (DoF) has disseminated updated information regarding domestic and export markets to local fisheries offices. This department has suggested that

the government should not include the fisheries sector under the lockdown measures. They have sent a letter to the government asking to keep functioning the supply chains. They have kept communicating with the wholesalers and mobile fish sellers in Dhaka. The department has organized a meeting with those groups and has noted the problems they have been facing due to COVID-19.

The Bangladesh Fisheries Research Institute (BFRI) has continued the research activities. Despite the effects of the pandemic, this institute has kept producing fish seed, keeping with the COVID-19 related guidelines, and distributed it to local small-scale farmers in many regions at a lower price. They have also provided some helpline phone numbers for farmers to contact and place their orders or ask for help. Fish farmers from different regions have expressed their gratefulness to BFRI for their help in providing fish seed at a lower price than the market price during the COVID-19 crisis.

The Bangladesh Fisheries Development Corporation (BFDC) has collaborated with the MoFL in the mobile fish selling initiative. This corporation has helped extend fish selling services in Dhaka and other big cities through their branch offices. They have used offices near fish lending centers to manage fish buy-sell and helped fishers during the COVID-19 crisis. Although the central office hours were reduced, they kept open their local branch offices to serve fishers.

At the local level

In rural Bangladesh, different responses came directly or indirectly from fishing communities, middlemen, local traders or *aratdar*, processors, and Upazila (sub-district) and District fisheries offices.

Fishing communities – in many cases, fishing communities have reduced meal plans to stay afloat during the severe time of the COVID-19 pandemic, especially during March-April 2020. Small-scale fishers and farmers have also started vegetable farming to fulfill their nutritional needs. They have worked in agricultural fields as day labourers. Small-scale fishers have further borrowed money from the middlemen to buy necessary food and grocery items. In many areas, small-scale fishers have continued fishing practices to avoid hunger and poverty. Many fishers have utilized the unsold fish for themselves or dried them up to sell in the future, hoping for a better price (Ahmed, 2020). A similar effect has been observed in the aquaculture sector, where many farmers temporarily stopped their operations.

Middlemen or local traders – many of them have continued buying and selling fish in the local markets, but only in a small amount. Some of them paused their fish trading work and invested money in other sectors, for instance, in paddy culture. They have been trying to take a loan from the bank with less interest based on the government declaration

(Dao, 2020). However, in some cases, middlemen have voluntarily helped small-scale fishers by providing food and grocery items.

Fish processors – the processing industry has reduced the number of workers in their plants due to higher costs and less income. In some cases, they have sent their workers on a forced vacation (Roy, 2020). However, some processing industries have continued their activities following the government guidelines, which have helped small-scale fisheries, especially the women, to continue the workflow.

Upazila and District fisheries offices – at the beginning of strict lockdown measures in 2020, local fisheries officers monitored and restricted the fishing activities. They also disseminated up-to-date information about the pandemic and restrictions to the small-scale fishers in rural areas. They encouraged fisherfolks to process unsold fish for the time being and preserve them to sell in the future. Later, when the fishing operation resumed, they encouraged fishers to follow the COVID-19 related guidelines.

Table 5.6 The governing responses by different actors and subsequent challenges during the COVID-19 pandemic (Source: Key informant discussion).

Level	Actors	Responses	Challenges
National	Ministry of Fisheries and Livestock	• Launched online fish buy and sell program • Set helpline booths for small-scale fishers in different regions • Provided food and grocery support	Fishers are not aware of such government initiatives, and they are not accustomed to online-based marketing. Foods and groceries have not been properly distributed.

	Department of Fisheries (DoF)	• Updated the market-related information to the supply chain stakeholders • Suggested the government should keep the supply chain functioning	Small-scale fishers have rarely benefited from this department during the pandemic.
	Bangladesh Fisheries Research Institute (BFRI)	• Conducted research activities related to COVID-19 and its impact on fisheries along with previous research projects • Produced fish seed and supplied to aquaculture farms during the pandemic	Small-scale fishers have rarely benefited from this program, which has mostly benefited culture fishers.
	Bangladesh Fisheries Development Corporation (BFDC)	• Helped to continue the fish supply chains • Helped small-scale fishers to sell their products in some areas	The benefits have not reached the small-scale fishers, especially in coastal Bangladesh.
Local	Small-scale fishers and fishing communities	• Reduced meal plan • Vegetable farming • Labour in the crop field • Continued fishing practices • Increased use of fish for own consumption • Dried unsold fish • Women diversified their income options, such as net mending, sewing clothes, gardening, and working in the crop field	Reduced meal plans have further threatened the food and nutritional security concerns for small-scale fishing communities. In addition, those who have continued fishing become susceptible to COVID-19 infection.
	Middlemen or local traders	• Continued a small amount of fish trade in local markets • Started trading other agricultural goods, e.g., vegetables • Took a loan from the government	Traders have faced difficulties in taking a loan from the bank since the process of getting money is difficult.

		• Supported small-scale fishers by providing food and groceries	
	Fish processors	• Reduced the number of workers in the processing industry • Reduced fish processing amount	Processing workers, especially women, lost their income because of their processing job loss. Those industries that remained open have increased the COVID-19 transmission concern.
	Upazila and District fisheries offices	• Monitored fishing activities and fish landing areas • Disseminated COVID-19 related updates and guidelines to small-scale fishers	Conflicts occurred between small-scale fishers and government officials based on the monitoring activities.

5.4 Challenges in dealing with the COVID-19 pandemic

With many governing actors playing various roles in fisheries management, there is a high chance of overlapping responsibilities and confusion about rules and regulations, creating constraints for effective management (Bennett and Dearden, 2014). Examples of these are heterogeneous and hierarchical relationships between stakeholders (e.g., government officials, fishery management groups and committees, and individual fishers), unequal power relations, lack of conflict management rules, reduction of fish production, and the slow recovery of the depleted fishery (Thompson et al., 2003; Sultana and Thompson, 2010). With small-scale fishers being excluded from the decision-making process (Mamun et al., 2016); powerful actors such as industrial trawlers receive the majority of the benefits (Khan et al., 2016).

The COVID-19 pandemic has brought new challenges, such as lockdown measures and mobility restrictions, especially for small-scale fisheries supply chains. The pandemic has exacerbated the pre-existing social and economic crises for small-scale fisheries in Bangladesh (Belton et al., 2021). The closure of major domestic and international markets has put pressure on the governing system. Although the export markets have not been closed for a long time, the damages have already been done for the fisheries sector in Bangladesh, including small-scale fisheries. Since the governing bodies were not prepared to tackle such an unexpected crisis, responsive measures have been taken by all levels of governing actors, from the local to the national. In the context of the markets and trades, the government's sudden lockdowns and mobility restrictions have largely affected supply channels of fish and fisheries products, including small-scale fisheries, increased social tensions and threatened food and nutritional security. The situation has brought a new challenge for the country to achieve the target 14b of SDG 14.

As shown in Table 5.6, the responses have mostly focused on short to medium-term recovery to minimize the effect of the pandemic. For example, the supply chain actors' common reaction to the challenges brought up by the pandemic has included reducing production costs, making loans more available, seeking alternative income opportunities, reducing food consumption, involving children and women in income-generating options (e.g., net mending and sewing clothes), and leveraging social capital through informal networks (Belton et al., 2021). Béné (2020) considers that some of these coping strategies are likely to undermine well-being and long-term resilience in fisheries due to their short-

term recovery focus. Ferrer et al. (2021) have suggested that taking long-term adaptive measures can have contributed to building specific and generalized household resilience to the COVID-19 pandemic-related difficulties. This study suggests that measures should go beyond resilience to addressing extreme events and long-term sustainable resilience by also addressing poverty and lack of access to credit, education and markets for small-scale fisheries.

Globally, fisherwomen involved in the supply chains have been more affected by the COVID-19 pandemic than men (Belton et al., 2021). A similar situation has been observed in Bangladesh, where small-scale fisherwomen have lost their post-harvest processing jobs (Roy, 2020; Ferrer et al., 2021). However, at the household level, fisherwomen have first diversified their work and earnings being able to feed their family members during the pandemic. Recognizing these vital roles that women play, the SSF Guidelines (section 3.1.4) emphasize gender equity and equality as fundamental in any development. Unfortunately, none of the responsive measures by the Bangladesh government has specifically supported fisherwomen who have lost their jobs due to the COVID-19 pandemic. Furthermore, the government has not taken women's perspectives in preparing COVID-19 related responsive measures, indicating the poor application of what SSF Guidelines suggested in section 3.1.6 (on consultation and participation). Given the contribution of women as an important actor of the post-harvest supply chain of market institutions, this study argues that if the situation regarding lack of support for

women continues, the country may not achieve the SDG Target 14b and other SDGs, including poverty reduction and gender equity.

Looking back at Bangladesh's legislation and regulations in governing fisheries, the majority of them have been amended a long time ago; thus, these amendments are not sufficient to keep pace with the changes in social, economic, cultural and environmental fields (Islam et al., 2017). These regulations are not adequate to face new challenges (Lebel et al., 2006), for instance, those brought by the COVID-19 pandemic. Many factors explain why the legislations are difficult to implement and not effective, and one of them is a lack of understanding of the social dynamics of small-scale fisheries. While the role of healthy fishing communities is crucial on the sustainability of fisheries resources (Salas et al., 2011), the small-scale fishing communities and other value chain actors are generally not consulted or informed in formulating plans in Bangladesh (Shamsuzzaman and Islam, 2018), which is also observed in minimizing the effects of COVID-19. Again, this situation indicates the poor application of many of the principles in the SSF Guidelines, including transparency. It is not surprising that small-scale fishers are not satisfied with what the governments have done so far in response to the pandemic, which might be the reason for non-compliance, not only with the COVID-related measures but also with other legislation, which may not align with their values (Kooiman and Jentoft, 2009).

