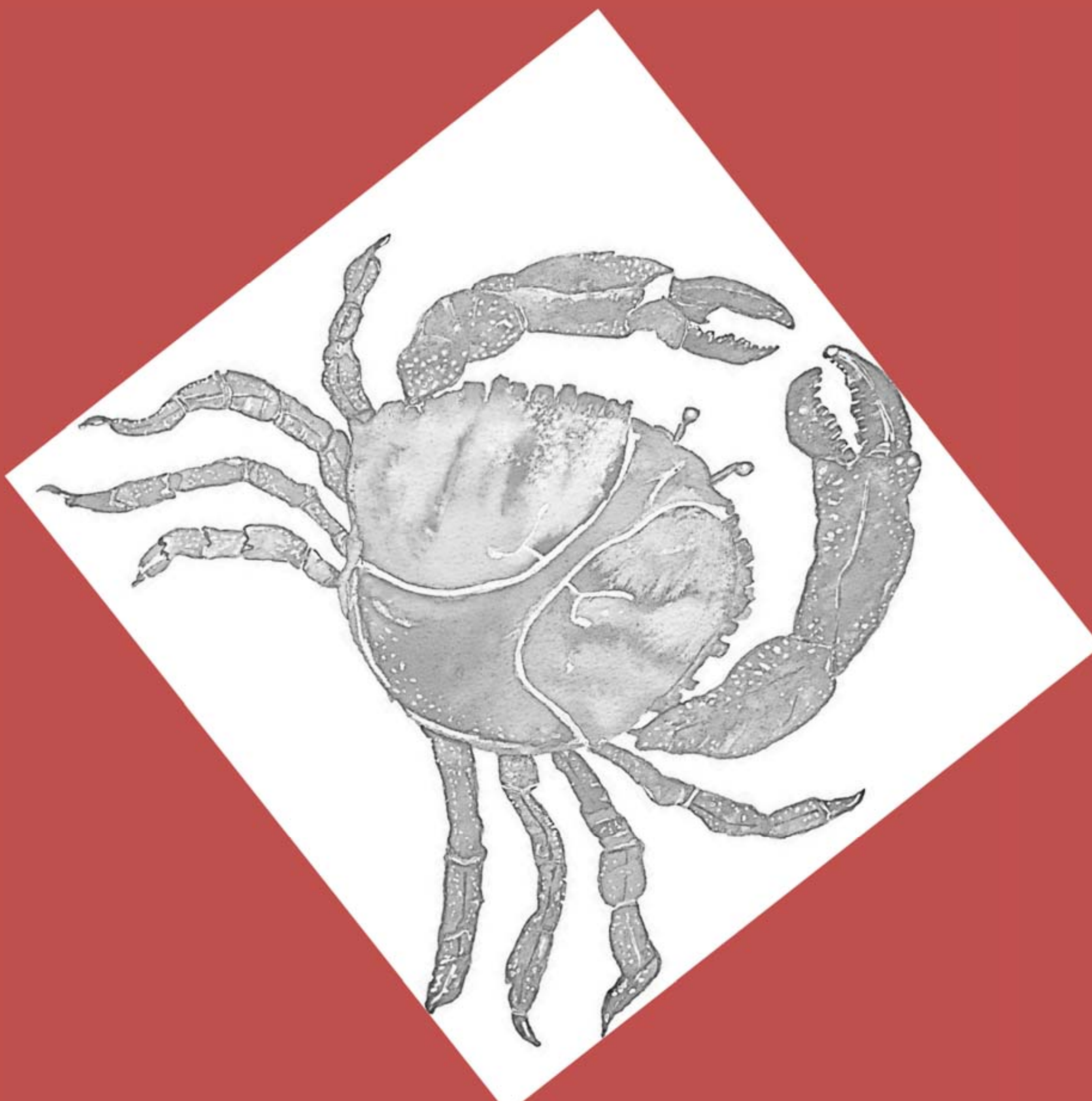
Impact of COVID-19 on the Mud Crab Value Chain in Rakhine State, Myanmar

May 2021



HARP-F Humanitarian Assistance and Resilience Programme Facility

MARKET ANALYSIS UNIT

MERCY CORPS

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Mercy Corps' Market Analysis Unit (MAU)

The Market Analysis Unit provides development practitioners and policymakers operating in Myanmar with data and analysis to better understand the present and potential impacts of COVID-19, conflict and other crises on:

- **Household purchasing power, coping mechanisms** and **access to basic needs;**
- **Value chains,** including **trade** (ag. Inputs, machinery, supply), **cross-border dynamics,** and **market functionality** (particularly as it relates to **food systems**);
- **Financial services,** including **financial services providers,** household and business **access to finance** and **remittances;** and
- **Labour markets** (formal and informal), with a focus on agricultural labour and low wage sectors (construction, factories, food services).

Table of Contents

Map of Study Area

Other Interviewed Stakeholders	No. of Stakeholders
Collectors	5
Traders	21
Transport Organizers	2
Other Fishers (Shrimp, Prawn, Fish)	8
NGOs & INGOs	5
Total	**41**

Acronyms and Abbreviations

AA	Arakan Army
CERP	COVID-19 Economic Relief Plan
COVID-19	Coronavirus Disease 2019
DoF	Department of Fisheries
FAO	Food and Agriculture Organization of the United Nations
GoUM	Government of the Union of Myanmar
IDP	Internally Displaced Person
IOM	International Organization for Migration
INGO	International Non-Governmental Organization
KII	Key Informant Interview
MAU	Rakhine Market Analysis Unit
MMK	Myanmar Kyat
MOALI	Ministry of Agriculture, Livestock and Irrigation
MYSAP	Myanmar Sustainable Aquaculture Programme
NGO	Non-Governmental Organization
TO	Transport Organiser
USD	United States Dollars
VC	Value Chain
VSLA	Village Savings and Loans Associations
VT	Village Tract
WB	World Bank
WHO	World Health Organization

Executive Summary

Mercy Corps, under the Rakhine Market Analysis Unit (MAU), conducted a study across Rakhine State in September 2020, two to five weeks after lockdowns and restrictions were imposed in the region. The objective of the study was to better understand the impact of COVID-19 (COVID) on the live mud crab[1] (or mud crab) value chain in the State.

A total of 359 respondents were interviewed from coastal communities (and those living along rivers and streams close to the sea), across four townships in Central and Northern Rakhine (Sittwe, Pauktaw, Myebon and Rathedaung), areas which are heavily reliant on the mud crab industry. Key market actors were surveyed, from mud crab fishers, to collectors, traders and transport organisers. These 359 mud crab fishers were interviewed using a combination of telephone and online surveys. Key Informant Interviews (KIIs) were conducted with 36 other market actors, using phone calls and Skype.

As the Rakhine, and more broadly Myanmar, mud crab industry is essentially completely reliant on the product's final export to China, COVID-imposed restrictions, including border closures, transportation and mobility constraints, significantly affected the sector. These challenges were exacerbated by declining demand and subsequent diminishing market price of mud crab, significantly impacting all market actors and the entire market system.

This report outlines key findings and proposed recommendations resulting from the study, to further guide humanitarian, development and market-oriented organisations, as well as donors and policy makers in the design and implementation of COVID response and relief programs to revitalize the mud crab industry.

Findings

KEY FINDING #1: COVID has shifted market conditions as a result of the border closure with China, decreasing the demand for export while increasing mobility restrictions. This has resulted in decreased household income for mud crab fishers, causing them to adapt their capturing and distribution practices – leading to sub-optimal coping strategies.

- Prior to COVID, 72% of respondents stated that the activity of capturing mud crab was significant to their livelihoods, contributing to more than half of their total household (HH) income. However, post-COVID, their income has significantly decreased;
- Main factors affecting mud capture activity post-COVID are: i) low prices (79%); ii) decreased demand (64%) and the home lockdown (58%);
- 94% of fishers have reduced the volume of mud crab captured;
- Frequently practiced coping strategies utilised by fishers can be categorized into: a) credit and loans and b) reducing food intake;
- Debt has increased among fishers, as 95% requested a loan over the period July-September.

KEY FINDING #2: Collectors are experiencing knock-on effects from market system and distribution disruptions due to COVID and the dependency on exports to China – however are leveraging existing resources including social capital and ponds.

- Prices paid to collectors have decreased by approximately 50-70% since January 2020;
- Collectors are maximizing the social capital they have established with traders in order to sustain their businesses;

[1] It should be noted that the terms 'live mud crab' and 'mud crab' are used interchangeably through the report, in reference to the *live* mud crab sector.

- Collectors with ponds are leveraging this resource; by storing both crabs and crablets[2] until they can maximize size and price if possible – a resilient characteristic to facing external shocks and stresses such as COVID.

KEY FINDING #3: Aligned with other market actors, traders are also experiencing significant losses after the pandemic due to the diminishing export market, border closures and the increased cost of transportation.

- Overall, traders did not change their commercial ties/selling channels in response to the pandemic, despite the fact that they reduced the average volume traded by 72%[3] post-Rakhine lockdown (as compared to 2019);
- Traders significantly lost profit during the closure of the Chinese border, as they stopped operations for several days or a month. Additionally, the Rakhine lockdown and curfew resulted in longer transport times (from 24hours to 36hours to Muse), resulting in higher costs and losses for traders;
- Traders reduced the number of pre-financing loans provided to collectors and fishers by approximately 30-60%, in some cases by 83%, while others stopped altogether. Established social capital and trust between value chain actors were key factors in determining cash advance recipients.

KEY FINDING #4: Transportation channels have been severely affected by COVID-19 restrictions and armed conflict, increasing the time and cost of transporting live mud crab - significantly impacting the sector and market systems.

- Transport Organisers (TOs) are responsible for hiring trucks (with drivers), offering a service of sending the final product to Muse or China, always via Mandalay;
- TOs have been significantly affected by COVID due to decreasing product demand and volume required for transport;
- In addition, the Rakhine lockdown and curfew restrictions meant TOs were required to issue travel authorisations, leading to difficulties at checkpoints.

KEY FINDING #5: The complete dependency of the live mud crab sector on the Chinese export market has affected all market actors due to a drastic reduction in demand and transportation challenges via Northern Shan.

- Market price for live mud crab is directly correlated to the size of crab, predominantly in line with Chinese gradient systems. Interviewed traders stated that pre-COVID, prices ranged between 2,500-12,000 MMK/Kg, decreasing post-COVID ranging between 2,000-8,500 MMK/Kg;
- When comparing average prices pre and post-COVID, traders paid collectors and fishers approximately 30% less for larger sized mud crab;
- Post-Rakhine lockdown, market operations and activity essentially ceased.

[2] Trading and exporting live mud crab weighing less than 100grams is illegal.
[3] Calculated using the average volume of mud crab traded pre and post-COVID.

Recommendations

Each recommendation is intended to inform several actors across the public and private sector including The Government (G), Humanitarian, Development Agencies and Donors (HDAD) and Private or Market Actors (P).

Recommendations	Sector
I. Facilitating the widening of fishers' distribution networks[4]. • Linking fishers with accessible collectors and market actors in the area through leveraging ICT systems (i.e. online marketplace); • This will also help fishers improve access to information, improving their overall agency and building their resilience to cope with the crisis as well as potential future shocks and stresses.	G, P
II. Support sustainable fishing practices by providing improved equipment as well as disseminating training on Good Practices, reducing the capture of crablets[5]. • Providing size selectivity traps will support fishers and other market actors to follow legislation requirements in order to encourage the sustainability of the resource; • Will encourage sustainable practices through the provision of training.	HDAD, G
III. Promote a subsidised program to reduce the impact of COVID-19 on the most vulnerable actors of the value chain. • Government subsidies will help keep jobs and stabilize the economy, while at the same time, promoting the product across the domestic market in the medium-term.	G, HDAD
IV. Increase the resilience of households relying on the mud crab sector. • Facilitate programs to diversify livelihood options; • Design programs that consider both mud crab seasonality as well as other potential local opportunities; • Engage the private sector often and frequently in program design; • Facilitate and promote VSLA programs at the village level to ensure inclusive financial access for the most vulnerable; • Increase opportunities for using ponds in order to increase resilience to market shocks as well as grow crabs to commercially viable sizes; • Ponds must be established outside mangrove areas in order to conserve mud crabs' natural habitat (i.e. 'backyard ponds').	HDAD, P
V. In addition to recommendation IV above, provide short-term development support to households dependent on the live mud crab sector. • Initiate mapping and baseline studies of HHs and villages which are highly dependent on the sector; • Design and implement programs based on above findings, facilitating relationship building across market actors.	G, HDAD

[4] Rakhine mud crab market actors use distribution networks to buy and sell among other actors, with whom they have established social capital. This recommendation should be gradually implemented, providing support and emphasizing relationship-based business transactions.
[5] Crablets are classified as mud crab weighing less than 100grams.

