

Article

The COVID-19 as a Driver for Alternative Trade Networks in the Small-Scale Fisheries: Portugal as a Case Study

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Abstract: The fisheries industry has been one of the most immediate and severely impacted sectors by the COVID-19 pandemic and lockdowns in particular. This study aimed to gather detailed information about the new initiatives that, preferentially on an online basis, emerged worldwide to trade fish and seafood. A special focus was applied on the usefulness of the digital tools in Portugal, which was considered as a case study. From a global view, the European countries resulted in being especially active to launch nationwide campaigns promoting the domestic consumption of fishing products. A total of 122 digital initiatives, distributed among 48 countries, mainly in America, Southern Europe, southeast Asia, and Oceania, were recorded all over the world to sell fish and seafood. Social media (33.6%), mainly through Facebook, WhatsApp, phone, and e-mail (25.4%) were the main channels used for this purpose. In Portugal, the entity responsible for the first-sale of fishing products allowed free access to the five online auctions that operate nowadays in this country. As expected, in 2020, this digital space experienced an increase in both users (94%) and volume of traded products (121%) compared to the previous year. Moreover, eight Portuguese online shops specializing in fresh fish and seafood, operating exclusively on an online basis, were identified in this study. In general, all of them reported an increase in new users during the first lockdown and were required to recruit additional employees to fulfil the added demand. In parallel, questionnaire surveys conducted in this study revealed that only 33% of the Portuguese fisher associations and producers organizations looked for new technologies as a valuable tool during the pandemic situation, being significantly more valued in the Northern region compared to the rest of the country. Aligned with this perception, 57% of fisher trainees in the Northern coast of Portugal opined that the pandemic changed their view on how the fishing catches can be traded, one way being the use of digital tools considered by the majority as an asset to face the arisen challenges. In conclusion, the key role globally played by digital tools to overcome many of the limitations posed by the pandemic, particularly for the small-scale fisheries, is evident. This recent open-minded environment for technological transition is an undoubted advantage for the future generation of fishers to modernize the classic trade channels into more functionally diversified supply chains.

Keywords: COVID-19; small-scale fisheries; digital solutions; e-commerce; Portugal



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1. Introduction

The current COVID-19 pandemic, caused by the SARS-CoV-2 coronavirus and sustained through human-to-human transmission, emerged in late 2019 in a fresh food market in Wuhan, China [1,2]. Because of the intense spread of the virus, with the coronavirus illness impacting over 110 countries and territories, the World Health Organization decided, on 11 March 2020, to state the current situation as a global pandemic [3–5]. Worldwide containment measures, such as travel and trade restrictions, business and school closures,

and the ban of public events and social gatherings, were then adopted [6]. This dramatic scenario has triggered a massive social and economic crisis [7–9], which has forced governments to take management actions directly focused on counteracting its subsequent negative impacts [10,11].

Fisheries may be considered one of the most immediate and severely impacted sectors during the containment periods, due to their high dependence on both exportations and the HORECA channel (comprising hotels, restaurants, and catering services). Actually, each stage of the fish and seafood supply chain has been particularly vulnerable to the disruptions imposed by the COVID-19 measures [12]. In a worldwide context, until the pandemic arose, the global production, trade, and consumption of fish and seafood had gradually increased throughout the previous decades, with total fisheries production reaching the highest level ever recorded in 2018 [13]. In contrast, the pandemic year of 2020 entailed a general decrease in the fish and seafood supply, consumption, and trade revenues [12,14]. According to estimates, the traded volume of fish and seafood declined by 3.2% in comparison with the pre-pandemic year, while the global consumption of fish dropped to 19.8 kg per capita [15], equalling levels reported prior to 2014 [16]. Furthermore, the number of industrial active fishing vessels in 2020 decreased by 9% compared to the previous year, with the highest declines in China and Europe [17], due to their severe lockdowns. In the case of small-scale fisheries (SSF), segmentation was established by vessels with less than 12 m in overall length [18] and that represents about 90% of the workers directly engaged in fisheries [19]. The impacts derived from the pandemic were particularly damaging in developing nations [12,20]. In such countries, the livelihood of the fishing communities often suffered critical disruptions that increased both food insecurity and malnutrition, especially among communities considered to be fish-dependent in terms of animal protein and micronutrients supply [12,21]. In this regard, particularly bleak was the case of Indonesia, where the number of active fishers and traders declined more than 90% [22]. For their part, the sales of fresh fish and seafood from small-scale fishers in developed countries such as France, Italy, and Spain decreased by 30% [12]. Specifically, in Portugal, the fish and seafood catches experienced a drop of 13%, reaching the lowest value ever registered (the systematic recording procedure in this country started in 1969) [23]. This data set demonstrates the huge impact caused by the pandemic circumstances on the SSF, a socioeconomic activity with a high worldwide relevance [24–26]. Thus, it is especially recommended to address studies about the new strategies that worldwide fishers and vendors carried out to face the above challenging circumstances, mainly as an attempt to foresee future marketing trends and potential sale channels.

In Portugal, the fishing fleet constituted of vessels with less than 12 m comprised 84.4% of the fisheries licenses in 2020 [23], playing a key social and cultural role at a regional level [27,28]. The extensive Portuguese coastline characterizes the historical and socioeconomic importance of this industry, which still counts with well-established traditional fishing communities. In terms of consumption habits, the Portuguese population is clearly inclined to consume fish and seafood, as demonstrated by the 56.8 kg consumed per person in 2017, over twice the average recorded in the European Union (24.3 kg) [29]. Nonetheless, according to ALIF (Associação da Indústria Alimentar pelo Frio) (personal communication), the trade of fresh fish and seafood was deeply impacted in Portugal, decreasing about 60% over the first period of lockdown that occurred between March and May 2020. The closure of the HORECA channel, along with the cancelation of fish festivals and promotion events, led to a lack of buyers at the first-sale markets followed by a price decrease for high-value species [30,31]. Although the household consumption of fish and seafood increased by 6% from 2019 to 2020 [32], it was not enough to offset the decline associated with the out-of-home consumption [33]. In light of such uncertainty, and similarly to the rest of the world, fishers and other players involved in the supply chain had to adapt to the new scenario, focusing their efforts on innovative solutions to reach the end-buyer.

To the best of our knowledge, no studies have been reported to date about alternative strategies tackled by the SSF during the pandemic. In this vein, the overall objective of the present study was to gather detailed and reliable information about the initiatives that, impelled by COVID-19 (and the first lockdown in particular), globally emerged to trade fish and seafood, emphasizing those with an online basis. In such a way, those approaches that globally relied on a technological basis were collected by an extensive web search. A particular focus was applied to Portugal, which was taken as a case study. The mitigation measures adopted by this country regarding the first-sale market of fishing products were analysed, also paying special attention to the performance of the online auctions during the pandemic period. Moreover, the activity of the national online fishmongers was assessed in order to better understand the effect of the first lockdown on the sectoral e-commerce. In parallel, questionnaire surveys were conducted to understand the willingness of fishers and training fishers to incorporate digital tools in their professional routine. Finally, the potential of such technology to evolve the fish and seafood trade in the near future, in terms of efficiency and transparency, is discussed.

2. Methodology

2.1. Search for Digital Initiatives

A web search was initially carried out in order to determine which nationwide campaigns were globally conducted by the appropriate governmental entities to promote the domestic consumption of fishing products. Furthermore, the digital initiatives globally arisen to trade fish and seafood were also analysed. In both search processes, relevant keywords in search engines, and databases such as Google Scholar and Web of Science, were used to look for specific scientific literature, official statistics, and policy reports published between April 2020 and April 2021. News articles and social media were also considered for this purpose due to the informal nature of the solutions that emerged. Thus, a list of digital coping strategies modulated by COVID-19 to trade fish and seafood was recorded into a table and later organized according to type of initiative and country, across all continents. Countries were marked on a map and the new-found approaches were depicted in a graph according to its respective category: website, application, social media or network, WhatsApp, phone or email, and platforms not specified.

