



## Research Article

# Effect of COVID-19 on Fisheries Products Exported from Southwest Bangladesh: A Case Study

Md. Asadur Rahman<sup>1</sup>, Md. Mehedi Alam<sup>1</sup>, Sanzib Kumar Barman<sup>1✉</sup>, Md. Jahid Hossain<sup>2</sup> and Kishor Kumar Tikadar<sup>1</sup>

<sup>1</sup>Department of Fishery Resources Conservation and Management, Faculty of Fisheries and Ocean Sciences, Khulna Agricultural University, Khulna-9100.

<sup>2</sup>Department of Aquaculture, Faculty of Fisheries and Ocean Sciences, Khulna Agricultural University, Khulna-9100.

ARTICLE INFO	ABSTRACT
<b>Article history</b> Received: 12 Apr 2022 Accepted: 07 May 2022 Published: 30 June 2022	The COVID-19 pandemic has posed unprecedented challenges for fisheries products export, which serves as a major export driver and employment for the people of Bangladesh. The nationwide lockdown has severely disrupted the supply chain; and port closures and international cargo restrictions have threatened export markets. To unpack the COVID-19 impacts, the detailed fisheries products export-oriented primary data of 45 fish processing plants were collected from Fish Inspection and Quality Control (FIQC), Khulna between January 2020 and December 2021. Ten key informant interviews were conducted with Upazila Fisheries Officer, FIQC personnel and stakeholders of fish processing plants to know the official export data during the pandemic periods. This was followed by further focus group discussions on fish processing plant employees to assess the real impact of COVID-19 on the export of fisheries products in southwest Bangladesh. In this paper, our study clearly shows that the COVID-19 has resulted in a squeeze export volume of fisheries products during the first wave of COVID-19 from March to May 2020. By 2020, it was observed that the amounts of exported products were somewhat stable, but the unit price (US\$/MT) continued to decline. However, the export market improved slightly in 2021 and the unit price of export products continued to rise. We also found some other adverse effects of COVID-19 such as delay in product shipment, increased cost of packing materials, purchase order cancelation from buyers, shortage and the increased price of raw materials, complete shutdown of few processing plants, increased transportation cost, shortage of containers, employee lay off from the company, etc. To meet these challenges, the government must take necessary measures to address this vulnerable sector and formulate appropriate policies to minimize the adverse effects of such uncertainties in the future.
<b>Keywords</b> COVID-19, Fisheries products, Export, Bangladesh	
<b>Correspondance</b> Sanzib Kumar Barman ✉: <a href="mailto:sanzibfrcm.kau@gmail.com">sanzibfrcm.kau@gmail.com</a>	

**Copyright** ©2022 by authors and BAURES. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

## Introduction

The fisheries sector is one of the most productive and dynamic industries in Bangladesh, it plays an important role in the economy, contributes to generating livelihoods opportunities, and earning foreign currency (Haque et al., 2015; Shamsuzzaman et al., 2020; Tikadar et al., 2021). Globally, Bangladesh is recognized as the leading fish producing country, accounting total production of 4.50 million metric tons (MT) during the Fiscal Year (FY) 2019-20, ranked third in the world in inland fish production, fifth in aquaculture production and eleventh in marine fish production (FAO, 2018; DoF, 2020). According to recent statistics, the fisheries sector contributes 3.52% to the national gross domestic products (GDP), 26.37% of the agricultural GDP, and

1.39% to the national export earnings (DoF, 2020). Nowadays, Bangladesh has achieved self-sufficiency in fish production, where total production has increased sixfold in the last 34 years (Shamsuzzaman et al., 2020). The entire fisheries sector supports the livelihoods of more than 12% of people nearly 170 million in the country directly and indirectly (DoF, 2020). About 1.4 million women depend on the fisheries and aquaculture sector for their livelihoods through fishing, farming, handling, and processing (BFTI, 2016).

The fisheries and aquaculture sectors have emerged as the second-largest contributor to the country's export profits (Ghose, 2014). In the FY 2019-20, Bangladesh earns a considerable amount of foreign currencies (US\$

## Cite This Article

Rahman, M.A., Alam, M.M., Barman, S.K., Hossain, M.J. and Tikadar, K.K. 2022. Effect of COVID-19 on Fisheries Products Exported from Southwest Bangladesh: A Case Study. *Journal of Bangladesh Agricultural University*, 20(2): 217–224. <https://doi.org/10.5455/JBAU.10262>

461.6 million) by exporting 70.95 thousand MT of fish, shrimps and other fisheries products (Shamsuzzaman et al., 2020). The major export items of fisheries products from Bangladesh are: frozen shrimp, frozen marine water fish, frozen freshwater fish, chilled fish, live fish, live kuchia (mud eel, *Monopterus cuchia*), live crab, dry fish, salted dehydrate, and fish scale/shrimp scull (Shamsuzzaman et al., 2017). The main export markets of Bangladeshi fisheries products are USA, UK, Japan, Belgium, Netherlands, Thailand, Germany, China, Italy, France, Canada, and Spain, where Bangladesh's exports of frozen fish, dried fish, salted and dehydrated fish are steadily expanding (Sanjee and Karim, 2016). Furthermore, frozen shrimp and prawns are Bangladesh's most exported commodities, bringing in a significant amount of foreign currency, with nearly 80% of total shrimp exports going to the United States and EU countries.