The lack of capacity and inadequate initiatives of the government to support small-scale fisheries has further made small-scale fishers susceptible to poverty. Poverty is one of the main reasons why small-scale fishers have violated both the existing legislations (Islam et al., 2017; Cinner, 2009) and the COVID-19 related lockdown measures and mobility restrictions (Table 5.7). Without proper alternatives, restrictions such as COVID-19 related lockdown or gathering bans in marketplaces in Bangladesh have become a huge burden for small-scale fishers in terms of food and nutritional security. Without alternative income-generating options, some fishers turned to crime and social unrest to express their frustration and loss of hope (Mozumder et al., 2018). Some small-scale fishers have embraced illegal fishing practices involving destructive fishing practices, which have substantially affected fisheries stocks. Although the government had a compensation plan for the imposed restrictions such as food, grocery, and monetary support, distributing money and foods to vulnerable people has not been effective (WorldFish, 2020a). As a result, the rural poor often complained that they did not get what they were supposed to. Sunny et al. (2021) and Islam et al. (2021) suggest that these responses have not been viable options due to poor implementation and effectiveness.

Table 5.7 Types and reasons for non-compliance with fisheries-related rules and regulations (*Source: Shamsuzzaman and Islam, 2018; Islam et al., 2017*).

Types of non-compliance	**Reasons for non-compliance**
• Illegal fishing practices using illegal fishing gears • Mesh size violation • Undersized fish harvest • Fishing during closed seasons	• Weak enforcement of regulations and lack of proper monitoring • Lack of appropriate legislation and implementation of penalty measures in exploiting fisheries resources • Political interference

• Fishing during COVID-19 pandemic • Violation of lockdown measures and mobility restrictions • Fishing in closed areas • Fishing outside of the prescribed boundary • Illegal fishing by foreign fishers	• Indebtedness and patron-client relationships • Poverty • Non-participation of key stakeholders in governance programs • Unequal incentive distribution • Limited alternative income options • Availability of illegal fishing gears • Corruption among enforcement officials • Habit and greed for more fish

Participation, accountability, coherence, and effectiveness are the hallmarks of good fisheries governance (Pinkerton, 1989), which is also one of the guiding principles of the SSF Guidelines as mentioned above, i.e., consultation and participation (section 3.1.6). This study argues that the existing governance structure of fisheries and their market channels, including the small-scale fisheries in Bangladesh, especially in the context of the COVID-19 pandemic, are weak and way behind in implementing section 7.4 (i.e., state's role in organizing fisheries and market institutions) of the SSF Guidelines. There is a need for a stronger local market and organization of fishers in unions/associations than the existing situation. Small-scale fishers are often subject to injustice, exploitation, and political neglect (Islam and Jentoft, 2019). Small-scale fishers do not have opportunities for active participation in the decision-making process concerning the governance-related issues that affect their income and livelihoods. They do not have active organizations to represent their concerns and interests in the political process (Islam, 2011). The traders or *aratdar* mostly dominate the supply chain governance of fish and fisheries products. Small-scale fishing communities are bound to local traders or *aratdar* in terms of credit support, a situation that has also been observed during the

COVID-19 pandemic. This way, the local traders become dominant and powerful actors in the supply chains, primarily at the local level. Mozumder et al. (2020) have found that local traders are the power holders at the local level, as they had secure political connections, and they could manipulate law enforcement and policy implementation through bribes and corruption.

Overall, the study suggests that the existing governance of small-scale fisheries is not well structured, which requires changes and modifications by understanding the dynamicity of small-scale fisheries and fishing communities as well as the capacities of government. The pressure on fisheries resources and involvement of different actors in fisheries sectors are gradually increasing, while the regulations related to the sector have remained almost the same that have taken a long time ago. Although small-scale fishers are the most important actor of fisheries supply chains, small-scale fishers' fates have remained the same: marginalized, underestimated, unrecognized, and often victimized. The participation of women in the fishing and decision-making process has been compromised due to the social, cultural and religious barriers. Further, the outbreak of the COVID-19 pandemic has accelerated the existing vulnerabilities of small-scale fisheries as well as brought new challenges. The issues of small-scale fisheries related to COVID-19 are not highlighted much by the media or government compared to other sectors, such as the garments industry, and one of the main reasons is that small-scale fishers are not organized, and they have no such platforms to raise up their voice. Thus, this study suggests a good governance structure is required in Bangladesh by ensuring equity in

terms of participation and profit distribution to promote small-scale fisheries and achieve the SDG Target 14b. Similar to Salas et al. (2019), this study also suggests strengthening the adaptive capacity of small-scale fishing communities, especially in response to crises like the COVID-19 pandemic, by promoting cooperation among the community members, scientists and formal and informal institutions as a step towards improving fisheries governance.

Chapter 6 Access to markets for the small-scale mud crab fishery

The chapter presents a case study analysis regarding access to markets for the small-scale mud crab fishery in the Sundarbans areas, Bangladesh. The chapter begins with an overview of the mud crab fishery in the Sundarbans areas, including the description of geographical location, the Sundarbans mangrove forest, and a brief history of the fishery. An in-depth case study related to market access for the small-scale mud crab fishery in Bangladesh is presented here to reveal issues and challenges facing this sector, especially during the COVID-19 pandemic. The chapter concludes with suggestions about how to improve the market structure and the governance of access to markets for the small-scale mud crab fishery in the area.

6.1 Overview of the mud crab fishery in Bangladesh

6.1.1 Biogeography

Mud crab (*Scylla serrata* Forsskål, 1775) is the most commercially important crab species, found mainly in the mangrove forests and estuaries of the Indo-West Pacific Ocean. Mud crab usually lives in deep burrows, and it is relatively easy to harvest by hand (Ewel, 2008). Crab is a top predator within the mangrove food web. The adult mud crabs spend most of their life in mangrove creeks and estuaries, but females migrate a long distance, even more than a hundred kilometres, seaward to the shallow oceanic platform from the coast to release their larvae (Hill, 1994). Further study by Demopoulos

et al. (2008) reveals that adult male and female mud crabs can also move from the mangrove forest to adjacent reefs and seagrass in search of food. After three to four weeks, the planktonic mud crab larvae return to the shallow coastal environments where adult populations are present (Brick, 1974).

Mud crab is found in the Southwest coastal part of Bangladesh, covering Khulna, Chittagong, Barishal, Satkhira, Bagerhat, and Cox's Bazar districts (Siddiqui and Zafar, 2002), and abundantly found in the Sundarbans mangrove forest and adjacent waters (Chandra et al. 2012). The coastal environment of Bangladesh has the potential to culture, capture and trade mud crab (Saha et al., 2000). The physical, chemical and biological parameters of Southwestern coastal waters are suitable for crab culture (Jahan and Islam, 2016). Thus, mud crab has been harvested from the Sundarbans and their surroundings for several decades for export.

6.1.2 The Sundarbans mangrove forest

Mangroves are the brackish water swamp forests found in estuaries along with riverbanks and lagoons in the tropical and sub-tropical regions of the world (Kumar et al., 2016). Mangrove forests are known for enriching floral and faunal diversity (Iftekhar and Takama, 2008), with unique adaptation mechanisms to the coastal environment, i.e., siltation, sedimentation and tides fluctuation (Paul et al., 2017). About 41% of the world's mangrove forests are found in South and Southeast Asia, where only the

Indonesian mangrove forests occupy 23% of the area (Malik et al., 2017). The Sundarbans mangrove forest, located in the Ganges-Brahmaputra-Meghna delta, between the coordinates 89°00′ and 89°55′E and 21°30′–22°30′N (Figure 6.1), is the largest mangrove area in the world. About 60% of the total forest cover (1,001,700 ha area) is in Bangladesh, while the rest is in India (Forest Department-FD, 2010). In 1997, the United Nations Educational, Scientific and Cultural Organization (UNESCO) had declared 1,397 km^2 of the forest area, covering the three parts (i.e., Sundarbans East, Sundarbans South, and Sundarbans West) as the World Heritage site due to its conservation value (WCMC, 2001; Sarker et al., 2019). The Sundarbans mangrove forest is known as the most diverse and productive ecosystem in the world (Borrell et al., 2016).

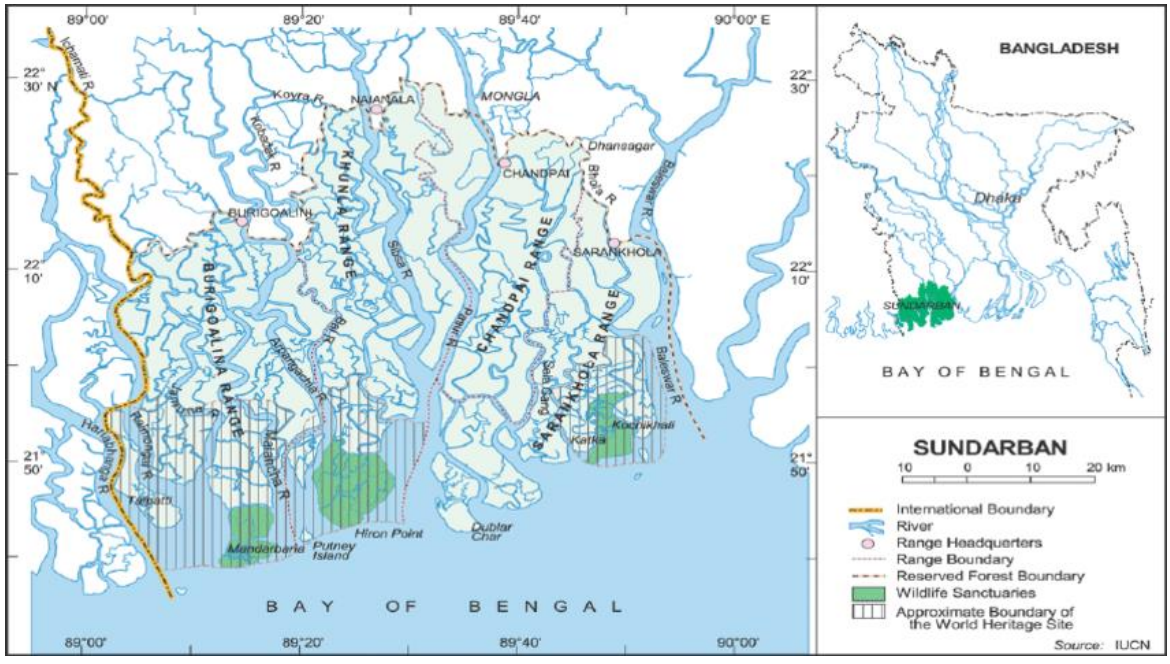

Figure 6.1 Map showing the distribution of Bangladesh Sundarbans mangrove forest (*Source: Rahman et al., 2010*).