2.2. Fish and Seafood E-Commerce in Portugal

Three different channels—official online auctions, online fishmongers, and app-based fishing e-marketplaces—already existing by the time the pandemic emerged were considered to analyse in detail the role played by Portuguese e-commerce to trade fishing products. The respective evolutions of the five national online auctions, Matosinhos, Figueira da Foz, Peniche, Sesimbra, and Portimão were analysed from 2018 to 2020 in terms of annual users and sales volume. The data were provided by the Statistical Service of Docapesca—Portos e Lotas, S.A., the official entity responsible for the online auctions in Portugal.

An independent web search, following the above methodology, was performed with the aim to determine the current online Portuguese fishmongers ($N = 8$). Because of their key role in fish and seafood e-commerce, the impact of the pandemic in their businesses was assessed and later summarized in a table. Five different issues were considered: (1) creation of e-marketplace, (2) number of customers, (3) fidelity of customers, (4) distribution area, and (5) staff recruitment. For this purpose, a custom-made questionnaire based on multiple-choice questions was applied by phone and e-mail between January and April 2021. The information extracted from questionnaires was finally complemented by the available literature in newspaper reports and social media.

Regarding the only app-based fishing e-marketplace existing in Portugal until 2021 (named Lota Digital), information on users registered in previous years was provided by the CEO of the company responsible for the app during a meeting held in April 2021, under a cooperation protocol.

2.3. National Survey Approach

An online survey was carried out to determine fisher associations' (N = 23) and producer organizations' (N = 4) perceptions regarding the usefulness of digital tools to trade fishing catches during the COVID-19 containment. Such stakeholders were settled along the entire Portuguese continental coastline. As a function of their respective locations, they were arranged in two different groups: north region (N = 13) and centre and south regions (N = 14). The questionnaire constituted of multiple-choice questions, created through the Google Forms platform, and were later disseminated by e-mail to their representatives. The survey was conducted between June and October 2020, with interviewer support provided by phone when needed. Specifically, participants were asked whether the digital tools were an asset for the fishing trade during the first lockdown. Moreover, fishers were encouraged to report any trading adaptations that they had adopted as a direct consequence of the national COVID-19 lockdown.

Aiming towards a similar goal, a second survey targeting fisher trainees (N = 53) was carried out during the same period. Such a survey occurred in cooperation with FOR-MAR (Fishing and Sea Professional Training Centre), the Portuguese institution responsible for national fishing training courses. The questionnaire contained multiple-choice questions and was conducted face-to-face in the Northern coast of Portugal, namely between Ílhavo and Póvoa de Varzim.

Both surveys were accompanied with an information letter about the study aims. By filling the questionnaires, the participants agreed to participate in anonymity.

2.4. Statistical Analyses

Results achieved from the questionnaire survey conducted in collaboration with the fisher associations and producer organizations were subjected to statistical analyses using the software SPSS Statistics 27.0.1 (IBM Corporation, New York, NY, USA) [34]. As described, two geographic regions were considered: the north region and the centre and south regions. All data were initially arranged in contingency tables and the non-parametric Fisher–Freeman–Halton exact test (2×3 contingency table) and Fisher's exact test (2×2 contingency tables) were applied. Statistically significant differences among the studied groups were accepted when $p < 0.05$.

3. Results and Discussion

3.1. Worldwide Trade

The European countries, particularly those with high values of fish consumption per habitant, such as Portugal, Spain, France, Italy, and Ireland, were the most outstanding at promoting the domestic consumption of fish and seafood during the COVID-19 lockdown (Table 1). Especially noticeable was the role played by Spain, which launched several regional campaigns across its territory (Table 1). Moreover, as expected, the European Commission also carried out a sectoral campaign, especially focused on raising citizen awareness about the local, seasonal, and sustainable consumption of fish and seafood [35]. In this regard, Argentina, Costa Rica, Peru, and Italy also aimed to support the local fishers through direct sales programs during the COVID-19 outbreak (Table 1). Likewise, in the United Kingdom, the Fishmongers' Company's Fisheries Charitable Trust partnered with The Seafarers' Charity funded grant projects that valued the creation of digital solutions to support new fish and seafood markets [36,37]. Recent data have shown that the digital campaign launched in the USA (under the promotional slogan: Eat Seafood America) achieved an investment return up to 800%, with a relevant increase of fish and seafood sales [38].

In overall terms, the applied contingency plans encouraged worldwide fishing workers to participate in initiatives based on direct sales, that being the digital platforms massively used for that purpose. Specifically, a total of 122 digital trading adaptations to sell fish and seafood during the 2020 lockdown were recorded around the world (see Appendix A). Such adaptations were distributed among 48 countries, mainly in America, Southern Europe,

southeast Asia, and Oceania, which are linked to high fish and seafood consumption patterns (Figure 1). The channel used by fishers, fish vendors, and governmental and non-governmental organizations to carry out such initiatives is depicted in Figure 2. Social media (33.6%), mainly through Facebook, WhatsApp, phone, and e-mail (25.4%), were the preferred channels used by fishers, being present in at least 41 and 31 countries, respectively. Furthermore, up to eight new mobile apps were created as an attempt to help the small-scale fishers to sell their own catches or, alternatively, to promote the e-commerce of fish and seafood (see Appendix A). In terms of new websites, and even assuming that a few were exclusively used as a simple contact database of fishers, fish farmers, fish vendors, and (online) fish markets, a total of 26 were operational during the pandemic, with Malaysia, the United Kingdom, and the USA leading the use of this type of channel (see Appendix A).

Table 1. Governmental campaigns (2020–2021) that arose during the pandemic to promote the domestic consumption of fish and seafood (1) and to support fishers through direct sales programs (2).

Campaign Name	Country	Source
Sea for Yourself (1)	United Kingdom	[39]
Pisciculteurs de France (1)	France	[40]
Eat More Fish (1)	Ireland	[41]
Prefira Pescado Português (1)	Portugal	[42]
Fruto del Mar (1)	Spain	[43]
Y tú has pescado hoy? (1)	Spain	[44]
Pescas la idea? (1)	Spain	[45]
Taste the Ocean (1)	European Commission	[46]
Great Australia Seafood Easy As (1)	Australia	[47]
Eat Seafood America (1)	USA	[48]
Pescados Argentinos: Sabores que te hacen bien! (1)	Argentina	[49]
Sosteniamo Pescatori e Acquacoltori (2)	Italy	[50]
Comé rico, comé sano, comé pescado y marisco Costarricense (2)	Costa Rica	[51]
Del Mar al Comedor, Contigo mi Pescador (2)	Peru	[52]

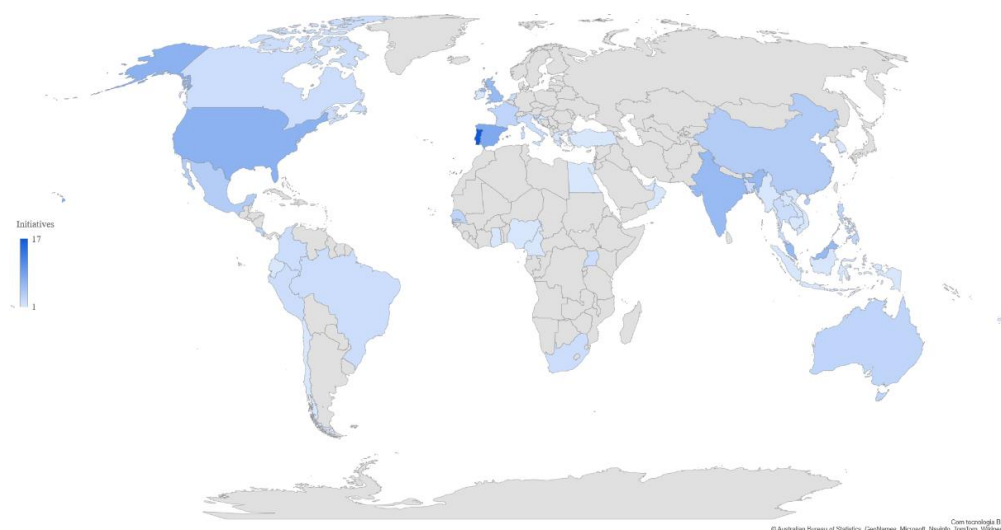


Figure 1. Global occurrence of new digital initiatives (n) to sell fish and seafood (countries in blue) during the COVID-19 pandemic. (Source: Appendix A).