The COVID-19 pandemic started on December 31, 2019, in Wuhan, China and it has paralyzed the world with its health and economic shocks and restricted the export and import facilities of goods across the world (Lu et al., 2020). The impact of COVID-19 on the workforce did not spare a country like Bangladesh. To prevent the early transmission of the virus, a mass shutdown was imposed by the governing body of Bangladesh from 26th March 2020. Therefore, production, marketing, processing, transportation and all other sectors were forced to cease, or substantially reduce operations, and hence production throughout the country (Hasan et al., 2021). Like other industries, COVID-19 was jeopardizing the fisheries and aquaculture sectors (Love et al., 2021; Sunny et al., 2021a). Therefore, the second-largest export earning fisheries and aquaculture sector has been disrupted due to a bottleneck in transportation and its effect on trade, labor and the supply chain.

As outlined above, the exporters of fisheries products become vulnerable stakeholders because they have to shoulder various risks, with a huge investment against multiple uncertainties, to return the invested capital. However, to our knowledge, very few researches were conducted about the impact of the COVID-19 pandemic on the fisheries sector in Bangladesh. Whereas, most of the studies have focused on the effect of COVID-19 on aquaculture production and its supply and value chain. There were no studies have explicitly found the impacts of COVID-19 pandemic on the export of fisheries commodities of Bangladesh. Therefore, the impact of COVID-19 on fisheries products exports remains largely unknown and undocumented. The main objectives of this research aim to address the impact of the COVID-19 pandemic on the export of fisheries products of Bangladesh.

## Materials and Methods

### Study Area

The study area comprises four southwest districts of Bangladesh, such as Khulna, Bagerhat, Satkhira, and Jashore (Figure 1). The selection of these study sites was justified based on the export of fish and fishery products from Bangladesh. The Khulna division exports the highest number of fish and fishery products in Bangladesh. Moreover, the majority of the export-oriented processing plants are also located in these four districts. In the 2020-2021 FY, the Khulna region provided 33727.55 MT of fisheries products where the total amount of export from Bangladesh was 76591.69 MT (DoF, 2020). These sites are also important for shrimp, crab, and kuchia farming.

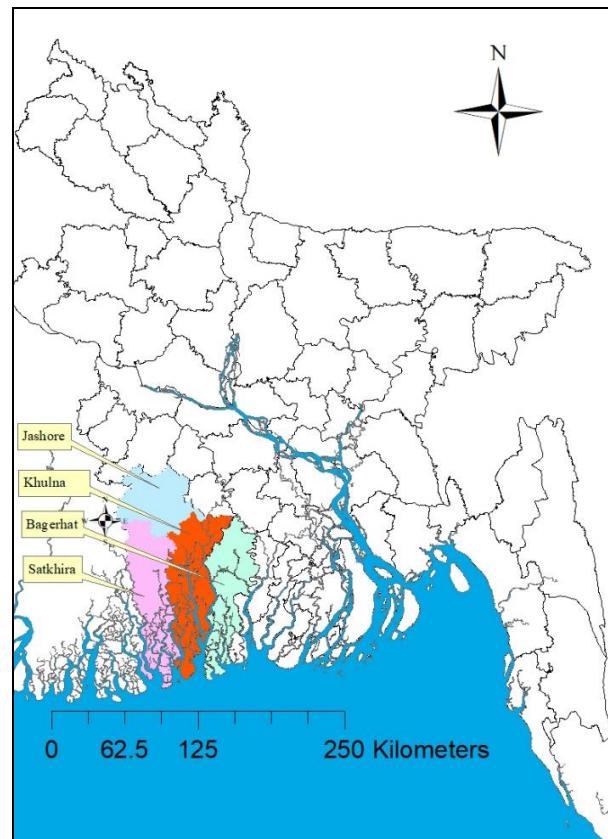


Figure 1. Map of the study sites.

### Data Collection

We have collected detailed export-related primary data of 45 fish processing plants from Fish Inspection and Quality Control (FIQC), Khulna, between January 2020 and December 2021. Data includes the total amount of fisheries products (i.e., shrimp, prawn, crab, fish and others), that each of the 45 processing plants exported per month and the foreign exchange they earned during the mentioned period.