The Sundarbans mangrove forest is enriched with diverse floral and faunal compositions. Chaffey et al. (1995) identified nearly 334 plant species, 50 species of mangrove, 35 legumes, 29 types of grass, 19 sedges, and 18 euphorbias in the forest. The Bangladesh part of the Sundarbans is a habitat for 45% mammals, 42% birds, 46% reptiles, and 36% amphibians of the total forest (IUCN, 2003; Khan, 2013). In particular, the Sundarbans are the host to about 50 species of mammals, 320 species of birds, 53 species of reptiles, 11 species of amphibians, 177 species of fish and 873 species of invertebrates (IUCN, 2003; Khan, 2013). The forest is comprised of around 200 islands and 400 inter-connected tidal rivers and canals full of fisheries resources, such as shrimp, crab, and fish (Hoq, 2003).

Apart from ecosystem services, the Sundarbans mangrove forest is important for the local economy, contributing to 41% of the country's forest revenue (Roy and Hossain, 2015). It provides livelihoods for people living around the forest through fishing, honey and wax collection, tourism, wood, and fuelwood (Islam and Islam, 2011). Over 3.5 million people are directly or indirectly involved in the Sundarbans mangrove forest for their income and livelihoods (Shah et al., 2010).

In recent decades, the biodiversity and ecology of the forest, and thus people's livelihoods, have been threatened due to natural and anthropogenic pressures. While the forest serves as a bio-shield for the coastal communities from natural disasters, such as during the cyclones *Sidr* (November 17, 2007) and *Aila* (May 25, 2009) (Bhowmik and

Cabral, 2013), natural disturbances, including diseases, natural disasters, rise in the sea level, increase in salinity, and insufficient regeneration of flora and fauna, affect the health of the Sundarbans (Hossain et al., 2015). The human-induced pressures include changes in land-use patterns, waste discharge from industry and aquaculture ponds, a decrease of freshwater flow, agricultural run-off and oil spillage from seaports (Islam and Bhuiyan, 2016; Chowdhury and Maiti, 2016; Das and Mandal, 2016). Besides, the forest is disappearing due to inadequate and inappropriate management strategies. According to Rahman et al. (2010), the problems related to management include a lack of well-trained personnel and institutional capacity, improper planning, insufficient knowledge about coastal zone management, and weak implementation of the development plans.

6.1.3 History of the Mud crab fishery

There are four species of mud crabs, i.e., *S. serrata, S. olivacea, S. tranquebarica and S. paramamosain,* considered economically valuable in different parts of the world (Allan and Fielder, 2003), with *S. serrata* being the most valuable in Bangladesh (Rahman et al. 2017, 2020). The mud crab (*S. serrata*) fishery in Bangladesh is an export-oriented fishery (Chandra et al., 2012; Ferdoushi and Xiang-Guo, 2013). The importance of mud crab had commercially grown in the late 1970s when mud crab export started. The export of crab from Bangladesh first began in 1977-78. Before then, mud crab was hardly harvested, and the local market was very small. The Muslim community in Bangladesh does not consider mud crab as part of a regular food item due to religious and cultural

reasons, which is one of the reasons for limited domestic markets for mud crab. The harvest of crab from the wild was the only source of crab (Ali et al., 2004; Rahman et al., 2017) until the fattening and rearing of crab gained popularity in the mid-1990s (Azam et al., 1998). Crab culture using cage, pen, and polyculture began in the 2000s (Khatun et al., 2009).

Disease outbreaks in shrimp farms during 1995-96 had switched the interest of farmers from shrimp aquaculture to mud crab farming (Karim and Stellwagen, 1998). Because mud crab is highly tolerant to changes in environmental conditions, such as salinity and temperature fluctuations and resistant to diseases, it is considered a good species to culture. Further, a high price and a strong demand for mud crab in international markets have accelerated the interest of crab farmers (Rahman et al., 2017). According to DoF (2019), about 9,377 ha of coastal ponds (2.35 % of total inland ponds) are used for crab production. Crab is exported to international markets in live or frozen form. Small-scale harvesters only sell live crab, while frozen crab meats are processed in large-scale industries. The exports of mud crab have increased many folds in the last decades (BEPB, 2002), and mud crab took the third rank among the fish and fisheries products exported in international markets in 2006-07 (DoF, 2008; Islam, 2018). The country earned foreign currency of about US$ 6.7 million in 2010-11, US$ 21.1 million in 2013-14 (DoF, 2015), and US$ 26 million in 2015 from the mud crab exports (FRSS, 2017).

Crab harvesting in the Sundarbans forest is done by small-scale fishers who make short trips within water less than 40-meter depth (according to the regulation of small-scale fishing mentioned in chapter 5), using traditional fishing gears. Small-scale harvesters also provide the only source of crab seeds for crab culture industries, which include three systems, i.e. crab fattening, grow-out, and soft-shell crab production, mostly for large-scale purposes. The production from these culture systems targets different tiers of the global crab market, with fattening being the dominant and most common culture practice, followed by grow-out culture and the recent trend of soft-shell crab production (Rahman et al., 2017). Since the supply of crab seeds for these culture systems is entirely dependent on the wild, given that successful hatchery production is yet to be established (Salam and Ross, 2000; Rahman et al., 2018), a noticeable decline in their population is observed, especially when the wild mud crab is indiscriminately harvested (Chantarasri, 1994). Furthermore, the shortage of seed supply from the wild restricted the expansion of the crab culture in Bangladesh (Marichamy and Rajapackiam, 2001).

6.2 Market structure for the mud crab fishery

6.2.1 Supply chain actors

A diverse group of actors is involved in the mud crab supply chains, including small-scale crab harvesters, crab farmers/fatteners, women, commission agents (locally known as *faria*), and depo owners (locally known as *aratdar*), exporters, and government

agencies. Besides, two cooperative associations are active in the mud crab supply chains. The association, situated in the study area, is formed by all the depo owners, named "Satkhira District Crab Traders Association Limited (SDCTAL)." The other one is formed by exporters, named "Bangladesh Live and Chilled Food Exporters' Association (BLCFEA)," located at the central market at Uttara (a suburb of the Dhaka district). Each actor plays different roles in the domestic and export supply chains of the mud crab (Table 6.1).

Table 6.1 The actors involved in the mud crab supply chains, their roles and estimated numbers (*Source: key informants and direct observation*).

Actors	**Roles in supply chain**	**Number and gender**
Crab harvesters	They harvest crab and sell to *faria*, local depo owners, or local consumers.	About 60% of harvesters are men, and 40% are women
Women	They are directly involved in crab harvesting, tightening chelate-legs after harvest, and sorting and grading at home before selling it to markets.	90% of sorting and grading are done by women at home or on-board
Commission agents or *faria*	They buy a small amount of crab from several crab harvesters, especially those that live far from local markets. They collect crab until they have a high volume before selling to the depo owners or crab farmers.	Mostly men (90%)
Crab farmers/fatteners	Crab farmers buy wild crab seed from the harvesters and rear them for 60-65 days near their house in a small pond (usually less than 1 hectare). They sell mature size crab to local depo owners or *faria*. Large-scale farmers/fatteners similarly rear the crab seeds, but they have a huge farm covering around 4-6 hectares.	Men and women are almost equal in number as workers on the farms
Local depo owners	They buy crab from the crab harvesters, *faria*, and small-scale farmers and sell it to large-scale crab fatteners, export traders, or consumers. They usually sell undersized crab to fatteners and standard mature sizes to export traders.	Almost 100% are men

SDCTAL	All the depo owners at the local markets are members of SDCTAL. The main purpose of this association is to facilitate the collection and transportation of crab for all the local depo owners to the central crab market at Uttara, Dhaka, in order to minimize transportation costs.	100% men
Export traders	Export traders are mostly based in the central crab market at Uttara, Dhaka. They buy crab from the local depo owners and, in some cases, directly from harvesters and sell to foreign buyers.	About 90% are men
BLCFEA	All the export traders are members of the BLCFEA. This association deals with export traders' welfare, raise their voices against government policies and consults with the government regarding change and modification of trade policies.	About 90% are men
Government agencies	**Department of Fisheries** inspects the health and the size of crab and provides a health certificate for export. It also monitors and executes the annual two months fishing ban during January and February.	About 60% men and 40% women represent the government officials of this department
	Forest Department is responsible for providing the "No Objection Certificate (NOC)" for crab export. Their job is to check the size of the crab and whether the exportable crabs are harvested following the forest-related rules and regulations. It works with the Department of Fisheries to monitor the annual crab fishing ban.	In the study areas, about 90% of officials of this department are men
	Airport Customs do the final inspection of crab at the airport before the departure. They also check whether the traders have paid the required fees.	Mostly men, but now women are also getting jobs
	Ministry of Commerce of Bangladesh provides licenses to export traders.	Mostly men

6.2.2 Supply chains

Based on the key informant interviews, the flow of mud crab from harvesters to end-users mainly follows six channels, as shown in Figure (6.2). Bangladesh mainly exports live or frozen soft-shell crab products. Given that mud crab is an export-oriented fishery, the

majority of the supply (98%) ends up with foreign buyers. On the other hand, only 2% of the crab supply reaches domestic consumers, including tourists and consumers in local markets and other parts of the country, through two different channels.