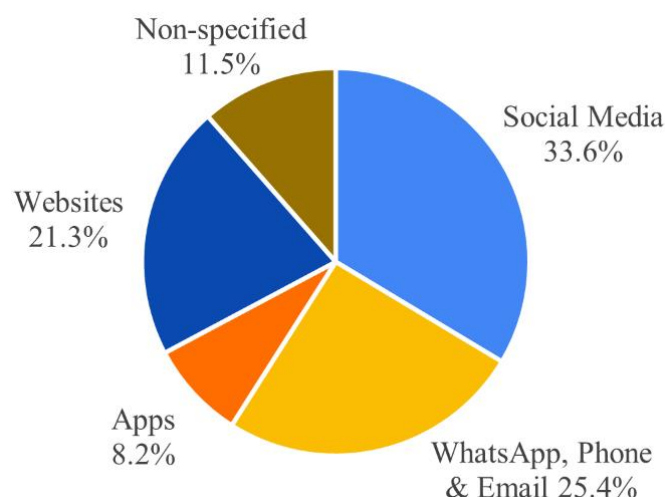


Figure 2. Digital trade initiatives to sell fish and seafood, arranged according to type of channel, that arose in 2020 during the COVID-19 lockdown. (Source: Appendix A).

A very interesting point that may be inferred from the presented data is the fact that, during the pandemic, similar initiatives and adaptations arose in both developed and developing countries, despite the structural differences existing among them. Regarding the low-income countries, a great asymmetry between Latin America and Africa and the Middle-East was however achieved. In Latin America, the governments recognized the importance of the SSF and decidedly promoted the use of online sales platforms [53,54]. As a consequence, this enhanced the weight of Latin countries within the worldwide digital trade scenario. In contrast, the situation in certain countries of Africa and Asia is much more complex, particularly in small rural areas. In such regions, the scarce affordability of technological equipment (e.g., smartphones) by the local population, along with severe structural handicaps related to the inexistence of mobile coverage or even electricity [55], are major issues that largely prevent the implementation of digital solutions to trade fishing products. Thus, once the COVID-19 lockdown started, fishing activity was temporarily suspended due to different reasons—either by governmental decree, fishers strikes, or inability to sell daily catches due to lack of buyers—in countries like Tunisia [12], São Tomé and Príncipe [56], Namibia [57], Mayotte [58], Madagascar [59], Sierra Leone, and Mauritania [60]. Moreover, in Kenya [61], Mozambique [62,63], and Seychelles [64], which are countries highly dependent on fish and seafood exports and the tourism industry, direct sales could not be considered an effective option because of the scarce buying power of domestic consumers.

Interestingly, consumers from emerging economies have been revealed as being more prone to increase their online shopping in the near future [65]. In this regard, Colombia, Argentina, Senegal, Rwanda, Indonesia, and Myanmar leveraged programs to expedite digitalization and e-commerce across their populations during the pandemic [66]. In overall terms, the COVID-19 pandemic triggered, undoubtedly, a global digital transformation, with food and beverage as the most actively demanded category among the online users [65]. The available data confirm the significant increase in the e-commerce of fish and seafood during this crisis all over the world, but especially in southeast Asia [67,68], the USA, whose e-sales volume tripled in 2020 [69], and even Europe, where the sale of fishing products have been slower to move online compared to other food categories [70]. Notwithstanding this success, it should not be forgotten that the digitalization of the sector must include an adequate training policy for human resources regarding IT literacy, aiming to equip fishers and vendors with the right skills and motivation. This technology revolution, once implemented, may decisively help to support the sustainability of the SSF, not only improving the catches traceability [71,72] but also preventing fishers from engaging in unreported or unregulated fishing.

3.2. Adaptations and Initiatives in the Portuguese Fish and Seafood Sale Network

As referred to above, Docapesca—Portos e Lotas, S.A. is the national entity responsible for managing the first-sale of fishing products in continental Portugal. In light of the declared pandemic situation, this institution established a contingency plan, adopting special measures to cope with the challenges posed by the new context. Thus, during the first national lockdown, Docapesca was compelled to reduce the working hours at certain physical first-sale markets. As an example, the first-sale market of Olhão (south), reduced the number of auctions per day, while in other locations like Vila do Conde (north), Figueira da Foz (centre), Albufeira, and Vila Real de Santo António (south), preferred completely to cancel their auctions for a few days a week [73]. In parallel, free access was granted to the five national online auctions taking place in the first-sale markets of Matosinhos (north), Figueira da Foz, Peniche, and Sesimbra (centre), and Portimão (south) [74]. In this regard, in 2020, the whole of online auctions registered an increase of 94% in users compared to the previous year (Figure 3), not only overcoming the drop suffered between 2018 and 2019 but, even more importantly, categorically demonstrating the acceptance of this tool during the pandemic. Consistently, the total amount of fishing products traded (kg) through such online auctions increased by 121% between 2019 and 2020 (Figure 4). Nevertheless, in terms of economic value, the total sales volume only rose by 58% in this same period (Figure 5), revealing a drop in the average price of the traded fishing product (EUR). Especially noticeable was the performance of the first-sale market of Peniche, which although in 2020 was ranked in second position in terms of nominal catches [23], led the online auctions in both registered users and transactions. In contrast, Matosinhos, whose fishing port is regularly ranked in the top three at a national level [23], did not register any online user during the considered period. In this regard, results are based on the data made available to the authors, and other causes not identified by the authors, for such a null contribution, must not be discarded.

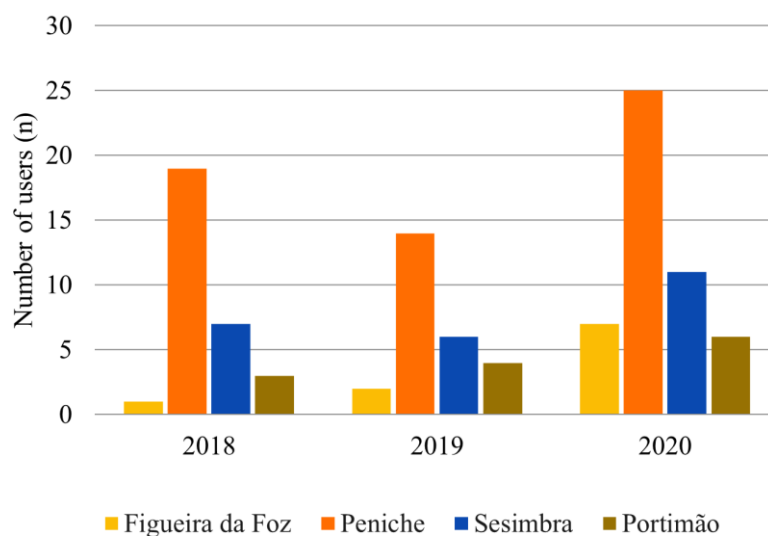


Figure 3. Total number of users (n) registered in the online auctions managed by Docapesca—Portos e Lotas, S.A. from 2018 to 2020.