Focus Group Discussions (FGD) were conducted with the stakeholders of the processing plant. The discussion was divided into two sessions. Each session was conducted for approximately 2 hours. During the selection of FGD participants, a representative from every section of the processing plant was considered to ensure homogenous participation. The participants were asked to identify the key impacts of COVID-19 on the export and their coping strategy after the COVID-19 induced restriction period.

In order to better understand the situation and provide in-depth information, Key Informant Interviews (KII) were conducted. The key informants included the 4 Upazila Fisheries Officer (UFO) from the Department of Fisheries (DoF), 3 FIQC personnel and 3 fish processing plant authorities. Most of the interview was audio-recorded after taking consent from the respondents, however, some key informants were uncomfortable speaking in front of microphones and so their dialogue was not captured. During the interview, they were mainly asked about the harmful effects of COVID-19 on fisheries exports of the region and which of them was the most severe. They were also asked about how we could overcome these harmful effects.

#### *Calculation of unit price (USD/MT)*

The unit price (USD/MT) of each product was calculated during the pandemic period (2020 to 2021) by monthly basis. To calculate the unit price, the price of the individual exported product was divided by the amount of that respective product as well.

#### *Data analysis*

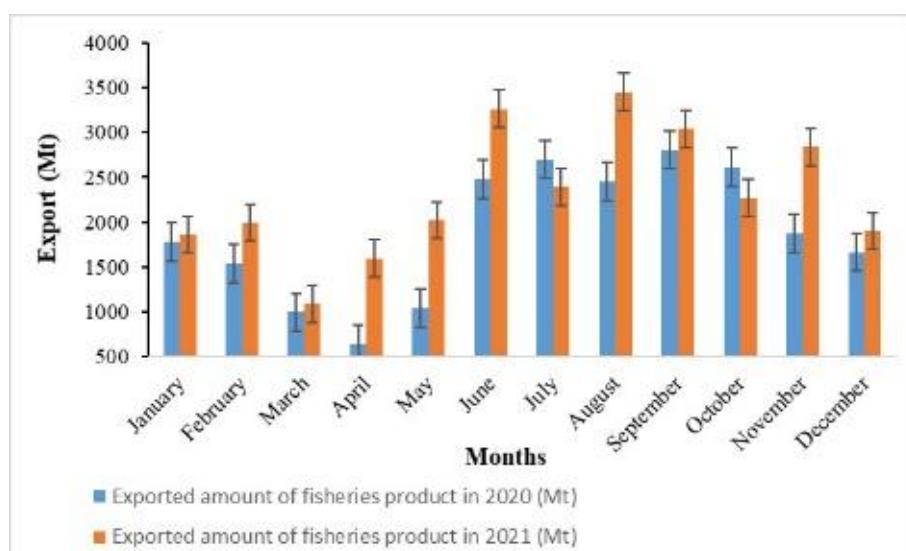
The interviewed data were summarized and entered into an MS Excel spreadsheet for data management and

analysis. All the statistical tests were done using the statistical software SPSS (Statistical Package for Social Science) version 25 (IBM SPSS, Armonk, NY, USA) and MS Excel. Finally, the analyzed data had presented in graphical and tabular forms.

