Report of the

Study on the Impacts of COVID-19 Pandemic

on the Fisheries Sector of the

ASEAN-SEAFDEC Member Countries

Southeast Asian Fisheries Development Center

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PREPARATION AND DISTRIBUTION OF THIS DOCUMENT

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EXECUTIVE SUMMARY

The COVID-19 pandemic that emerged at the end of 2019 and prolonged up to 2022 has severely affected not only the health and life of the people but also the economies, worldwide. Several measures had been imposed to contain and prevent the spread of COVID-19, such as lockdowns, curfews, closing of borders, travel restrictions, among others. Such measures had disrupted all human activities including those engaged in fisheries as well as the whole supply chain of fish and fishery products, resulting in drastic impacts on the fisheries and aquaculture sector of the Southeast Asian region. SEAFDEC in collaboration with the ASEAN–SEAFDEC Member Countries, therefore, conducted the "Study on the Impacts of the COVID-19 Pandemic on the Fisheries and Aquaculture Sector of the ASEAN–SEAFDEC Member Countries" from 2020 until May 2021 with the purposes to: 1) describe the impacts of the COVID-19 pandemic on the fisheries and aquaculture sector of the ASEAN–SEAFDEC Member Countries, 2) identify the mitigation measures and support programs of the countries in response to the impacts of COVID-19, and 3) provide recommendations to mitigate the impacts of COVID-19 and revive the fisheries and aquaculture sector of the ASEAN–SEAFDEC Member Countries after the COVID-19 pandemic as well as mitigate the impacts of other pandemics and disasters on fisheries and aquaculture in the future.

The results of the Study revealed the various impacts of the COVID-19 pandemic on the fisheries and aquaculture sector of the ASEAN–SEAFDEC Member Countries, which could probably magnify into either positive or negative consequences. For capture fisheries and fish processing sub-sectors, the direct impacts were the decrease in number of fishing operations at sea, difficulties in acquiring workers especially migrants for commercial fishery and processing plants, difficulties to access fish ports and cold storage facilities, decreased processing lines, and decrease in the overall quantity of capture fishery production. For the aquaculture sub-sector, the access of fish farmers to their farms was restricted and farmers had to prolong the culture period resulting in the increased aquaculture cost, while several aquaculture inputs were also found to be in shortage or had become more expensive. On the fish trade-related aspect, the major impacts were the decrease in the number and duration of operational markets making the demand for fish and fishery products less, decrease in the number of fish traders, among others. While there were shortages in the supply of fish and fishery products due to restricted fishing and aquaculture activities, some harvested products were not utilized due to inaccessibility to fish ports, cold storage facilities, or markets, resulting in spoilage of the catch. In terms of fishery management, the countries maintained the MCS and other enforcement activities waters and remained a high priority throughout the pandemic. There were difficulties in the monitoring of fishing vessels and fishing activities at sea. While the COVID-19 caused drastic impacts on the economy and well-being of people engaged in the fisheries sector, the decrease in fishing and other activities resulted in the recovery and improved condition of fishery and natural resources.

Based on the results of the Study and views gathered from the ASEAN–SEAFDEC Member Countries, the recommendations were developed for relevant stakeholders in to support the relevant fisheries and aquaculture stakeholders (*e.g.* fishers, fish farmers, fishery workers, fishing operators, fish traders, consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others) on how to mitigate the impacts of the COVID-19 pandemic. These recommendations are also intended to revive the fisheries and aquaculture sector of the ASEAN–SEAFDEC Member Countries after the COVID-19 pandemic and mitigate the impacts of other pandemics and disasters that may emerge in the future. The recommendations are categorized into different aspects, namely: 1) Fisheries management; 2) Facilitating movement during curfew/lockdown; 3) Improving cold storage and processing; 4) Market and trade interventions; 5) Financial interventions; 6) Enhancing livelihoods; 7) Facilitating employment and welfare of fish workers; 8) Implementing COVID-19 prevention measures; 9) Enhancing the application of technology; 10) Boosting cooperation among responsible agencies; 11) Promoting cost-effective aquaculture inputs; and 12) Enhancing the application of traceability schemes.

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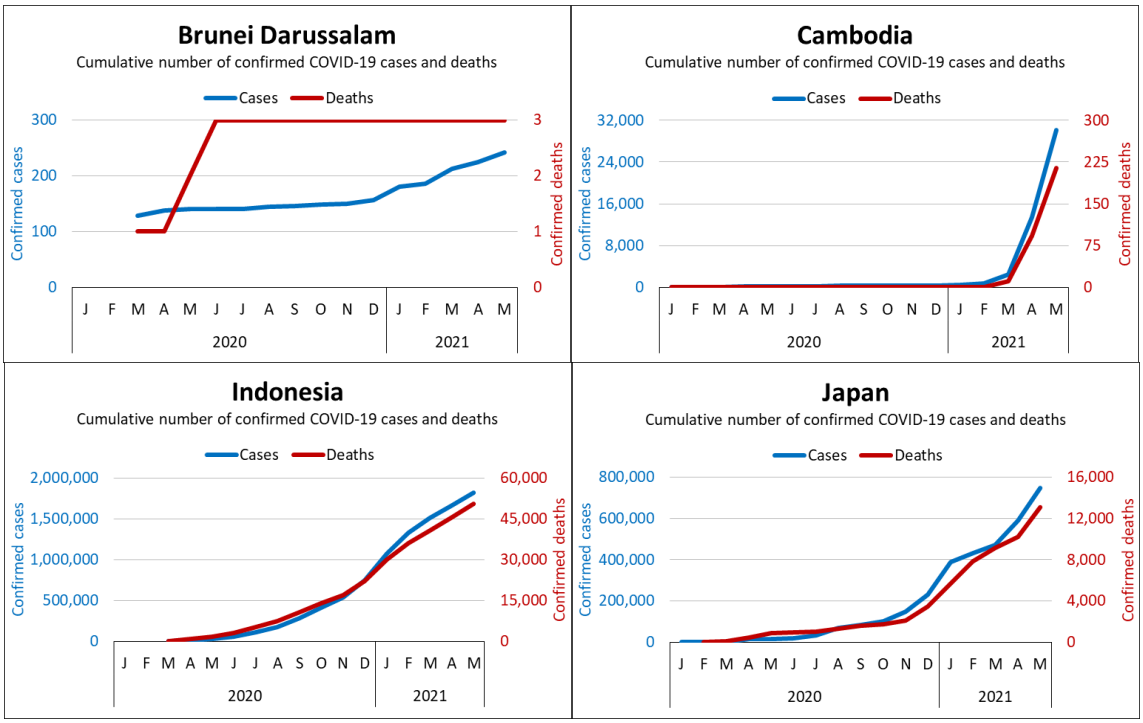
I. INTRODUCTION

The coronavirus disease 2019 (COVID-19) is a new infectious disease caused by an emergent coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was initially reported at the end of December 2019. The World Health Organization (WHO) declared COVID-19 as a global pandemic on 11 March 2020 (World Health Organization, 2021). Since then, countries around the world have implemented several regulations and containment measures such as lockdown, home confinement, travel restrictions, and business closures to control the disease outbreak. Such measures, however, resulted in drastic impacts on people's livelihood, food security, social activities, and economies of the countries at various levels and scales.

By the end of May 2021, the world's total number of COVID-19 confirmed cases, confirmed deaths, and vaccinations were around 393.22 million, 5.73 million, and 10.2 billion, respectively (Mathieu *et al*., 2021; Ritchie *et al*., 2021). In the ASEAN–SEAFDEC Member Countries, namely: Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam, **Figure 1** shows the number of COVID-19 confirmed cases and deaths. Brunei Darussalam recorded a total of 242 confirmed cases and three confirmed deaths. Cambodia had 30,094 confirmed cases and 214 confirmed deaths. Indonesia had a total of more than 1.82 million confirmed cases and 50,578 confirmed deaths. Japan reported a total of 746,485 confirmed cases and 13,059 confirmed deaths. Lao PDR had a total of 1,912 confirmed cases and three confirmed deaths. Malaysia had a total of 572,362 confirmed cases and 2,796 confirmed deaths. Myanmar reported a total of 143,629 confirmed cases and 3,217 confirmed deaths. The Philippines had 1,230,301 confirmed cases and 20,966 confirmed deaths. Singapore recorded a total of 62,051 confirmed cases and 33 confirmed deaths. Thailand had a total of 159,792 cases and 1,031 deaths. Viet Nam reported 7,432 confirmed cases and 47 confirmed deaths.



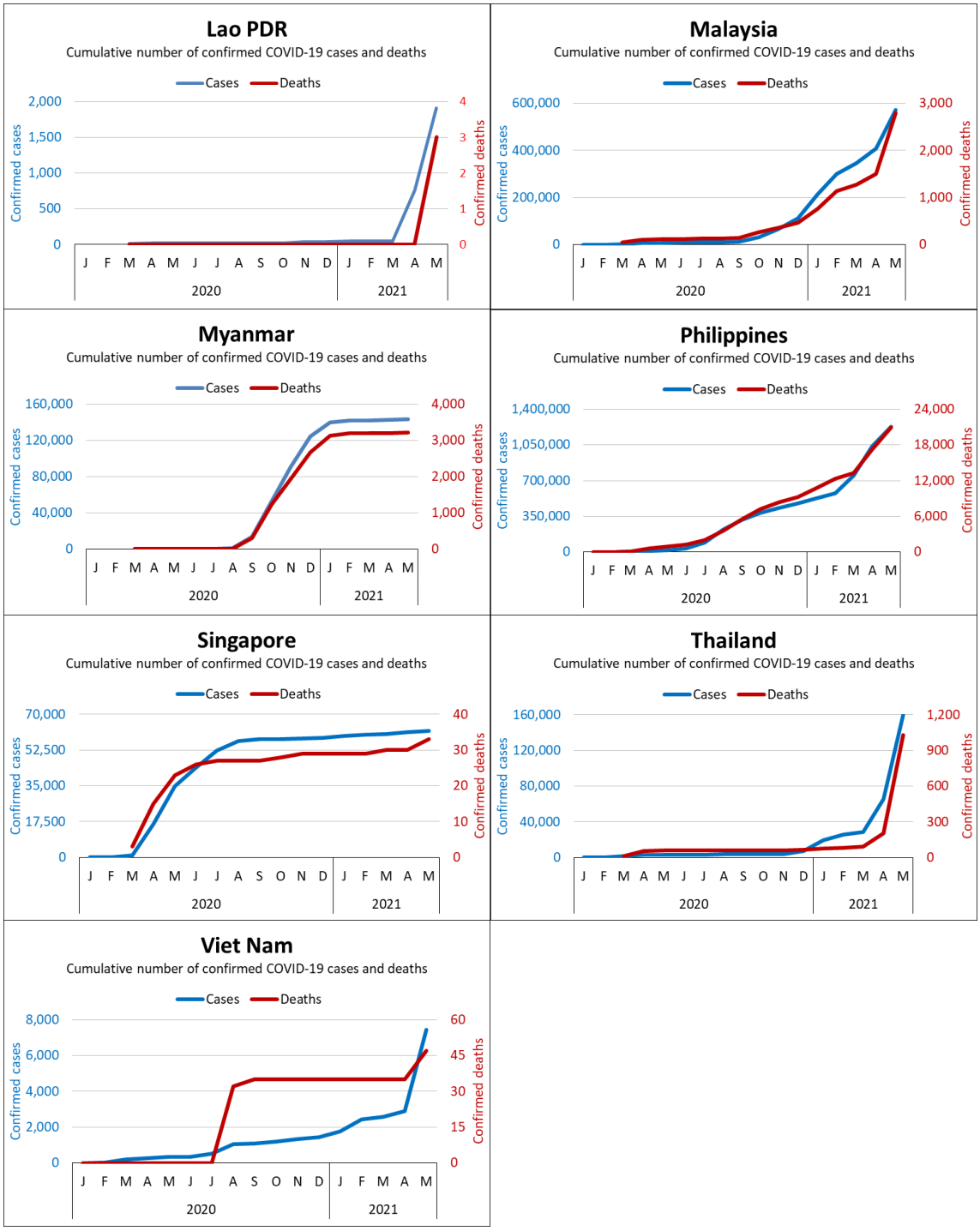


Figure 1. Cumulative number of confirmed COVID-19 cases and deaths in the ASEAN-SEAFDEC Member Countries from January 2020 to May 2021 (Source: Ritchie *et al*., 2020)

With regard to the vaccination rate against COVID-19 as of May 2021 in the respective ASEAN-SEAFDEC Member Countries. **Figure 2** shows the proportion of the people with a complete initial protocol who have received all doses prescribed by their vaccination regimen (*e.g*. two doses for Pfizer/BioNTech, Moderna, Oxford/AstraZeneca, etc. and one dose for Johnson & Johnson) as well as the proportion of people who were partially vaccinated.