Regarding the market adaptations made to trade fishing products, two initiatives that have arisen in the Northern region achieved favourable results and deserve to be mentioned. Firstly, local fishers in Castelo do Neiva sold their daily catches directly to the final consumers (personal communication), due to the official suspension of the auction activity in this village. On the other hand, and with the collaboration of the local fishers association, the first-sale market of Esposende had to assume a forced online character, being the fish auction performed through the Facebook social network [75]. Aligned with this digital innovation, a total of eight Portuguese online shops specializing in fresh fish and seafood, targeting the end-buyer and operating exclusively on an online basis, were

identified in this study (Table 2). Six of them were based in the centre and south regions of continental Portugal, one in the Azores, and the other in Madeira archipelago. It is necessary to notice that half of those online fishmongers were already operating in pre-pandemic conditions. Therefore, only four of them, whose sale strategies were essentially based in the HORECA channels and the grocery industry, actually created new online fishmongers to reach the final consumers. In general, all of them reported an increase in new users during the first lockdown, implying a higher demand of their products and, consequently, a positive impact on the direct benefits of their commercial activities [76,77]. This fact is corroborated by a study from the Portuguese Post Office, which revealed that the trade of “fresh products” was among the ones that showed the greatest growth during the first three months of the pandemic [78]. Thus, it seems evident that the Portuguese traditional fishmongers had to adapt their classic business models in order to reduce the impacts posed by circulation restrictions, adopting, in many cases, innovative strategies to reach the end customers. Throughout the entire country, they bet through digital platforms, home-delivery, and customized services, starting to receive orders by mobile phone, WhatsApp, or email, or even by social networks such as Facebook and Instagram (see Appendix A).

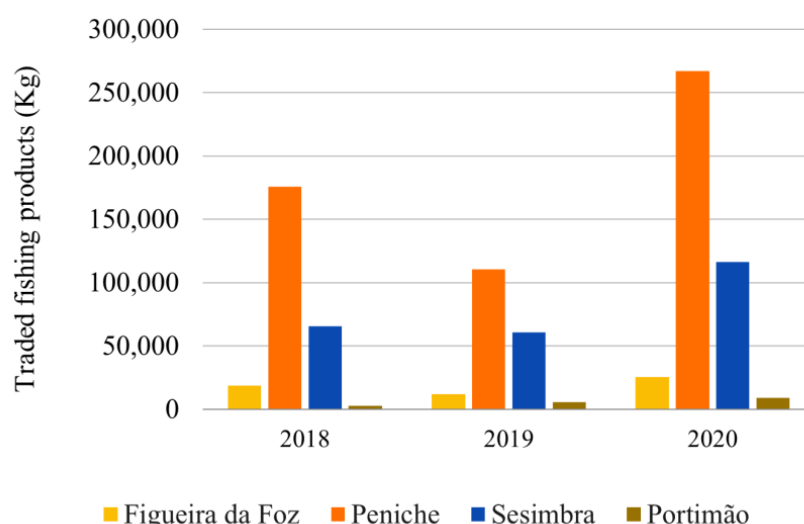


Figure 4. Amount of fishing products (kg) sold in the online auctions managed by Docapesca—Portos e Lotas, S.A. from 2018 to 2020.

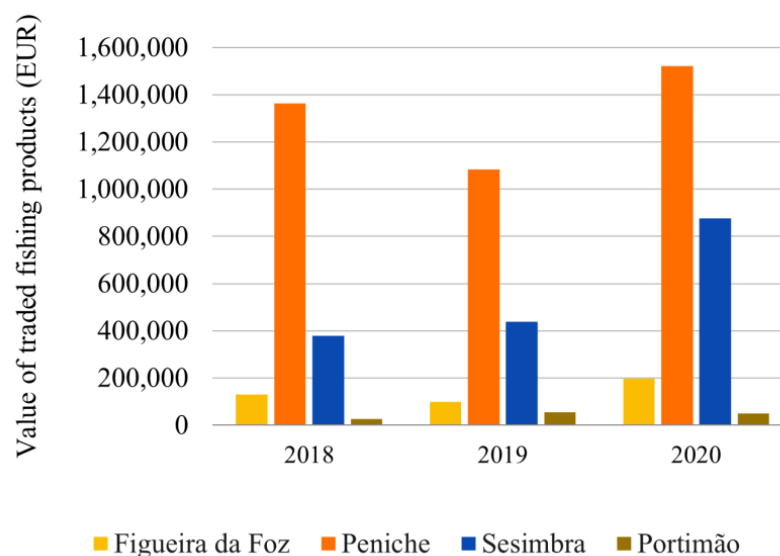


Figure 5. Value of the fishing products (EUR) sold in the online auctions managed by Docapesca—Portos e Lotas, S.A. from 2018 to 2020.

Table 2. Assessment of impacts caused by the pandemic on the business of Portuguese online fishmongers.

Company Name	Creation of a New E-Marketplace	Increased Number of Costumers	Fidelity of New Costumers	Increased Distribution Area	Hired More Staff
Interviewed by phone					
“Peixinho da Lota”		x	x	x	
“Saber a Mar”	x	x		x	
“Cabaz do Peixe”		x	x		
“Cabaz Fresco Mar”		x	x		x
Source: news articles					
“Fat Tuna”	x				x
“Vidinha à Mesa”	x				
“O melhor peixe do mundo”		x	x		
“Nutrifresco”	x				

Driven by this changing environment, the performance during the pandemic of the app Lota Digital (<https://lotadigital.com/>, accessed on 17 September 2021), a technological solution used in Peniche (centre of Portugal) and consisting of a first-sale market that allows users to sell the fishing catches before landing, must be highlighted as a real success. This app was launched in 2019 and, notwithstanding the initial poor engagement of fishers, more than tripled the number of registered fishers in 2020, once the lockdown altered the established classic channel of first-sales (personal communication). The results presented in this work show, however, the great heterogeneity existing in Portugal in the matter of digital trade of fresh fish and seafood. Considering that most of the e-commerce initiatives and online auctions were concentrated in the centre and south regions, a greater effort must be sustained in the near future to promote digital solutions minimizing the technological gap within its territory.

3.3. Stakeholder Survey

Only 33% of the Portuguese fisher associations and producers organizations that participated in our survey considered the new technologies as a valuable tool during the pandemic situation (Figure 6). Regarding this question, the proportion of affirmative responses was higher in the north region compared to the rest of the country (46% vs. 21%, respectively) (Figure 6). Similarly, significant differences were found when participants answered questions about eventual fish and seafood trading adaptations that occurred during the pandemic period. In the north region, 38% of respondents recognised an increase in direct sales from fishers to the end consumer ($p < 0.05$), also being conscious of the creation of new sale channels specifically promoted by small-scale fishers and supported by local radios and social networks (Figure 7). In contrast, the responses given by the associations and producers organizations placed in the centre and south regions were surprisingly negative (null value in both questions) (Figure 7). The marked differences found between regions might be due not only to intrinsic characteristics of the population, modulating the consequent consumer profile, but also to the high legal heterogeneity that rules the fishing products first-sales in Portugal. For instance, in Northern small towns, such as Vila Praia de Âncora, Apúlia, and Vila do Conde, the first-sales of fishing products are subjected to an exception regime [79] that allows the fishers to sell their own catches. As a consequence, these local fishers are largely used to directly trade their catches, having a wide and well-known network of customers that could be easily reached by phone or WhatsApp once the fishing market is closed.

Fisher trainees' perceptions of the use of digital tools to sell fishing products during the COVID-19 lockdown is shown in Figure 8. One of the most interesting results achieved in this additional survey is that 57% of respondents reported that the pandemic changed their view about how fishing catches can be traded. Moreover, 67% considered the use of digital tools as an asset to face the challenges that arose from the pandemic (Figure 8).

Especially noticeable is the fact that 47% recognized the advantage to regulate and sell catches before landing (Figure 8). In agreement with this perception, the great performance of the app Lota Digital during the first nationwide lockdown confirms that fishers benefited from this first-sale e-market. This app evolved to the recently launched official program “Leilão a Bordo—Inboard Auction” [80], promoted by Docapesca—Portos e Lotas, S.A., which intends to implement it at a national level by 2023. According to the heterogeneity of local approaches that we found, and considering that the app focuses on the first-sale market, it will be very interesting to study the acceptance and performance it will have among the fishing communities, particularly the ones settled in Northern Portugal. Be that as it may, although the small-scale fishers have not been particularly keen to use digital tools in a professional context to date, it is evident that the pandemic has created an open-minded environment for technological transition, which, as our survey points out, should be tackled by the future generation of fishers.