## **Results and Discussion**

### *Effects of COVID-19 on the exported amount (MT) of fisheries products*

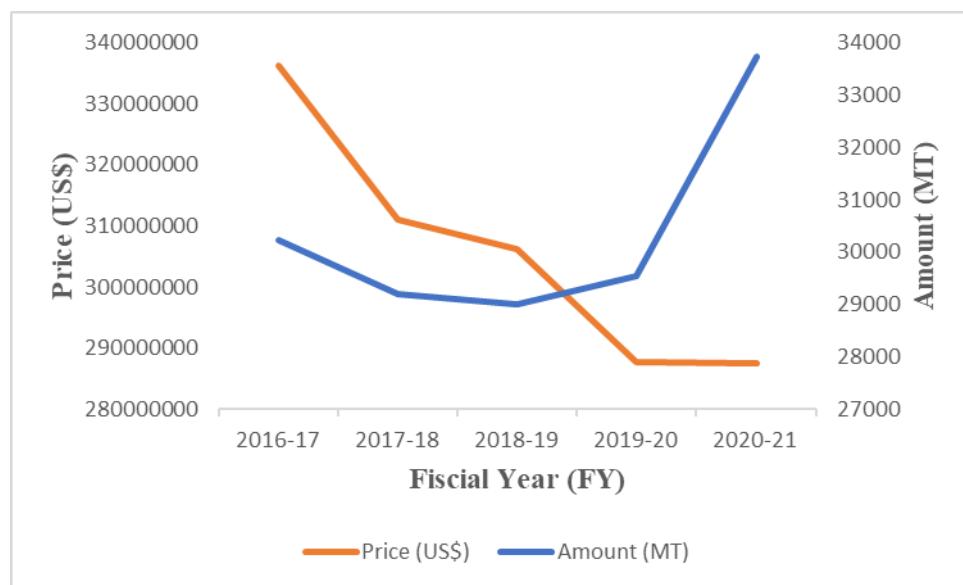
The impact of the COVID-19 pandemic on the exported fisheries products during the consecutive year of 2020 and 2021, are shown in Figure 2, respectively. Results of this present study revealed a clear diagram in which the lowest exports were recorded in April 2020 during the first peak emerging phases of the COVID pandemic compared to other months of this year, respectively. The commencement of COVID-19 has led to a national lockdown, resulting in lower national production, frozen transportation links, and as a result, lower average exported fisheries products, which support the present findings as well (Hasan et al., 2021). The food shortage has worsened as a result of the lockdown. The supply of fish and fishery resources (aquatic food), which plays a vital part in Bangladeshi diet and nutrition, has also been affected during this pandemic situation (Sunny et al., 2021a). The results of the present study also showed that the average amount of the exported products has significantly decreased from January (about 2000 MT) to April (about 600 MT) in 2020. However, a dramatically increased graphical line was observed from May to July 2020 and then again fluctuated the exported amount. These irregular fluctuations might be happened due to the rapid influence of the COVID pandemic in Bangladesh as well (Sunny et al., 2021a).



**Figure 2.** Effects of the COVID-19 on the amount (MT) of exported fisheries products during 2020 and 2021.

In contrast, the exported number of fisheries products was very similar during the month of January in 2020 and 2021, respectively (Figure 2). However, the lowest amount was recorded during March 2021, compared to other months of this year, respectively. Then the exported amounts had gone through ups and downs during the rest of the months, and finally stretched as similar to the month of January which was about two thousand metric tons in December 2021, respectively. In Bangladesh, the first COVID-19 cases were identified on 8 March 2020 and abruptly increased the suspected cases during April and May 2020. However, the new suspected case rate in Bangladesh rose sharply reached 1155% in mid-April (considered the peak period), when 186% was the highest in Asia, putting Bangladesh above of India, Indonesia, Thailand, and Sri Lanka, respectively (Sunny et al., 2021b). In contrast, during the year of 2021, the infected cases with death rate were increased again from March to May, considered the second wave of COVID-19 and strict lockdown was executed. To stop

the spread, the government announced yet another lockdown from July 1 to July 7 2021, which was then extended till further notice (Bari and Sultana, 2021; Sunny et al., 2021b). During this peak period of pandemic (2020 and 2021), all modes of transportation (Road, rail, water, and air) would be prohibited, and all public and private offices would be closed, with the exception of pharmacies, groceries, and other unavoidable necessities, as well as other emergency services. People that relied primarily on aquatic resources, such as fishing, fish processing, fish selling, and fish farming, were finding it impossible to counteract the COVID-19 outbreak which might be affected the fisheries production and exported amounts, and supports the current study findings as well (Sunny et al., 2021a; Hasan et al., 2021). Therefore, the comparison between fisheries exported amounts and the unit prices during and before the pandemic years are described in Figure 3.



**Figure 3.** Comparison between export amounts vs. unit prices of fisheries commodities before and during pandemic from the study area.

#### *Effects of COVID-19 on export earnings (USD)*

Bangladesh's fishing sector has risen to become the country's second-largest source of export revenue (Hasan et al., 2021; Sunny et al., 2021b). The results of the present study revealed the unwholesome scenario of the export earnings during the pandemic (2020 and 2021) in southwest Bangladesh, which are shown in detail in Figure 4. Results showed the significantly lowest earnings (US\$) from the export fisheries were recorded during the month of March 2021 and April 2020, respectively. The highest amount of export earnings was recorded in September 2020 and August 2021, respectively. However, the overall export

earnings were significantly higher in 2021 compared to 2020, respectively. The COVID-19 pandemic harmed small-scale fishermen and the communities and industries that rely on them (e.g., fishers and dealers), as both total catch weight and price per kilogram of fish decreased, resulting in huge drops in total catch value after the outbreak. Although catch-weight and value fluctuated throughout the year, they plummeted when the pandemic was declared (Campbell et al., 2021), which also supports the present findings as well.