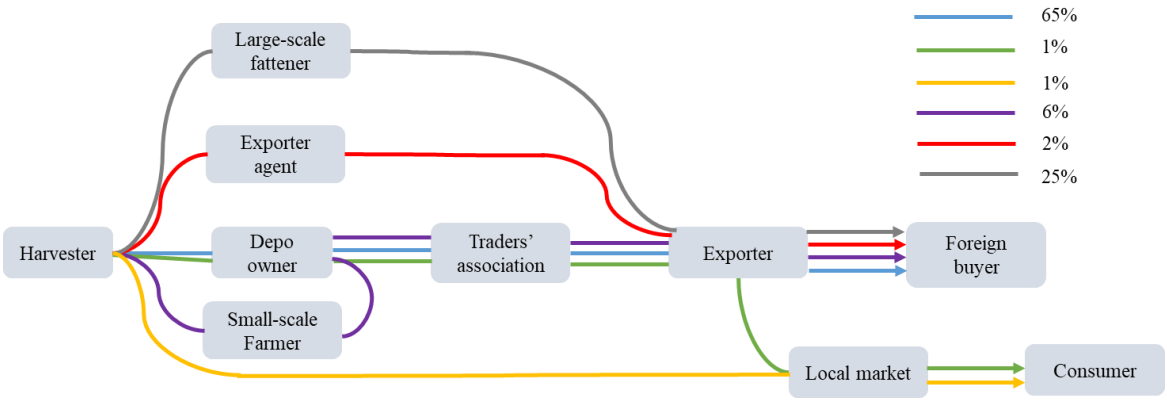

Figure 6.2 The supply channels and percentage of flow for the mud crab fishery in Bangladesh (*Source: key informants*).

The structure of the mud crab supply chain is complex. At the local level, depo owners are at the center of the chain (Figure 6.2). The local depo owners are connected to almost all the actors within the market chains except foreign buyers. They are also connected to domestic markets for selling a small number of crab that are rejected for the export markets. For example, weak or broken crabs are not exportable. In that case, both the exporters and local depo owners sell it to domestic markets. Crab harvesters also sometimes sell weak or broken crabs directly to the consumer or give them to their friends and relatives. The export traders are the last market chain actor in Bangladesh. They sort and grade all the crabs that they collect from different local markets by maintaining the export market standard before the shipment (Table 6.2). The shipment of

crab for export departs the international airport in Dhaka in the morning; thus, their work begins early in the day (around 4:00 am) and ends by around 7 am. For the remainder of the day, they work on collecting crab from local markets for the next shipment.

Small-scale crab harvesters are the most important actors within the supply chains since they provide crab for both the domestic and export markets. Crab harvesters are the only source of soft-shell crab supply to the large-scale fatteners. They are involved in crab harvesting for their daily income and livelihoods. Compared to all the supply chain actors, the profit margin for crab harvesters is small since they collect crab from the Sundarbans mangrove forest and sell to markets for whatever price the middlemen, i.e., depo owners or *faria*, offer. On the other hand, the remaining actors except SDCTAL are able to secure their profits from the amount of crab they buy and sell at each level of the supply chain (Figure 6.3). The export traders secure the maximum profits (68%), followed by the local depo owners (10%). Both the small-scale farmers/fatteners and the large-scale fatteners secure around 8% of the profit from the number of crabs they rear for 60-65 days. The exporters' agent or *faria* acts as a bridge between crab harvesters, farmers and depo owners, and they earn 8% of the profits in the supply chain.

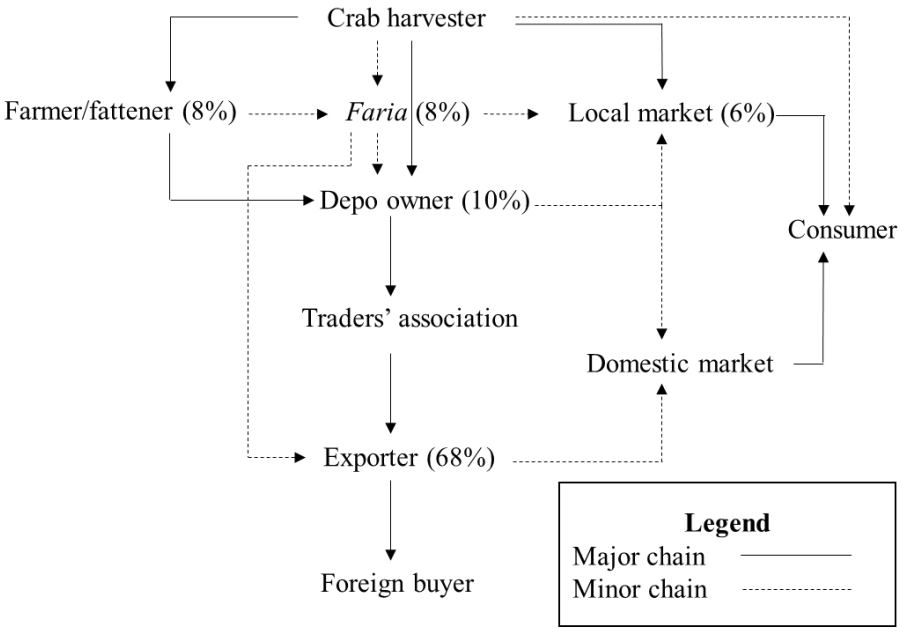

Figure 6.3 Mud crab supply chains in Bangladesh with the percentage of profits earned by the main stakeholders (*Source: key informants*).

6.2.3 Price setting

The regular prices for mud crab vary depending on various factors, such as size, international market demand, foreign currency exchange rate, transportation cost, and sorting and grading cost. Crab exporters at Uttara, Dhaka, set a regular price for all sizes of crab following the international standard (Table 6.2). The grading system of mud crab depends on sex, size, bodyweight, gonadal maturation and hardness of the carapace. Generally, the bigger size male crab fetches a higher price, while the price for female crab depends on the gonadal development, i.e., the price is high if the gonad is full. In setting the price, export traders first individually set the regular buying prices considering

the money exchange rate, market demand, sorting and grading cost, and domestic and export transportation cost, which indicate a non-cooperative oligopoly market structure.

Once the price is determined, crab exporters would inform their agent and local depo owners over the phone or via Internet (e.g., social media). Other actors except for crab harvesters of the supply chains similarly set crab prices by considering the transportation cost, store rental cost, the number of dead or weak crab discards, and labour cost. Each stakeholder is free to determine the prices at each stage of the supply chain, as well as negotiate for better prices. However, this negotiation does not apply to small-scale harvesters and farmers because they are bound to the middlemen (i.e., *faria* or *aratdar*), and are obliged to sell their products at whatever price middlemen offer, which is often less than the prevailing market prices. Crab harvesters and small-scale farmers receive help from middlemen, i.e., *faria* and *aratdar,* in terms of monetary support (locally known as *dadhon*) during their need, for instance, to buy food for family members.

The price for crab is highest in the winter, i.e., December-February, due to high demand in the Chinese New Year, and lowest during the summer, i.e., May-July, when the crab is not as tasty. In most cases, price and demand fluctuations affect the small-scale harvesters since they have a rare chance of bargaining in the setting of prices. They are also unable to form a union to negotiate the product prices on their behalf because they have no power and are bound to year-round indebtedness. Other supply chain actors can adjust the price depending on the market situation. For example, a crab harvester gets US

$10/kg for XXL crab weight (more than 500g/piece), and the depo owner buys it from the harvester and sells it for US $14/kg with US $3/kg profit. If the price falls by US $1/kg, the depo owner will give US $9/kg to the harvester and sell it for US $13/kg, indicating that the depo owner still secures a US $3/kg of profit. The crab harvesters get the lowest price, which affects their income, making them unable to pay the money back to the moneylenders on time. This was certainly the case when the COVID-19 pandemic led to the mud crab market disruptions at the beginning of 2020 (as discussed below in section 6.4). The average price of mud crab at every market actor's level is presented below in Table (6.2).

Table 6.2 The average price range of mud crab at different stages of the supply chains in Bangladesh (*Source: key informants*).

Male						
Size	**Weight (g)**	**Price (US$/Kg)**				
		Harvester	**Farmer**	***Faria***	**Local depo**	**Exporter**
XXL	>500	$7-12	$7-13	$8-13	$9-14	$14-20
XL	>400	$6-10	$7-12	$7-10	$7-11	$12-18
L	>300	$5-8	$6-8	$6-9	$6-10	$11-17
M	>250	$4-6	$5-7	$4-7	$6-9	$10-16
SM	>200	$3-5	$4-6	$3-6	$4-7	$9-15
SSM	>150	$2-3	$2-4	$2-4	$3-5	$4-13
Female						
Size	**Weight (g)**	**Price (US$/Kg)**				
		Harvester	**Farmer**	***Faria***	**Local depo**	**Exporter**
FF1	>200	$8-12	$9-12	$9-13	$10-13	$14-22
F1	>180	$7-10	$8-11	$8-11	$9-12	$13-20
KS1	>180	$3-8	--	$3-9	$4-9	--
F2	>150	$2.5-6	$3-7	$3-6	$4-8	$10-17
F3	>120	$2-4	$2-5	$3-5	$3-6	$10-16
KS3	>120	$2-5	--	$2-6	$4-7	--

6.3 Governance of mud crab access to markets

The access to the market for small-scale mud crab fishery involves diverse interactions among the governing actors. Similar to the governing system explained in chapter 5, the mud crab fishery is governed by several actors. At the domestic market level, local depo owners, commission agents, and crab fatteners dominate over the small-scale fishers, farmers, and women (Table 6.3). At the national level, the export traders are the main actors of the governance system. Although small-scale fishers/harvesters are the most important actors given their input and contribution to the crab supply chain, their involvement in the governance structure is largely marginalized. The majority of the key informants indicate that small-scale harvesters have the least influence on the present market institutions' structure. Women involved in the crab fishery are barely recognized as an actor group of the governing bodies, although they significantly contribute to the supply chain of the market institutions. At the export market level, the exporters play the major governing role. The government agencies are mostly involved in the market institutions in the case of crab export.

Table 6.3 The governing interactions between the governing actors in the crab supply chain (*Source: key informants and direct observation*).