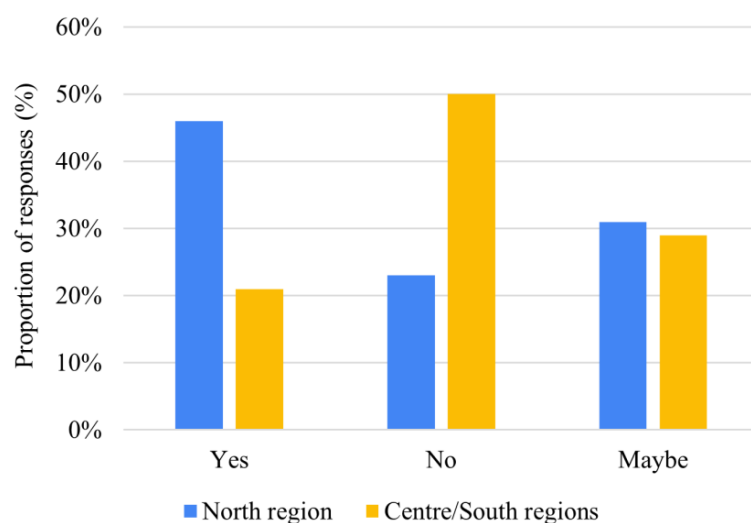


Figure 6. Perceptions of fisher associations and producer organizations located in the north region (N = 13) and centre and south regions (N = 14) of continental Portugal, considering “the use of digital tools constituted an asset to trade fishing catches during the COVID-19 lockdown”.

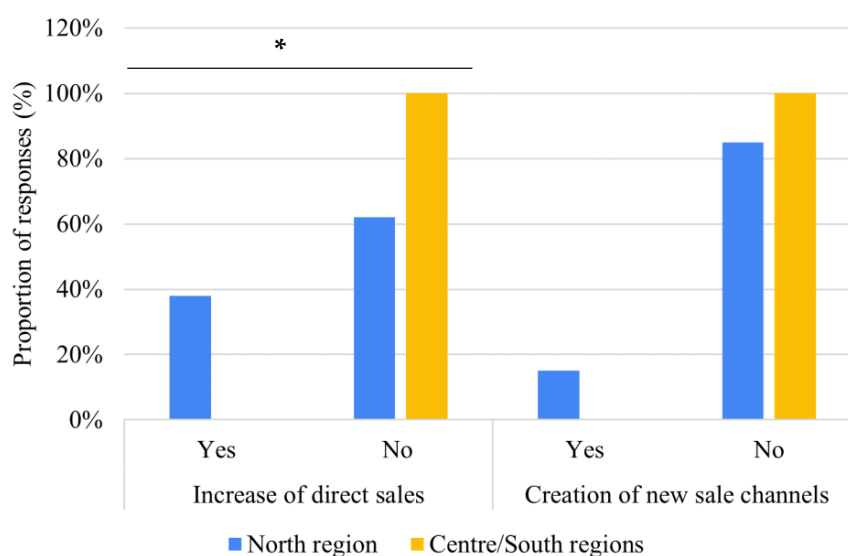


Figure 7. Perceptions of fisher associations and producer organizations located in the north region (N = 13) and the centre and south regions (N = 14) of continental Portugal, considering the “changes in the trade of fishing catches during the COVID-19 lockdown”. * Means significant differences ($p < 0.05$) between the north region and the centre and south regions.

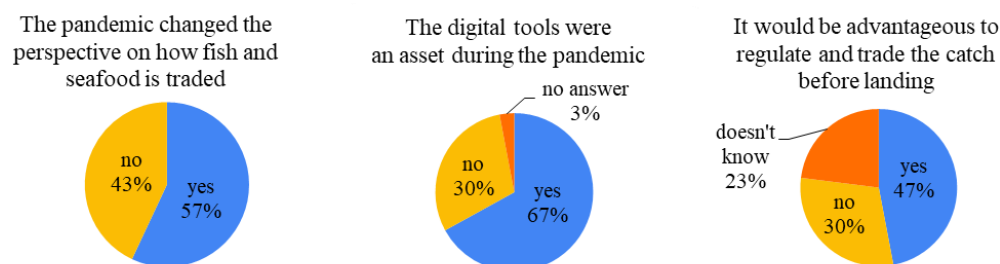


Figure 8. Perceptions of fisher trainees (N = 53) in the Portuguese north region, considering the use of digital tools to sell fishing catches during the COVID-19 pandemic.

4. Conclusions

The lockdown caused by the COVID-19 pandemic situation led the fishing sector to develop new marketing approaches and sales channels to trade the fishing products. From a global view, a total of 122 initiatives, distributed among 48 countries, aimed to shorten the supply chains by digitally mediated direct sales. Social media, mainly through the Facebook social networks, and WhatsApp, phone, and e-mail were the main channels used for this purpose. In Portugal, the adopted solutions by the public institutions were in line with the international literature. Especially noticeable was the huge increase in both users and the number of traded products experienced in 2020 by the digital channel responsible for the first-sale online auctions in this country. Moreover, our research identified up to eight Portuguese specialized fishmongers operating exclusively on an online basis, which also increased the record of new users during the first lockdown. Questionnaire surveys revealed that 46% of the Portuguese fisher associations and producers organizations based in the north region considered the new technologies as valuable tools during the pandemic situation, with more than half of inquired fisher trainees also opining that the pandemic changed their view about how the fishing catches can be traded. In summary, the present study demonstrates the digital transformation that was globally triggered by the pandemic to trade fresh fish and seafood. This recent willingness to use technology should definitely play a pivotal role in the modernization process that the SSF needs to address in the near future. Further studies will be needed in the short term to analyse the impacts of such a transformation on the small-scale fishers all over the world, paying particular attention to what extent the equal opportunities to benefit from this technological transition is being ensured in developing countries.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. List of countries and digital tools used as alternatives for fish commerce during the COVID-19 pandemic.

Country	Initiative	Source/References
Australia	Facebook “Wynyard Rock Lobster”	Wynyard Rock Lobster Facebook Page. https://www.facebook.com/WesternRockLobster/ (accessed on 14 April 2020). Ogier, E.; Sen, S.; Jennings, S.; Magnusson, A.; Smith, D.C.; Colquhoun, E.; Rust, S.; Morison, J. Impacts of COVID-19 on the Australian Seafood Industry: January–June 2020. FRDC 2016-128, Canberra, AU, 2021, 66 pp. Available online: https://www.frdc.com.au/Archived-Reports/FRDC%20Projects/2016-128-Product-Impacts-COVID19-Report-01Mar2021.pdf (accessed on 23 March 2021); Rimrod, F. Crayfish to be sold direct from boats to consumers in bid to combat COVID-19 slump. <i>WAtoday</i> , 15 September 2020. https://www.watoday.com.au/national/western-australia/crayfish-to-be-sold-direct-from-boats-to-consumers-in-bid-to-combat-covid-19-slump-20200915-p55vqi.html (accessed on 20 May 2021); Jambor, C.; Jeffery C. Seafood industry moves online to stay afloat as COVID-19 launches fishes into uncharted waters. <i>ABC News</i> , 10 April 2020. https://www.abc.net.au/news/2020-04-10/seafood-industry-moves-online-to-stay-afloat-during-covid-19/12137598 (accessed on 23 March 2021).
	Non-specified channels	Islam M.Z. Digitalisation comes to bereft farmers’ rescue. <i>The Daily Star</i> , 21 April 2020. https://www.thedailystar.net/business/news/digitalisation-comes-bereft-farmers-rescue-1895134 (accessed on 12 May 2021); The Fish Tank. Fish and Aquatic Food Systems COVID-19 Updates: Bangladesh. <i>World Fish Center</i> , 5 May 2020. http://blog.worldfishcenter.org/2020/05/covid-19-updates-bangladesh/ (accessed on 12 May 2021).
Bangladesh	Non-specified channel	Anthony Samy S.M. Digital Transformation in the Asia Pacific Region - International Webinar: The Impacts of COVID-19 on Fish Trade, October 2020. Available online: http://www.fao.org/3/cb1845en/cb1845en.pdf (accessed on 23 March 2021); LinkedIn Page. https://bd.linkedin.com/in/m-d-5735b1b9?trk=public_profile_samename_profile_profile-result-card_result-card_full-click (accessed on 21 February 2021).
	Social media n.d.	Ndum, A.M.; Brito, B.M.; Monefa, M.; Jaia, P.S.; Miah, R.; Leis, M.; Eyng, V. Fish chain interrupted: How COVID-19 affects markets and trades. OFI Governance research, 2020. Available online: https://www.ofigovernance.net/covid-19-access-to-markets (accessed on 23 February 2021).
Brazil	WhatsApp	Globo G1 Amazonas News. ADS divulga contato de piscicultores e frigoríficos com peixes para pronta-entrega em Manaus. April 3, 2020. https://g1.globo.com/am/amazonas/noticia/2020/04/03/ads-divulga-contato-de-piscicultores-e-frigorificos-com-peixes-para-pronta-entrega-em-manaus.ghtml (accessed on 23 March 2021).
	Website (with contacts)	Food and Agriculture Organization. O The impact of COVID-19 on fisheries and aquaculture food systems, possible responses. 2021. FAO Information paper, November 2020. Rome, 35p. Available online: https://doi.org/10.4060/cb2537en (accessed on 23 March 2021).
Cambodia	Non-specified channels	O’Leary M. African women join forces to overcome COVID-19 challenges in aquatic food systems. <i>WorldFish</i> , 3 May 2021. Retrieved from http://www.worldfishcenter.org/story/african-women-join-forces-overcome-covid-19-challenges-aquatic-food-systems (accessed on May 2021).
Cameroon	Phone	