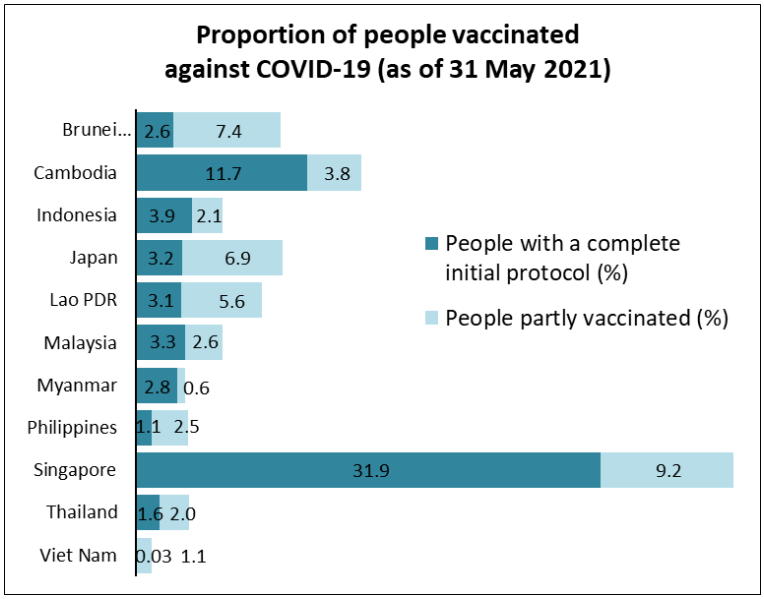


Figure 2. Proportion of people vaccinated against COVID-19 in ASEAN-SEAFDEC Member Countries as of May 2021 (Source: Mathieu *et al*., 2021)

Consequently, COVID-19 has quickly spread throughout the globe and made severe impacts on the lives of people and the economies, including the fisheries and aquaculture sector. The fisheries and aquaculture sector plays an important role in nutrition and food security as well as income generation and employment. Before the virus outbreak, the world fishery and aquaculture production for human and non-human consumption contributed USD 401 billion to the global economy in 2018. Many countries in the Southeast Asian region were major producers of fish and fishery products globally, which were traded not only in the international markets and local markets (FAO, 2020d). The region's total contribution was approximately 46.5 million t (21.9 %) to the world's total fishery production of about 211.9 million t in 2018. The fishery production of the region increased from 42.1 million t in 2014 to 46.5 million t in 2018 with an annual average rate of increase of 2.5 % (1.1 million t) (Southeast Asian Fisheries Development Center, 2020).

Currently, there is no evidence of COVID-19 transmission to people from food (Bondad-Reantaso *et al*., 2020). According to both the World Health Organization (WHO) and the World Organisation for Animal Health (OIE), the COVID-19 pandemic is being sustained through human-to-human transmission and not through international trade in animals and animal products. Fish and fishery products can become contaminated if handled by people who are infected with COVID-19 and who are not following good hygiene practices (FAO, 2022). Nevertheless, the COVID-19 pandemic caused adverse impacts on the global fisheries and aquaculture sector including fishing activities (artisanal and commercial scales), aquaculture (species, markets, financial capacity of farms), producers supplying the food services sector (hotels, restaurants, catering), working conditions along the supply chain (especially for women and other vulnerable workers), and fisheries management processes as consequences of the restrictions imposed by the Governments. In response, the Food and Agriculture Organization of the United Nations (FAO) primarily focused on supporting, restarting, and strengthening the fisheries and aquaculture sector's supply chains and livelihoods with a focus on the most vulnerable groups and regions (FAO, 2020b, 2020c, 2021).

In terms of fisheries management, the COVID-19 pandemic has disrupted the operations of Regional Fisheries Management Organisations (RFMOs), which have jurisdiction over fish stocks that either straddle the exclusive economic zones (EEZs) of several countries or are predominantly in areas beyond national jurisdictions. The pandemic has made the fight against illegal, unreported and unregulated (IUU) fishing more difficult due to the reduced monitoring, control and surveillance (MCS) capacity, where evidence of increased IUU fishing remains difficult to observe and estimate. Furthermore, it has been difficult for RFMOs to collect the necessary data required to assess the health of stocks and the

state of ecosystems (Organisation for Economic Co-operation and Development, 2021). On the other hand, some countries in the Southeast Asian region (*e.g*. Malaysia) maintained the MCS and other enforcement activities in their national waters and remained a high priority throughout the pandemic.

In Southeast Asia, the Southeast Asian Fisheries Development Center (SEAFDEC) organized a Webinar in July 2020 to discuss and assess the impacts of COVID-19 on the fisheries and aquaculture sector, which brought together international, regional, and national fisheries agencies, and industry representatives. During the Webinar, the information on the major impacts of the pandemic on the food supply chain of local, national, regional, and international trade was shared. The COVID-19 pandemic has caused heavy impacts on the fisheries and aquaculture sector, especially on the socioeconomic conditions of the stakeholders, *e.g*. fishers, fish farmers, traders, consumers, as the shutdown of food services along the supply chain puts much stress on them not only on the production aspect but also in marketing and trade (Kaewnuratchadasorn *et al*., 2020). Moreover, the pandemic also aggravated the vulnerability of small-scale fishing households in the region which was their limited ability to mitigate the negative impacts of crises (Ferrer *et al*., 2021).

In order to sustain the fisheries and aquaculture sector of the ASEAN-SEAFDEC Member Countries, during and after the COVID-19 pandemic, a comprehensive assessment of the impacts of COVID-19 is necessary to establish all-inclusive programs and mitigation measures to support the stakeholders. Therefore, during the Forty-third Meeting of the SEAFDEC Program Committee in November 2020, SEAFDEC Secretariat proposed to conduct the study with the objectives of 1) describing the impacts of the COVID-19 pandemic on the fisheries and aquaculture sector of the ASEAN-SEAFDEC Member Countries, 2) identifying the mitigation measures and support programs of the countries in response to the impacts of COVID-19, and 3) providing recommendations to mitigate the impacts of COVID-19 and revive the fisheries and aquaculture sector of the ASEAN-SEAFDEC Member Countries after the COVID-19 pandemic as well as mitigate the impacts of other pandemics and disasters on fisheries and aquaculture in the future. This study was conducted under the project "Assistance for Capacity Building Development in the Region to Address International Fisheries-related Issues" supported by the Japanese Trust Fund.

II. MATERIALS AND METHOD

The data and information were collected from the ASEAN-SEAFDEC Member Countries (**Figure 3**) during February–May 2021 using the questionnaire prepared by SEAFDEC Secretariat based on FAO guidelines (FAO, 2020). The questionnaire was deliberated and finalized during a series of Regional Consultation Workshops organized by the SEAFDEC Secretariat with the participation of the representatives from the ASEAN-SEAFDEC Member Countries and relevant officers from the SEAFDEC Departments. The questionnaire was composed of closed-ended questions on the status of fisheries and aquaculture before and during the COVID-19 pandemic until May 2021 including the subsectors (*i.e*. capture fisheries, aquaculture, and fish processing) as well as fisheries trade and gender roles. The questions were divided into four categories: A) fishery statistics during 2018–2020; B) COVID-19 restriction measures; C) impacts of COVID-19 on fisheries and aquaculture activities based on a set of indicators specifying the cause of impacts (*i.e.* COVID-19 restrictions) and adaptations of stakeholders to such impacts; D) mitigation measures and support programs; and E) contribution of the fisheries and aquaculture sector. The National Focal Points from the ASEAN-SEAFDEC Member Countries were responsible for gathering the primary and secondary data and information as inputs to the questionnaire.

For the analysis, the data and information compiled from the questionnaire were summarized to describe the COVID-19 restriction measures, fishery statistics before and during the COVID-19 pandemic, impacts of COVID-19 on fisheries and aquaculture activities, mitigation measures and support programs, and contribution of the fisheries and aquaculture sector.

Finally, the Regional Workshop was organized by the SEAFDEC Secretariat and participated by the representatives from the ASEAN-SEAFDEC Member Countries and SEAFDEC Departments to verify the data and information provided by the countries in the questionnaire and develop the recommendations to mitigate the impacts of COVID-19 and revive the fisheries and aquaculture sector of the ASEAN-SEAFDEC Member Countries after the COVID-19 pandemic as well as mitigate the impacts of other pandemics and disasters on fisheries and aquaculture in the future.

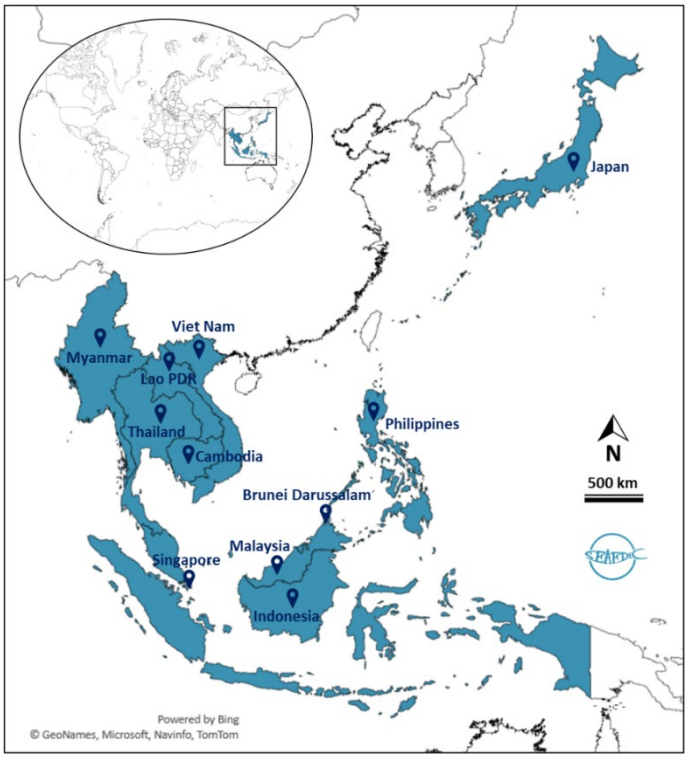


Figure 3. Study area in the ASEAN-SEAFDEC Member Countries (Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam)

III. RESULTS AND DISCUSSION

Among the ASEAN-SEAFDEC Member Countries, Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Singapore, and Thailand were able to provide data and information, and submitted the accomplished questionnaire to SEAFDEC. It should be noted that for Myanmar, the fiscal year of the reported data covered the period from April of the current year to March of the following year.

A. COVID-19 Restriction Measures

Table 1 shows the restriction measures enforced by the government of the respective countries from local to national levels to prevent the spread of COVID-19 during the study period. Such restrictions had made different impacts on the fisheries and aquaculture sector of the respective countries which are discussed in detail in the following section.