Governing actors	**Governing interactions**	**Dominant actors**
Harvesters-Forest Department	• Harvesters need to take the entry pass from the Forest Department • Conflicts occur if harvesters try to enter into the forest without entry pass and	Forest officials

	collect firewood, honey, and fish instead of crab • Forest officials ask for extra money, seize fishing gear, or issue a fine if harvesters are found doing illegal fishing or collecting firewood • Compliance/non-compliance with annual ban strategy	
Women-crab fatteners	• Women work more than eight hours a day without overtime payment • Women receive fewer wages than men • Fattening farm owners set the wages • No benefits and income support for women	Fattening farm owner
Harvesters-depo owners	• Harvesters borrow money in advance of sale from the depo owners and lose their bargaining power • Depo owners set regular crab prices • Harvesters do not get fair prices for their products, and conflicts occur sometimes based on the price • Conflicts also occur if harvesters sell crab to other than pre-determined depo owner	Depo owner
Harvesters-local consumers	• Harvesters and consumers set the price through bargaining • Harvesters try to sell broken or diseased crab • Conflicts occur if consumers take too long to pay	Both are equal
Harvesters-Commission agents or *faria*	• *Faria* provide credit support for harvesters • *Faria* set the regular crab prices • Conflicts occur depending on crab quality and price	*Faria*
Harvesters-farmers/fatteners	• Conflicts occur based on the price and seed quality	Farmers/fatteners
Local depo owners-exporters	• They sometimes bargain to set the crab price • Local depo owners sort and grade crab based on exporter's demand • Conflicts occur if the crab quality is not good	Exporters

Export traders-governmental agencies	• Discuss and consult to deal with the export-related issues • Conflicts occur based on the inspection of crab quality, issuing export certificates and licenses	Both are almost equal

One of the main reasons why small-scale harvesters and women are underrated in their governing role is a lack of proper policies and guidelines to govern the market institutions. It seems that those actors who have money and power can easily dominate the governance of the market institutions (Table 6.3). None of the actors is obliged to follow specific policies for domestic markets. Additionally, access to credit from commercial banks is comparatively easy for local and export traders than for small-scale fishers and farmers. Small-scale fishers do not have enough property to guarantee their ability to return commercial banks' credit. Hence, they mostly rely on the credit supporter, i.e., middlemen. However, the export business follows the "Bangladesh crab export policy, 1998," which mostly speaks about licensing and inspecting crab. The export business also follows the "Fish and Fish Products (Inspection and Quality Control) Ordinance, 1983" that guides the size, quality and sorting/grading of crab for export. Foreign buyers let their requirements be known to exporters at the export level, and all the supply chain actors are obliged to follow them.

As presented in Table 6.1, the depo owners and export traders have formed their associations to deal with the issues related to their business, while small-scale harvesters, farmers or women have no such platforms to raise their issues and concerns. All the depo

owners have formed the SDCTAL association in the Satkhira region, and it manages the transportation of crab from all the depo owners at the local level to the central crab market at Uttara, in Dhaka. Furthermore, all the depo owners can come together to make a collective decision through this platform. For example, in some cases, they stop delivering crab to Uttara if the export trader harasses the members of the SDCTAL association in terms of price, payment and quality. The association does not allow membership for crab harvesters, *faria*, or crab farmers unless they start trading crab. Every three years, the depo owners elect an executive committee of 13 members to manage and direct the association.

The exporters based at Uttara, Dhaka, formed the BLCFEA association. The association consults and discusses with the government bodies or local depo owners to solve big issues, for instance, if local depo owners stop delivering crab for a certain demand. They discuss with the government agencies to provide their input and suggestions for developing dynamic mud crab export-related policies. For example, a few representatives from the BLCFEA and the representatives from environmental organizations and journalists were consulted by the Forestry Department in 2013 to modify the crab business policy. The Department agreed and assured to form a new policy for the crab business, but still, the policy is under planning. Like the depo owners' association, their members manage the BLCFEA. Every two years, members of the association elect a new executive committee of 11 members to run this association.

Furthermore, all the key informants opined that crab harvesters have never been consulted in setting policies and regulations governing the production and the markets. Small-scale crab harvesters are obliged to maintain the annual two months fishing ban imposed by the government. During the ban period, small-scale crab harvesters lose their income since crab harvest is their main profession. Additionally, there are not enough alternative job opportunities for them. Although the government has a compensation scheme for the affected harvesters during the ban period, proper distribution of support is a big concern. Thus, crab harvesters become further vulnerable to the moneylenders for monetary support. This way, crab harvesters fall into a trap and are obliged to sell their landed catches to the middlemen at less than the market price. A similar situation is observed for small-scale farmers.

6.4 The impact of the COVID-19 pandemic on the mud crab fishery

While crab harvesters are already dealing with many difficulties within the supply chain, the outbreak of COVID-19 and the subsequent lockdown and mobility restrictions have had further negative effects on their access to the market. The effect of the pandemic has been severe from the last week of January to May 2020. According to 85% of the key informants, the income for small-scale crab harvesters has reduced due to the pandemic (Figure 6.4). The key informants indicated that the main reasons behind the income loss include the closure of international markets (75%), disruption of supply channels (70%), the price drop in the domestic markets (65%), and reduced demand for crab, both at the

domestic and export markets (50%). Additionally, 40% of the key informants argued that crab harvesters have a lack of alternative income opportunities. Thus, similar to small-scale fisheries in Bangladesh, as explained in chapter 5, the pandemic has not only affected the income for small-scale harvesters; according to 60% of the respondents, the pandemic has also raised the food and nutritional security concerns for harvesters and their family members.

Although the pandemic has affected the income of all the market institutions' actors, small-scale harvesters have faced a major loss due to their socio-economic status. Other supply chain actors have tried to adjust to the sudden price fluctuation, for instance, by reducing the family expense and utilizing savings, but small-scale harvesters or farmers have not been able to do so. As a result, 30% of the key informants noted that crab harvesters had borrowed money from the depo owners in such a situation, which again tied them up with moneylenders.

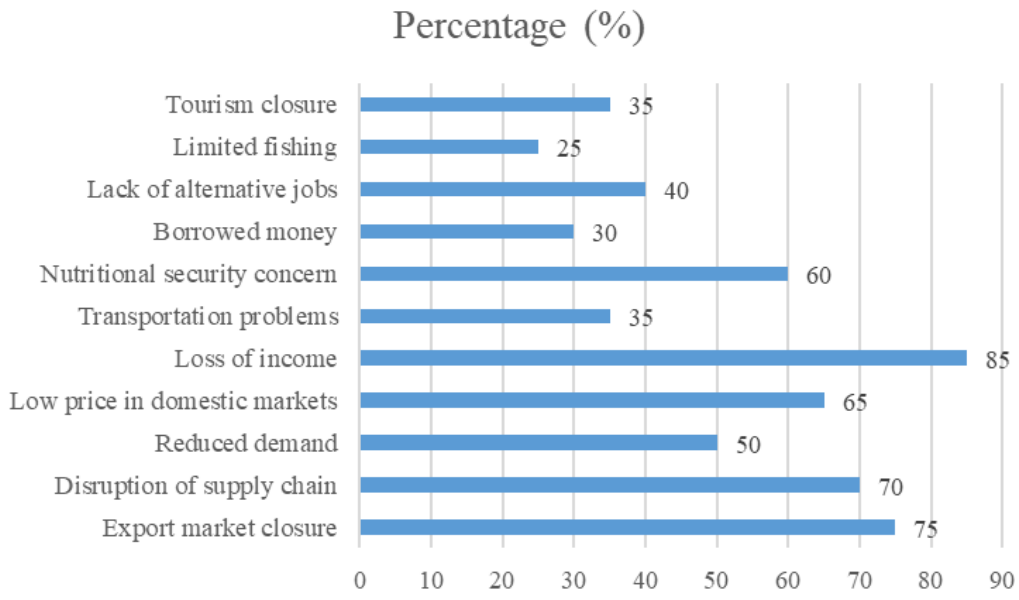

Figure 6.4 The effect of the COVID-19 pandemic on the mud crab fishery (*Source: key informants with multiple responses*).

6.5 Interactions in the crab supply chain

As presented in Table 6.3, in most of the cases, interactions are related to credit support, price setting, the quality of crab, government benefits, and required certificates or clearance for export trade. These interactions are discussed below.

Credit support – crab harvesters form a trust agreement with depo owners every time they borrow money in advance of sales from depo owners. Because of this trust agreement, crab harvesters have lost their autonomy and freedom in choosing suitable buyers and bargaining to set prices. The trust agreement between those groups determines the crab price for harvesters' daily products. A conflict occurs if crab harvesters or small-

scale farmers sell their products to a buyer other than the moneylender. A crab exporter key informant from Uttara, Dhaka, explained, “the local depo owners have also been bound to exporters for credit support in the past. However, now the depo owners have become self-dependent and can invest money in the crab business from their savings or take a loan from a/the Bank.”

Price setting –interactions among all the actors in the supply chain in terms of price negotiation are the most common, except for harvesters and small-scale farmers. At the domestic level, crab harvesters do not have bargaining power in setting the price of their products. As a result, crab harvesters often get unfair prices for their products, and they are the ultimate sufferer of any price fall. The number of crab exporters has increased at the export level, and they are getting connected to new foreign buyers. Due to social media-based communication advancement, especially through “WeChat,” export traders reach out to foreign buyers and sometimes offer lower prices than other traders offer. The same key informant exporter explained, “foreign buyers are nowadays looking for new traders in Bangladesh who sell crab at lower prices than others.”

Crab quality – foreign buyers do not compromise the quality of crab. Thus, all the actors of the crab supply chain need to maintain the quality of their products. Since foreign buyers do not accept weak, dead, diseased, or broken crab, in some cases, the importing countries have rejected crab shipments from Bangladesh due to the presence of weak, dead, or broken crab in the past. Further consequences of such a situation include the

cancellation of export trade licenses for responsible traders. As a result, tensions arise between actors if someone tries to sell broken or dead crab; for example, disputes between local depo owners and exporters are common in this regard. As elaborated by a key informant depo owner, "we usually get a good quality crab from the small-scale harvesters and pack them in a bucket for transportation. However, the quality of the crab sometimes can be deteriorated if the weather temperature is high and the transportation is not good. But the exporters always blame that we intentionally deliver broken or dead crab, which is not true." Although small-scale crab harvesters maintain the good quality of their products, they do not receive fair prices for their products. Moreover, this situation indicates how the international market requirements influence the domestic markets of the mud crab fishery.