VI. Facilitate flexible distribution channels with secured and guaranteed access to export to China, enabling traders to continue their livelihoods at the same capacity as prior to the outbreak. • In the short to medium term, government support is required to support the export of mud crab to China, to help fisher HHs overcome the shock of the crisis; • Facilitation of mud crab export is necessary, abiding by COVID-enforced food safety and health measures; • The current infrastructure needs to be amended, adapting mechanisms which will maximize efficiencies, easing transportation and export processes and procedures. This could include, for example, upgrading trucks to include refrigeration, consistent forms of identification, allowing for easier passage through checkpoints, etc.	G, P
VII. Facilitate traders' distribution networks with stakeholders, both domestically and internationally, to diversify market channels to build resilience against current and future shocks. • Similar to Recommendation (I) above, linking traders with accessible market actors through leveraging ICT systems (i.e. online marketplace); • This will also help improve access to information, improving overall agency and building their resilience to cope with the crisis as well as potential future shocks and stresses; • Perform a comprehensive market assessment, both domestically and internationally; • Design and implement a program targeting: • International mud crab export markets; • Developing the domestic mud crab market through establishing new distribution channels and raising consumer awareness.	G, P, HDAD
VIII. Conduct a technical study to guide the sustainability of the mud crab value chain.	G, HDAD
IX. Design, implement and promote a Mangrove Conservation Plan/Program (as per evidence gathered from the technical study). • A detailed plan is necessary to set up appropriate management of mangroves for the sustainability of all its resources; • Special attention should be given to the capture and management of crablets, which is a challenge for the crab resource; • The plan must consider Mangrove Friendly Aquaculture if aquaculture is practiced within mangrove areas; • It should consider the promotion of Community Forestry Plans; • It should take into consideration opportunities of ecotourism as part of conservation management.	G, HDAD
X. Promote policies that contribute to mangrove restoration and conservation in Rakhine State (as per evidence from Recommendation VIII). • Policies to protect and restore mangroves are necessary for an effective program that builds the natural habitat of the mud crabs.	G, HDAD
XI. Enforce crab protection legislation, especially during mating season, by controlling the market in Muse during that period.	G

1. Introduction

1.1 Background

On 31 December 2019, the Wuhan Municipal Health Commission in Wuhan City, Hubei province, China, reported a cluster of pneumonia cases (including seven severe cases) of unknown aetiology, with a common reported **link to Wuhan's Huanan Seafood Wholesale Market**, a wholesale fish and live animal market[6]. One month later (30 January 2020), the World Health Organization (WHO) declared this first outbreak of a novel coronavirus (2019-nCoV) a "Public Health Emergency of International Concern (PHEIC)" and provided technical advice to China and other countries[7]. On 11 March 2020, the Corona Virus Disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO), occurring three months after the initial focus on Wuhan (China). The pandemic spread rapidly around the world, with Myanmar reporting its first two cases of COVID-19 on 23 March. Rakhine was marked as the epicentre of the second wave that swept the country in August, announcing 16 cases including local transmissions. By 16 October, two months after a spike in cases in Rakhine State, the Myanmar Department of Public Health, Central Epidemiology Unit, Situation Report -193, reported 2,428 confirmed cases and nine deaths[8] at the State level.

The Government of the Union of Myanmar (GoUM) enacted precautions for the containment of the spread of the disease, including border closures, social distancing and lockdowns. The 6 April GoUM-imposed lockdown saw Myanmar migrants return to their towns of origin, both in-country and abroad. These measures, implemented to stop the spread, have had serious consequences on the fish and seafood trade[9], especially for Myanmar products destined mainly for export. Future consequences will likely be far-reaching.

Myanmar's proximity to and broad commercial ties with China[10], impacted the Rakhine live mud crab fishery industry relatively early (from December 2019) due to the markets' dependency on final export to China. As market demand decreased in China, so did the prices. Participants of the study (market actors of the mud crab industry) refer to the COVID-19 crisis as three different periods, in reference to how the mud crab market was affected: a) **COVID in China** (December 2019); b) **COVID in Myanmar** (January to August); and c) **COVID in Rakhine** (from 16 August for at least 1 month). Consequently, these markers have determined three periods of comparison within the study: prior to COVID (referred to as pre-COVID), post-COVID (January to August 2020), and post-Rakhine lockdown (16 August onwards).

The COVID-19 pandemic has been jeopardizing healthcare, economies and food systems throughout Myanmar[11]. Many communities are struggling with challenging financial services since the pandemic began, primarily due to inflexible reimbursement schemes strictly applied by lenders. The most vulnerable community members continue to carry the burden of a slowing economy, decreased incomes, lack of job opportunities, and a lack of sufficient resources for basic needs[12].

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[6] "Timeline of ECDC's response to COVID-19." *ECDC,* https://www.ecdc.europa.eu/en/covid-19/timeline-ecdc-response. Accessed 15 October 2020.
[7] "Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of the novel coronavirus (2019-nCoV)." *WHO,* https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov). Accessed 15 October 2020.
[8] "Situation report 193 – Coronavirus Disease 2019." *MOHS*, 17 October 2020, https://mohs.gov.mm/page/9575. Accessed 19 October 2020.
[9] "COVID-19 disrupts seafood markets and production." *CBI*, 9 April 2020, https://www.cbi.eu/news/covid-19-disrupts-seafood-markets-production. Accessed 19 October 2020.
[10] "FishAdapt: Strengthening the adaptive capacity and resilience of fisheries and aquaculture-dependent livelihoods in Myanmar." *FAO*, August 2020. Accessed 17 October 2020.
[11] "Delta Rapid Market Assessment Report." *Mercy Corps,* 11 June 2020, https://www.mercycorps.org/research-resources/delta-rapid-market-assessment-report. Accessed 17 October 2020.
[12] "FAO Myanmar Newsletter, September 2020 - Issue #3." *FAO,* http://myanmar.un.org/sites/default/files/2020-10/FAO%20Myanmar%20newsletter%20-%20Issue%203.pdf. Accessed 17 October 2020.

1.2 Timeline of COVID-19 Restrictions and Rakhine Armed Conflict Events

Although the first in-country COVID-19 cases were detected on 23 March, Rakhine's mud crab industry began to slow down from January 2020, strongly influenced by events in China beginning December 2019. China's domestic demand was declining, leading to reduced demand in Rakhine. The fluctuations in the industry, from January to August 2020, were predominantly driven by Chinese market demands and Chinese governmental restrictions, up until a peak in Rakhine's cases (16 August). In response to the 16 August peak in cases, the Government of the Union of Myanmar (GoUM) declared restrictions at the State level, including a State lockdown, curfews, quarantines and checkpoints, which significantly impacted the industry[13].

Additionally, regional armed conflict did not cease during the COVID-19 crisis, with clashes in June especially disrupting the mud crab export trade[14].

The two most significant events disrupting and leading to the halt of mud crab export for several days included: a) the Chinese border closure from 22 July to 23 August, in addition to; b) the Rakhine lockdown from 16 August, including a 2-month curfew, travel and transport restrictions.

Table 1. Timeline of COVID-19 Restrictions and Major Rakhine Armed Conflict Events Affecting the Mud Crab Value Chain.

COVID-19 / Armed Conflict events	
March	
11	COVID-19 is declared a pandemic by the World Health Organization (WHO).
13	GoUM forms the COVID-19 Control and Emergency Response Committee (CERC), restricting gatherings of five or more people.
19	Myanmar authorities implement quarantine measures for travellers arriving from Italy, Iran, France, Spain and Germany.
23	First two reported cases of COVID-19 in Myanmar.
31	First COVID-19 related death in Myanmar.
April	
6-7	GoUM announces lockdowns, curfews and cancellation of the Water Festival (Thingyan) for Yangon, Mandalay, Sagaing regions, as well as Shan, Kayah, Kachin and Mon States. NGO staff were the only ones to adhere to stay-at-home recommendations in Rakhine.
12-16	GoUM distributes 50billion MMK ($36million USD) worth of basic food staples in one off assistance package to 4 million households (HH).
27	GoUM releases the COVID-19 Economic Relief Plan (CERP).

[13] It should be noted that demand was still low prior to August 2020, with the GoUM responding with increased hygiene and control methods in Muse.
[14] This is anecdotal information, gathered from interviews with mud crab traders.

May	
4	GoUM permits the transportation of goods, movement of trucks and passenger vehicles following the April lockdown.
June	
1	GoUM permits businesses, such as factories, hotels and restaurants to re-open once authorities have completed inspections.
22	The GoUM General Administration Department resolution for 20,000MMK per household for 5.4million HHs as COVID-19 stimulus payments.
28-29	**Major Rakhine Conflict Event:** Approximately 10,000 civilians from the Ku Taung village tract of southern Rathedaung township flee after clashes between the Arakan Army (AA) and the Myanmar Military (Tatmadaw).
July	
4	Suspension of cross-border trade in Maungdaw township, following an increase in COVID positive cases from individuals returning from Bangladesh (including two boatmen).
9	**Major Rakhine Conflict Event:** Under the 1947 Burma Immigration Act, 23 people were jailed, for a six-month term, in Northern Rakhine. They were charged with “illegal entry” upon returning from Bangladesh, following the official suspension of cross-border movement due to COVID-19.
21	Schools begin to re-open in staggered phases.
22	The Chinese government closes the Myanmar-China border at Muse (Shan State) until 23 August. Some Chinese companies in Yangon purchase small amounts of mud crab for export via airplane to China.
28	GoUM releases an additional 100billion MMK in loans, targeting agricultural and livestock businesses, export/import, manufacturing, supply chain, food and beverage, foreign job agencies and vocational schools.
31	GoUM permits travel to most destinations.
August	
1	GoUM permits outdoor gatherings of less than 15 people.
10	16 confirmed COVID-19 cases across Rakhine State, with two local transmissions in Buthidaung and Kyauktaw townships with the remainder having returned from travel either domestically or internationally.
16	Following a one-month hiatus, a local transmission is reported in Sittwe (the last local transmission was found 16 July).
20	Following a spike of local transmission cases, the GoUM imposes lockdown measures in Sittwe including: • Encouraging the public to stay at home, excepting civil servants, companies and factory workers in Sittwe; • All four local airlines cancelled flights to and from Sittwe; • Travel and transport restrictions for the entire State; • Closure of Sittwe markets (except for food from 4am-10am).
21	Government imposes a two-month curfew in Sittwe (9pm-4am).

22	Local transmissions keep rising after 16 August. The Rakhine State Government introduces a state-wide "stay-at-home" order and other measures aimed at preventing local transmission. Equipment and specialists are sent to Sittwe hospitals, including Polymerase Chain Reaction (PCR) testing.
25	A total of 96 reported cases in Rakhine State, 80 of which occurred between 16 and 25 August 2020. 82 cases were transmitted locally.
31	No reported cases across Internally Displace Person (IDP) camps. IDPs who were in contact with confirmed COVID-19 cases were placed in quarantine and tested.
September	
1	Rakhine State reports 409 cases across 16 townships since 18 May.
17	Rakhine reports 838 locally transmitted cases in all 17 townships (490 in Sittwe, 40 in Pauktaw), with one fatality.
18	The Chinese government locks down the border city of Ruili (Yunnan province), after two travellers from Myanmar test positive for COVID-19.
21	Yangon imposes another lockdown.
23	**Major Rakhine Conflict Event:** Clashes in Rathedaung township among the AA and Myanmar Military forces the displacement of villagers from Shwe Laung Tin (Rathedaung Township) to Sittwe. The study survey team replaces Shwe Laung Tin for another village in Rathedaung.
27	Myanmar health authorities report 10,734 COVID-19 cases and 226 fatalities across the country.

1.3 Government of the Union of Myanmar (GoUM) Relief Initiatives

The GoUM formed the COVID-19 Control and Emergency Response Committee (CERC) and working group committee to address the pandemic on 13 March 2020. The response included the prohibition of group gatherings and the cancellation of traditional festivities in April (Thingyan or Water Festival). On 28 April 2020, the GoUM released the COVID-19 Economic Relief Plan (CERP) to mitigate the economic impact of COVID. The plan defined seven goals, ten strategies, 36 action plans and 76 actions covering a broad range of extraordinary fiscal measures and policy responses. Its main goals were to improve both macro and microeconomic environments, easing the impact of COVID on both businesses and households through monetary reforms, the COVID-19 Fund and Contingency Fund[15] and strengthening the health sector. In addition, the GoUM provided food relief packages early, however distribution of assistance was sporadic and geographically limited[16], with many of the country's most vulnerable continuing to require additional relief measures.

[15] "Overcoming as One: COVID-19 Economic Relief Plan." *Government of the Republic of the Union of Myanmar*, 27 April 2020, https://www.mopfi.gov.mm/sites/default/files/COVID-19%20Economic%20Relief%20Plan(CERP)-Eng_0.pdf. Accessed 17 October 2020
[16] "FAO Myanmar Newsletter, September 2020 - Issue #3." *FAO,* http://myanmar.un.org/sites/default/files/2020-10/FAO%20Myanmar%20newsletter%20-%20Issue%203.pdf. Accessed 17 October 2020.