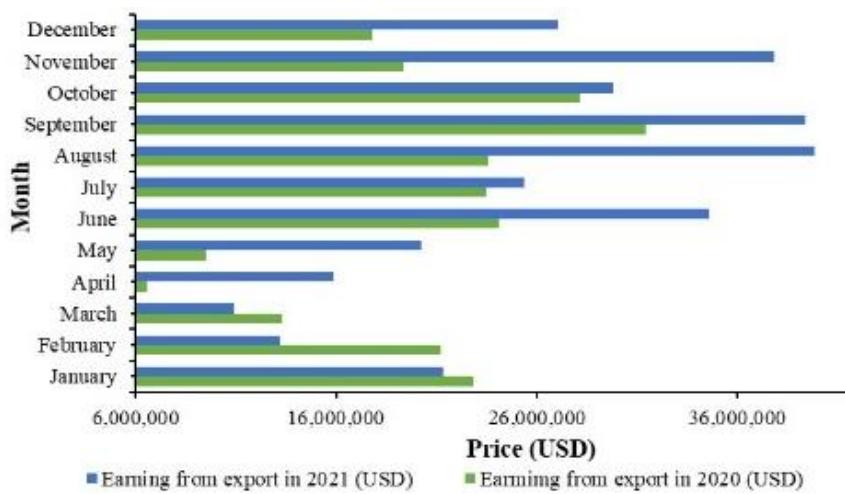


Figure 4. Comparison between the export earnings (USD) during 2020 and 2021.

#### Effects of COVID-19 on the export earnings (USD) especially from shrimp and prawn

Bangladesh exports ten types of fishery goods to over 55 countries: frozen freshwater, marine water fish and shrimp, chilled fish, live and dry fish with salted and dehydrated fish, kuchia and crab (*Scylla sp.*) in live condition, as well as fish scales/shrimp skulls, respectively (Sunny et al., 2021b). Among them, prawn and shrimp's contribution as an export fisheries products were recognized as the highest-earning resource compared to others. Thus, Figure 5 and Table 1, specially presented the export earning prices (US\$) and amount (MT) of prawn and shrimps, respectively. Findings of the present study revealed the highest export earnings which were recorded during January 2020 and November 2021 for prawn as the month of December to January generally considered for the peak harvesting time of prawn (*Macrobrachium rosenbergii*) in Bangladesh. In contrast, the peak harvesting time for shrimp (*Penaeus monodon*) usually remains twice a year, during December to January and June to July in

Bangladesh. However, the month of September 2020 and August 2021 was recorded as the highest export earnings for shrimp which was just after one of the peak harvesting time June to July. Meanwhile, the harvesting period of prawn once a year and for shrimp twice a year in Bangladesh, thus the present study findings revealed the lowest earnings during May 2020 and July 2021 for prawn, and April 2020 and March 2021 for shrimp, respectively. However, this situation does not indicate only the seasonal production factor for prawn and shrimp but also the interruption of world trade due to the national and international travel limitations caused by the COVID-19 pandemic (Love et al., 2021) as well. Therefore, the reduced worldwide and domestic demand for shrimp, as well as higher production input costs, have harmed Bangladesh's export-driven shrimp economy (Belton et al., 2021; Love et al., 2021; Mandal et al., 2021), which also supports the present study findings as well.

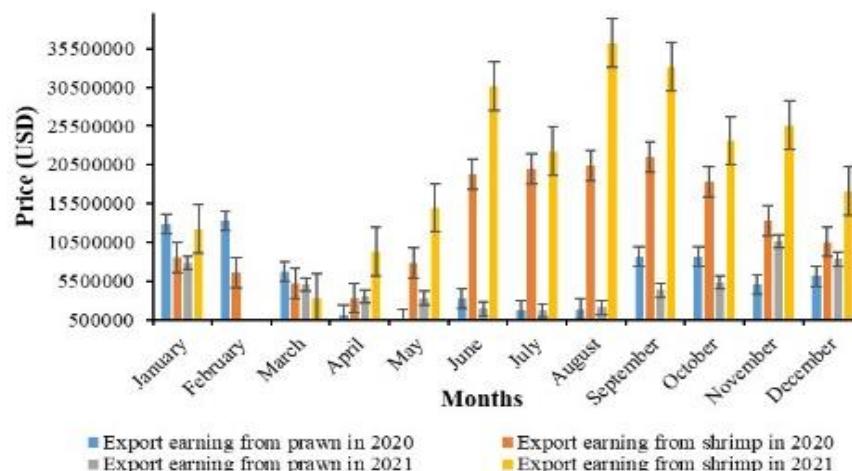


Figure 5. Comparison between the export earnings from prawn and shrimp during the years 2020 and 2021.