Government's aid – conflicts between the actors of the crab supply chain also occur based on government benefits for the small-scale harvesters. For instance, the government provides compensation for small-scale harvesters during the annual two months ban. However, crab harvesters hardly receive what they are supposed to. As explained in chapter 5, the compensation is mostly received by the people who are close to local politicians or people in charge of distribution. A similar situation has been observed during the severe exposure to the COVID-19 pandemic during March-May 2020. In 2020, the actors within the market chain of the crab fishery had suffered from the COVID-19 pandemic as well as the cyclone '*Amphan.'* In response to those crises,

the government provided food packages and loans facilities for the affected people, including the crab supply chain stakeholders.

Nevertheless, these benefits have hardly reached all the stakeholders. A key informant crab harvester in Munshiganj explained, “the government benefits are mostly received by the people who are either friends or relatives of government officials, and this is the trend here. Nowadays, we do not expect much from the government because we know what will happen at the end.” In terms of the loan, a key informant depo owner noted, “it is true that government arranges loan facilities for affected traders, but the loan seekers need to show many documents to get the loan, for instance, property ownership documents, which many traders have not.”

Misuse of power – is also observed in accessing forest for crab harvest and in getting the certification required for export trade. Sometimes, the income for crab harvesters is affected when forest officials illegally ask for extra money to allow harvesters to enter the forest. During the annual ban period, all the crab supply chain actors are able to continue their business except crab harvesters since they harvest crab from the forest directly. Thus, the situation indicates that the annual crab ban strategy only hinders market access for small-scale crab harvesters. At the export level, export traders must take a No Objection Certificate (NOC) from the Forest Department, a health certificate from DoF, and clearance from airport customs to export crab. Export traders argue that these government departments misuse their power. For instance, exporters sometimes need to

pay extra money in order to get their certificates on time. Otherwise, the government officials may use excuses, such as that the application is incomplete, the quality of crab is not good, or the crab is harvested from the forest during the annual ban period, to delay the issuing of the certificates. On the other hand, a key informant from the Department of Fisheries explained, “export traders sometimes try to export crab without maintaining the government regulations. Sometimes, we have found the bad quality or undersize crab in their shipment that affects the reputation of our crab in international markets. Sometimes, they apply for certificates without proper documents. In such a situation, we hold their application, and that causes delays.”

6.6 Gender issues in the mud crab supply chain

Women are an important part of the mud crab supply chains, contributing significantly to the fishery’s supply chain. Apart from crab harvest, women are also involved in post-harvest sorting and grading of crab at the house and sometimes in the crab depo. They work as day labourers in large-scale crab farms to supplement their family income. However, they are marginalized and underrepresented in several instances.

Crab harvesting is one of the second professions after shrimp post larvae collection, where women are directly involved in fishing in Bangladesh. Women harvest crab with their husbands or elderly members of a family. They also process it on-board, i.e., tightening the chelate legs. In some cases, they lead their family income if their husband

is sick or passed away. Although women have a direct contribution to the crab supply chains, they are usually treated as a helping hand and are barely treated as an equal in the markets. Often, women get lower prices for their products than their men counterparts. A similar situation is seen in crab farms, where women work as day labourers and get lower wages than men. According to 95% of the key informants, the COVID-19 pandemic has further reduced women's income since they have not been able to go for crab harvest and contribute to the family income (Figure 6.5).

Although women participate in crab harvest and contribute to their family income, they still have to perform unpaid household chores. They arrange and cook meals for the family members. They go to the forest and collect firewood. If one of their family members gets sick, women take full care of them until they recover. About half of the key informants argue that the outbreak of COVID-19 increased women's household workload, as the schools were closed and they had to spend extra time caring for older people at home (Figure 6.5).

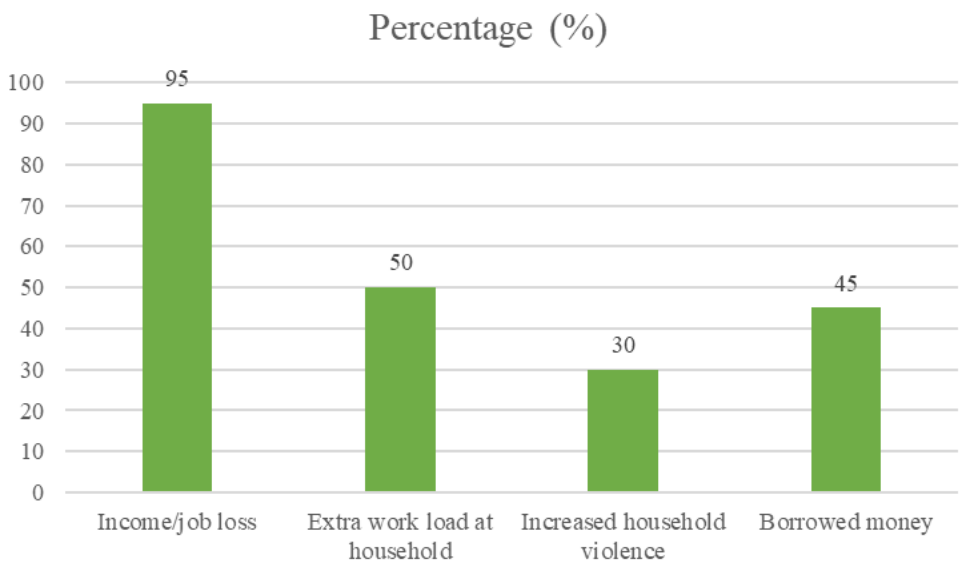

Figure 6.5 The impacts of the COVID-19 pandemic on women involved in the mud crab fishery (*source: key informants with multiple responses*).

Apart from household chores and crab harvesting, women take part, to a lesser extent, in crab grading, sorting, washing, and tightening of chelate legs in large-scale crab farms. Usually, these jobs are mostly occupied by the youth at the farm and local depo. During the severe exposure to the COVID-19 pandemic, women lost their processing-related jobs due to the closure of crab farms as well as the supply to export markets.

While women are involved in crab harvesting, sorting, grading, and to a limited extent, selling, they are not involved in decision-making related to the supply chain of market institutions. The crab supply chain is a male-dominated sector in Bangladesh. For example, none of the members of SDCTAL are women. A few women have export licenses at the export level, but their husbands or men mainly run the business. A key

informant of the administrative office of BLCFEA explained, “women are usually not involved in crab export; it is their husband who takes extra license by their wife’s name to export a double amount of crab and enhance their income.” Only eight women are members of BLCFEA among the 161 members. However, their participation in decision-making is uncertain. A key informant researcher from the Sylhet Agricultural University noted, “the present market structure and the socio-cultural system in Bangladesh hardly encourage women to come forward and participate in management related to crab market chains.”

Although women involved in the mud crab supply chains face many challenges both at the household and at market levels, no platform has been found in the study area dealing with women-related issues. A few non-governmental organizations sometimes highlight women-related issues, but it is unlikely to see proper initiatives be taken by the respective departments, for instance, the Department of Fisheries. An expert from the Bangladesh Agricultural University suggested, “women are not organized and do not even know their rights. During the COVID-19 pandemic, women were stuck at home, none of the government or non-government supports was specified for women.” Thus, many women had to borrow money from the middlemen to feed their family members, as indicated by 45% of the key informants (Figure 6.5).

6.7 Implications and key lessons

The above findings of the study suggest that the structure and governance of the mud crab fishery's market access are weak, which again indicates poor implementation of what SSF Guidelines suggested in section 7.4. The stakeholders associated at each stage of the supply chain usually govern their own part of the chain, except harvesters and women, who influence the structure and governance of market institutions as a governing actor, which is also suggested by Coronado et al. (2020) in the case of octopus fishery in Mexico. Some factors limit the access for small-scale harvesters and women in the market institutions. For instance, the buyers for crab are pre-determined in most cases due to the patron-client relationships that form in terms of monetary support between the depo owners and small-scale harvesters. As opposed to Mirera et al. (2014), this study has found that small-scale crab harvesters have a rare connection to hotels and restaurants, domestic market outlets, and exporters to sell their products at higher prices. This may not be the case if the country were to implement the relevant principles of the SSF Guidelines, for instance, section 3.1.1 (human rights and dignity), 3.1.3 (non-discrimination), 3.1.4 (gender equality and equity), and 3.1.5 (equity and equality).

While the SSF Guidelines urge countries to recognize the central role that small-scale fishers play in the post-harvest supply chain (section 7.1), the study revealed that crab harvesters are marginalized and underestimated by other actors, mostly by middlemen or depo owners. Like Coronado et al. (2020), the study shows that the existing markets of

mud crab are structured in a way that makes crab harvesters dependent on the merchants (e.g., middlemen or depo owners) to sell their harvest. As a result, crab harvesters lose their bargaining power and autonomy and freedom, which is also suggested in other studies, such as Rodrigues and Villasante (2016) (in the case of marine invertebrates in São Vicente, Cape Verde), and Willmann et al. (2017) (in studying human rights-based approach in general and in small-scale fisheries). Furthermore, the COVID-19 pandemic has disrupted the income and livelihood of crab harvesters and made them dependent on middlemen for credit support (Sunny et al., 2021). This way, the middlemen make barriers for small-scale harvesters' access to market institutions, making it challenging to achieve the SDG Target 14b.

In section 7.6, the SSF Guidelines suggest that governments should facilitate small-scale fisheries' non-discriminatory access to local, national and international markets, which is not yet applied well in the case of the mud crab fishery in Bangladesh. The lack of the government's policies to regulate the market institutions enables the middlemen to dominate the supply chain and have power over the crab harvesters. As a result, the crab harvesters hardly get fair prices for their fish and fisheries products, which is also confirmed by Mirera et al. (2014) and Mozumder et al. (2018) in the case of mud crab in East Africa and hilsa fishery in Bangladesh, respectively. To some extent, the government agencies are involved in the harvest and export levels of the supply chains. At the harvest level, the government imposes an annual crab harvest ban during the crab-breeding period, which often creates a barrier for small-scale harvesters' access to market

institutions. While other stakeholders remain active in the supply chain during the ban, small-scale harvesters become vulnerable to income loss and dependence on the moneylenders to maintain their livelihoods. This study suggests that alternative income opportunities should be generated for crab harvesters to implement this policy.