2. Research Objectives and Approaches

2.1 Objectives

The ***aim of the study*** was to assess the impact of COVID-19 on the fisheries industry in Rakhine State, with a specific in-depth assessment on the impact to the live mud crab value chain. Targeted components of the chain include: supply; labour; changes in employment and income; and markets and trading constraints at state, national and international levels. On-the-ground data was also gathered to assess detailed information on the challenges and coping strategies experienced by key actors facing the effects of the pandemic. The study aims to deliver impactful and inclusive recommendations to humanitarian, development and market-oriented organisations, the government, donors and policy makers. This will in turn support interventions to alleviate the effects of COVID-19, revitalizing the mud crab industry and contributing to the resilience of vulnerable groups in Rakhine.

Mud crab was targeted as the focus of the study as:

a. Rakhine's mud crab industry is especially vulnerable to the effects of COVID-19 as its value chain is dependent on final export to China. China was already dealing with sluggish demand at home in January[17]. Imposed restrictions, such as border closures, an early measure adopted by the GoUM to stop the spread of the disease, further exacerbated the impact on the industry;
b. The majority of individuals who reside in Central and Northern Rakhine's coastal communities, as well as those who live near rivers and/or streams in close proximity to the sea, are engaged in the mud crab sector[18] to some degree – contributing to their household income;
c. Mud crab capture is a relatively low intensity activity for men and women, requiring minimal equipment and capital investment (less than 50,000MMK). The most common capturing practice is referred to as "trap and hold", utilising traps and small boats. Additionally, as a license is not required, the capture is performed by different ethnic minority communities, including those living in Internally Displaced Person (IDP) camps.

2.2 Geographic Scope

The study focused on coastal areas (including communities along rivers and streams) in Central and Northern Rakhine State, focusing on locations close to mud crab's natural habitat (mangroves). Anecdotal information gathered from the Department of Fisheries (DoF) in Rakhine indicates that Pauktaw and Myebon are the most significant mud crab production areas in the region, with Pauktaw considered the most relevant studied township as its landscape is comprised of higher degrees of natural habitat conducive for mud crab growth. It is estimated that Pauktaw generates 40% of the State's production while Myebon produces approximately 30%. Sittwe and Rathedaung each comprise 5% of production.

Townships were selected based on the significant natural habitat of crabs and volume capture. Sittwe township was less significant in terms of capture activity; however, as the State's capital, was included for its commercial relevance since it hosts several Chinese companies and traders with more means of communication. Out of the four townships, Rathedaung is the only one located in Northern Rakhine.

Villages were selected based on information provided by crab traders, combined with the research team's prior knowledge and experience of the region. Additionally, villages were selected based on the importance of mangrove areas and ensuring inclusive diverse ethnic representation. Villages were determined through analysis of mangrove area maps produced by REACH[19] and the International Organization for Migration

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[17] "Instant View: China's Economic Growth Slows to 6.1% in 2019, near 30-year low." *Reuters*, 16 January 2020. https://www.reuters.com/article/us-china-economy-gdp-instantview-idUSKBN1ZG092. Accessed October 17, 2020.
[18] This is anecdotal information gathered from U Win Chay (a key transport organiser), who stated that approximately 75% of Rakhine's coastal communities rely on the mud crab activity.
[19] REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Operational Satellite Applications Program (UNOSAT).

(IOM) in July 2016. This allowed data collection from villages both in near and distant proximity to main commercial roads and hubs.

Individual village leaders provided information on the number of households (HH) who were engaged in livelihoods pertaining to the fishing industry, with the study targeting 5% of these households (HHs) overall. Quantitative data was gathered from a selection of 40 villages outlined below.

Table 2: Surveyed Villages by Township.

	Myebon	Pauktaw	Rathedaung	Sittwe
1.	Kone Baung	Kon Tan	Kan Pyin	Aung Daing
2.	Kyee Kaung Daung	Sin Tet Maw	Nyung Pin Gyi Rakhine	Thae Chaung
3.	Yae Shin	Nga Pyi Tet	Nyaung Pin Gyi Muslim	Ra Tan
4.	Laung Drike	Chaw Chaung	Pan Zin Maw	Chin Laing Hpin
5.	Nyaung Taw	Pyun Khaung	Kyun Gyi	Ah Myint Kyun
6.	Tha Yet Taung	Ah Lel Kyun	Sa Pyin Gyi	Ohn Ray Hpaw
7.	Wet Yu	Pon Nar Gyi	Sa Pyin Chay	
8.	Kyauk Hpyar	Nan Tet Kyun	Pha Rar Hla	
9.	Kat Taung Swea	Ah Wa Kan	Sa Kaing	
10.	Kan Htaung Gyi	Sin Paik		
11.	Mg Shin	Gyin Chaung		
12.	Gant Gaw	Net Chaung [20]		
13.	Sittara			

2.3 Methodology and Research Tools

Fieldwork was conducted during September 2020, after a peak in local COVID-19 transmission cases (16 August) and government-imposed restrictions (20 August) across Rakhine State, including a ''stay-at-home'' order, lockdowns and night curfews. All fieldwork was completed in 2020, prior to the more recent political events of February 2021.

The study utilised a combination of both qualitative and quantitative data collection methods, applying respective research tools. An initial (a) **desk review** (secondary data) included reviewing: prior reports and studies on fisheries; data related to COVID and livelihoods in Rakhine and recent studies on the impact of COVID across primary sectors in Myanmar. The study continued with (b) **the development of qualitative and quantitative tools** (see below), implemented through surveys during the course of fieldwork.

The study ensured inclusion and careful consideration of Rakhine's social landscape, including its **multi-ethnic society** (individuals from ethnic Rakhine, Rohingya and Chin groups all participated in the study); and the **marginalization of certain groups**: (1) Rohingya in IDP camps and villages; (2) women. Ethnic minorities were represented as follows: 3% were Chin (2 out of 12 female) in Myebon township; 16% were Rohingya (all male) in Pauktaw and Rathedaung townships.

[20] Net Chaung was the only IDP Camp included in the study.

Table 3: Summary of Mud Crab Fishers per Township, Disaggregated by Ethnic Group and Gender.

Township	Villages	Fishers	Rakhine			Rohingya			Chin		
			Total	M	F	Total	M	F	Total	M	F
Sittwe	6	41	41	19	22	-	-	-	-	-	-
Myebon	13	118	106	83	23				12	10	2
Pauktaw	12	150	104	85	19	46	46	0	-	-	-
Rathedaung	9	50	40	34	6	10	10	0	-	-	-
Total (No.)	40	359	291	221	70	56	56	0	12	10	2
Total (%)	-	-	81%	62%	19%	16%	16%	0%	3%	2.5%	0.5%

The research team consisted of three enumerators based in Sittwe township, who underwent training with a national research assistant and were supported through the entire study.

Individual surveys with crab fishers. Quantitative data was collected from a total of 359 crab fishers, who were surveyed across four targeted townships. Surveys were conducted via phone calls, with targeted respondents completing questionnaires through an online survey tool "encuestafacil.com"[21]. All participants had captured crab over the last 12 months. Out of these respondents, 287 were male (80%) and 72 female (20%) from a total of 40 villages (two Chin villages in Myebon, two Rohingya villages, one IDP camp in Pauktaw, and one Rohingya village in Rathedaung).

Key Informant Interviews (KII) were held with private sector actors i.e. **traders, collectors and transport organisers** (36), 35 of which were Rakhine male and one female, in order to collect qualitative data. KIIs with other stakeholders were also held with members of **INGOs and UN agencies**[22] (5), with one female among them. Semi-structured questionnaires were used for different actors in the fishery industry, especially those from the mud crab value chain. Unfortunately, it was not possible to interview Rakhine State and local related authorities such as the Department of Fisheries (DoF). Interviews were conducted using Skype[23] and phone calls due to COVID mobility restrictions.

2.4 Limitations

- The survey platform encuestafacil.com had some off-line usage limitations, which generated incomplete questionnaires when internet connectivity was poor or dropped. This required additional time to manually scrub data, discard incomplete surveys and place follow-up calls with several respondents in order to maintain target sampling.
- An armed clash occurred in Rathedaung during the survey period, displacing the population of Shwe Laung Tin village to Sittwe. In order to respect recently displaced participants, the research team substituted this village with fishers from Sa Kaing village (also in Rathedaung).
- The lack of internet access in Myebon and Rathedaung hampered the use of videoconferencing in KIIs. Although not the most ideal tool for in-depth research, it provided a platform in which trust could be established between the research team and key informants, during a time where in-person interviews were not feasible.

[21] This website is also known as 'www.easygoingsurvey.com', an online surveying tool to design, collect and analyze data from study participants.
[22] Although information gathered from 5 interviewed NGOs is not explicitly outlined in the study, it was used to contextualize, interpret and further analyze data from other stakeholders.
[23] The usage of Skype over the duration of the study was limited due to connectivity issues.

3. Overview of the Mud Crab Industry

3.1 Context: Mud Crab within the Fishery Industry

Studies on the economic value of marine and coastal ecosystem services in the Bay of Bengal showed that these ecosystem services are valued at $8.5billion USD a year, almost 60% of which is contributed by mangroves and coral reefs[24]. As per the World Bank, 53.1% of Myanmar's population live in coastal areas[25]. With a coastline of 3,000km[26], Myanmar has established and developed a highly productive fisheries sector, vital for its national food security, income generation and export revenue. Its coastal habitats are considerably ecologically diverse, including coral reefs, mangroves, sandy beaches and mudflats[27].

As per the Department of Fisheries (DoF), in 2017-2018 fiscal year[28], the total production of fish in Myanmar was 5.87 Million Tonnes (MT), 54% of which came from marine fisheries[29]. Of this, 10% (0.57 MT) of a range of 45 fish products were exported, at a value of $711.72million USD. The top three exported products in 2018 (in monetary terms) were:

1. Rohu (*Labeo rohita*): 65,064MT at an export value of $67million USD;
2. Live mud crab (*Scylla serrata*)*:* 15,562MT at an export value of $48million USD;
3. Fish Meal: 38,409MT at an export value of $38million USD.

Mud crab is the second most important fisheries product (in terms of economic value), predominately exported to China and Thailand. While China imported the highest volume of fishery products from Myanmar during 2010-2017, Thailand has been steadily increasing imports, recently superseding China as the number one importer in 2018[30].

Although the study focused on the aforementioned four townships, mud crab is also captured in other coastal locations across Rakhine, the Delta, Mottama Gulf (Mon State), and other regions in Southern Myanmar.

Fish, shrimp and mud crab industries. Rakhine State's main fishery products include a variety of fish, shrimp and prawn (from marine fishing and aquaculture), as well as mud crab. According to the Rakhine Fisheries State Department[31], the volume of fish captured in 2018-2019 was 200,000MT; shrimp and prawn 35,000MT; and 30,000MT of mud crab. Of this, 33% of fish, 67% of mud crab and 86% of shrimp and prawn are intended for export.

Recent modelling estimated that mangroves reduce the impact of natural disasters in coastal areas by an average of $165million USD per year[32,33]. The conservation of fisheries resources and the maintenance of ecological systems, including mangrove forest wetlands, are the main factors in the sustainable

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[24] Emerton, L. "Assessing, demonstrating and capturing the economic value of marine and coastal ecosystem services in the Bay of Bengal Large Marine Ecosystem." *BOBLME*, December 2014, http://www.boblme.org/documentRepository/BOBLME-2014-Socioec-02.pdf. Accessed 20 October 2020.
[25] Soe, K.M. et al. "Myanmar Inland Fisheries and Aquaculture: A decade in review." *ACIAR*, 2020, https://aciar.gov.au/publication/books-and-manuals/myanmar-fisheries-decade-review. Accessed 20 October 2020.
[26] "Myanmar – Mission Report on Coastal Aquaculture." *FAO*, 2003, http://www.fao.org/3/ad497e/ad497e05.htm. Accessed 20 October 2020.
[27] Idem.
[28] It should be noted that one fiscal year of fisheries data in Myanmar covers the period from 1 April of the current year to 31 March of the following year.
[29] "Fishery Statistics 2018." *The Republic of the Union of Myanmar, MoALI, DoF*, 2018. Accessed 20 October 2020.
[30] "Fishery Statistics 2019." *The Republic of the Union of Myanmar, MoALI, DoF*, 2019. Accessed 20 October 2020.
[31] This is anecdotal information gathered from discussions with the Rakhine state Fisheries Department.
[32] Losada, I., et al. "The Global Flood Protection Benefits of Mangroves." *IKI, BMU,* 2018, https://www.conservationgateway.org/ConservationPractices/Marine/crr/library/Documents/GlobalMangrovesRiskReductionTechnicalReport10.7291/V9DV1H2S.pdf. Accessed 20 October 2020.
[33] "Myanmar Country Environmental Analysis." *The World Bank*, 2019, https://www.worldbank.org/en/country/myanmar/publication/myanmar-country-environmental-analysis. Accessed 17 October 2020.

development of the fisheries industry in Myanmar. Their contribution to the fisheries industry and livelihoods of individuals who live along coastal zones[34] is significant.