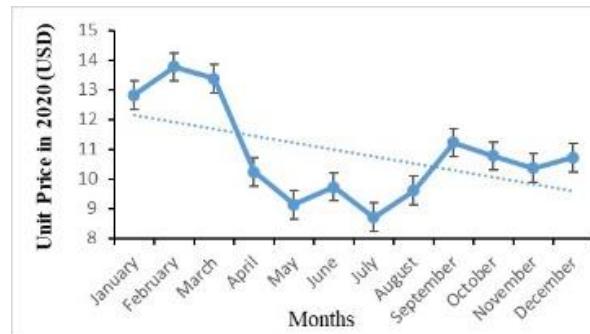
**Table 1.** Exported amount of shrimp (MT) and prawn (MT) during 2020 and 2021

Month	Prawn exported in 2020 (MT)	Shrimp exported in 2020 (MT)	Prawn exported in 2021 (MT)	Shrimp exported in 2021 (MT)
January	784.3870	808.6830	567.7440	1167.747
February	787.1720	618.6250	390.6710	508.2040
March	423.8170	372.8520	399.0420	336.1430
April	72.13600	332.1940	296.2410	951.0500
May	37.81500	829.8270	228.5470	1513.833
June	190.5050	2109.563	138.8960	2883.637
July	135.4380	2299.279	128.3300	2038.140
August	133.6780	2106.895	110.8610	3144.861
September	514.0450	2141.368	218.7450	2654.451
October	553.2180	1923.663	282.6340	1837.937
November	369.2220	1334.211	617.8830	2070.722
December	504.3190	1051.176	522.8200	1169.957

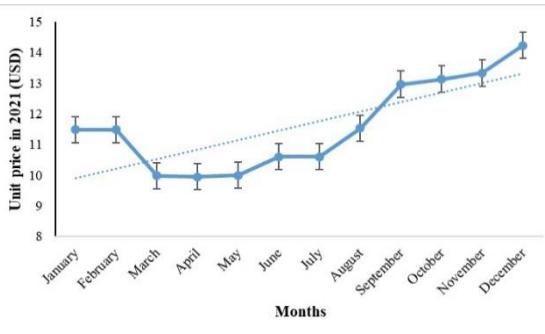
#### *Effects of COVID-19 on the unit price (USD/MT) of the exported products*

Economic activities are shaped by the demand and supply balance, which is the fundamental premise of the economy (Barman et al., 2014; Gezmen et al., 2015). Thus, the unit price (US\$/MT) of the exported fisheries products during the pandemic have drawn a clear graphical line, described in Figure 6 & 7, respectively. The findings of the current study have clearly presented that the unit price/value was comparatively high during the month of January to March (approx. 13-14 US\$/MT) in the year 2020 than the rest of the months, respectively. After that, during the first wave of COVID-19 (March to May), suddenly it

was decreased significantly and recorded the lowest unit price (near to 8 US\$/MT) in July 2020, which has been defined by a clear dash line (Figure 6). This unexpected situation arisen due to decreasing demands and supply chains both from international and domestic industries, respectively, which had been consistent according to the KII and FGDs during the study period. Therefore, shortage of raw materials and containers, increased shipment charges and even the cancellation of huge shipment orders directly affected both the demand and supply chain of exports, described in detail in the graphical Figure 8.



**Figure 6.** Unit price (USD/MT) of the exported products during 2020.



**Figure 7.** Unit price (USD/MT) of the exported products during 2021.

In contrast, the average decreasing trend of unit prices was sustained from March to July 2021, however, the overall unit price trend was in a growing trend, which has been expressed by a clear dash line in Figure 7. Therefore, the present findings are very clear to explain that pandemic has not only had an impact on aquatic organism export rates, but it has also had an impact on domestic fisheries and aquaculture facilities by reducing or eliminating demand from both foreign and domestic consumers. Thus, the current findings are very similar and supported by Can et al. (2020), in which they were

concerned and stated that if the pandemic is not controlled in some way, it will wreak havoc on the aquaculture and fishing industries. Hence, the real scenario of COVID-19 effects on the export fisheries of the southwest Bangladesh are presented by a clear graphical Figure 8, which was verified by the consistent source of KII, FGD etc.