Furthermore, many local stakeholders and members of academia argue that the annual two-month ban policy is not appropriate because those months are not a proper breeding period for the crab. They suggest conducting a further study on the crab-breeding period to make appropriate amendments to the policy. At the supply chain level, the government agencies are less involved, and this study again confirmed what Mirera (2011) has found, namely that the misuse of power and mismanagement practices are common in developing countries, for instance, in the mud crab fishery of Bangladesh.

In terms of women's involvement, the existing governing system of the crab supply chains hardly allows women to participate in decision-making, thus, indicating the poor implementation of section 8 (gender equality) of the SSF Guidelines. Tuelieres (1992) argues that women were the first to start crab harvesting. Despite the participation of women in crab harvesting being almost equal to men's participation (Bhuiyan et al., 2021), this study has found that women are largely underrepresented in decision-making. One of the main reasons for this situation is a lack of a common platform for women to express their perspectives. They urgently need organizational support or form an association/union among the women to get fair treatment in the supply chains.

Frangoudes et al. (2019) argue that women's labour is framed as "helping" rather than "fishing." Like Frangoudes (2013), this study suggests that the active participation of women in the mud crab supply chain governance can bring new perspectives and knowledge to improve the existing market structure. Moreover, this study has found that a number of the SSF Guidelines are not implemented regarding the mud crab fishery in Bangladesh. Since the SSF Guidelines provide an important tool to achieve SDG 14b, including through integrating them into the legal frameworks and relevant processes, the country should pay more attention to implementing these guidelines in order to promote the achievement of SDG 14b.

Chapter 7 Conclusion and recommendations

This study aimed to look at the existing marketing structure and how the markets for fish and seafood function, and the governance interactions at structural and actor levels in markets, especially in the context of the COVID-19 pandemic, to identify any trends which might be useful to develop and implement successful market institutions policies. This chapter concludes the major findings of the study and provides policy recommendations based on the analysis of the results. The chapter ends with future research suggestions.

7.1 COVID-19 and market access for small-scale fisheries worldwide

The COVID-19 pandemic has caused worldwide disruptions of major supply channels for fish and fisheries products, which have created new challenges for small-scale fisheries and have complicated their market access. The analysis of the online-based reports and published articles show that small-scale fisheries of 47 countries that this study covered have been negatively affected by the COVID-19 pandemic in terms of income and livelihoods, especially during March and April 2020. Small-scale fishers who depend entirely on the fisheries became susceptible to poverty. They had limited opportunities to diversify their income and fisheries products. Women have been unable to work outside of their home, inhibiting thus their contribution to the family income and have been loaded with additional unpaid household work.

In response to the pandemic, the study identified some positive impacts on small-scale fisheries to enhance their opportunities to access markets. In many cases, small-scale fishers have arranged markets outside of normal places and had a better chance to interact directly with the consumers to sell their products. This way, they have received better prices for their products, regained the bargaining power, and reconnected to the local consumers. In addition, to a smaller extent, different governmental and non-governmental organizations have helped small-scale fishers to sell their products, along with other agricultural goods, through online-based platforms.

While different governments have taken initiatives to minimize the effects of the pandemic, in most cases, these initiatives have not particularly focused on small-scale fisheries. In many cases, governments have declared specific forms of support for supply chain actors (e.g., traders and processors); however, specific support for small-scale fishermen and fisherwomen have been rare. Such cases indicate that small-scale fishers are not being treated as an important supply chain actor of the market institutions. The findings suggest that the majority of the responses from the government have focused on short or medium-term recovery rather than minimizing the long-term effect of the COVID-19 pandemic.

Thus, the study recommends that countries that have been struggling to deal with the COVID-19 crisis, developing short, medium, and long-term resilience plans for facing future crises like COVID-19. At the same time, the ‘institutional’ or ‘structural’ changes

are also required in the long run by addressing the existing challenges to deal with future crises or ways to build resilience for small-scale fisheries. The equitable distribution of benefits among all the supply chain actors should be promoted and ensured by the government.

Moreover, the understanding of how small-scale fisheries operate, the social dynamics of fishing communities, and in the context of the market, how the markets are structured, governed and functioned is required in order to make changes in the institutional or structural changes, develop plans as well as to achieve SDG 14b of the UN 2015 Sustainable Development Goals. Otherwise, the governmental developmental plan or response may not be best effective or not bring the best results of it, similar to what has been observed in terms of governments' responses to minimize the effect of the pandemic on small-scale fisheries in many countries.

7.2 COVID-19 and small-scale fisheries in Bangladesh

On a national scale, in Bangladesh, the study shows similar barriers for small-scale fisheries in accessing markets during the COVID-19 pandemic. The overall governance of small-scale fisheries is complex and is not well structured. Many governing actors are involved, while their roles and responsibilities are not well defined or complementary to each other in many cases. Traders and moneylenders mostly dominate the fisheries supply chain. Small-scale fishers and women working in the fisheries face year-round

financial crises due to their socio-economic status, and the middlemen take advantage of this situation. Small-scale fishers lose their autonomy and freedom in the markets due to the patron-client relationships built with moneylenders in terms of financial support in times of need. They rarely have opportunities to participate in the supply chain-related decision-making, although they contribute most to the fisheries production in Bangladesh. It seems that the supply chain actors who have money and local political support can easily dominate the fisheries supply chain. Further, small-scale fishers are not organized; they barely have associations/unions to represent their issues and concerns. Although small-scale fishers have formed associations/unions in some cases, mainly the non-fishers, especially those with money and political support, run these.

The outbreak of the COVID-19 pandemic has created further severe challenges for small-scale fisheries, especially during March-May 2020, by disrupting both the domestic and export market channels. Although the severe effects of the pandemic have not lasted for a long time, the damage has been done for small-scale fisheries by seizing their income and making them vulnerable to food security, poverty, and patron-client relationship. The pandemic has made small-scale fishers became more dependent on the middlemen for monetary support and means to feed family members. The government has offered stimulus packages and loans with low interest for traders and processors to recover from the COVID-19 effects; however, no specific support has been offered by the government for small-scale fisheries.

Overall, the analysis of the COVID-19 pandemic situation of small-scale fisheries in Bangladesh highlights that small-scale fisheries are not given their desired recognition and space in the decision-making process, which is also indicated in the review of the prevailing situation of small-scale fisheries' social and governing system. The country should develop strategies in order to improve the existing condition of small-scale fisheries and their access to markets.

The government should pay more attention and provide direct support to small-scale fisheries in facing future crises by providing subsidies, increasing fish prices, and developing new local fish markets. A consultation process should start between government, fisheries professionals, a representative from supply chain stakeholders, including small-scale fishermen and women, to identify emerging problems in fisheries supply chains and to enhance capacities. A gender-inclusive governance structure should be developed, where both men and women can contribute to decision-making regarding access to resources and markets as provided by SDG 14b (Mozumder et al., 2020).

Further, fisheries development plans and policies need to address the fundamental social, economic, and environmental issues that affect small-scale fishing communities and their livelihoods. This study recommends that the relationships and networks between the fishing communities be strengthened to provide social safety and an institutional bridge towards the transition to the financial inclusion of small-scale fisheries. The country should pay attention to the power relation between small-scale fishers and other supply

chain actors. The country should also consider any kind of change/restructure in the supply chains or institutions to mitigate opportunities for other supply chain actors and take advantage of small-scale fisheries. A clear and accessible national plan should be made by consulting all the fisheries' stakeholders, including small-scale fishers, which will ultimately help the country to achieve the SDG 14b. In this case, the legal frameworks related to small-scale fisheries need to be improved by undertaking measures such as governance reform and education of key stakeholders, including small-scale fishers (Shamsuzzaman and Islam, 2018).

7.3 Access to markets for the mud crab fishery

On a local scale, the study has identified that small-scale mud crab harvesters' access to the supply chain of the market institutions is compromised as a governing actor. First of all, the market structure for the mud crab fishery is not well developed. Specific guidelines or regulations for market governance are missing. Although certain actors of the crab supply chain are organized among themselves, for example, the depo owners and traders, such organization is absent for small-scale harvesters. Even if the harvesters get organized, the non-fisher people use their influence and power to control the harvesters' associations/unions. This situation clearly indicates the violation of human rights and dignity of small-scale harvesters, which is the 1st principle of the SSF Guidelines. Thus, at the structural level, the depo owners or exporters mostly have chances to interact and make decisions related to the supply chain of the mud crab fishery.

As explained in chapter 2, the market is a social institution where all the supply chain actors come together to buy and sell their products through interactions, mostly in the form of transactions. However, this study reveals that such interactions of harvesters with other actors of the market institutions are mostly missing at the actor level. Certain interactions of the mud crab harvesters with other supply chain actors occur based on different issues, for instance, monetary support, where small-scale harvesters are often victimized. The study has found three main reasons why an ideal interaction between different supply chain actors of market institutions is missing. First, as explained in chapter 6, the government is not directly involved in guiding the supply chain of the mud crab fishery; thus, depo owners and exporters dominate other actors of the market institutions. As a result, small-scale harvesters have no other option but to follow the exporters and depo owners. Second, the domestic markets for the mud crab fishery have not been properly developed due to cultural and religious restrictions. Thus, the interactions between harvesters and local consumers are missing. Finally, the mud crab fishery is export-oriented. The major routes of the crab supply chain starting from the local market to Uttara, Dhaka, and then to foreign buyers. At the local markets, the depo owners are the main buyers for mud crab. As a result, small-scale harvesters are indirectly forced to sell their products to depo owners, which ultimately limits their access to the market as a strong governing actor due to patron-client relationships.