Table 1. COVID-19 restriction measures enforced in Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, and Thailand as of May 2021

Country	COVID-19 restriction measures
Brunei Darussalam	• Travel restrictions all over the country (since July 2021 until further notice) • Exit and entry by land through a control post at the border (from 2020 until further notice) - transportation services should not travel more than five hours and transport operators should undergo a COVID-19 swab test before travel and at the border • Travel passes to enter the country (since 2020 until further notice), for travelers to provide pre-departure COVID-19 negative test results, arrange a hotel for quarantine, comply with arrival procedures and logistics, post-arrival health procedures, and pre-return procedures • Physical and social distancing (from March 2020 to the present) as guidelines issued by the Ministry of Health (MOH) • BruHealth (from May 2020 to present), an online application of the MOH encouraging all business establishments to require all visitors to scan using the BruHealth QR code when entering the premises for efficient contact tracing
Indonesia	• Large-scale Social Restrictions (PSBB) (31 March 2020–10 January 2021) - restrictions on activities in public places or facilities which is imposed by local governments at the Provincial/District/City levels • Public Activity Restrictions (PPKM) (11 January 2021–8 February 2021) - restrictions on community activities COVID-19 high-risk areas • Micro PPKM (9 February 2021–present) - similar to PPKM but imposed in smaller areas
Lao PDR	• Travel restrictions
Malaysia	• Movement Control Order (MCO) (18 March 2020–31 October 2021) - only essential services including fisheries were allowed to operate; all levels of supply chains regarding agricultural and fishing industries were allowed to be operated; implemented in different phases in 2020 and 2021, including the Conditional MCO and Recovery MCO; MCO was included in the National Recovery Plan launched in June 2021

Country	COVID-19 restriction measures
Myanmar	• Lockdown and travel ban (April–June 2020 and September 2020–February 2021) - stay at home and limited transportation for trade; a prohibited gathering of five or more people; test the body temperature of fishers before fishing and infected fishers were not allowed to go fishing; reduced workforce for work, companies, and factories and limited hours for local wholesale markets • WHO Guidelines in the Workplace - workers should be 1 m apart and not facing each other; food workers should thoroughly and frequently wash their hands with alcohol-based sanitizers; workers should be wearing personal protective equipment (PPE) such as face masks, hair nets, disposable gloves, clean overalls, and boots; sick workers who are showing COVID-19 symptoms should be isolated immediately
Singapore	• Crew sign-on/off restrictions (from 27 March 2020 to present) - change of crew was only permitted for vessels under special circumstances • Movement control restrictions (from April 2020 to present) • Nationwide partial lockdown (April 2020–February 2021) - closure of non-essential businesses; restricted number of diners in restaurants
Thailand	• Emergency Decree on Public Administration in Emergency Situations, B.E. 2548 (2005) - additional ad hoc procedures to prevent COVID-19 contamination in aquatic animals and fish and fishery products • Article 9 of the Emergency Decree on Government Administration in Emergency Situations, B.E. 2549 (No. 1) (until the COVID-19 situation is resolved) - fish farmers should comply with the public health guidelines by disinfecting vehicles used for the transport of aquatic animals with chlorine before entering and exiting the farm • Restriction of unnecessary travel by public transportation - public transportation was temporarily out of service • Public Health Guidelines - distancing, mask-wearing, hand washing, taking the temperature, testing, and application (DMHTTA); refraining from holding events that gather large numbers of people, rearranging work time, and reducing activity time • Curfew imposed daily from 21:00 h to 04:00 h • Closure of wholesale seafood markets that were the origins COVID-19 outbreak (20 December 2020–1 March 2021)

B. Fishery Statistics

B.1 Capture fisheries

B.1.1 Capture fishery production

Figure 4 shows the capture fishery production of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand during 2018–2020.

For Brunei Darussalam, the total capture (only marine) fishery production slightly increased from 13,566 t (USD 55.34 million) to 13,725 t (USD 55.55 million) but decreased to 13,074 t (USD 55.19 million).

For Cambodia, the total capture fishery production decreased from 656,105 t in 2018 to 601,100 t in 2019.

For Indonesia, the total capture fishery production increased from 7.36 million t (6.70 million t for marine and 0.70 million for inland) to 8.55 million t (7.81 million t for marine and 0.74 million t for inland).

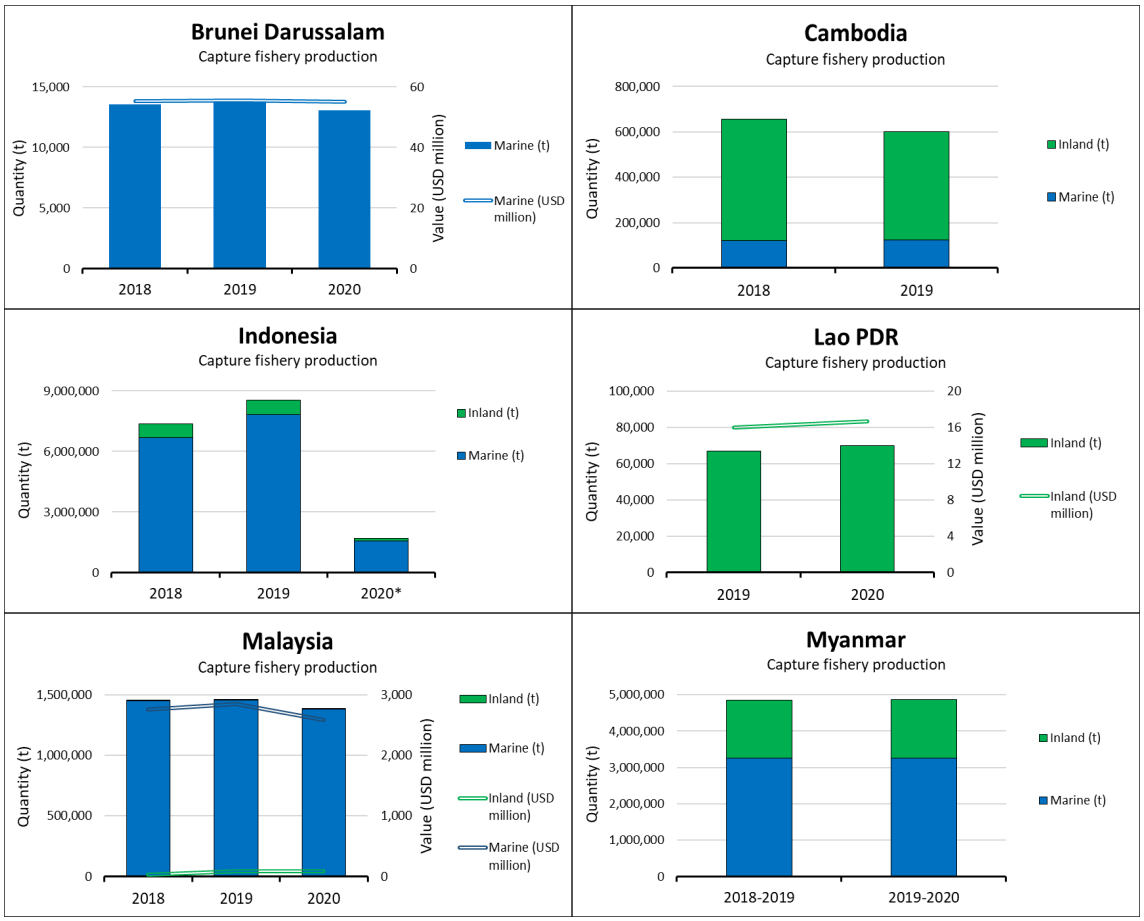
For Lao PDR, the total capture fishery production from inland fishery was around 67,000 t (USD 15.97 million) in 2019 and increased to 70,000 t (USD 16.69 million) in 2020.

For Malaysia, the total capture fishery production of 1.46 million t (USD 2,756 million) in 2018 and 1.46 million t (USD 2,855 million) in 2019 had decreased to 1.39 million t (USD 2,589 million) in 2020.

For Myanmar, the total capture fishy production increased from 4.85 million t (3.25 million t for marine and 1.60 million t for inland) in 2018–2019 to 4.87 million t (3.26 million t for marine and 1.61 million t for inland) in 2019–2020.

For Singapore, the total capture fishery production (only marine) was 1,310 t (USD 9.08 million) in 2018 and 1,418 t (USD 9.00 million) in 2019.

For Thailand, the total capture fishery production decreased from 1.54 million t (USD 2,192 million) in 2018 to 1.53 million t (USD 2,355 million) in 2019 and increased to 1.59 million t (USD 2,264 million) in 2020.



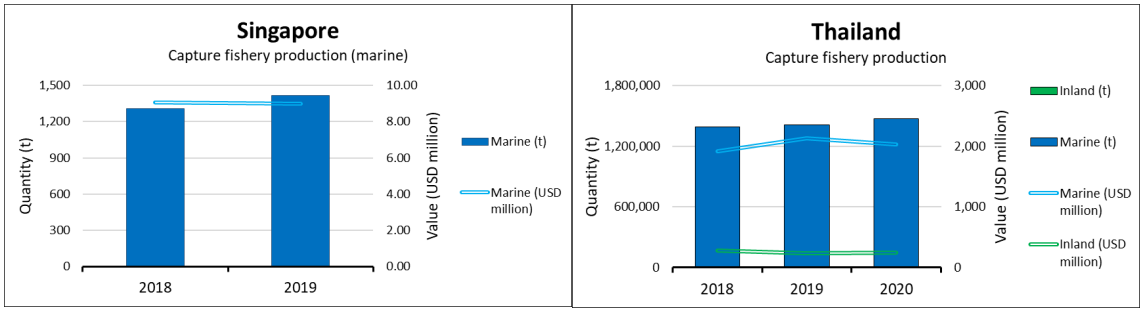


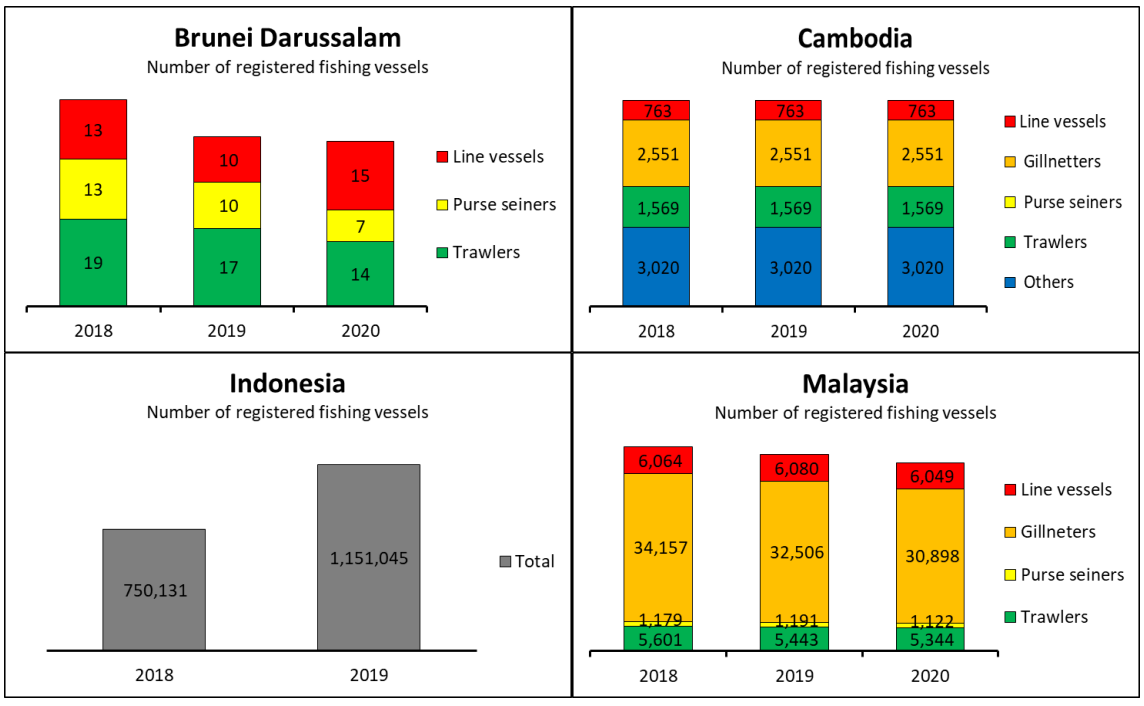
Figure 4. Capture fishery production of Brunei Darussalam, Indonesia (*data in 2020 was partial and unofficial), Lao PDR, Malaysia, Myanmar, Singapore, and Thailand by quantity (t) and value (USD million) from 2018 to 2020

B.1.2 Registered fishing vessels

The number of registered fishing vessels in Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Singapore, and Thailand during 2018–2020 is shown in **Figure 5**.