Mud Crab inhabit coastal areas, estuaries and backwaters. They are a common component of the fauna of mangrove forests, usually burrowing in mud or sandy mud. They have a diverse diet as omnivores and feed on a wide range of animal and plant resources[35,36]. Mangroves serve as a source of shelter for fish and crab, with several coastal species spending the critical early stages of their lives in mangrove waters. The DoF states that further research and extension work is required in order to disseminate best practices, including conservation of mud crab resources. This would include setting up protected areas for crab or conserving their natural habitats such as mangroves. The entire mud crab value chain is essentially dependent on its natural breeding at its source. The conservation and quality of mangrove resources is critical, in order to preserve and further develop the mud crab sector in a sustainable manner (see Box 1).

Box 1: Sustainability of the Mud Crab Sector.

The availability of wild mud crab has been significantly decreasing over the years due to over-fishing, capturing female crab and/or crablets who have not fully reached maturity. In addition, the conservation of mud crab's natural habitat (mangroves) needs to be strictly enforced in order to protect their population in the wild.

Ponds serve as a suitable resource to allow crablets (juvenile crab) to mature to full size (100 grams), the minimum size to be commercialized.

Internationally, mud crab hatcheries have also proven successful in breeding or allowing crablets to reach maturity. In support with the Myanmar Sustainable Aquaculture Program (MYSAP), the first crab hatchery in Myanmar began operations in April 2019 in the Delta region, yet there are currently no hatcheries, or plans for establishing them in Rakhine state.

As export demand was growing rapidly prior to COVID-19, mud crab "fattening" became a booming industry practice in Myanmar, if resources such as ponds or hatcheries were available to farmers. However, this trend is yet to reach Central and Northern Rakhine.

Although more mud crab conservation efforts are required across Myanmar, certain regulations are enforced and followed by actors in the value chain. Most critically, it is illegal to fish or export live mud crab weighing less than 100 grams (g). Typically, collectors will not accept mud crab under 100g (unless they own ponds to keep them). Prices are determined by their weight and mud crab under 100g cannot be exported. Best mud crab farming practices are required in order to further develop this industry in a sustainable way. Investing in hatcheries and ponds (outside of mangrove areas) could support the industry, adding to the resilience of actors' livelihoods.

Sources:

"FishAdapt: Strengthening the adaptive capacity and resilience of fisheries and aquaculture-dependent livelihoods in Myanmar." *FAO*, August 2020.

"Fishery Statistics 2018." *The Republic of the Union of Myanmar, MoALI, DoF*, 2018. Accessed 20 October 2020.

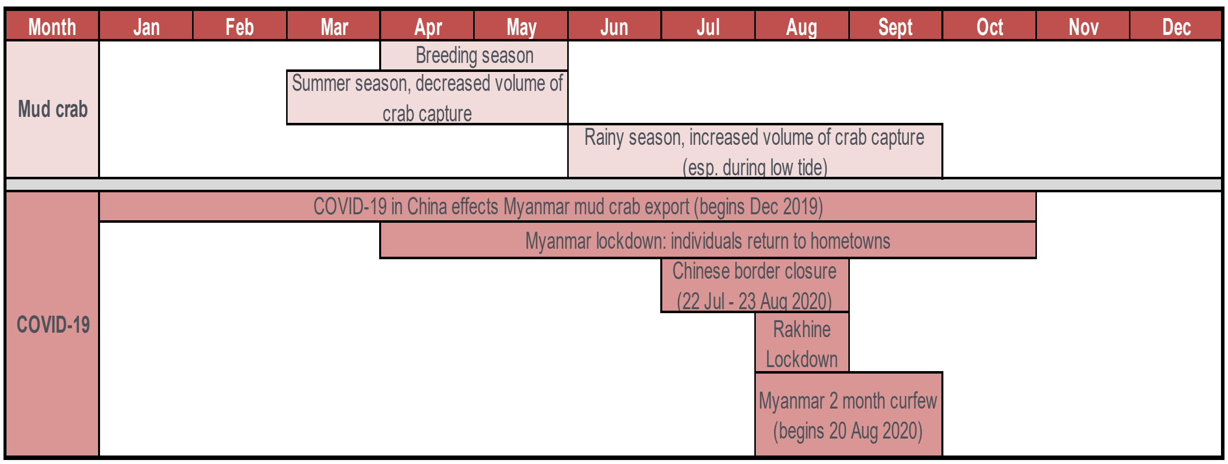
[34] Idem.
[35] Hill, B.J. "Salinity and temperature tolerance of zoeae of the portunid crab Scylla seratta." Marine Biology, 1974, https://link.springer.com/article/10.1007%2FBF00395104. Accessed 17 October 2020.
[36] Shelley, C. "Capture-based aquaculture of mud crabs (Scylla spp.)." *FAO*, 2008, http://www.fao.org/3/i0254e/i0254e13.pdf. Accessed 17 October 2020.

3.2 Seasonality of the Mud Crab Industry

The mud crab breeding cycle occurs between April and May in their natural habitat (mangrove forest and surroundings). Higher volume and therefore opportunities of capture occur during the rainy season (June to September), while progressively decreasing to its lowest levels in the summer season (March to May). Additionally, optimal harvests for mud crab occur four to five days before and after full moons, as their behaviour is in part driven by tidal cycles.

Key characteristics of Myanmar's typical annual mud crab production cycles are outlined in Figure 1 below, contrasted against main COVID-19 factors which have affected exports from Rakhine to China.

Figure 1: Seasonality of Mud Crab vs. Critical COVID-19 Events Affecting Rakhine's Mud Crab Industry.



3.3 Mud Crab Value Chain's Main Features

Myanmar and more specifically Rakhine's live mud crab value chain is entirely dependent on its final export to China, through the border town of Muse[37] in Northern Shan State. The crab are transported via Mandalay to the border by cargo trucks, where branches of Chinese importer companies check their quality and replace the water in the boxes used to transport the live mud crabs. There is a lack of refrigerated trucks in the region, meaning live mud crab are typically transported in Styrofoam boxes. However, as crabs are sensitive to high temperatures, long travel times compounded by poor transport mechanisms equate to significant crab mortality rates – which cannot be sold or exported to market.

3.3.1 Actors, their Functions and Activities

The study identified six main functions, carried out by six respective actors in the mud crab value chain, outlined in Figure 2 below.

[37] Muse is a town in North Eastern Myanmar, bordering China.

Table 4: Main Mud Crab Actors and Functions.

Actor	Function
Crab Fishers	Capture crab at or near their village.
Collectors	Collect crab from fishers within their own and neighbouring villages and sell to traders (often located, but not necessarily) within their village tract (VT).
Traders	Purchase mud crab mainly from collectors (but also crab fishers) in Rakhine State and sell them to international traders or importer companies. Some traders purchase from some fishers as well.
Transport Organisers	Hire trucks with drivers; organise transport provided in boxes[38] by traders to be sent to importers in Muse (border) or China.
Agents/Intermediary Companies	Based in Mandalay, check the quality of the product, change water and support transport, including changing trucks.
International Traders	Based mainly in Muse or China and purchase live mud crab to sell in Chinese markets.

The identified functions within the live mud crab value chain starts with supply (capture or fishing mud crab), collection, and continues on to trading and exporting, transport (and transport support in Mandalay), and ends with the importing by Chinese traders/companies.

Figure 2: Mud Crab Value Chain Functions, Stakeholders and Activities in Central and Northern Rakhine State.

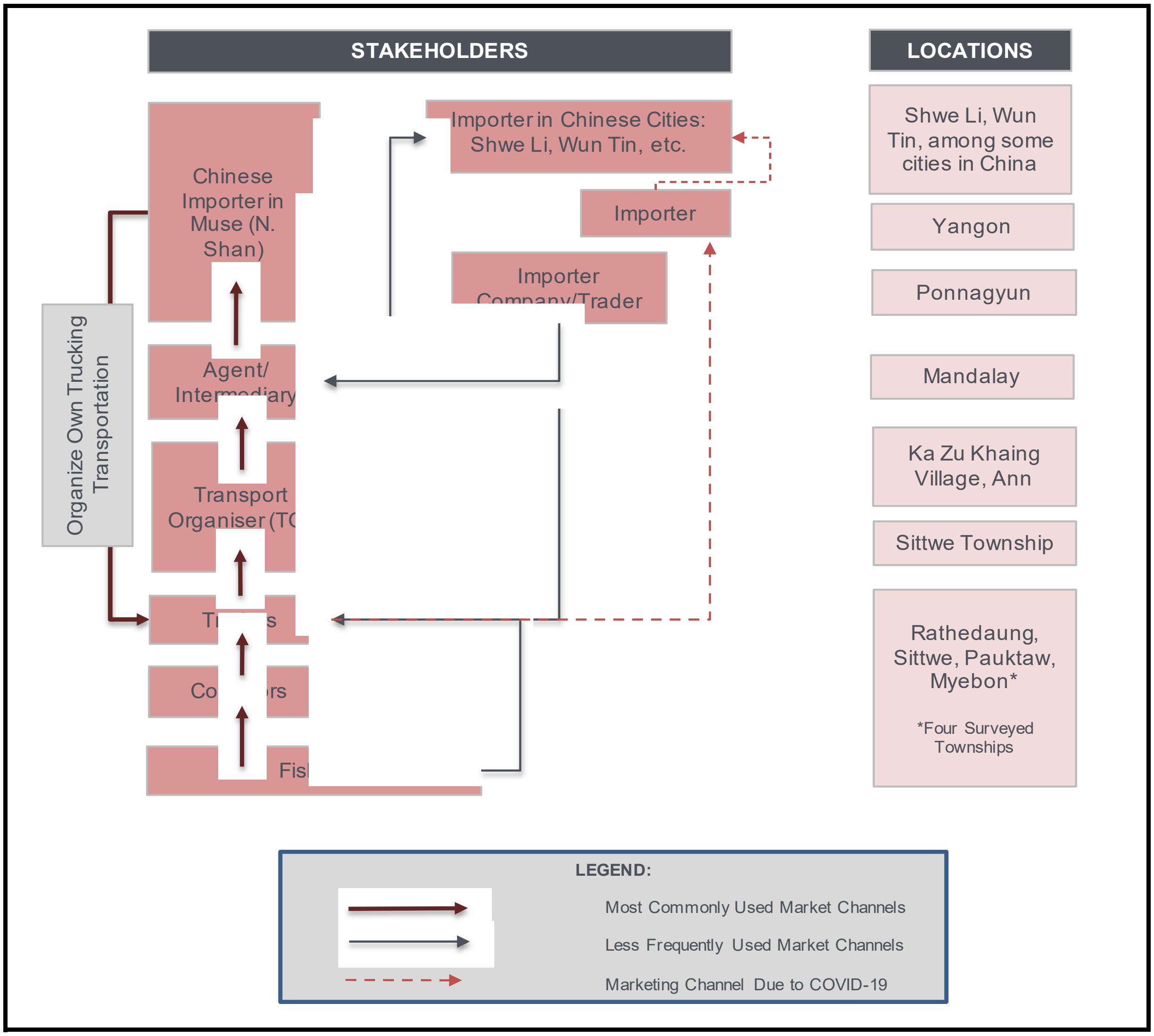
Function	Input supply/ production	Collection	Export and Trade	Transport	Transport support	Import and Wholesale in China
Stake-holders	Fishers	Collectors	Traders	Transport Organisers	Agent/ Intermediary Companies	International Traders
Activities	• Capture • Tie up	• Collect at village level • Determine size gradient • Tie up • Weigh • Overnight storage in boxes • Package • Store in ponds	• Clean • Determine size gradient • Tie up • Weigh • Package • Store (river or boxes)	• Organise cargo trucks	• Switch trucks in Mandalay • Replace water • Remove dead crabs (Mandalay or Muse)	• Purchase in Muse (border) or Chinese city • Sell in Chinese markets

[38] Generally, each box contains 30 Kg of crab. However, one transport organiser (3 years ago) decreased the amount of crab per box, from 25Kg to 22Kg.

3.3.2 Marketing channels

Figure 3 represents the marketing channels identified in the four townships: Rathedaung, Sittwe, Pauktaw and Myebon, demonstrating the reliance of the mud crab value chain on its final export to China.

Figure 3: Marketing Channels: Stakeholders, Functions and Locations.



There are a variety of market actors to whom Rakhine traders sell product for export:

a. Traders sell to traders in Muse, facilitated by middlemen in Mandalay;
b. Traders sell to a company located in Muse with a Mandalay branch;
c. Traders sell to Chinese trader-companies in Ponnagyun;
d. Traders exporting through a Chinese company based in Ponnagyun;
e. Traders sell to Chinese traders in Chinese cities;
f. Traders sell to Yangon importer companies, for final export to China via plane.

Some traders sell via companies based in Ponnaygyun and Sittwe townships, while others sold directly to import traders based in Muse. Only a few traders stated they sell directly to traders in China.