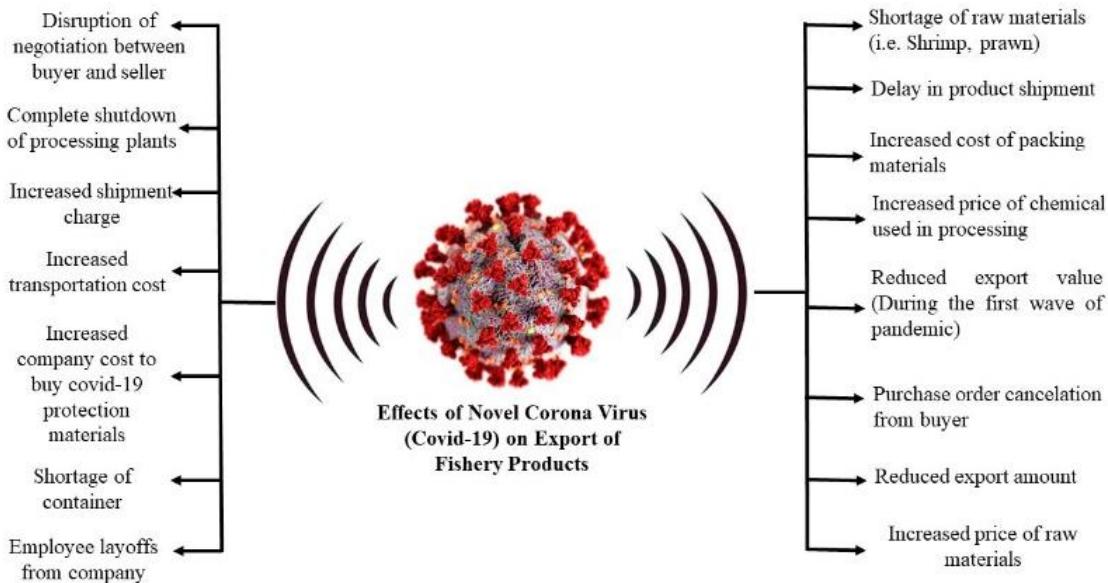


Figure 8. Effects of COVID-19 on export of fishery products from southwest Bangladesh (Source: FGD and KII).

### Conclusion and recommendations

The COVID-19 pandemic has wreaked havoc on Bangladesh's export fishery, as well as the country's overall domestic and foreign economy. Due to movement limitations, reduced purchasing power, and further impact on the most disadvantaged workers in export industries, food demand and supply chains are significantly hampered. Thus, any government action should be centered on protecting this vulnerable sector as well as people's food security, particularly among the disadvantaged, even though it may be damaging to economic growth in the short term. Boost shelf life of exported products to compete in international markets, increase raw material production (i.e., shrimp and prawn), and relaxation of restrictions on fisheries export products such as customs clearance flexibility and financing to lose-selling enterprises on simple terms during these unforeseen crises could help to improve the demand and supply chain of the export fisheries of Bangladesh. This paper will help to create clear scenarios for the export fisheries of Bangladesh affected by the COVID-19 pandemic, and will shed light on the domestic and international economic losses, which can be avoided by taking quick appropriate steps as well.

### Acknowledgment

The author wishes to acknowledge the officers of FIQC, Upazila Fisheries Officers (UFO), Industry managers and other stakeholders for their sincere support and cooperation in this research.

### Author's contribution

Md. Asadur Rahman: Design, formulation, field data collection, data analysis, review and writing of the manuscript. Md. Mehedi Alam: Review and writing of the manuscript. Sanzib Kumar Barman: Design, formulation, editing, review, and writing of the manuscript. Md. Jahid Hossain: Field data collection, review and writing of the manuscript. Kishor Kumar Tikadar: Review and writing of the manuscript.

### Competing interests

The authors have declared no competing interests exist in this research work.

### References

- Bari, R. and Sultana, F. 2021. Second Wave of COVID-19 in Bangladesh: An Integrated and Coordinated Set of Actions Is Crucial to Tackle Current Upsurge of Cases and Deaths. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.699918>
- Barman, P.P., Begum, R., Marine, S.S., Barman, S.K. and Barman, A.K. 2014. Fish marketing systems and socio-economic status of aratdar in Gaibandha district, Bangladesh. *Journal of Sylhet Agricultural University*, 1(2): 239-245.
- Belton, B., Rosen, L., Middleton, L., Ghazali, S., Mamun, A.A., Shieh, J., ... and Thilsted, S.H. 2021. COVID-19 impacts and adaptations in Asia and Africa's aquatic food value chains. *Marine Policy*, 129, 104523. <https://doi.org/10.1016/j.marpol.2021.104523>
- BFTI (Bangladesh foreign trade institute)., 2016. study on sector-based need assessment of business promotion council-fisheries products Kawran Bazar, Dhaka.
- Campbell, S.J., Jakub, R., Valdivia, A., Setiawan, H., Setiawan, A., Cox, C., ... and Box, S. 2021. Immediate impact of COVID-19 across tropical small-scale fishing communities. *Ocean & coastal management*, 200: 105485. <https://doi.org/10.1016/j.ocecoaman.2020.105485>
- Can, M.F., Şimşek, E., Demirci, A., Demirci, S. and Özkan, A. K. A. R. 2020. The evaluation of the early impacts of the COVID-19