For Brunei Darussalam, the total number decreased from 45 in 2018 to 36 in 2020 in because there were not enough fish workers to work onboard fishing vessels, some vessels are still under maintenance outside the country, and cannot return due to entry restrictions, and the imported spare parts of the vessels under repair took longer to be delivered.

For Cambodia, the total number was steady at 7,910 between 2018 and 2020. For Indonesia, there was a significant increase from 750,131 in 2018 to 1,151,045 in 2019. For Malaysia, there was a decreasing trend in the number of trawlers and gillnetters from 2018 to 2020. For Myanmar, there was a slight increase in the total number from 3,211 in 2018–2019 to 3,213 in 2019–2020. For Singapore, the total of 34 fishing vessels remained the same between 2018 and 2020. For Thailand, the total number decreased from 37,698 in 2018 to 32,529 in 2019 and significantly increased to 55,513 in 2020.



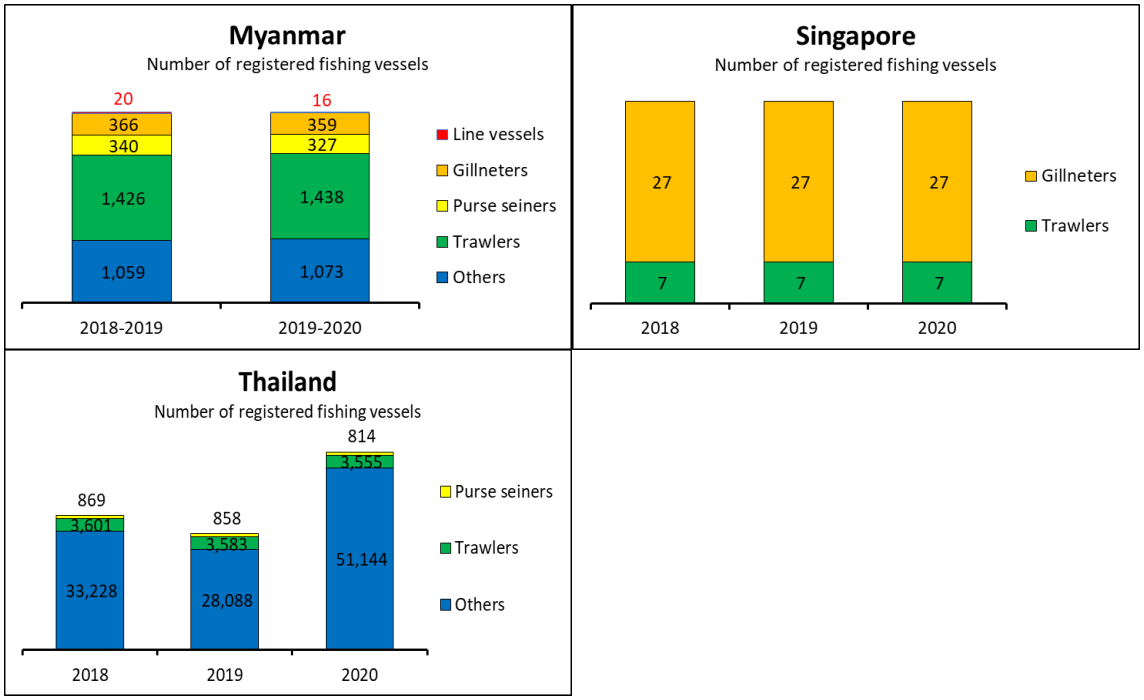


Figure 5. Number of registered fishing vessels in Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020

B.2 Aquaculture

B.2.1 Aquaculture production

The aquaculture production of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand during 2018–2020 is shown in **Figure 6**.

For Brunei Darussalam, although the total aquaculture production decreased from around 1,248.25 t (USD 10.33 million) in 2018 to around 973.99 t (USD 7.98 million) in 2019, there was a significant increase with around 3,501.38 t (USD 24.26 million) in 2020 which was due to the significant increase in inland aquaculture production.

For Cambodia, the total aquaculture production significantly increased from around 254,048 t in 2018 to 307,408 t in 2019.

For Indonesia, there was a decrease in the total aquaculture production from about 15,771,805 t in 2018 to 14,845,015 t in 2020, which was reflected by the decrease in production from the brackishwater and inland aquaculture.

For Lao PDR, the total aquaculture production from inland aquaculture was around 67,000 t (USD 33.58 million) in 2019 and significantly increased to 122,000 t (USD 33.97 million) in 2020.

For Malaysia, the total aquaculture production increased from 391,465 t (USD 736.63 million) in 2018 to 411,783 t (USD 806.01 million) in 2019 but decreased to 400,018 t (USD 772.89 million) in 2020.

For Myanmar, the total production slightly decreased from 1,130,350 t in 2018–2019 to 1,121,350 t in 2019–2020.

For Singapore, the total production increased from 5,702.00 t (USD 33.31 million) in 2018 to 5,831.00 t (USD 36.15 million) in 2019.

For Thailand, the total production increased from 921,876.00 t (USD 3,031.76 million) in 2018 to 963,415.00 t (USD 3,193.31 million) in 2019; but decreased to 1,028,048.00 t (USD 3,071.94 million) in 2020.

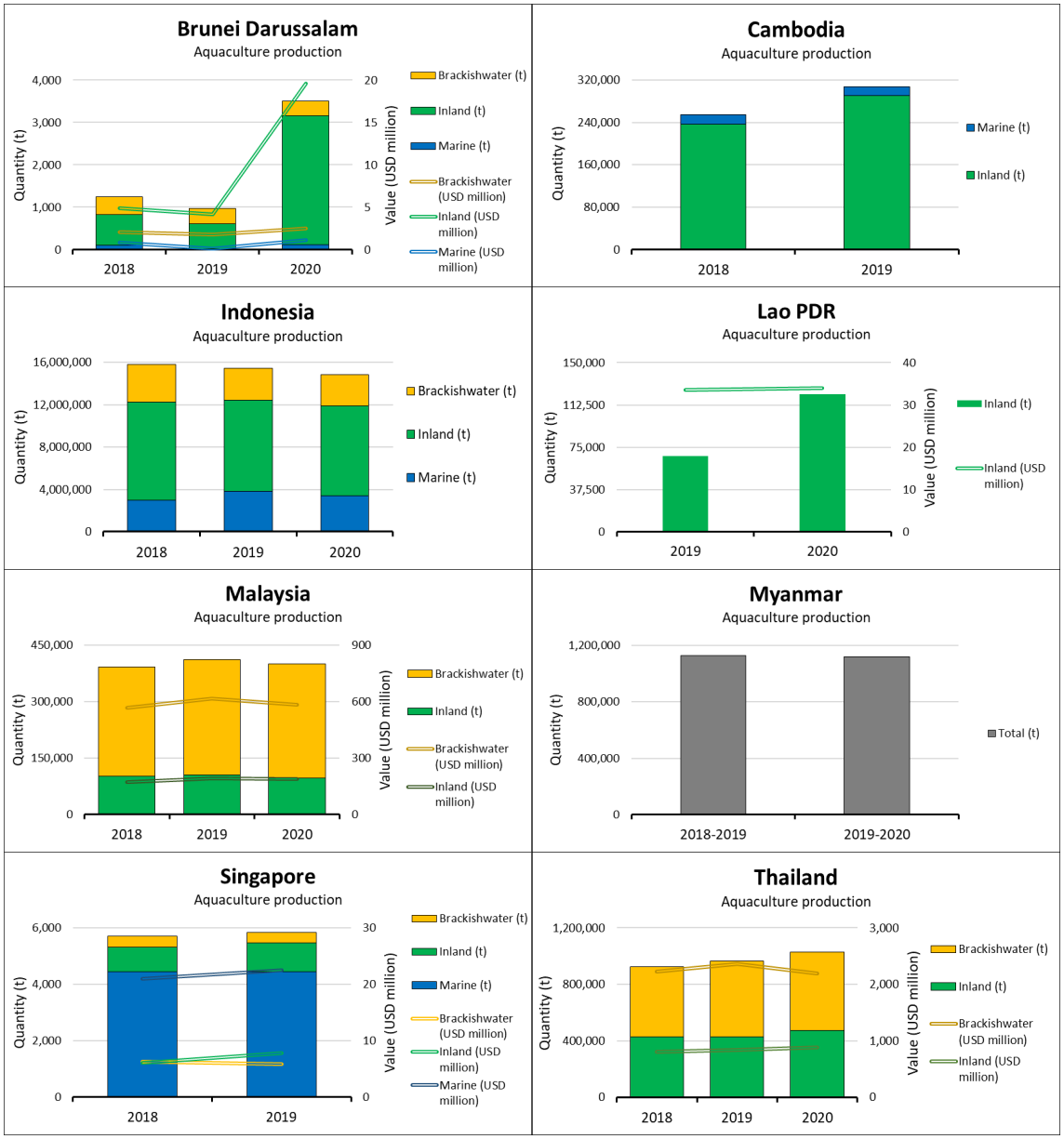


Figure 6. Aquaculture production of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, and Thailand by quantity (t) and value (USD million) from 2018 to 2020

B.2.2 Production of top three cultured species

Figure 7 shows the production of the top three cultured species based on the value in 2019 and compared to 2018 and 2020.

For Brunei Darussalam, the top three species include blue shrimp, groupers, and seabass. The value of blue shrimp significantly decreased from USD 4.89 million (724.32 t) in 2018 to USD 0.96 million (142.19 t).

For Malaysia, the top three cultured species include white shrimp, catfish, and seaweeds. The value of white shrimp increased from around USD 192.29 million (36,007.25 t) in 2018 to USD 208.37 million (38,767.11 t) in 2019 but decreased to USD 193.87 million (35,148.65 t) in 2020.

For Myanmar, the top three cultured species include rohu, mrigal carp, and catla. The value of rohu decreased from around USD 658,754.04 million (548,961.70 t) in 2018–2019 to USD 614,286.00 million (361,344.71 t) in 2019–2020.

For Singapore, the top three cultured species include barramundi, groupers, and milkfish. The value of the barramundi increased from around USD 6.71 million (844.43 t) in 2018 to USD 9.80 million (1,247.82 t) in 2019.

For Thailand, the top three cultured species include white leg shrimp, Nile tilapia, and walking catfish. The value of white leg shrimp increased from around USD 1,768.05 million (358,947.00 t) in 2018 to USD 1,839.25 million (378,508.00 t) in 2019 but decreased to USD 1,766.62 million (372,633.00 t) in 2020.