Table A1. Cont.

Country	Initiative	Source/References
Canada	Facebook and Instagram	Ndum, A.M.; Brito, B.M.; Monefa, M.; Jaia, P.S.; Miah, R.; Leis, M.; Eyng, V. Fish chain interrupted: How COVID-19 affects markets and trades. OFI Governance research, 2020. Available online: https://www.ofigovernance.net/covid-19-access-to-markets (accessed on 23 March 2021); Smith, E. Nova Scotia: Lunenburg lobster captain sells directly to consumers to stay afloat during COVID-19. <i>Canadian Broadcasting Corporation CBC</i> , 6 April 2020. https://www.cbc.ca/news/canada/nova-scotia/gail-atkinson-lobster-fishery-covid-19-nova-scotia-1.5523635 (accessed on 23 February 2021).
Chile	Website “Caleta en Línea”	Innovación Chilena. “Caleta en línea”, el nuevo portal para comprar directo a los pescadores artesanales. 24 December 2020. https://innovacionchilena.cl/caleta-en-linea-el-nuevo-portal-para-comprar-pescado-a-pescadores-artesanales/ (accessed on 12 April 2021).
China	WhatsApp and App	Tang, Y.; Zhang, Y.; Sun, Y.; Yang, H.; Zhang, Y. Provisions for trade of fish and fish products in trade agreements in times of crisis and pandemic: recommendations for negotiation and capacity building. 20 October 2020. https://www.unescap.org/sites/default/files/20%20Final-Team%20Tang%20Yi-China.pdf (accessed on 18 June 2021).
	Website and TikTok	China Blue Sustainability Institute. Voice of China Fishery Vol. 01, 13 May 2020. http://www.chinabluesustainability.org/?p=3693&lang=en (accessed on 23 May 2021); Personal communication with China Blue Sustainability Institute in 27 May 2021.
Colombia	Facebook and Instagram	Núñez, E.B. Resiliencia Taganguera: La venta de pescado por las redes sociales. <i>Hoy Diario del Magdalena</i> , 31 May 2020. https://www.hoydiariodelmagdalena.com.co/archivos/372424 (accessed on 12 April 2021); Urieles, R. Taganga, pueblo de pescadores que por la pandemia volvió a sus raíces. <i>El Tiempo</i> , 24 June 2020. https://www.eltiempo.com/colombia/otras-ciudades/cuarentena-en-colombia-en-taganga-vuelven-a-la-pesca-durante-la-pandemia-510684 (accessed on 12 April 2021).
Costa Rica	Facebook “Mercado del Mar” App and Website “Buy-SME”	Mercado del Mar Facebook Page. https://es-es.facebook.com/mercadodmar (accessed on 25 February 2021). United Nations Conference on Trade and Development. COVID-19 and e-commerce: a global review. United Nations, Geneva, March, 2021. Available online: https://unctad.org/system/files/official-document/dtlstict2020d13_en_0.pdf (accessed on 1 May 2021)
Croatia	WhatsApp	WWF. Transforming small scale fisheries - Impact of COVID-19 on Mediterranean fisheries. WWF Mediterranean Marine Initiative (MMI), 2020. https://www.wwfmmi.org/what_we_do/fisheries/transforming_small_scale_fisheries/impact_of_covid_on_mediterranean_fisheries (accessed on 11 March 2021).
Ecuador	WhatsApp “Asociación de Producción Pesquera Artesanal Eloy Alfaro”	El Universo. Catálogo de oferta pesquera artesanal intenta reducir intermediación. 5 September 2020. https://www.eluniverso.com/noticias/2020/09/04/nota/7962691/catalogo-pescadores-artesanales-crisis-coronavirus (accessed on 15 February 2021).
Egypt	Non-specified channel	Belton, B.; Rosen, L.; Middleton, L.; Gazali, S.; Mamun, A.A.; Shieh, J.; Noronha, H.S.; Dhar, G.; Ilyas, M.; Price, C.; et al. COVID-19 impacts and adaptations in Asia and Africa’s aquatic food value chains. Penang, Malaysia: CGIAR, Research Program on Fish Agri-Food Systems, Working Paper: FISH-2021-02. 31p. 2021. Available online: https://digitalarchive.worldfishcenter.org/bitstream/handle/20.500.12348/4497/fa616a1fef7b31247610de33f720f9fe.pdf
Ghana	Website “Loojanor”	<i>Loojanor Home Page</i> . https://lojaanor.profishgh.com/ (accessed on 23 February 2021).