4. Impact of COVID-19 and Armed Conflict on the Mud Crab Value Chain

4.1 Key Areas of Impact

The onset of COVID has amplified fragilities in Rakhine's mud crab sector. The value chain already lacked the appropriate infrastructure such as better roads and refrigerated trucks[39]. COVID and armed conflict in the state have compounded these challenges, exposing VC actors to various livelihood vulnerabilities. Overall, there are **three key and interrelated factors** negatively impacting all VC actors across the mud crab sector post-COVID.

1. Decreasing demand in the Chinese market;
2. Subsequently leading to reduced mud crab market prices;
3. Transportation restrictions and lockdowns impacting:
    a. All mud crab sector market actors, especially traders and transport organisers (TOs) who are faced with government-imposed transportation restrictions including daily curfews (9pm-4am) and multiple checkpoints across major distribution routes;
    b. Which has instigated increased supply chain disruptions and transportation costs (both in terms of time and money);
    c. Ultimately hindering access to the Chinese export market, the primary importer at the national level - the Rakhine live mud crab value chain is dependent on the Chinese export market.

4.2 Crab Fishers

Prior to COVID, 72% of respondents stated that the activity of capturing mud crab contributed to more than half of their total household income. However, the post-COVID environment of decreased export demand and lower prices have disrupted the mud crab value chain, negatively impacting these family's food and economic security. Interrupted distribution networks and the lack of diversified market channels have compounded the negative impact, straining households' ability to rebound from the external shocks and stresses posed by the pandemic.

Box 2: Surveyed Crab Fishers.

A quantitative phone survey was conducted with 359 fishers (20%F). 66% ranged between 26-45 years old, followed by 21% within the range of 46-60-years old. Only 4% (11) of households were female-headed, with a total of 3 teenagers (Rohingya) heading HHs in Pauktaw, 2 in Kon Tan and 1 in Sin Tet Maw villages.

FISHING/LIVE MUD CRAB SUPPLY. Shifting market conditions post-COVID have had a demonstrator effect across the mud crab value chain. As a result, 90% of interviewed fishers stated that they are dedicating **less time** to crab capture since the outbreak.

Specifically, interviewed fishers have ***decreased the volume of crab they capture*** due to:

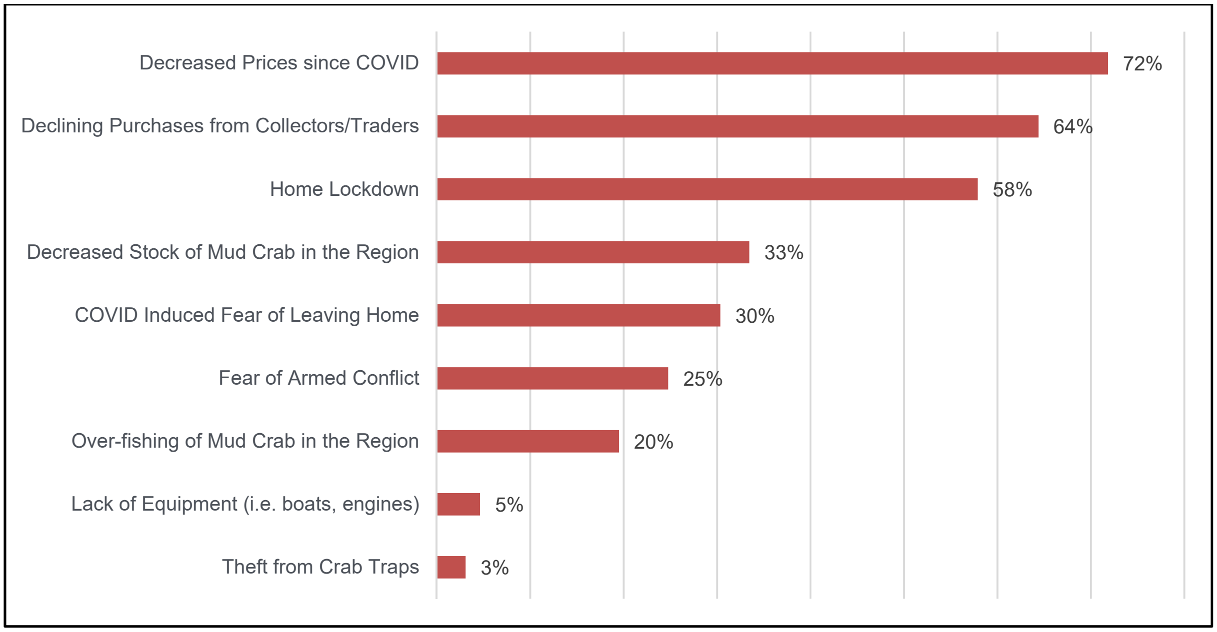
1. **Decreased prices** post-COVID (72%);
2. **Declining purchases (i.e. decreased demand)** from collectors and traders (64%);
3. **Home Lockdown** post-COVID (58%).

[39] Refrigerated trucks would compensate for long travel times, by increasing the longevity of mud crabs' lives. Mud crab mortality rates pre-COVID were 3Kg/30Kg.

Rathedaung township was most affected by the home lockdown (72% of respondents, 56% female). On average, 30% of crab fishers across the four townships decreased their activity as a self-imposed restriction due to a fear of COVID-19, including 48% of Rathedaung and 30% of Myebon fishers.

In Pauktaw, 52% (10) of crab fisherwomen decreased capturing activities stating decreased stock of crab in their area, however the majority of these fisherwomen (7), captured mud crab from aquaculture[40]. Many people, originally from Pauktaw, rely significantly on jobs and trading with Sittwe due to its proximity. Interestingly in Pauktaw, the number of fishers increased due to COVID imposed restrictions, as they were unable to travel to Sittwe for their livelihoods.

Figure 4: Reasons for Decreased Mud Crab Capture Post-COVID.

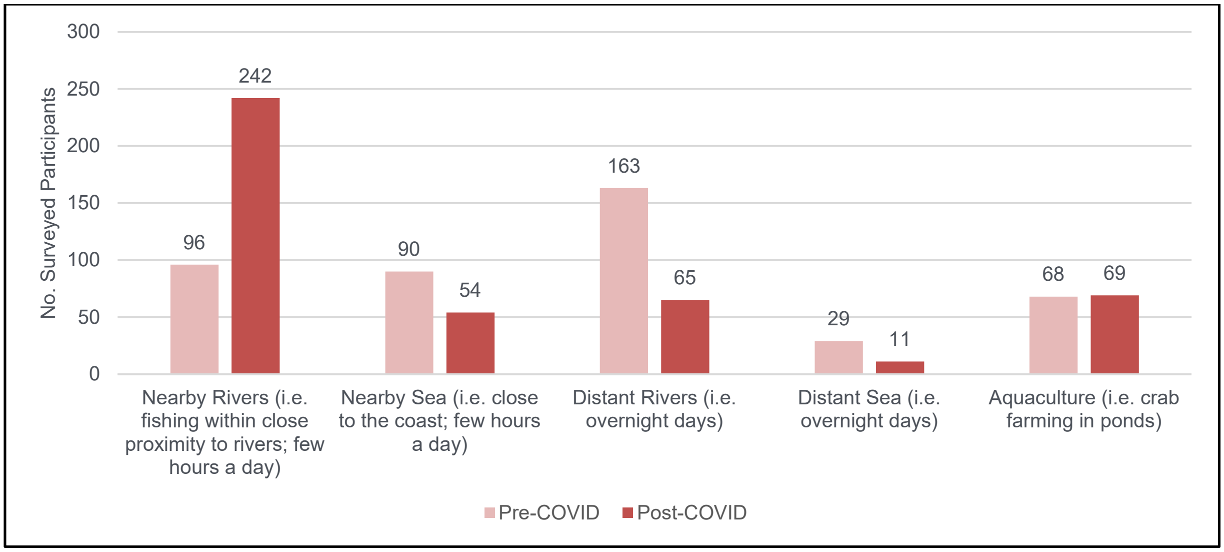


All respondents considered both ***COVID-19 and the armed conflict*** to be factors affecting their mud crab capture (30% and 25% respectively). Rathedaung's fishers were more affected than other townships, with 62% expressing that armed conflict was a significant factor in reducing the capture of crab, and 48% that COVID-19 disrupted their activity. This could be attributed to the intense clashes, which occurred continuously in Rathedaung and frequently arose in Myebon townships.

Pre-COVID, the most common ***crab fishing practices*** were overnight fishing on the river (two to three days) and fishing in nearby rivers (during the day). This was followed by fishing in the sea close to the coast (not overnight). However, the crisis and armed conflict have caused fishers to shift their practices of overnight river fishing and daily fishing near the coast to instead practice daily fishing in nearby rivers. Although specific data on how these shifting practices have impacted the volume of crab supplied was not gathered, mud crab fishers stated they were capturing less crab due to decreased demand and declining market price.

[40] Aquaculture is the practice of growing mud crabs in ponds.

Figure 5: Main Crab Capture Locations Pre and Post-COVID.



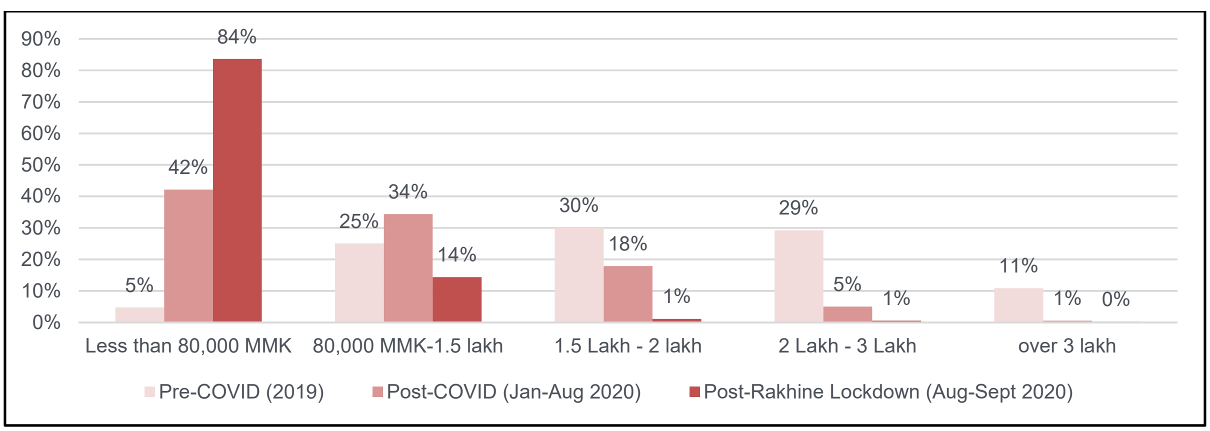
Overall, 94% of fishers reduced the ***volume of crab captured*** post-COVID, as result of the lower demand from the Chinese market. 100% of ethnic Chin (Myebon township) and 100% of ethnic Rohingya in IDP camps reduced their monthly volume of capture.

Interviewed fishers stated the outbreak has led to a ***significant decrease in income*** from mud crab capture, deteriorating even further post-Rakhine lockdown.

Pre-COVID, 70% of fishers stated they earned over 150,000MMK per month[41]. This number drastically drops post-COVID (January-August), with only 24% of fishers reporting this level of income. Furthermore, only 2% of fishers attained more than 150,000MMK per month post-Rakhine lockdown.

Conversely, prior to COVID, 5% of fishers stated they earned less than 80,000MMK per month. However post-Rakhine lockdown, the majority of fishers (84%) now earn less than this. It is evident from this data that the Rakhine lockdown has nearly paralyzed the mud crab sector in the region, severely impacting the livelihoods and earning potential of mud crab fishers.

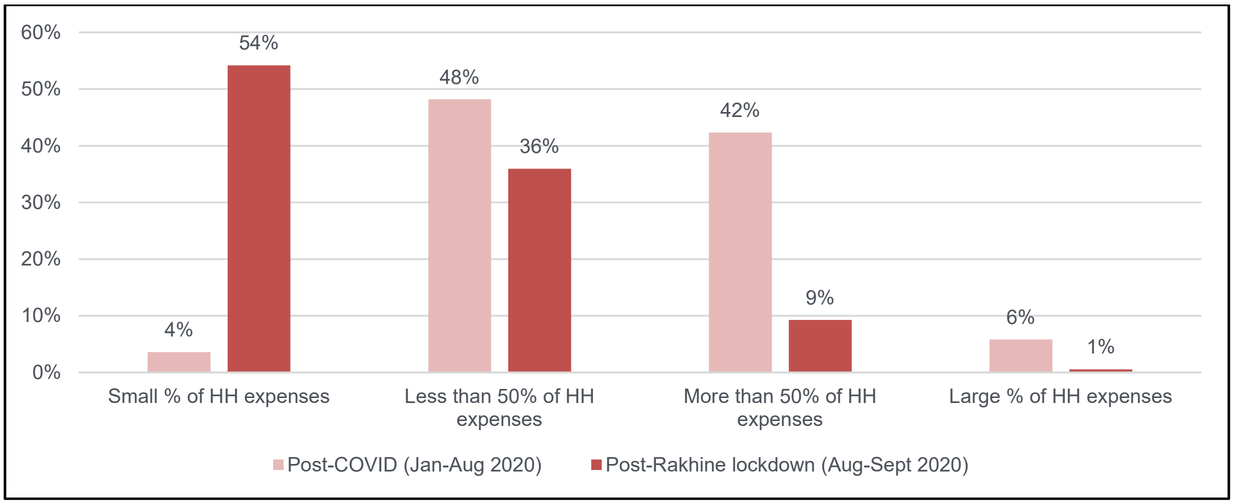
Figure 6: Fishers Monthly Income (MMK) Pre-COVID vs. Post-COVID vs Post-Rakhine Lockdown.