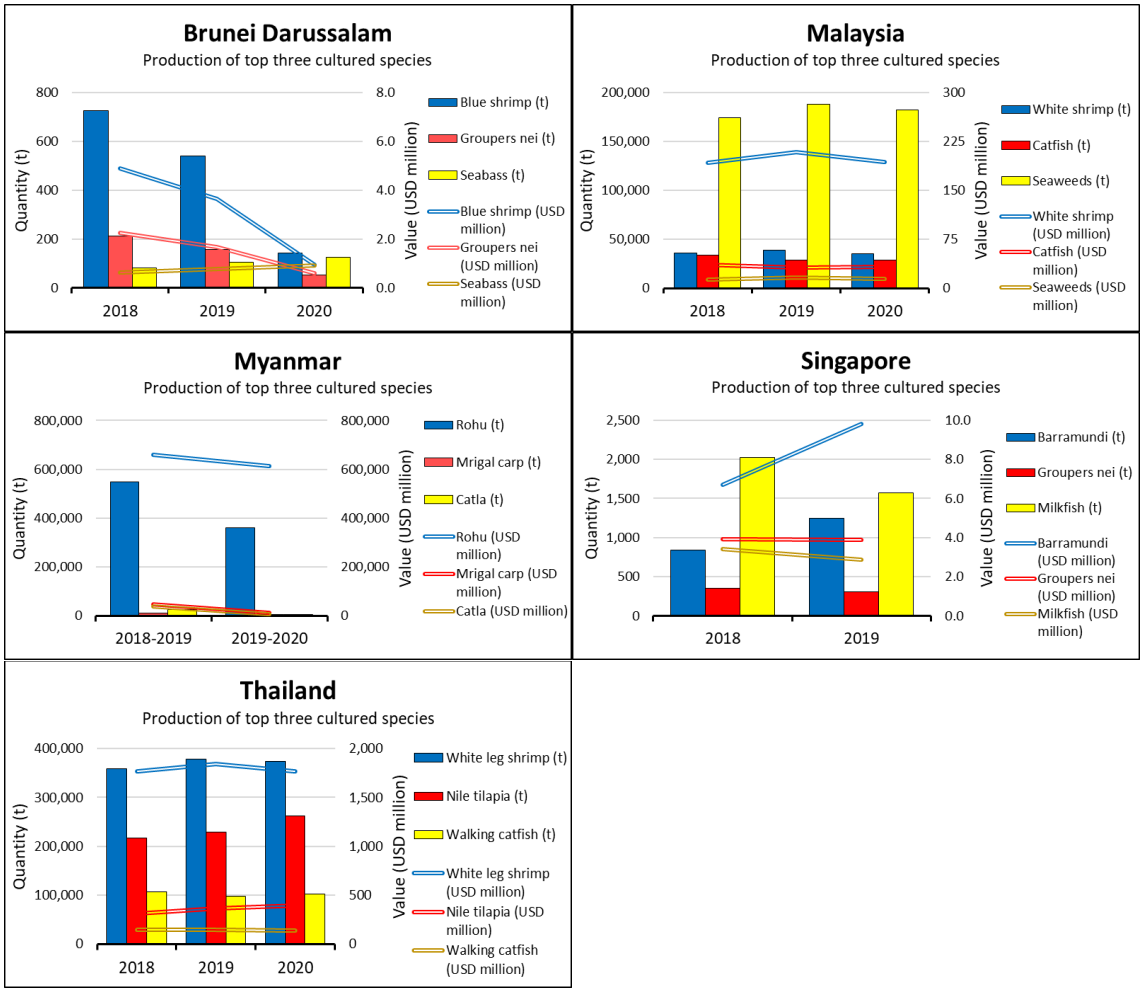


Figure 7. Production of the top three cultured species (ranking based on the value in 2019) in Brunei Darussalam, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020 by quantity (t) and value (USD million)

B.2.3 Seed production of top three species

Figure 8 shows the total seed production during 2018–2020 and the top three species based on the value in 2019.

For Brunei Darussalam, the top three species include blue shrimp, white shrimp, and tilapia. The total value significantly decreased from around USD 1.55 million (110.39 million pcs) in 2018 to USD 0.88 million (40.42 million pcs) in 2020, and the value of blue shrimp had a significant decreasing trend from USD 1.33 million (109.90 million pcs) to USD 0.06 million (4.82 million pcs) in 2020.

For Cambodia, the total seed production significantly increased from around 210 million pcs in 2018 to 222 million pcs in 2019.

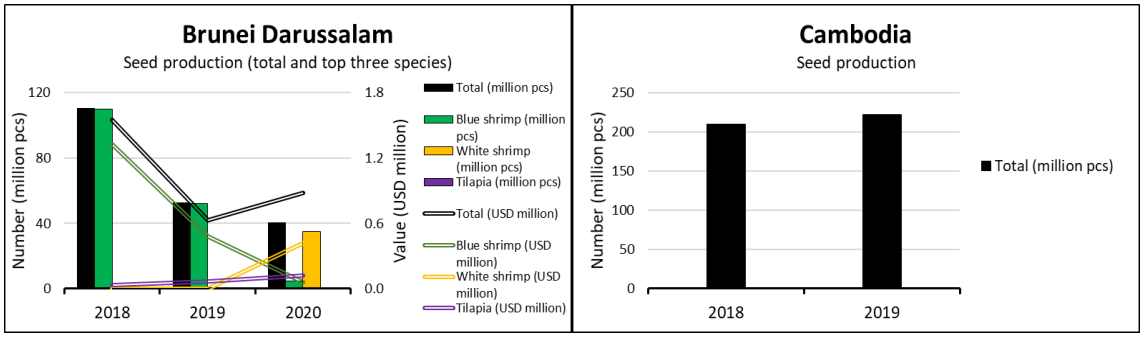
For Indonesia, the top three species include shrimp, tilapia, and catfish; and the value of catfish significantly increased from around USD 687.66 million (51,719.39 million pcs) in 2018 to USD 2,605.35 million (374,836.40 million pcs) in 2019.

For Lao PDR, the top three species include tilapia, silver barb, and catfish. The value of tilapia increased from USD 2.84 million (84 million pcs) in 2019 to USD 3.15 million (97.5 million pcs) in 2020.

For Malaysia, the top three species include white shrimp, tiger shrimp, and freshwater catfish. The total quantity decreased from around 8,461.46 million pcs in 2018 to 6,938.78 million pcs in 2020, and the value of white shrimp significantly increased from USD 21.69 million (2,721.83 million pcs) in 2019 to USD 41.28 million (5,545.13 million pcs) in 2020.

For Singapore, the top three species include milkfish, barramundi, and groupers. The total quantity significantly decreased from 19.95 million pcs in 2018 to 10.28 million pcs in 2019, and the seed production of milkfish significantly decreased from 7.13 million pcs in 2018 to 4.69 million pcs in 2019.

For Thailand, the top three species include Nile tilapia, giant freshwater prawn, and catfishes. There was an increasing trend in the total value from around USD 177.97 million (11,144.14 million pcs) in 2018 to USD 225.35 million (13,667.34 million pcs) in 2020, and the value of Nile tilapia had an increasing trend from around USD 102.80 million (5,536,06 million pcs) in 2018 to USD 115.75 million (6,037.34 million pcs) in 2020.



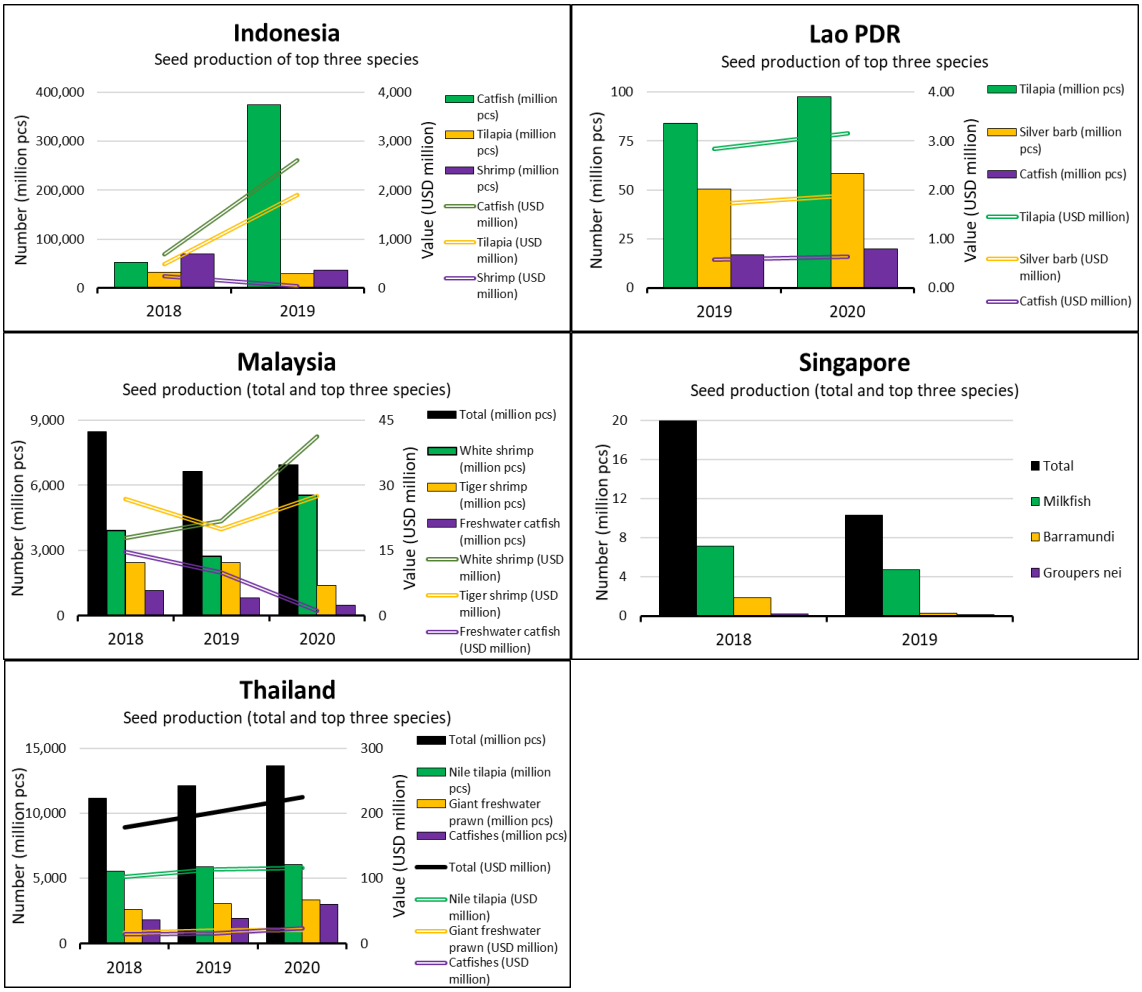


Figure 8. Total seed production and the top three species (ranking based on the value in 2019) in Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Singapore, and Thailand from 2018 to 2020 by quantity (million pcs) and value (USD million)

B.2.4 Production of top three cultured ornamental fishes

Figure 9 shows the production of the top three cultured ornamental fishes based on the value in 2018–2020. For Brunei Darussalam, total value significantly increased from around USD 15,000.00 (2,862.00 pcs) in 2019 to USD 22,000.00 (25,711.00 pcs) in 2020. The top three species include goldfish, guppy, and angelfish; and the value of goldfish significantly decreased from USD 10,500.00 (467 pcs) in 2019 to USD 75.00 (85 pcs); while the value of guppy significantly increased from USD 1,200.00 (1,560 pcs) in 2019 to USD 13,000.00 (19,113 pcs) in 2020.

For Indonesia, the total quantity decreased from around 410.82 million pcs in 2018 to 398.91 million pcs in 2019. The top three species include koi, Arowana, and clownfish; and the production of koi decreased from 404.05 million pcs in 2018 to 396.61 million pcs in 2019.

For Malaysia, despite the continued decrease in the total quantity of production, the total value of production increased from USD 84.42 million (325.33 million pcs) in 2018 to USD 123.52 million (287.53 million pcs) in 2019 but decreased to USD 122.72 million (227.94 million pcs) in 2020. The top three cultured species were cyprinids (including barb, danio, goldfish, koi), poecilids, and characins; and the value of cyprinids decreased from USD 27.01 million in 2018 (100.10 million pcs) to USD 23.92 million (99.65 million pcs) in 2019 but increased to USD 34.07 million (82.51 million pcs) in 2020.

For Myanmar, the top three species include *Labeo rohita*, *Punctius gonionotus*, and *Cyprinus carpio*. Despite there was an increase in the value of the total value of production from around USD 13,600 million (680 million pcs) in 2018–2019 to USD 16,569 million (718 million pcs) in 2019–2020, the value of *Labeo rohita* significantly decreased from around USD 8,910 million (446 million pcs) in 2018–2019 to USD 4,252 million (184million pcs) in 2019–2020.

For Singapore, the total value had a decreasing trend from around USD 39.64 million (124 million pcs) in 2018 to USD 35.36 million (110 million pcs) in 2020. The top three species include catfishes, tetras, and mollies. Also, the value of catfishes had a decreasing trend from USD 4.26 million (11 million pcs) in 2018 to USD 4.06 million (10 million pcs).