- pandemic on the export of fishery commodities of Turkey. *Marine and Life Sciences*, 2(1): 18-27.
- DoF (Department of Fisheries)., 2020. Yearbook of Fisheries Statistics of Bangladesh, 2019-20. Fisheries Resources Survey System (FRSS), Department of Fisheries. Bangladesh: *Ministry of Fisheries and Livestock*, 2020. 37: 141p.
- FAO (Food and Agriculture Organization)., 2018. The state of world fisheries and aquaculture (opportunities and challenges) Food and Agricultural Organization of the United Nations, Rome, Italy.
- Gezmen, S., Şimşek, E. and Demirci, A. 2015. Evaluation of dynamics of fish retail trade in İskenderun. *Journal of Aquaculture Engineering and Fisheries Research*, 1(1): 33-44.  
<https://doi.org/10.3153/JAEFR15003>
- Ghose, B. 2014. Fisheries and aquaculture in Bangladesh: Challenges and opportunities. *Annals of Aquaculture and Research*, 1(1): 1-5.
- Haque, M.M., Alam, M.R., Alam, M.M., Basak, B., Sumi, K.R., Belton, B. and Murshed-E- Jahan, K. 2015. Integrated floating cage aquageoponics system (IFCAS): An innovation in fish and vegetable production for shaded ponds in Bangladesh. *Aquaculture Reports*, 2: 1-9.  
<https://doi.org/10.1016/j.aqrep.2015.04.002>
- Hasan, N.A., Heal, R.D., Bashar, A., Bablee, A.L. and Haque, M.M. 2021. Impacts of COVID- 19 on the finfish aquaculture industry of Bangladesh: a case study. *Marine Policy*, 130: 104577. <https://doi.org/10.1016/j.marpol.2021.104577>
- Love, D.C., Allison, E.H., Asche, F., Belton, B., Cottrell, R.S., Froehlich, H.E., ... and Zhang, W. 2021. Emerging COVID-19 impacts, responses, and lessons for building resilience in the seafood system. *Global Food Security*, 28: 100494.  
<https://doi.org/10.1016/j.gfs.2021.100494>
- Lu, H., Stratton, C.W. and Tang, Y.W. 2020. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *Journal of medical virology*, 92(4): 401.  
<https://doi.org/10.1002/jmv.25678>
- Mandal, S.C., Boidya, P., Haque, M.I.M., Hossain, A., Shams, Z. and Mamun, A.A. 2021. The impact of the COVID-19 pandemic on fish consumption and household food security in Dhaka city, Bangladesh. *Global Food Security*, 29: 100526.  
<https://doi.org/10.1016/j.gfs.2021.100526>
- Sanjee, S.A. and Karim, M. 2016. Microbiological quality assessment of frozen fish and fish processing materials from Bangladesh. *International journal of food science*.  
<https://doi.org/10.1155/2016/8605689>
- Shamsuzzaman, M.M., Islam, M.M., Tania, N.J., Al-Mamun, M.A., Barman, P.P. and Xu, X. 2017. Fisheries resources of Bangladesh: Present status and future direction. *Aquaculture and Fisheries*, 2(4): 145-156.  
<https://doi.org/10.1016/j.aaf.2017.03.006>
- Shamsuzzaman, M.M., Mozumder, M.M.H., Mitu, S.J., Ahamad, A.F. and Bhyuiyan, M.S. 2020. The economic contribution of fish and fish trade in Bangladesh. *Aquaculture and Fisheries*, 5(4): 174-181.  
<https://doi.org/10.1016/j.aaf.2020.01.001>
- Sunny, A.R., Mithun, M.H., Prodhan, S.H., Ashrafuzzaman, M., Rahman, S.M.A., Billah, M. M., Hussain, M., Ahmed, K.J., Sazzad, S.A., Alam, M.T., Rashid, A. and Hossain, M.M. 2021b. Fisheries in the context of attaining Sustainable Development Goals (SDGs) in Bangladesh: COVID-19 impacts and future prospects. *Sustainability*, 13(17): 9912.  
<https://doi.org/10.3390/su13179912>
- Sunny, A.R., Sazzad, S.A., Prodhan, S.H., Ashrafuzzaman, M., Datta, G.C., Sarker, A.K., Rahman, M. and Mithun, M.H. 2021a. Assessing impacts of COVID-19 on aquatic food system and small-scale fisheries in Bangladesh. *Marine Policy*, 126: 104422. <https://doi.org/10.1016/j.marpol.2021.104422>
- Tikadar, K.K., Kunda, M. and Mazumder, S.K. 2021. Diversity of fishery resources and catch efficiency of fishing gears in Gorai River, Bangladesh. *Heliyon*, 7(12): e08478.  
<https://doi.org/10.1016/j.heliyon.2021.e08478>