[41] This number has been aggregated from data collected over the course of the study: 30%, 29% and 11% of fishers earned 1.5-2lakh, 2-3lakh and over 3lakh respectively.

This significant reduction in income has forced mud crab fishers to subsequently ***reduce household expenditures*** both post-COVID and even more so post-Rakhine lockdown. Post-Rakhine lockdown, 54% of fishers stated that they were able to cover only a small proportion of their basic household expenses (i.e. food, clothing, medical and education), with 36%, less than half of their expenses from the income generated from crab activity. Additionally, post-COVID (January to August), 48% of fishers were able to cover more than half of their basic expenses, while post-Rakhine lockdown, only 10% were able to meet this. It is apparent that fishers are struggling to meet their essential HH needs from mud crab activity. Data is further disaggregated in Figure 7 below.

Figure 7: The Proportion of Basic HH Expenses (i.e. food, clothing, medical, education) Covered from Mud Crab Capture Income.



Diminishing levels of income and correlated reduction of expenses have pushed fishers to employ sub-optimal coping strategies. The most practiced coping strategies used by respondents[42] can be categorized into two main groups: a) credit and loans and b) reduced food consumption.

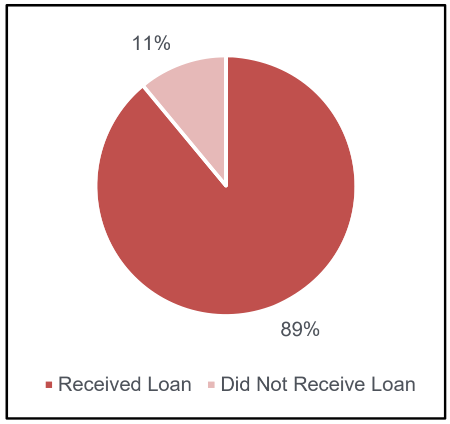
DEBT. 84% of fishers stated their ***level of household debt*** had increased over just 3 months (July-September). This value is lower when compared to the period between 16 August to September, when 95% of fishers obtained credit as a coping strategy to mitigate the effects of the lockdown, as well as the significant decrease in the mud crab trade. 45% of the loans obtained from July-September 2020 were between 50,000-250,000MMK. Family and relatives were the most important borrowing source amongst fishers (60%), while 32% either obtained loans or were extended credit from collectors or traders. Smaller proportions relied on moneylenders (17%).

60% of fishers earned two lakhs from crab capture activity pre-COVID. Considering that loans ranged between 50,000-250,000MMK from July-September 2020, it can be inferred that the loans were to cover basic household expenses.

[42] It should be noted that the survey was conducted 4-5 weeks after the Rakhine lockdown (beginning 16 August 2020).

Only 5% of HHs took out loans from Village Savings and Loans Associations[43] (VSLAs). Although a small proportion, VSLAs can act as a relevant source at the village level as they mainly focus on women's access to small amounts of capital, at low rate interests. VSLAs can support the poorest families by providing modest loans and reducing debt.

Figure 8: Households Receiving a Loan from July to September 2020.

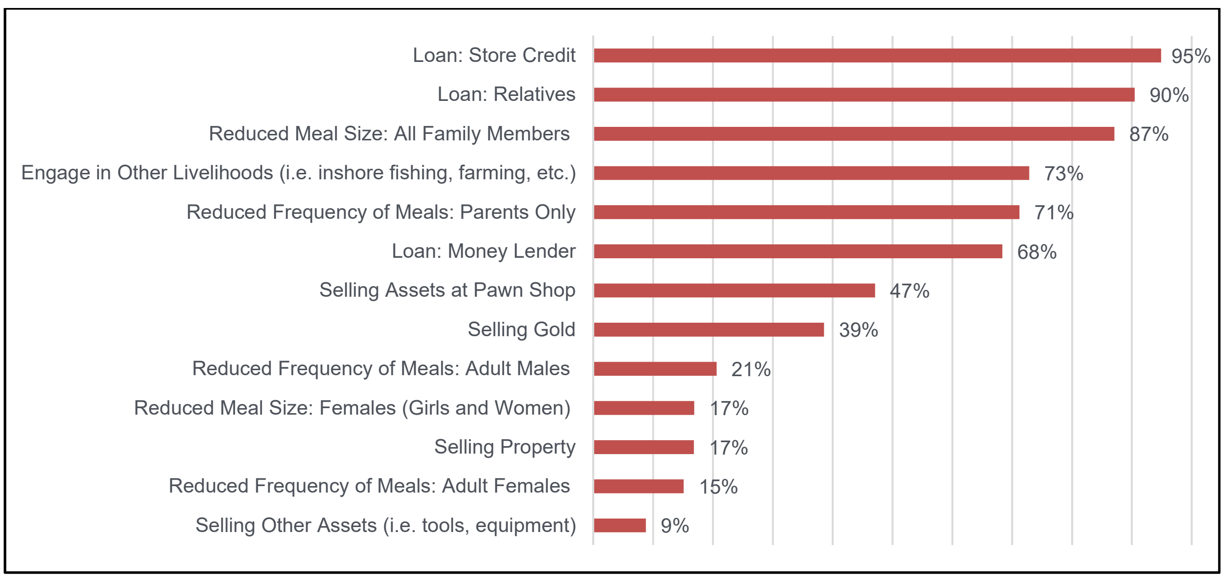


Post-Rakhine lockdown, fishers relied on obtaining credit or loans even more heavily as a coping mechanism. As is typical across Myanmar, HHs are more prone to rely upon informal sources of funding to meet their financing needs. 95% of respondents stated they obtained credit from local stores, while 90% borrowed money from relatives, and 68% obtained loans from moneylenders. As has been evidenced by prior development aid projects, these strategies can quickly escalate and become negative, pushing households into protracted cycles of debt. This is especially true, should the effects of the crisis be prolonged, without programs that could re-establish or improve the current source of income (live mud crab) or provide alternative ones. It is necessary to understand the seasonal variations in the mud crab supply in order to provide tailored and meaningful support to the communities.

In addition to increasing debt levels, 87% of fishers reported they have ***reduced meal sizes*** for all family members, post-Rakhine lockdown in order to cope with reduced income. Moreover, 71% stated that ''parents'' are skipping meals. Although these figures appear high, it is worth highlighting that the survey was conducted during the Rakhine lockdown (end of September 2020) – when 84% of fishers earned less than 80,000MMK per month and 90% of them unable to cover at least half of their basic household expenses from capturing mud crab.

Furthermore, 73% of fishers have **shifted to other livelihoods activities** (including inshore fishing and farming) in order to supplement their loss of income[44] due to COVID imposed lockdown and transportation restrictions.

Figure 9: Frequent Household Coping Mechanisms Post-Rakhine Lockdown.



[43] VSLA is a mechanism that ensures that loans are managed under rules adapted to the community's own needs and respects the income dynamics of their rural context.
[44] Due to the scope and scale of the study, further information on livelihood activities and/or baseline data was not gathered.

SALES CHANNELS. Since the crisis, decreased mud crab prices led an average of 29% of fishers to shift selling live mud crab to other collectors and traders, with 3% stopping the activity altogether. However, the majority of fishers (68%) continued to use their regular sales channels after the outbreak. Rathedaung township noted the highest change in sales channels, with 40% of fishers finding different collectors and traders to sell to. This is correlated with findings from Rathedaung fishers, who experienced less disruption in exporting when compared to their counterparts from other townships. It can be inferred that high levels of concentrated conflict in the region may have pushed both fishers and collectors to broaden their sales network. Moreover, it can be inferred from findings, indicating that value chain actors in Rathedaung have established ***high degrees of social capital*** (or "lucrative connections") amongst each other, enabling them to continue exporting with greater ease, as compared to other targeted townships.

The challenges fishers faced for ***selling live mud crab*** worsened slightly over September, (one month after the Rakhine lockdown) including a lack of demand from collectors, traders and low prices for mud crab. Travel restrictions further exacerbated these challenges, making it more difficult for fishers to access collectors and traders, limiting their ability to get their product to market.

Generally, mud crab are captured from the wild using the ´trap and hold´ technique[45], which utilises traps without size discrimination, so crablets smaller than 100g are also captured. As these fishers do not have access to ponds to allow the crablets to reach full maturity to trade and export, they are left even more vulnerable in the crisis. Typically, fishers will sell crablets, at lower prices, to collectors that own ponds. However, this prevents fishers from obtaining higher prices, negatively impacting their agency and overall earnings.

4.3 Crab Collectors

Collectors[46] experienced similar challenges to fishers correlating to decreased market demand in China, expressing they experienced between a 50-60% decrease in the ***volume of crab*** collected post-COVID. In addition, COVID mobility restrictions, including government-imposed curfews and ***transportation limitations***, have affected collectors on both sides of the value chain. Firstly, they have faced challenges in collecting crab from fishers. This has then led to challenges in being able to sell their product in a timely manner to traders, as government-imposed curfews have shifted regular night transportation to early morning.

This, compounded with lower mud crab market prices, has decreased ***collector's income***. Price data gathered from KIIs (14 crab traders) indicates that prices paid to collectors have decreased by approximately 50-70% since January 2020. For example, pre-COVID, larger crabs could yield a maximum market price of 12,000 MMK/Kg. However post-COVID, traders would not pay over 6,000-6,500 MMK/Kg. A more detailed analysis of prices is presented in Section 4.6 below.

Collectors are attempting to adapt to these post-COVID volatile market conditions through implementing varying strategies. Firstly, collectors ***with ponds*** are utilising the strategy of storing both crabs and crablets[47] until market trade is restored at the border (Muse in Shan State) and crablets have grown enough to be traded, obtaining a higher price. As previously mentioned, (Box 1 above) ponds can be a sustainable method for raising mud crab, and a resilient infrastructure, as collectors without ponds were more significantly impacted by the effects of the crisis as opposed to those with ponds.

Secondly, all interviewed collectors expressed difficulties in ***obtaining additional funds or loans*** to supplement their income reduction. Several collectors stated they were forced to pawn gold in order to

[45] Conservation laws prevent fishers from capturing crablets, as allowing them to grow, would in turn lead them to achieve full maturity and increase breeding rates. As per sizing gradients, larger crab would also fetch a higher market price.
[46] A total of five crab collectors, none female, were interviewed through key informant interviews (KIIs).
[47] As previously mentioned, trading and exporting live mud crab weighing less than 100g is illegal.

continue their businesses. In turn, several collectors have responded by reducing the number of loans and/or cash advances disbursed to fishers, a common practice prior to COVID.

Thirdly, collectors are ***maximizing the social capital*** they have established with traders in order to sustain their businesses. Typical to the Rakhine context, collectors have maintained frequent and ongoing communication with traders, building a foundation of trust, which has been further developed through years of collaboration. These relationships have played a significant role to keep businesses running post-COVID by allowing collectors to plan purchases from fishers and final sale to traders (supply chain management).

4.4 Traders

Resulting from decreased demand and prices from the Chinese market, interviewed crab traders[48] expressed that COVID-19 impacted ***crab supply***, decreasing the quantity of product captured and traded. To mitigate for lower demand, traders continued to **maintain regular communication**[49] down the value chain (with collectors and fishers) enabling actors to adjust the volume of crab captured according to Chinese demand.

The overall size of crab supplied to traders was unaffected since the onset of COVID. However, a few traders reported they received slightly larger sized crabs post-Rakhine lockdown, as businesses stopped capturing crab for four weeks[50].

Seasonality was also considered when analysing the quantity of crab in the post-COVID environment. As expected, the volume of crab decreased during the breeding season (April-May), with larger crab during the rainy season (June-September)[51]. At the same time, more capture was obtained when tides were high, during slack waters[52] as it occurs annually. A few traders commented on the increased volume of female crab captured during the period between January to July, negatively impacting the natural breeding season.

Crab stakeholders have been requesting for several years that mud crab be protected, especially during breeding season. The requirement for more stringent enforcement of conservation policies is evident.

Some traders work directly with Chinese companies with branches in Ponnagyun, such as KT 888, using a size grading system in accordance with the Chinese market which includes five different sizes[53], outlined in Section 4.6 below.

Traders in Rakhine demonstrated several established ***trading relationships*** and a level of understanding within the export value chain of live mud crab. As shown in Figure 3 above, the main export channel lies via Muse's township roads (Northern Shan State), while an alternative less used route exists via Yangon (discussed below). Rakhine traders, in partnership with Muse importers, showed less awareness of the cost and losses associated with transportation. The transportation component is sometimes managed by the importer, located in Muse.