For Thailand, although the total value significantly decreased from USD 58.03 million (103 million pcs) in 2018 to USD 20.60 million (82 million pcs) in 2019, there was an increase to USD 36.67 million (151 million pcs) in 2020. The top three species include *Betta splendens*, *Poecilia reticulata*, and *Gyrinocheilus aymonieri*. The value of *Betta splendens* had an increasing trend with a significant increase from USD 5.65 million (23 million pcs) in 2018 to USD 13.26 million (40 million pcs) in 2020.

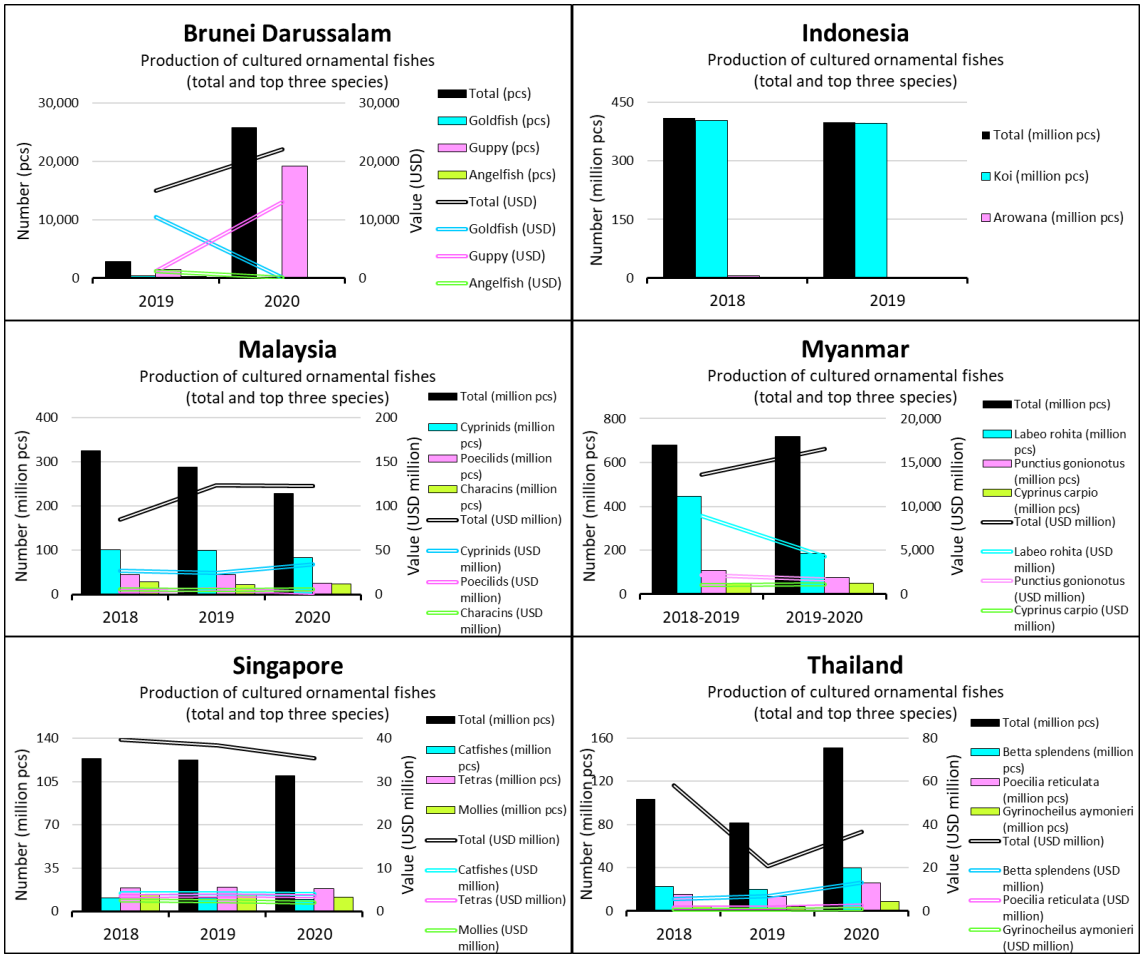


Figure 9. Total production of cultured ornamental fishes and the top three species (ranking based on the value in 2019) in Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020 by quantity (million pcs) and value (USD million)

B.3 Fisheries Trade

B.3.1 Exported fish and fishery products

Figure 10 shows the total in 2018–2020 and the major fish and fishery products (based on value in 2019) exported by Brunei Darussalam, Indonesia, Japan, Malaysia, Myanmar, and Thailand.

For Brunei Darussalam, the total exports of fish and fishery products decreased from USD 7.90 million (1,763.55 t) in 2018 to USD 6.71 million (2,455.03 t) in 2019 but significantly increased to USD 15.22 million (3,419.25 t) in 2020 due to the significant increase in shrimp production (1,960.07 t at USD 11.56 million) in 2020. The top five exported fish and fishery products include tuna, grouper, shrimp, pompano, and round scad; although the value of tuna increased from USD 0.95 million (1,016.12 t) in 2018 to USD 2.43 million (2,455.03 t) in 2019, it decreased to USD 2.08 million (1,294.22 t) in 2020.

For Cambodia, the latest available data was only in 2018 with a total value of exported fish and fishery products of around USD 85.31 million (41,969 t) including fish, crustaceans, mollusks, and others.

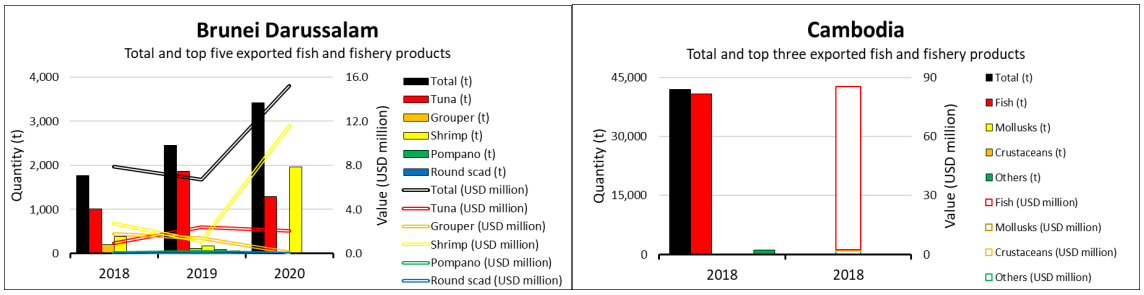
For Indonesia, there was an increasing trend in the total exported value from USD 4,860.90 million (1.13 million t) in 2018 to USD 5,205.21 million (1.26 million t) in 2020. The exported fish and fishery products include shrimp, tuna, squid, crabs, and seaweeds; and the value of shrimp slightly decreased from USD 1,742.12 million (0.20 million t) in 2018 to USD 1,1719.17 million (0.21 million t) in 2019 and increased to USD 2,040.18 million (0.24 million t) in 2020.

For Japan, there was a decreasing trend in total value from USD 2.75 million (0.75 million t) in 2018 to USD 2.14 million (0.63 million t) in 2020. The top five fish and fishery products include scallops, cultured pearls, sea cucumbers, mackerels, and frozen fish fillets; and the value of scallops decreased from USD 0.35 million (0.07 million t) in 2019 to USD 0.24 million (0.06 million t) in 2020.

For Malaysia, there was an increasing trend in the value of exports from USD 759.71 million (0.28 million t) in 2018 to USD 1,007.87 million (0.34 million t) in 2020, although the data in 2020 is unofficial. The top three fish and fishery products include shrimps, fish, and aquatic invertebrates; and the value of shrimps increased from USD 241.28 million (33,667.00 t) in 2018 to USD 319.57 million (55,882.00 t) in 2019 but decreased to USD 236.62 million (38,074.37 t) in 2020.

For Myanmar, the total value significantly increased from around USD 204.55 million (135,492.12 t) in 2018–2019 to USD 266.95 million (194,533.13 t) in 2019–2020. The top five fish and fishery products include rohu, fish meal, squid, ribbon fish, and hilsa. The value of rohu increased from USD 58.62 million (57,783.53 t) in 2018–2019 to USD 61.00 million (58,838.11 t) in 2019–2020.

For Thailand, the total exported value decreased from around USD 7,101.22 million (1.56 million t) in 2018 to USD 6,559.52 million (1.65 million t) in 2020. The top exported fish and fishery products include processed tuna, frozen shrimp, processed shrimp, pet food, and other processed fish and fishery products. Although the value of processed tuna decreased from USD 2,432.75 million (0.51 million t) in 2018 to USD 2,255.53 million (0.53 million t) but it increased to USD 2,461.64 million (0.58 million t) in 2020.



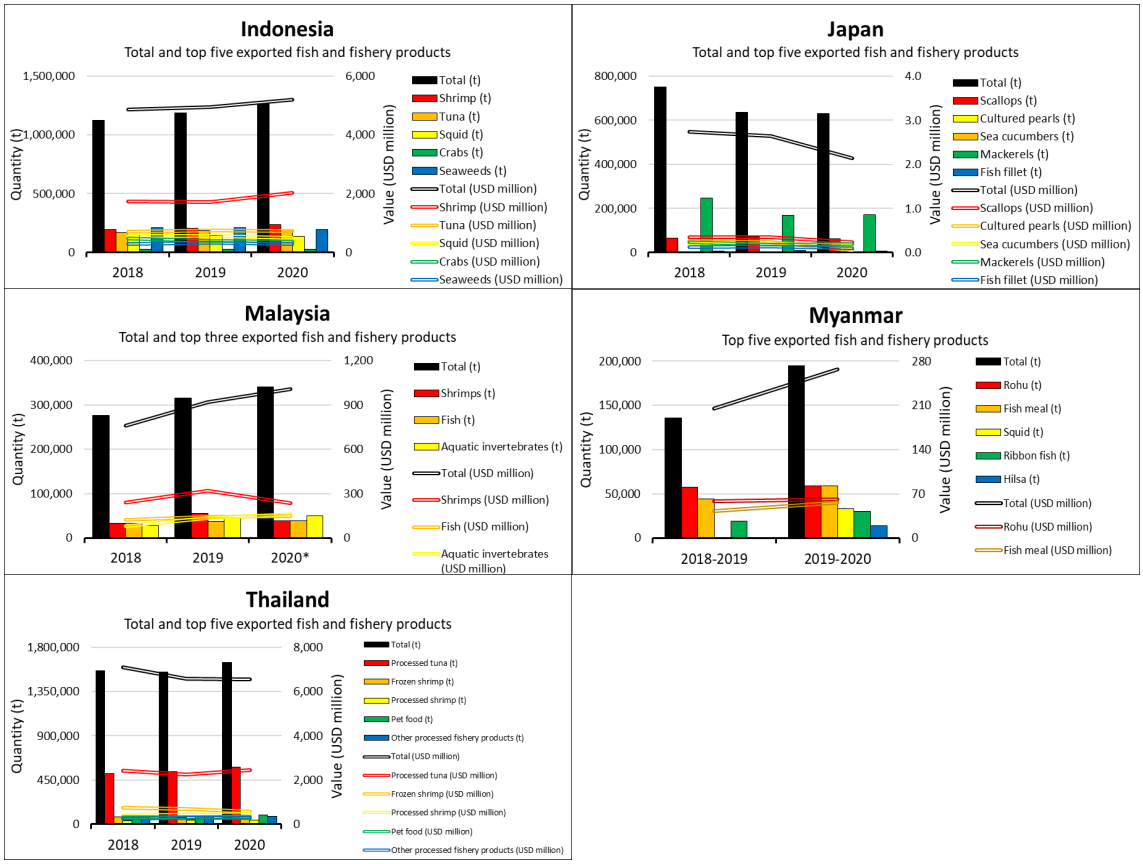


Figure 10. Total and major exported fish and fishery products (ranking based on the value in 2019) of Brunei Darussalam, Cambodia, Indonesia, Japan, Malaysia (*data in 2020 is unofficial), Myanmar, and Thailand from 2018 to 2020 by quantity (t) and value (USD million)

B.3.2 Imported fish and fishery products

Figure 11 shows the total and major fish and fishery products (based on value) imported by Brunei Darussalam, Indonesia, Japan, Malaysia, Myanmar, and Thailand in 2018–2020.