This study suggests developing and implementing some long-term plans and strategies to overcome the existing challenges in the mud crab supply chain, as well as to improve the

market structure in Bangladesh. First, the country should diversify the market by introducing and regulating the domestic markets rather than depending only on export markets. Especially, the lessons from the COVID-19 pandemic suggest diversifying markets for the small-scale mud crab fishery would help build a strong resilience to future market disruptions. Béné et al. (2021), Asante et al. (2021), and Sunny et al. (2021) have also suggested such a solution. The domestic markets should be developed through better coordination among the governing bodies, educating consumers and raising public awareness. Second, the government should also arrange fair credit support availability for crab harvesters and better regulate the activities of moneylenders or middlemen. Hence, proper policies regarding the market institutions should be formulated by consulting all the supply chain actors for maintaining the domestic and export supply chains of the mud crab. The participation of crab harvesters in decision-making is crucial since they hold the best knowledge (Jentoft et al., 1998). Third, the market governance structure should be modified based on the social dynamics of the stakeholders, institutional capacity, and interactions between the actors to secure the successful implementation of these policies. For instance, the modified market governance structure should visualize the invisible actors within the mud crab supply chain (e.g., women, harvester, and farmers) with their equitable participation, given their role in the community by ensuring income for their family and food security locally (Jimenez et al., 2020). As Coronado et al. (2020) suggested, it is necessary to find mechanisms to improve the conditions of those actors at the beginning of the supply chain who often feel limited or have no capacity to bargain for the benefits from their

products. More efforts from both the government and non-government organizations should be put to raise awareness among small-scale harvesters and farmers to recognize their rights and avail full benefits from the mud crab supply chains, for example, by providing fair credit support and helping fishers to form their union. Therefore, they can actively engage in price setting and reduce the vulnerability to price fluctuations and changes in international market requirements and conditions.

7.4 Gender issues in small-scale fisheries and market institutions

While small-scale fishing is a male-dominated profession, women do the majority of the post-harvest activities. Recognizing the vital contribution of women to the supply chain, the SSF Guidelines have highlighted the necessity of women's participation in all the divisions of small-scale fisheries. However, many countries, including Bangladesh, are still far behind in implementing the SSF Guidelines and in providing space for fisherwomen where it is necessary. In Bangladesh, this study shows that women are not equitably treated as an important actor in decision-making related to small-scale fisheries. Women are hardly consulted in fisheries and market-related policies. As shown in the case study of the mud crab fishery (Chapter 6), women in the mud crab supply chain are often underestimated and unrecognized. The majority of the women involved in the supply chain barely know their rights and opportunities. They have little access to market information, policies, or regulations due to illiteracy and social structure deficiencies. Thus, they are mostly obliged to rely on the dominant male member of their family for

information and decision. They do all the household activities, take part in direct crab harvests, and work in the agricultural field or fish/crab farms to supplement their family income. All the hard work women do have rarely been acknowledged by other actors of the supply chains. Thus, this study argues that the country will not achieve SDG 14b without equal treatment of women in the fisheries market institutions. The government should take initiatives to ensure that the provisions of the SSF Guidelines related to women are implemented in all the aspects of the fisheries supply chain to achieve SDG 14b.

7.5 Future research suggestions

Several further research needs have been identified related to small-scale fisheries governance in Bangladesh. The governability of small-scale fisheries in terms of access to markets is another topic to explore in Bangladesh. In chapter 5, this study has highlighted how small-scale fisheries and their governing systems are diverse, complex, and dynamic. Future studies can identify how the governing interactions in the context of access to markets for small-scale fisheries have the potential to enhance governability in a concrete and pragmatic sense. In addition, studies can identify what drives the interactions between the governing actors and where the government should pay more attention to enhance the governability.

The empirical example of this study has focused on mud crab fishery, while there is a scope to conduct a similar study on other important fish species, for instance, hilsa (*Tenualosa ilisha*) fishery, in order to assess the country's status towards achieving SDG Target 14b. Besides, the study focused on access to markets for small-scale fisheries; the other part of the SDG Target 14b, i.e., access to marine resources for small-scale fishers, is still an important topic to explore. Since Bangladesh has committed to achieving SDG 14 and reaching the target 14b by 2030, a comprehensive understanding of the present status of the small-scale fishers' access to marine resources may bring the government's attention to the gaps in implementing this commitment.

In Bangladesh, many studies have already been conducted on legal aspects of small-scale fisheries management (e.g., Uddin et al., 2019; Shamsuzzaman et al., 2016, 2017, 2018, 2020). However, further studies are required on the governance aspects regarding access to marine resources for small-scale fisheries in Bangladesh. Studies can also be conducted on the "step zero" analysis of legal frameworks of small-scale fisheries in Bangladesh. Additionally, studies can do the unpacking of legal and policy frameworks, following the approach presented by Nakamura et al. (2021). This study has highlighted the existing legal frameworks related to the management of small-scale fisheries. Future studies can identify how the existing fisheries-related legislation was established, who has been consulted, or what the procedure was for these legal frameworks to come into effect. It can also provide an insight into whether and how the respective stakeholders, for instance, small-scale fishers, reacted to the legislation. The studies can explore how

timely and effective the existing legal frameworks are. Such analyses could provide lessons and identify scopes to improve future policy formulations. For example, as highlighted in chapter 6, a comprehensive study is required regarding the annual mud crab harvesting ban policy and its mismatch because January and February are two important months for crab export and income for crab harvesters given the high demand for crab in the Chinese New Year.

Finally, a study is required to understand the long-term effects of the COVID-19 pandemic on small-scale fisheries' access to markets and resources. This study has presented the early effects of the pandemic on small-scale fisheries and the access to markets for the small-scale mud crab fisheries. Other studies could focus on other important small-scale fisheries in Bangladesh, for example, the hilsa fishery. In addition, future studies can analyze whether the pandemic has worsened the vulnerabilities of small-scale fisheries. It can also recommend a few ways to move towards viability by analyzing the immediate and long-term responses taken to support small-scale fisheries globally and in Bangladesh.

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Appendix I Research Instrument

Questionnaire ID # Date of interview: _ _ / _ _ / _ _

Part 1: General Information

1. Age/age range: _____
2. Sex: _____
3. Area/region: _____
4. How long have lived/worked in the area/region? _____
5. What is your role in the market chain of small-scale mud crab fishery, e.g. harvester, processor, trader, researcher, government/NGO representative?
    - How long have you been in this role? _____
6. In your opinion, what are two or three of the access to market problems facing the small-scale fisheries in this area/region?
7. What are the impacts of COVID-19 on small-scale fisheries regarding access to markets?
8. Mud crab in Bangladesh
    - How demandable is the mud crab fishery in the domestic markets? Can you explain the drivers that enable or hinder domestic market access for small-scale mud crab fishery?
    - What are the key challenges facing mud crab fishery in Bangladesh?

Part 2: Structure of Markets

9. Can you explain the structure of the supply chain for the mud crab small-scale fisheries? Through what channels and mechanisms are crabs reaching the consumers from the harvesters?
10. Who are the key actors/organizations involved in the market supply chain?
11. Are small-scale harvesters happy with the existing market structure? If not, why?
12. How are the prices set in the markets? Do the consumers have a say in price determination? Do the fish harvesters get fair prices for their products? 1=Yes, 2=No. And why?
13. What are the direct and indirect challenges faced by small-scale fisheries in accessing markets?

Part 3: Governance of Markets

14. How are the mud crab supply chains governed? By what mode, e.g., self-governance, co-governance, or hierarchical governance? How effective is the governance mode?

15. What are the roles played by different market chain actors/organizations in governing the supply chains?
16. Do the governments have any specific regulations or policies to guide the mud crab supply chains? If so, how do these regulations/policies enable or hinder the access to markets for small-scale fisheries?
17. Can you explain whether small-scale fishers are consulted in formulating or changing market-related rules and regulations?
18. What are the initiatives taken by the government to maintain the domestic and export supply chains during the pandemic?

Part 4: Gender Issues

19. What are the roles that women play in the harvest or post-harvest supply chains of the fishery?
20. What are the problems faced by women in the supply chain of the fishery? Do the government take into consideration the issues and concerns affecting women? Are there venues for women to express their perspectives?
21. How do the government treat women involved in the harvest or post-harvest crab supply chains?
22. How has COVID-19 affected women? How have they responded?

Part 5: Interactions between supply chain actors and market regulatory bodies

23. How do the governing bodies interact with small-scale crab fisheries in free or regulated markets? Through what mechanisms and channels? What factors drive these interactions?
24. What are the interactions that take place at the structural level of markets, e.g., self-governance, co-governance, and hierarchical governance, and why? How would you characterize these interactions between market structure (e.g., perfect competition, imperfect competition, and buyers' power) and small-scale fishers?
25. Do the small-scale fishers comply with the existing market structure? If not, why? What are the likely consequences if they do not follow the specific market channels (e.g., not selling to pre-determined buyers)?
26. Do the export market requirements enable or hinder small-scale fisheries' access to markets as well as domestic supply chain governance? If so, how?

27. **Is there anything else you would like to add regarding the topics covered?**

Thank you for your responses!

Appendix II Key informant discussion

Small-scale fisheries

28. Major problems in small-scale fisheries
29. Fishing communities connection to each other and interaction between them
30. The impact of the export market on small-scale fisheries governance
31. Marginalized actors of fisheries supply chains
32. Women's roles in small-scale fisheries
33. The interaction between the governing bodies and small-scale fisheries

Small-scale fisheries governing system

1. The governance structure of small-scale fisheries
2. The key organizations/actors involved in small-scale fisheries governance
3. The government's consideration of women involved in the harvest or post-harvest supply chains of small-scale fisheries
4. The impact of COVID-19 on the governing system of small-scale fisheries

Impacts of the COVID-19 pandemic on small-scale fisheries

1. Impacts of COVID-19 on small-scale fisheries and their supply chain
2. Lockdown and transportation-related difficulties for small-scale fisheries
3. Vulnerable supply chain actors to the pandemic
4. The problems faced by women because of COVID-19
5. Impact of COVID-19 on social relations between the fishing communities

Responses to the COVID-19 pandemic

1. The strategies have taken by the fishing communities to minimize the effect of COVID-19
2. The strategies have taken by women in response to the pandemic
3. The supports for small-scale fishers from different sources during the COVID-19 pandemic
4. The local or national government takes the initiatives to maintain the domestic and export supply chains during the pandemic
5. Small-scale fishers' reaction to the supports provided by the government during COVID-19