[48] A total of 14 traders, 7% of which were female, were interviewed via KIIs.

[49] It should be noted that data specific to levels and frequency of communication between value chain actors pre and post-COVID was not gathered due to the scope and constraints of the study.

[50] From 22 July to 23 August, the Chinese border In Shan State was officially closed to import products from Myanmar (including the Rakhine lockdown beginning 16 August).

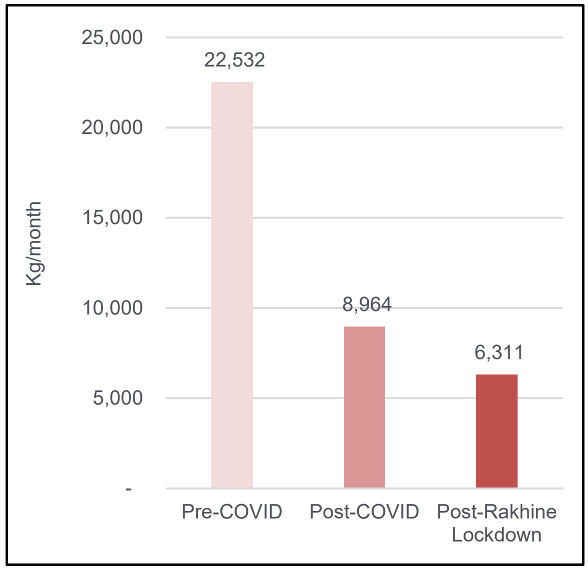
[51] Some traders expressed that crabs are bigger in the rainy season, when rain and saltwater are mixed.

[52] Crabs are generally moving and foraging during slack waters, as they are not swept up in the tidal exchange.

[53] The Chinese market purchases crab using 5 different sizes: AA (more than 300 g), A, B, C and D.

In general, traders continued to purchase mud crab from the same collectors or fishers since the beginning of COVID. Some traders stated they **reduced staff** by 20-50% as demand decreased, while others retained their staff throughout the crisis. Typically, family members are involved in activities related to trading.

Figure 10: Average Volume (Kg/Month) of Crab Traded.



Overall, traders did not ***diversify markets*** as an adaptation to the crisis. Firstly, trading continued at differing levels, experiencing some disruptions primarily over the period from 22 July to 30 August, or 5 September. Despite supply chain interruptions, some businesses with "lucrative connections" in Muse, still managed to continue trading crab with China, experiencing only three to five days of disruptions. Secondly, the income from exporting mud crab to China is almost double than that received from the domestic market, with fishers receiving 200MMK per mud crab domestically versus 500MMK per exported mud crab (or 70,000MMK vs. 120,000MMK per box). It would not be competitive to entirely shift to a domestic market with essentially no demand. Due to this, traders continued operating their businesses, utilising Chinese traders, in hopes for both Chinese demand and market prices to recover. Domestic mud crab prices are insufficient for fishers to continue capturing crab since the income received would not cover basic operational expenses.

During the Chinese border closure (22 July-23 August), only 3 out of the 14 consulted traders shifted to a new ***selling channel***. Utilising relationships of trust with other businesses as well as relatives, these traders sold small quantities of mud crab to traders in Yangon[54], for final export via airplane to China. One trader in particular stated that the price received for their product when transporting via Yangon was 20% lower through Muse. It should be noted that using this new selling channel cannot be considered a significant adaptation to the crisis, as one trader expressed they only sent 20% of the overall volume usually transported through Muse. Increasing market diversity by broadening marketing networks in Yangon, including channels for other markets in addition to the Chinese, will increase traders, and subsequently other VC actors' resilience to market shocks.

All interviewed traders stated the ***volume traded*** decreased dramatically after January 2020, decreasing even further post-Rakhine lockdown. Data from individual trading has been used to calculate average volume for each period, illustrated in Figure 10.

Traders sold an average of 22,532 Kg of crab per month in 2019 and only 8,964 Kg per month post-COVID, demonstrating a significant drop of 60%. Comparing average volumes pre-COVID and post-Rakhine lockdown, traders decreased the volume of crab sold by a startling 72%. Again, this can be attributed to volatile market conditions, compounded by the fact that trade was halted for a few days over this period.

Interestingly, Rathedaung traders experienced less market trading disruptions resulting from COVID when compared to other traders in studied townships. Individual data collected through interviews showed that traders in Rathedaung decreased the volume of crab no more than 33% in January-August 2020 compared to 2019. Meanwhile, traders in Sittwe decreased their volume of crab between 14% and 84%, with certain traders in Myebon and Pauktaw decreasing the volume of crab traded up to 83% and 91% respectively.

[54] The majority of crab were sold for trade in China, with a small proportion of crab sold in domestic markets.

Table 5: Range of Decreases in Volume (%) Among Traders Across the Same Township.

	Sittwe	Rathedaung	Pauktaw	Myebon
Max. recorded decrease in volume	84%	33%	91%	83 %
Min. recorded decrease in volume	14%	0%*	28%	28%

**One trader stated he continued trading at the same level both pre and post-COVID.*

Overall, interviewed Rathedaung traders continued similar economic crab activity post-COVID, primarily using the marketing channel through Chinese companies established in Ponnagyun (where live mud crab is prepared for export). Although not explicitly mentioned, KIIs with traders attributed this higher degree of trade consistency to informal yet "lucrative connections" at the border (Muse), allowing for the final export of mud crab, even with the Chinese border closure and Rakhine lockdown (16 August). In addition, traders who work with Chinese-based companies in Ponnagyun stated prices received for crab were standardized using a five-size grading system according to the Chinese market[55]. Traders only stopped trading for about five days, which occurred two to three times during 2020. This established social capital with key export counterparts has helped ease the impact of COVID for Rathedaung traders.

Myebon traders were the only group who experienced lower supply. This can be explained as fishers and collectors were primarily Rakhine migrants[56] who frequently work in the shrimp industry and returned to their hometowns in March due to COVID-19. In Myebon, three out of five traders interviewed explained that 70-90% of the mud crab they purchased comes from ponds[57]. In contrast with Rathedaung, where practically all mud crabs (90%) come from wild capture. The majority of traders stated significant ***profit losses***[58] during the crisis, especially during the Chinese border closure (22 July-23 August 2020). Traders were forced to cease operations for a few days during this period (ranging from three to five days, to up to 20 days). Although a few traders were able to sell small quantities of product within the local market and to Yangon, this adaptation was neither generalized, nor generated enough income to supplement their overall loss.

In addition, profits were significantly reduced after the Rakhine lockdown. However, 5 out of 14 traders were still able to sustain their business, yet with trading lower volumes of crab. On 21 August, the GoUM[59] imposed a curfew resulting in extending transportation hours, essentially resulting in daytime travel only (see Box 3).

All 14 interviewed traders stated diminishing profits since January 2020: some reported no profit, while others lost from 6-10million MMK up to 22million MMK. One trader in particular lost nearly 70% of his profit post-COVID when compared to pre-COVID earnings. Traders experiencing no profit were simply “sustaining their businesses”, especially during the aforementioned Chinese border closure. Again, primary reasons included: low prices and quantity exported as compared to 2019, the increased cost of transportation, and an increase in crab mortality due to longer transportation times (see Box 3).

[55] The Chinese market purchases crab using 5 different sizes: AA (more than 300 g), A, B, C and D.
[56] Workers (migrants) from Mrauk-U, Rathedaung and Maungdaw used to work in shrimp farms in Myebon and would capture mud crab as an additional source of income.
[57] Shrimp and prawn ponds were abandoned a few years ago in Myebon, so those ponds may have been used or adapted to grow live mud crablets.
[58] The study asked respondents to compare their profit pre and post-COVID as the scope of the study was to focus on the impact of COVID-19, the effect on livelihoods, and the measurable impact on actors of the crab value chain.
[59] The GoUM imposed a 2-month curfew from 9pm to 4am on 21 August.

The provision of ***pre-financing loans*** (or cash advances) to both collectors and fishers, as well as re-payments of these loans have been affected by the crisis. Overall, traders reduced the number of pre-financing loans provided to collectors and fishers by approximately 30-60%. However, in some cases, pre-financing loans were reduced by 83% or stopped altogether by traders. The value of the loans ranged from 1.5 to 6lakhs for collectors and fishers, with higher amounts generally disseminated to collectors. Established social capital and trust between traders, collectors and fishers has been a key factor when deciding who to prioritize for pre-financing loans. Only 21% of interviewed traders expressed difficulties in acquiring investment capital after COVID-19 for continuing to run the business. The majority were assured they have the assets and/or cash (or relatives) for continuing the business.

An over reliance on the Chinese export market is evident, placing the live mud crab sector in jeopardy and diminishing VC actor's resilience to the pandemic's shocks. Should border closures and transport restrictions continue and/or worsen due to COVID, actors will be forced to explore alternative livelihoods in order to meet their basic household expenses, unless, in the (unlikely) scenario that domestic demand for live mud crab, and subsequently prices increase.

Box 3: Transportation Restrictions.

The Rakhine lockdown, curfew and transportation restrictions have significantly impacted live mud crab distribution channels, resulting in longer hours of transportation since:

- Restricted night travel now increased transportation times from 24 to 36hours from Rakhine to Muse, in some cases increasing to 48hours until arriving at destination cities in China;
- Checkpoints were increased along the route to Mandalay, with an additional five stops to Muse;
- The checkpoint in Ann township closed at 6pm, further increasing the length of the trip;
- Trucks needed to be changed before entering Mandalay;
- Traders usually pay crab collectors in Rakhine, yet only receive payment from the importer/trader in China, Muse or Mandalay three to four days later. Due to the volatility of market conditions post-COVID, oftentimes market prices would decrease in this interim period;
- Drivers were requested to quarantine at both their destination as well as when returning to Rakhine, resulting in drivers declining to work.

VC actors expressed higher levels of crab mortality post-COVID*, due to longer transport times. As the mud crab value chain and market price is based on *live* mud crab, it is imperative that distribution channels are improved.

**Crab mortality has increased from 3Kg/30Kg pre-COVID to 6-8Kg/30Kg post-Rakhine lockdown.*

4.5 Transport Organisers (TOs)

The role of TOs[60] within the live mud crab value chain is to organise product transport from different traders in Rakhine in order to reach importer companies or traders at Muse (border town). TOs hire cargo trucks, including drivers. Owners of trucks circumvent the challenge of finding drivers[61] due to COVID restrictions, including lockdowns, curfews and quarantine.

As previously mentioned, **transportation channels** have been directly affected by the COVID-19 crisis, as well as disruptions caused by armed conflict in Rakhine. In both cases, product loses are assumed by the trader. Traders fully absorb transportation costs when using a TO solely for logistical purposes; 400 MMK/Kg (pre-COVID) and 500 MMK/Kg (post-COVID). However, when the import company organises the transport, this equates to almost double the price; 700 MMK/Kg. In 2017, one Transport Organiser stated boxes were re-structured from 25Kg to 22Kg by adding a frozen water bottle. This kept the temperature lower within the box, reducing crab mortality during transportation to Mandalay. However,

[60] A total of 2 TOs, none female, were interviewed through KIIs for the study.

[61] Key informants expressed that despite the increased transportation time by 12hours or more, drivers' wages were not increased.

the majority of study participants transport live mud crab in the ratio of 30Kg per box. Losses due to crab death were up to 23% during transport post-COVID.

Table 6: Transport Cost Differentials and Increases Prior and Post-Rakhine Lockdown.

	Prior to travel restrictions (until June 2020)	Post-Rakhine Lockdown
Transport at night	10%	Not allowed
Transport during the day	-	20%
Truck change overs in Mandalay	20-22%	20-22%

The entire ***transport business*** was affected on account of transportation restrictions, including no transport between 22 July and the end of August[62]. According to KIIs with traders, transport prices have increased 20-22% after COVID-19 due to the need to change trucks in Mandalay as transport is longer. Transporting one Kg of crab used to cost 400MMK in 2019 and post-COVID costs 500MMK. A full truck used to cost six to seven lakhs (2019) and post-COVID costs nine lakhs.

One major TO, who organises transport from seven townships, estimates a 25% ***profit loss*** for 2020. The increased product losses during transit affects TOs, as traders will have less purchasing power when trading, lowering revenue for both parties. Additionally, during the height of COVID-19 (July-mid September) truck owners faced difficulties in hiring drivers. Although transportation times were increased, and drivers were asked to quarantine (in Mandalay, Yangon and when returning to Rakhine) their salaries were still not proportionally increased.

Despite these transport challenges, there were no specific changes in packaging or type of trucks used. For example, switching to refrigerated cargo trucks or alternative routes in order to reduce losses. These changes would be highly unlikely due to Rakhine's poor infrastructure, a significant increase in the number of checkpoints, and stringent curfews in place since August 2020. In addition, refrigerated cargo trucks are rare in Myanmar due to their high cost of operation, which would subsequently increase traders cost of transport. During the Rakhine lockdown, crab stakeholders have requested the Government to lift the transport prohibition, which pushed to suspend exports for a few days or weeks, affecting all actors of the value chain. (See Appendix 1 for a detailed impact on prices due to COVID-19 among surveyed trader respondents.)