For Brunei Darussalam, the total value of imports decreased from USD 25.00 million (5,469.07 t) in 2018 to USD 24.67 million (5,565.78 t) in 2019) but increased to USD 29.94 million (7,140.70 t) in 2020. The top five fish and fishery products include shrimp, fresh fish, Spanish mackerel, red snapper, and squid; and there was an increasing trend in the value of shrimp from USD 3.34 million (579.57 t) in 2018 to USD 29.94 million (766.70 t) in 2020.

For Cambodia, the latest available data was only in 2018 with a total value of imported fish and fishery products of around USD 26.42 million (18,222 t) including fish, crustaceans, mollusks, and others.

For Indonesia, the total value of imports increased from USD 459.99 million (0.30 million t) in 2018 to USD 476.65 million (0.30 million t) in 2019 but decreased to USD 428 million (0.28 million t) in 2020. The top five fish and fishery products include fish meal, crabs, mackerel, salmon, and fish fats and oils; and the value of fish meal had an increasing trend from USD 97.78 million (0.13 million t) in 2018 to USD 105.77 million (0.14 million t) in 2020.

For Japan, the total value of imports had a decreasing trend from USD 16.20 million (2.38 million t) in 2018 to USD 13.73 million (2.25 million t) in 2020. The top five fish and fishery products include frozen shrimps, tuna fillet, Pacific salmon, preserved shrimps, and other fish fillets; and the value of

frozen shrimps had a decreasing trend from USD 1.50 million (0.14 million t) in 2018 to USD 1.33 million (0.14 million t) in 2020.

For Malaysia, the total value of imports had an increasing trend from USD 1,058.87 million (0.47 million t) in 2018 to USD 1,313.05 million (0.52 million t) in 2020. The top three fish and fishery products include fish, aquatic invertebrates, and shrimps; and the value of fish increased from USD 407.01 million (0.22 million t) in 2018 to USD 437.31 million (0.22 million t) in 2019 but decreased to USD 428.82 million (0.21 million t) in 2020.

For Myanmar, the total value of imports significantly decreased from around USD 0.12 million (285.33 t) in 2018–2019 to USD 0.06 million (104.63 t) in 2019–2020. The top five fish and fishery products include dried fish, Atlantic salmon, salmon, mussels, and mackerel. The value of dried fish significantly decreased from USD 0.07 million (124.23 t) in 2018–2019 to USD 0.03 million (62.65 t) in 2019–2020.

For Thailand, the total value of imports had a decreasing trend from USD 4,432.15 million (2.15 million t) in 2018 to USD 4,004.24 million (2.17 million t) in 2020. The top five fish and fishery products include frozen skipjack tuna, frozen squid, frozen fish, frozen albacore, and frozen yellowfin tuna; and there was a decreasing trend in the value of frozen skipjack tuna from USD 1,019.80 million (0.58 million t) in 2018 to USD 865.92 million (0.56 million t) in 2020.

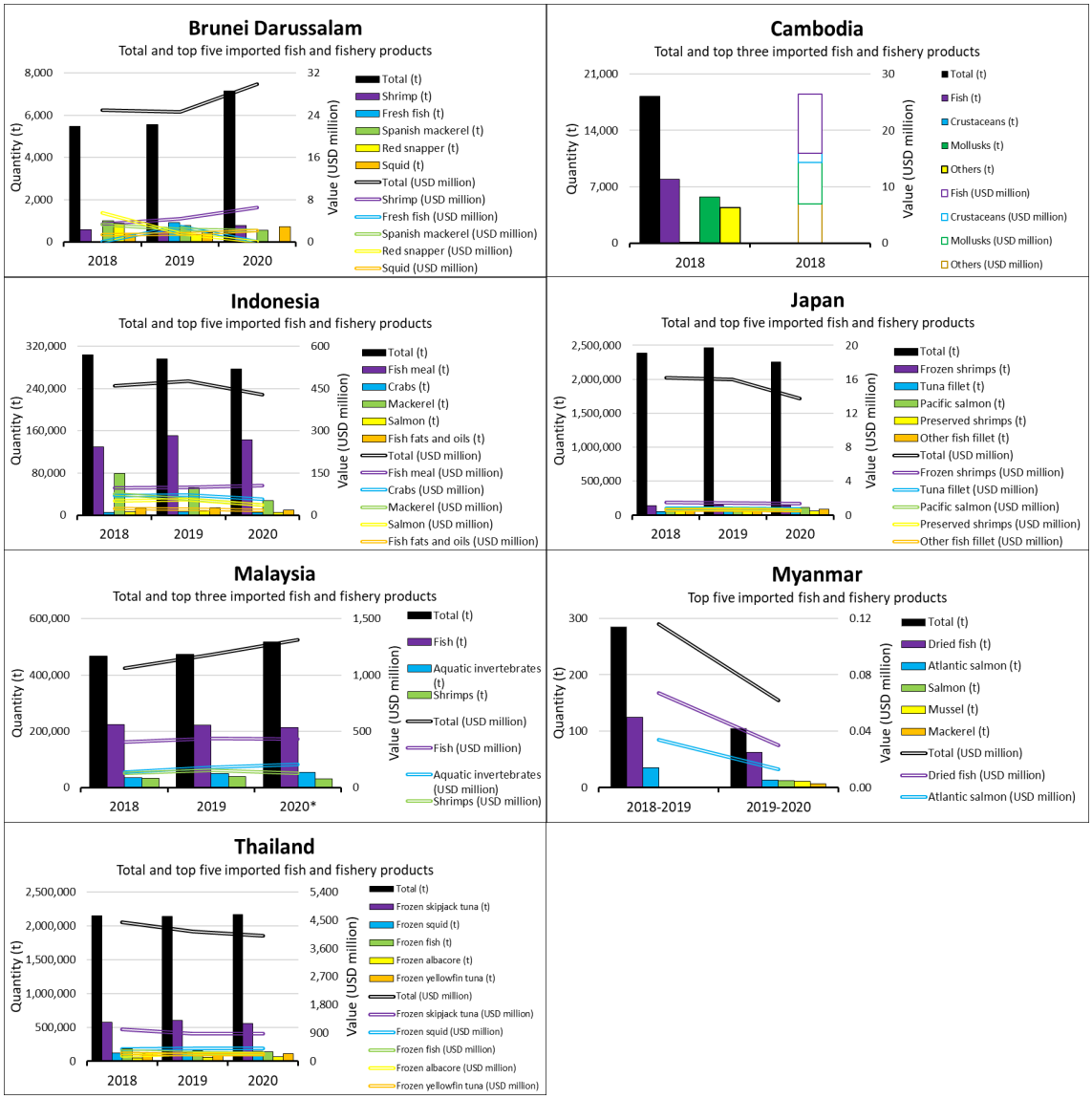


Figure 11. Total and major imported fish and fishery products (ranking based on the value in 2019) of Brunei Darussalam, Cambodia, Indonesia, Japan, Malaysia (*data in 2020 is unofficial), Myanmar, and Thailand from 2018 to 2020 by quantity (t) and value (USD million)

B.3.3 Producer price of top three species from capture fisheries

Figure 12 shows the producer price at wholesale markets or landing centers of the top three species from capture fisheries of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand in 2018–2020.

For Brunei Darussalam, the price of yellowfin tuna decreased from USD 1.58/kg in 2018 to USD 1.40/kg in 2020; tuna-like species also decreased from USD 2.01/kg in 2018 to USD 1.53/kg in 2020, and marine shrimp increased from USD 6.58/kg in 2018 to USD 7.93/kg in 2020.

For Indonesia, the price of Indian mackerel decreased from USD 2.76/kg in 2018–2019 to USD 2.42/kg in 2020; skipjack tuna also decreased from USD 2.21/kg in 2018–2019 to USD 1.73/kg, and mackerel tuna increased from USD 1.35/kg in 2018 to USD 2.07/kg in 2019 but decreased to USD 1.38/kg in 2020.

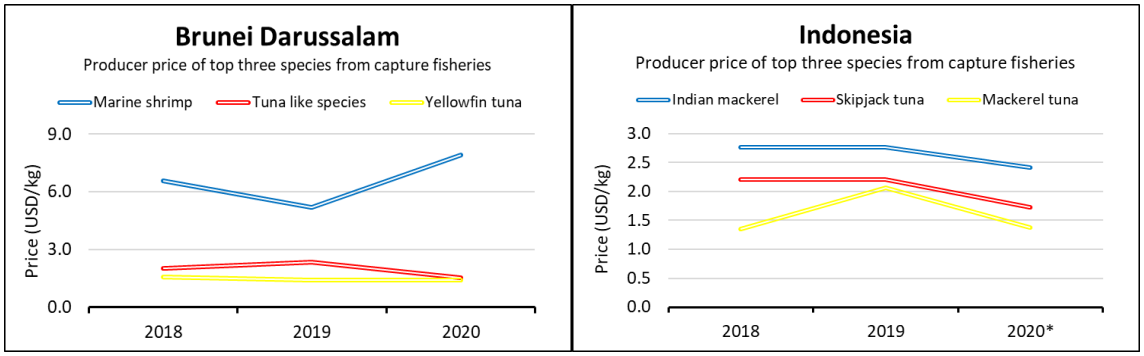
For Lao PDR, the price of *Labeo chrysophekadion* increased from USD 4.51/kg in 2019 to USD 5.39/kg in 2020; while *Cyclocheilichthys enoplos* and *Cirrhinus microlepis* both increased from USD 3.94/kg in 2019 to USD 4.31/kg in 2020.

For Malaysia, the price of Indian mackerel continued to decrease from USD 2.18/kg in 2018 to USD 1.78/kg in 2020; short bodied mackerel increased from USD 1.57/kg in 2018 to USD 1.76/kg in 2019 but decreased to USD 1.19/kg in 2020; and sardines slightly increased from USD 1.31/kg in 2018 to USD 1.34/kg in 2019 but decreased to USD 1.20/kg in 2020.

For Myanmar, the price of Mrigal carp increased from USD 2.50/kg in 2018–2019 to USD 3.00/kg in 2019–2020 but decreased to USD 2.80/kg in 2020–2021; common carp increased from USD 1.20/kg in 2018–2019 to USD 1.70/kg in 2019–2020 and 2020–2021, and rohu was stable at USD 1.30/kg in 2018–2019 and 2019–2020 and slightly increased to USD 1.40/kg in 2020–2021.

For Singapore, the price of tropical spiny lobster slightly decreased from USD 19.69/kg in 2018 to USD 19.39/kg in 2019; threadfins slightly decreased from USD 15.71/kg in 2018 to USD 15.55/kg in 2019, and natantian decapods slightly decreased from USD 12.80/kg in 2018 to USD 12.57/kg in 2019.

For Thailand, the price of green tiger shrimp increased from USD 10.87/kg in 2018 to USD 12.36/kg in 2019, but decreased to USD 9.54/kg in 2020; silver pomfret increased from USD 8.73/kg in 2018 to USD 10.88/kg in 2020, and giant tiger prawn decreased from USD 11.04/kg in 2018 to USD 10.20/kg in 2020.