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Country	Initiative	Source/References
Greece	Facebook	(See reference of “Croatia”).
Fiji	Facebook “Ank Fish Sales Navo Nadi Fiji”	Ank Fish Sales Navo Nadi Fiji Facebook Page. https://www.facebook.com/Ank-Fish-Sales-Navo-Nadi-Fiji-110047740650027/ (accessed on 12 May 2021); Davila, F.; Wilkes, B. <i>COVID-19 and food systems in Pacific island countries</i> . Australian Centre for International Agricultural Research (ACIAR) Technical Report 96, Australian Government, Canberra, 2020. pp. 93–126. Available online: https://aciarc.gov.au/publication/covid19/5-covid-19-and-food-systems-pacific-island-countries
France	Facebook, Website (with contacts) “P.N. Marin du Golfe du Lion” and Website “Petite Pêche”	(See reference of “Croatia”).
	WhatsApp	Nambudiri, S. Virtual fish markets operate via WhatsApp in Kochi. <i>The Times of India</i> , 23 July 2020. https://timesofindia.indiatimes.com/city/kochi/virtual-fish-markets-operate-via-whatsapp/articleshow/77115521.cms (accessed on 21 March 2021).
	App “State Fisheries Development Corporation”	NDTV. Bengal government starts selling fish online to beat price rise amid lockdown. 30 March 2020. https://www.ndtv.com/kolkata-news/coronavirus-lockdown-west-bengal-government-starts-selling-fish-online-to-beat-price-rise-2202689 (accessed on 23 February 2021).
India	App “Meengal”	Bharathi, S.P. ‘Meengal’: Govt launches home delivery app for seafood in Chennai. <i>The News Minute</i> , 24 April 2020. https://www.thenewsminute.com/article/meengal-govt-launches-home-delivery-app-seafood-chennai-123216 (accessed on 24 February 2021).
	Facebook and WhatsApp	Athira, M. How fish markets opened on Facebook and WhatsApp during the lockdown in Kerala’s capital. <i>The Hindu</i> , 18 June 2020. https://www.thehindu.com/society/how-fish-markets-opened-on-facebook-and-whatsapp-during-the-lockdown-in-keralas-capital/article31860503.ece (accessed on 12 March 2021).
	Phone	Nagaraj A. Caught in pandemic’s net, fish sellers struggle to stay afloat in India. <i>Reuters News Agency</i> , 28 September 2020. https://www.reuters.com/article/us-india-women-fishing-idUSKBN26J1B6 (accessed on 23 February 2021).
Indonesia	Non-specified channel	Ferrer, A.J.G.; Pomeroy, R.; Akester, M.J.; Muawanah, U.; Chumchuen, W.; Lee, W.C.; Hai, P.G.; Viswanathan, K.K. Covid-19 and Small-Scale Fisheries in Southeast Asia: Impacts and Responses. <i>Asian Fish. Sci.</i> 2021, 34 (1), 99–113. https://doi.org/10.33997/J.AFS.2021.34.1.011 .
Ireland	Website “KishFish”	Pope, C. Click for home: The best Irish websites for online shoppers. <i>The Irish Times</i> , 14 September 2020. https://www.irishtimes.com/news/consumer/click-for-home-the-best-irish-websites-for-online-shoppers-1.4351678 (accessed on 12 April 2021).
Italy	App “Pesca Mia”	European Commission. COVID-19 – FLAG Response Message Board. <i>FARNET News</i> , 9 April 2020. https://webgate.ec.europa.eu/fpfis/cms/farnet2/news-events/news/covid-19-flag-response-message-board_en (accessed on 23 February 2021).
	App	(See reference of “Croatia”).
Laos	Facebook “Tanglee Seepanthong”	Howe J. The e-commerce response to COVID-19. <i>International Trade Centre News</i> , 21 April 2020. https://etradeforall.org/news/itc-the-e-commerce-response-to-covid-19/ (accessed on March 2021).

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Country	Initiative	Source/References
Malaysia	Facebook “NEKMAT” and Website “Nekmatbiz”	Facebook Page “Persatuan Nelayan Kebangsaan—NEKMAT” [Online]. accessed on: 2021; Bernama (18 April 2020). Online sales of fresh fish, seafood increases five-fold. <i>Malaysiakini</i> , Retrieved from https://www.malaysiakini.com/news/521255 (accessed on May 2021).
	Website “MySeafoodMart”	https://myseafoodmart.com/ (accessed on May 2021).
	Website “MyFishman”	Harper, J. 'Asia's fishermen and farmers go digital during virus'. <i>BBC News</i> , 2 June 2020. https://www.bbc.com/news/business-52767227 (accessed on 29 March 2021).
	Non-specified channel	Azra, M.N.; Kasan, N.A.; Othman, R.; Noor, G.A.G.R.; Mazelan, S.; Jamari, Z. Bin; Sarà, G.; Ikhwanuddin, M. Impact of COVID-19 on Aquaculture Sector in Malaysia: Findings from the First National Survey. <i>Aquac. Reports</i> 2021, 19, 100568. https://doi.org/10.1016/J.AQREP.2020.100568 .
Mexico	Facebook, WhatsApp, Instagram, Twitter and TikTok	Comunidad y Biodiversidad, A.C. (COBI). Everything changes: local solutions of small-scale fishers for adapting to the COVID-19 pandemic. Monthly Report 1 July 2020. Available online: https://cobi.org.mx/wp-content/uploads/2020/06/COBI-Local-solutions-to-the-COVID-19-1th-July-Eng.pdf (accessed on 23 March 2021); Comunidad y Biodiversidad, A.C. (COBI). The technological revolution and the digital divide in times of the COVID-19 pandemic, Monthly Report 5 October 2020. Available online: https://cobi.org.mx/wp-content/uploads/2020/10/COBI-Report-COVID-technology-English5oct.pdf (accessed on 23 February 2021).
		Syed, A.A. Mobile app connects fish farmers with aquaculture information despite COVID-19 in Myanmar. <i>CGIAR Research Program on Fish Agri-Food Systems (FISH)</i> , 10 December 2020. https://fish.cgiar.org/news-and-updates/news/mobile-app-connects-fish-farmers-aquaculture-information-despite-covid-19 (accessed on 23 February 2021).
Netherlands	Website “#supportyourlocalsNL” from Fish Tales	Holmyard, N. COVID-19 crisis drives European producers to trial new ways to sell seafood. <i>Seafood Source</i> , 16 April 2020. https://www.seafoodsource.com/news/foodservice-retail/covid-19-crisis-drives-european-producers-to-trial-new-ways-to-sell-seafood (accessed on 23 February 2021).
	Website “Online Food Market”	<i>Online Food Market (OFM) Home Page</i> . https://www.onlinefoodmarket.nl/ (accessed on 23 February 2021); <i>Etenover Home Page</i> . https://etenover.nl/ (accessed on 23 February 2021).
New Zealand	Website (with contacts)	<i>Seafood New Zealand Home Page</i> . https://www.seafood.co.nz/covid-19-information/where-to-buy-seafood/ (accessed on 13 May 2021).
Nigeria	Non-specified channels	Fakoya K.A. African small-scale fisheries in the time of Covid-19: Voices from the continent - A Nigerian perspective. <i>PLAAS</i> , 2 July 2020. https://www.plaas.org.za/african-small-scale-fisheries-in-the-time-of-covid-19-a-nigerian-perspective/ (accessed on 13 May 2021); (see reference of “Egypt”).
Oman	Website “Behar” platform	Food and Agriculture Organization. Information on COVID-19 and small-scale fisheries. <i>FAO News Release</i> , 19 February 2021. http://www.fao.org/3/ca8959en/ca8959en.pdf (accessed on 23 February 2021); <i>Lojaanor Home Page</i> . https://lojaanor.profishgh.com/fishmas (accessed on 23 February 2021).