4.6 Price Variations Due to COVID-19 in Rakhine State

As previously mentioned, mud crab price varies according to their size. Interviewed traders stated that pre-COVID, prices ranged between 2,500-12,000 MMK/Kg, while post-COVID ranged between 2,000-8,500 MMK/Kg. Average prices for larger crab were 7,892 MMK/Kg pre-COVID and 5,538 MMK/Kg post-COVID, approximately a 30% decrease (see Table 8 and Appendix 1).

[62] There were additional losses for traders and transport organisers when the Chinese border closed suddenly, (22 July) with further losses post-Rakhine lockdown and curfew were imposed.

Table 7: Mud Crab Price Ranges Pre vs Post-COVID.

Period	Max. Prices (MMK/Kg)	Average of Max. Prices (MMK/Kg)	Min. Prices (MMK/Kg)
2019	12,000	7,893	2,500
2020 (January-16 August)	8,500	5,538	2,000

(Source: primary data from KIIs with traders in the four townships)

Comparing individual price variations among traders of the four townships, the study shows that prices in Pauktaw and Myebon suffered the biggest decrease (almost 60%). A comparison of prices pre and post-COVID shows a higher decrease in prices for larger-classification crab.

Table 8: Range of Price Decreases (%) by Township Due to COVID-19.

Township	Sittwe (3 traders)	Rathedaung (4 traders)	Pauktaw (2 traders)	Myebon (5 traders)
Min. price decrease (%)	7%	22%	25%	14%
Max. price decrease (%)	46%	40%	57%	58%

(Source: 14 interviewed traders)

Table 9: Detailed Prices per Kg Paid to Collectors from One Trader Selling to an Importer in Ponnagyun.

Size/Grading Classification	Prices per Kg		
	2019	**Pre-COVID**	**Post-Rakhine Lockdown**
AA	7,000-12,000 MMK	Max 6,500 MMK	4,500-8,000 MMK
A	6,000-11,000 MMK	5,500 MMK	
B	5,000 MMK	4,500 MMK	
C	4,000 MMK	3,500 MMK	
D	3,000-8,000 MMK	1,500-2000 MMK	

One trader from Sittwe reported that the Chinese market typically provided slightly higher prices in January due to Chinese New Year, receiving up to 15,000 MMK/Kg. Selectively few traders from Pauktaw and Sittwe[63], mentioned a slight increase in prices in September 2020 as compared to January-August.

[63] These participants were interviewed after 13 September 2020.

5. Conclusion

The mud crab sector has been significantly growing over the last few years, contributing to the livelihoods of the majority of households in the coastal communities of Central and Northern Rakhine. According to the FAO[64], it is expected that the fishing sector will continue experiencing uncertain market demand and lower prices.

The over-dependency on exporting to the Chinese market and the unlikely possibility for a quick shift to a domestic market (due to lack of demand and lower prices) are weaknesses in the live mud crab sector. Diversifying market channels would increase, to some extent, the resilience for all actors of the value chain. Developing the national market would have to consider the obstacle of a significant price increase.

The onset of COVID-19 has exposed fragilities in the market system, reiterating the urgency for immediate action, enabling actors to diversify and build resilience for potential future external stresses and shocks. The aforementioned market-specific factors, challenges and needs should be carefully analysed in order to inform, develop and implement innovative and sustainable market solutions.

Critical relief measures, from both the government and/or development sector will be required, should transportation restrictions and the effects of the crisis be prolonged. Support to the mud crab industry should especially focus on supporting vulnerable fisher households, especially those from different ethnic groups and female-headed HHs.

Aspects to monitor over the coming year:

- Mud crab market trend in the Chinese market: demand and prices, especially before the Chinese New Year, is a great opportunity for the mud crab sector to recover;
- Trade conditions at the border with China (Muse): closure and potential requirements or exceptions for exports;
- Coping strategies among fishers - the types of livelihoods they are currently adopting and whether the skills they have attained from the mud crab sector are easily transferrable to their new vocations.

[64] "FAO Myanmar Newsletter, September 2020 - Issue #3." *FAO,* http://myanmar.un.org/sites/default/files/2020-10/FAO%20Myanmar%20newsletter%20-%20Issue%203.pdf. Accessed 17 October 2020.

6. Recommendations

The following table summarizes key findings discovered over the course of the study, linked to recommendations aimed to add to the resilience of the mud crab sector in Rakhine, as well as inform several actors across the public and private sector. Key actors are identified for each recommendation, differentiated between the Government (**G**), Humanitarian, Development Agencies and Donors (**HDAD**) and Private or Market Actors (**P**). In addition, recommendations have been categorised as either immediate to medium-term (**M**) effect (four to eight months) or longer-term (**L**) effect (over nine months) to implement and provide results.

Table 10: Summary of Key Findings, Recommendations, Key Actors and Proposed Timeline.

<table>
<tr><th>KEY FINDING</th><th>RECOMMENDATIONS</th><th>SECTOR</th><th>M</th><th>L</th></tr>
<tr><td rowspan="2">KEY FINDING #1: COVID has shifted market conditions as a result of the border closure with China, decreasing the demand for export while increasing mobility restrictions. This has resulted in decreased household income for mud crab fishers, provoking them to adapt their capturing and distribution practices – leading to sub-optimal coping strategies.</td><td>I. Facilitating the widening of fishers’ distribution networks[65].
• Linking fishers with accessible collectors and market actors in the area through leveraging ICT systems (i.e. online marketplace);
• This will also help fishers improve access to information, improving their overall agency and building their resilience to cope with the crisis as well as potential future shocks and stresses.</td><td>G, P</td><td>✓</td><td>✓</td></tr>
<tr><td>II. Support sustainable fishing practices by providing size selectivity traps with scape room as well as disseminating training on Good Practices, reducing the capture of crablets[66].
[RISK: Fishers obtain lower prices from capturing crablets as most of them do not have access to ponds, to allow them to grow until maturity (100g), ensuring a higher market price]
• Providing size selectivity traps will support fishers and other market actors to follow legislation requirements in order to encourage the sustainability of the resource;
• Will encourage sustainable practices through the provision of training.</td><td>HDAD, G</td><td></td><td>✓
✓</td></tr>
</table>

[65] Rakhine mud crab market actors use distribution networks to buy and sell with other actors, with whom they have established social capital. This recommendation should be gradually implemented, providing support and emphasizing relationship-based business transactions.
[66] Crablets are classified as mud crab weighing less than 100grams.

KEY FINDING	RECOMMENDATIONS	SECTOR	M	L
	III. Promote a subsidised program to reduce the impact of COVID-19 on the most vulnerable actors of the value chain. [**RISK:** Over-dependency on the Chinese market poses challenges in expanding this sector to either domestic or international markets activity during the crisis] • Government subsidies will help keep jobs and stabilize the economy, while at the same time promoting the product across the domestic market in the medium-term.	G, HDAD	✓	
	IV. Increase the resilience of households relying on the mud crab sector. [**RISK:** any sector with only a single established market (China) is at risk due to lack of diversified channels. HHs also require additional income during mud crab low/closed season]. Facilitate programs to diversify livelihood options: • Design programs that consider both mud crab seasonality as well as other potential local opportunities; • Engage the private sector often and frequently in program design; • Facilitate and promote VSLA programs at the village level to ensure inclusive financial access for the most vulnerable; • Increase opportunities for using ponds in order to increase resilience to market shocks as well as grow crabs to commercially viable sizes: • Ponds must be established outside mangrove areas in order to conserve mud crabs' natural habitat (i.e. 'backyard ponds').	HDAD, P	✓ ✓ ✓	✓
	V. In addition to recommendation IV above, provide short-term development support to households dependent on the live mud crab sector. • Initiate mapping and baseline studies of HHs and villages which are highly dependent on the sector; • Design and implement programs based on above findings, facilitating relationship building across market actors.	G, HDAD	✓	✓
KEY FINDING #2: Collectors are experiencing knock-on effects from market system and distribution disruptions due to COVID and the dependency on exports to China – however are leveraging existing resources including social capital and ponds.	**VI. Facilitate flexible distribution channels with secured and guaranteed access to export to China, enabling traders to continue their livelihoods at the same capacity as prior to the outbreak.** [**RISK:** as the sector is completely dependent on one established market (China), it is difficult to absorb unexpected internal and external shocks] • In the short to medium term, government support is required to support the export of mud crab to China, to help fisher HHs overcome the shock of the crisis; • Facilitation of mud crab export is necessary, abiding by COVID-enforced food safety and health measures;	G, P	✓ ✓	

KEY FINDING	RECOMMENDATIONS	SECTOR	M	L
	• The current infrastructure needs to be amended, adapting mechanisms which will maximize efficiencies, easing transportation and export processes and procedures. This could include for example upgrading trucks to include refrigeration, consistent forms or identification, allowing for easier passage through checkpoints, etc. **Also see Recommendations III-V above**			✓
KEY FINDING #3: Aligned with other market actors, traders are also experiencing significant losses after the pandemic due to the diminishing export market, border closures and the increased cost of transportation.	**VII. Facilitate traders' distribution networks with stakeholders, both domestically and internationally, to diversify market channels to build resilience against current and future shocks.** [**RISK:** any sector with only a single established market (China) is at risk due to lack of diversified channels] • Similar to Recommendation (I) above, linking traders with accessible market actors through leveraging ICT systems (i.e. online marketplace); • This will also help improve access to information, improving overall agency and building their resilience to cope with the crisis as well as potential future shocks and stresses; • Perform a comprehensive market assessment, both domestically and internationally; • Design and implement a program targeting: o International mud crab export markets; o Developing the domestic mud crab market through establishing new distribution channels and raising consumer awareness. **Also see Recommendation VI above**	G, P, HDAD	✓ ✓	✓ ✓
KEY FINDING #4: Transportation channels have been severely affected by government-imposed restrictions and armed conflict, increasing the time and cost of transporting live mud crab - significantly impacting the sector and market systems.	**See Recommendations VI and VII above**	G, P, HDAD		
KEY FINDING #5: The complete dependency of the live mud crab sector on the Chinese export market has affected all market actors due to a drastic reduction in demand and transportation challenges via Northern Shan.	**See Recommendations I-XI**	G, P, HDAD		

KEY FINDING	RECOMMENDATIONS	SECTOR	M	L
Conservation Recommendations.	**VIII. Conduct a technical study to guide the sustainability of the mud crab value chain** [**RISK:** Capture of crablets and females, especially during breeding period, and the destruction/disturbance of mangroves interfere with the sustainability of the resource]	G, HDAD	✓	
	IX. Design, implement and promote a Mangrove Conservation Plan/Program (as per evidence gathered from the technical study). [**RISK:** The lack of programs protecting and revitalizing mangroves increases the risk for damaging this coastal ecosystem in Rakhine and affecting a critical livelihood for coastal populations. In addition, the entire mud crab value chain is dependent on the sustainability of this resource, re-enforcing the requirement for immediate conservation measures] • A detailed plan is necessary to set up appropriate management of mangroves for the sustainability of all its resources; • Special attention should be given to the capture and management of crablets, which is a challenge for the crab resource; • The plan must consider Mangrove Friendly Aquaculture if aquaculture is practiced within mangrove areas; • It should consider the promotion of Community Forestry Plans; • It should take into consideration opportunities of ecotourism as part of conservation management.	G, HDAD		✓ ✓ ✓ ✓ ✓
	X. Promote policies that contribute to mangrove restoration and conservation in Rakhine State. • Policies to protect and restore mangroves are necessary for an effective program that builds the natural habitat of the mud crabs.	G, HDAD		✓
	XI. Enforce crab protection legislation, especially during mating season, by controlling the market in Muse during that period. [**RISK:** If market demand exists, fishers will not stop catching crab during the mating season, as this activity significantly covers basic expenses of fishers' families]	G		✓

Appendices

Appendix 1| Detailed Impact of Prices Due to COVID-19 Among Trader Respondents

Period	Sittwe			Rathedaung							Pauktaw				Myebon										Max. Prices	Avg. of Max. Price	Price Decrease (%)
	Trader 2	Trader 3		Trader 4		Trader 5		Trader 6	Trader 7		Trader 7		Trader 8		Trader 9		Trader 10		Trader 11		Trader 12		Trader 13		MMK/Kg	MMK/Kg	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.			
2019	5,000	7,000	12,000	4,500	8,000	5,500	7,000	6,500	4,000	10,000	4,000	5,000	7,000	9,000	2,500	7,000	9,000	10,000	4,000	12,000	6,000	7,000	4,000	12,000	12,000	7,893	-
2020 (Jan-Aug)	3,000	-	6,500	3,500	5,000	3,500	5,000	5,000	2,500	6,000	3,000	4,500	3,000	4,000	2,000	6,000	-	7,000	2,500	6,500	4,540	8,500	4,500	5,000	8,500	5,538	30%

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