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Country	Initiative	Source/References
Peru	Facebook “Mercado Virtual Pescados y Mariscos- Piura Norte”	Mercado Virtual Pescados y Mariscos-Piura Norte Facebook Page. https://www.facebook.com/groups/218129652610969/ (accessed on 13 April 2021); Oceana. Coronavirus en Perú: Iniciativas ciudadanas para la pesca artesanal. <i>La Mula—Oceana</i> , 29 June 2020. https://oceana.lamula.pe/2020/06/29/coronavirus-en-peru-iniciativas-ciudadanas-para-la-pesca-artesanal/oceana_/ (accessed on 13 April 2021).
	WhatsApp	The Conversation. How small-scale seafood supply chains adapt to COVID-19 disruptions. 30 April 2021. https://theconversation.com/how-small-scale-seafood-supply-chains-adapt-to-covid-19-disruptions-159435 (accessed on 21 March 2021).
Philippines	Facebook	Manlosa, A.O.; Hornidge, A.-K.; Schlüter, A. Aquaculture-Capture Fisheries Nexus under Covid-19: Impacts, Diversity, and Social-Ecological Resilience. <i>Marit. Stud.</i> 2021, 20, 75–85. https://doi.org/10.1007/s40152-021-00213-6 .
	Facebook “Fresh C Foods”	Fresh C Foods Facebook Page. https://www.facebook.com/people/Fresh-C-Foods/100064142520785/ (accessed on 12 April 2021); Organización del Sector Pesquero y Acuícola del Istmo Centroamericano. Comé Rico, comé sano, comé pescado y mariscos costarricenses! <i>Sistema de la Integración Centroamericana (SICA)</i> , 23 March 2021. https://www.sica.int/noticias/come-rico-come-sano-come-pescado-y-mariscos-costarricenses_1_126779.html (accessed on 18 June 2021).
	Facebook “Fish Tiangge”	Fish Tiangge Facebook Page. https://www.facebook.com/FishTiangge?_rdc=1&_rdr (accessed on 23 February 2021); U.S. Agency for International Development (USAID). United States and Philippines partner to support fisherfolk during Covid-19. 12 May 2020. https://www.usaid.gov/philippines/press-releases/may-12-2020-united-states-and-philippines-partner-support-fisherfolk (accessed on 23 February 2021).
Portugal	Phone (“Silva Fish”, “Mercado Municipal de Benfica”), Phone and Email (“Peixaria Veloso”, “Mercado Municipal de Alvalade) and Facebook “Silva Fish”	Dias Real, F. Peixe fresco em casa: descubra quem faz entregas ao domicílio. <i>Time Out—Lisboa</i> , 24 March 2020. https://www.timeout.pt/lisboa/pt/compras/peixe-fresco-em-casa-descubra-quem-faz-entregas-ao-domicilio (accessed on 18 June 2021).
	Phone “Tó Peixe”	Oliveira, S.S. Olhò peixe fresquinho: Estas 6 bancas e empresas entregam em casa, do Porto a Viseu. <i>Sapo Visão</i> , 28 April 2020. https://visao.sapo.pt/visaose7e/comer-e-beber/2020-04-28-olho-peixe-fresquinho-estas-6-bancas-e-empresas-entregam-em-casa-do-porto-a-viseu/ (accessed on 18 June 2021).
	Phone and Facebook “Mercado de Angeiras”	Jornal Renovação. Peixeiras de Angeiras reinventam-se devido à pandemia de Covid-19 e entregam peixe em casa. 19 March 2021. http://jornal-renovacao.pt/2021/03/peixeiras-angeiras-reinventam-devido-pandemia-covid-19-entregam-peixe-casa/ (accessed on 18 June 2021); Ribeiro M. Peixarias do Porto que fazem entregas ao domicílio. <i>Time Out</i> , 10 March 2021. https://www.timeout.pt/porto/pt/compras/peixarias-ao-domicilio (accessed on 18 June 2021).
	Phone and Email	Aldeia, C.V.P. Âncora: Pescadores do Nova Jerusalém fintam pandemia e entregam peixe fresco a porta, <i>Jornal C—O Caminhense</i> , 24 April 2020. https://jornalc.pt/v-p-ancora-pescadores-do-nova-jerusalem-fintam-pandemia-e-entregam-peixe-fresco-a-porta/?v=35357b9c8fe4 (accessed on 18 June 2021).

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Country	Initiative	Source/References
Republic of Korea	Facebook “APPCEsposende”	APPCEsposende Facebook Page. https://www.facebook.com/APPCEsposende/ (accessed on 24 May 2021); E24. Lota em direto no “Facebook” para escoar peixe fresco. 15 April 2021. https://www.e24.pt/enoticias/detalhe/lota-em-direto-no-facebook-para-escoar-peixe-fresco-de-esposende (accessed on 24 May 2021).
	Facebook “AlémMar” and “Junta de Freguesia de Benfica”	AlémMar Facebook Page. https://www.facebook.com/Alémmar-109236614061463/ (accessed on 6 July 2021); Junta de Freguesia de Benfica Facebook Page. https://www.facebook.com/jfbenfica (accessed on 18 June 2021).
	Website (with contacts) “Junta de freguesia de Alvalade”	Junta de Freguesia de Alvalade. Há Entregas ao Domicílio nos Mercados de Alvalade 13 March 2020. https://www.jf-alvalade.pt/ha-entregas-ao-domicilio-nos-mercados-de-alvalade/ (accessed on 18 June 2021).
	Website “Saber a mar”	Saber a Mar—Peixe fresco em sua casa Home Page. https://www.saber-a-mar.com (accessed on 24 May 2021).
Samoa	Non-specified channels	(See reference of “Cambodia”).
Samoa	App “Maua”	United Nations Conference on Trade and Development. <i>COVID-19 and e-Commerce: A Global Review</i> ; Geneva, 159p. 2021. Available online: https://unctad.org/webflyer/covid-19-and-e-commerce-global-review .
Senegal	Facebook and WhatsApp	Alliance for Food Sovereignty in Africa (AFSA). <i>African Coronavirus Stories: Perspectives on COVID-19 Challenges to Livelihoods and Food Systems</i> . 128p. 2021. Available online: https://afsafrica.org/wp-content/uploads/2021/02/covid-19-english-stories-en.pdf .
	App “WISE”	FHI 360. WISE project recognized for industry-changing innovation. 8 September 2020. https://www.fhi360.org/taxonomy/term/1527 (accessed on 24 May 2021).
Singapore	Facebook “Tekka Online Market”	Tekka Online Market Facebook Page. https://www.facebook.com/TekkaOnlineMarket/ (accessed on 25 May 2021); Quek, E. Coronavirus: Going, going, gone... at Tekka Market's first livestream sale. <i>The Straits Times</i> , 6 May 2020. https://www.straitstimes.com/lifestyle/food/going-going-gone-at-tekka-markets-first-livestream-sale (accessed on 25 May 2021).
	Facebook “Lian Huat Seafood”	Lian Huat Seafood Facebook Page. https://www.facebook.com/LianHuatMarketplace/ (accessed on 25 May 2021); Pillai, S. Retail goes live (stream). <i>The Business Times</i> , 9 January 2021. https://www.businesstimes.com.sg/brunch/retail-goes-livestream (accessed on 25 May 2021).
	Facebook “Wang Lei”	Wang Lei Facebook Page. https://www.facebook.com/wanglei.singapore (accessed on 17 June 2021).
Slovenia	Facebook and phone	Carvalho, N.; Guillen, J.; Calvo Santos, A. <i>The impact of COVID-19 on the EU-27 fishing fleet</i> . European Commission, Joint Research Centre Technical Report, Publications Office; 2020. Available from: https://op.europa.eu/en/publication-detail/-/publication/8c68fca6-40de-11eb-b27b-01aa75ed71a1/language-en/format-PDF/source-181583037 .
Solomon islands	Facebook “Reef Fish Solomon Islands”	Reef Fish Solomon Islands Facebook Page. https://www.facebook.com/AVonlinefishshop/ (accessed on 25 May 2021); (See reference of “Fiji”).

Table A1. Cont.

Country	Initiative	Source/References
Spain	WhatsApp and email “Pescados Loureda”	Cápelan, B. Coronavirus: Una pescadería de A Coruña se reinventa y comienza a servir a domicilio. <i>Quincemil</i> , 7 April 2020. https://www.elespanol.com/quincemil/articulos/actualidad/coronavirus-una-pescaderia-de-a-coruna-se-reinventa-y-comienza-a-servir-a-domicilio (accessed on 25 February 2021).
	WhatsApp, Phone and Non-specified channel	Neumann, J. European Businesses Will Need E-Commerce Sites to Beat Recession. <i>Bloomberg</i> , 9 June 2020. https://www.bloomberg.com/news/articles/2020-06-09/europe-s-businesses-need-e-commerce-to-beat-the-recession (accessed on 25 February 2021).
	WhatsApp	Fisheries Areas Network (FARNET). COVID-19—FLAG Response Message Board. European Commission, 9 April 2020. https://webgate.ec.europa.eu/fpfis/cms/farnet2/news-events/news/covid-19-flag-response-message-board_en.html (accessed on 23 February 2021).
	Facebook	Europa Azul. Pescadores de Canarias venden sus descargas por Facebook. 6 April 2020. https://europa-azul.es/pescadores-facebook/ (accessed on 23 February 2021).
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Table A1. Cont.

Country	Initiative	Source/References
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Table A1. Cont.

Country	Initiative	Source/References
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	Facebook “Amory Seafood Co” and Website	Amory Seafood Co Facebook Page. https://www.facebook.com/AmorySeafoodCo/ (accessed on 25 May 2021); Solyst, J. Seafood businesses go online to stay afloat. <i>Chesapeake Bay Program</i> , 28 May 2021. https://www.chesapeakebay.net/news/blog/seafood_businesses_go_online_to_stay_afloat (accessed on 25 May 2021).
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