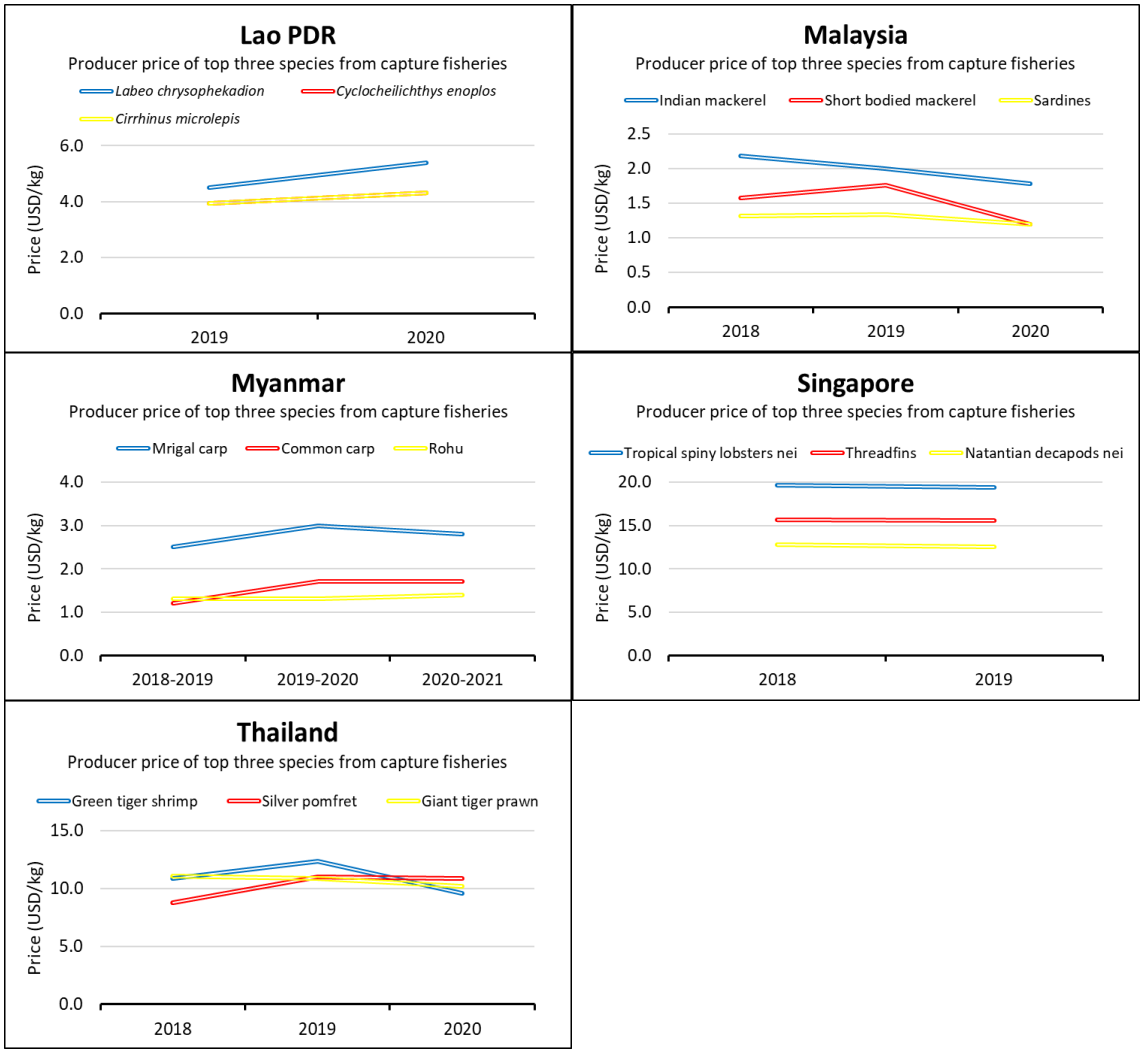


Figure 12. Producer price (USD/kg) of the top three species from capture fisheries of Brunei Darussalam, Indonesia (*data in 2020 is not yet validated), Lao PDR, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020

B.3.4 Farm gate price of top three cultured species

Figure 13 shows the farm gate price of the top three cultured species in Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020. For Brunei Darussalam, the farm gate prices of groupers, blue shrimp, and seabass were stable from 2018 to 2020 at USD 9.00/kg, USD 7.50/kg, and USD 7.50/kg, respectively. For Indonesia, the prices of shrimp, tilapia, and catfish were constant from 2018 to 2020 at USD 4.63/kg, USD 1.66/kg, and USD 1.42/kg, respectively. For Lao PDR, the price of silver barb increased from USD 1.69/kg in 2019 to USD 1.94/kg in 2020; tilapia increased from USD 1.58/kg in 2019 to USD 1.72/kg in 2020, and catfish increased from USD 1.35/kg in 2019 to USD 1.51/kg in 2020. For Malaysia, the price of tiger shrimp decreased from USD 7.30/kg in 2018 to USD 6.97/kg in 2019 and increased to USD 7.40/kg in 2020; white shrimp continued to slightly increase from USD 5.46/kg in 2018 to USD 5.70/kg in 2020, and freshwater catfish had a slightly increasing trend from USD 1.18/kg in 2018 to USD 1.20/kg in 2020.

For Myanmar, the price of Mrigal carp increased from USD 2.50/kg in 2018–2019 to USD 3.00/kg 2019–2020 but decreased to USD 2.80/kg in 2020–2021; Catla continued to increase from USD 2.60/kg in 2018–2019 to USD 3.20/kg in 2020–2021, and rohu increased from USD 1.30/kg in 2018–2019 and 2019–2020 to USD 1.40/kg in 2020–2021.

For Singapore, the price of groupers increased from USD 15.39/kg in 2018 to USD 16.93/kg in 2019; barramundi decreased from USD 10.52/kg in 2018 to USD 9.93/kg in 2019, and milkfish increased from USD 2.30/kg in 2018 to USD 2.47/kg in 2019.

For Thailand, the price of white leg shrimp decreased from USD 4.93/kg in 2018 to USD 4.73/kg in 2020; Nile tilapia increased from USD 1.43/kg in 2018 to USD 1.50/kg in 2020; and walking catfish increased from USD 1.36/kg in 2018 to USD1.41/kg in 2020.

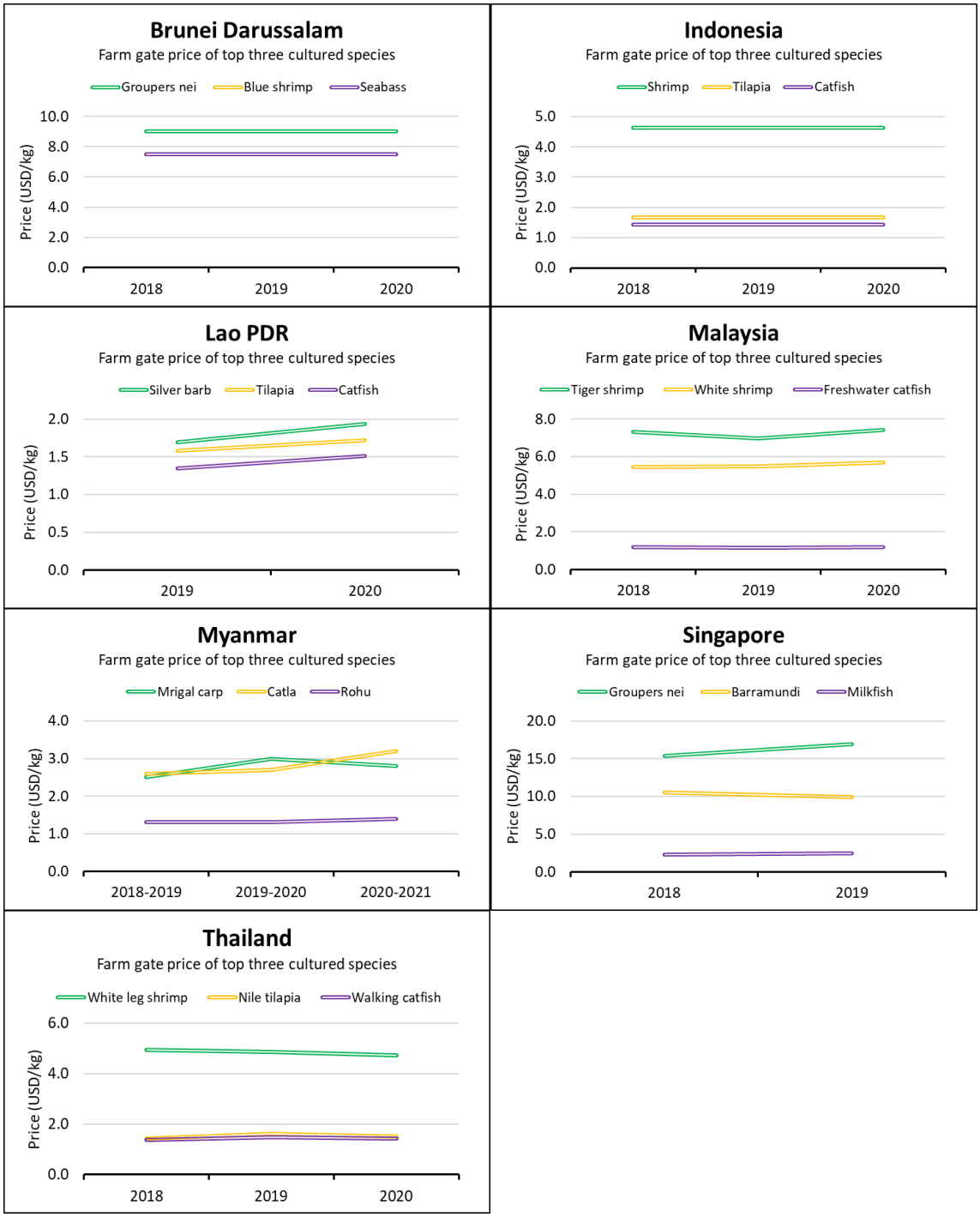


Figure 13. Farm gate price (USD/kg) of the top three cultured species in Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020

B.4 Fish workers

B.4.1 Onboard fishing vessels

The number of fish workers on board fishing vessels in Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020 disaggregated by sex and nationality is shown in **Figure 14**.

The fish workers (national and migrant) in Brunei Darussalam were all males with the total number decreased from 2,281 in 2018 to 2,051 in 2019 and slightly increased to 2,164 in 2020. The average total number of fish workers was composed of around 28 % migrant workers and the number continued to decrease from 2018 to 2020 due to the restriction measures for the migrant workers leaving their home countries and entering Brunei Darussalam which were considered an additional burden to the existing high cost of recruiting migrant workers. Hence, the remaining national and migrant workers continued working and the local people were employed to work onboard.

For Cambodia, the fish workers are generally engaged in inland fishing activities. Although there is no available data on workers onboard fishing vessels, it was observed that there was a significant decrease in the number of workers related to fisheries in 2019.

For Indonesia, all fish workers were Indonesians and the total number significantly decreased from 2.64 million in 2018 to 2.39 million in 2019.

The total number of all-male national and foreign fish workers in Malaysia continued to decrease from 128,148 in 2018 to 119,828 in 2020. The average number of foreign workers was around 25 % of the average total number of fish workers, which continued to decrease because the foreign workers returned to their home countries during MCO. Moreover, the COVID-19 restriction measures such as the compulsory COVID-19 test and 14-day quarantine hampered the recruitment of new foreign workers.

The fish workers in Myanmar were all males and the total number significantly decreased from 168,198 in 2018–2019 to 80,325 in 2019–2020 due to lockdown measures and restricted transportation in outbreak areas; thus, a pass/permit was issued by the local government to the fish workers.

The total number of fish workers in Singapore remained at 63 in 2018 and 2019 but decreased to 42 in 2020. The decrease in the number of fish workers was due to border closures when some fish workers were not willing to undergo the quarantine measures and pay the costs to enter Singapore. Thus, the current fish workers continued working although fishing operations were reduced.

In Thailand, there was a significant decrease in the total number of fish workers from 29,483 in 2018 to 17,796 in 2020. From 2018 to 2019, more than half of the fish workers were migrants; however, the proportion of migrant workers decreased to around 38 % in 2020. Among the average total number of migrant fish workers, 0.17 % were female. The significant decrease in the total number of fish workers was attributed to the restrictions on the movement of laborers and the shortage of migrant workers which resulted in ceasing fishing operations and resorting to recruiting Thai workers.

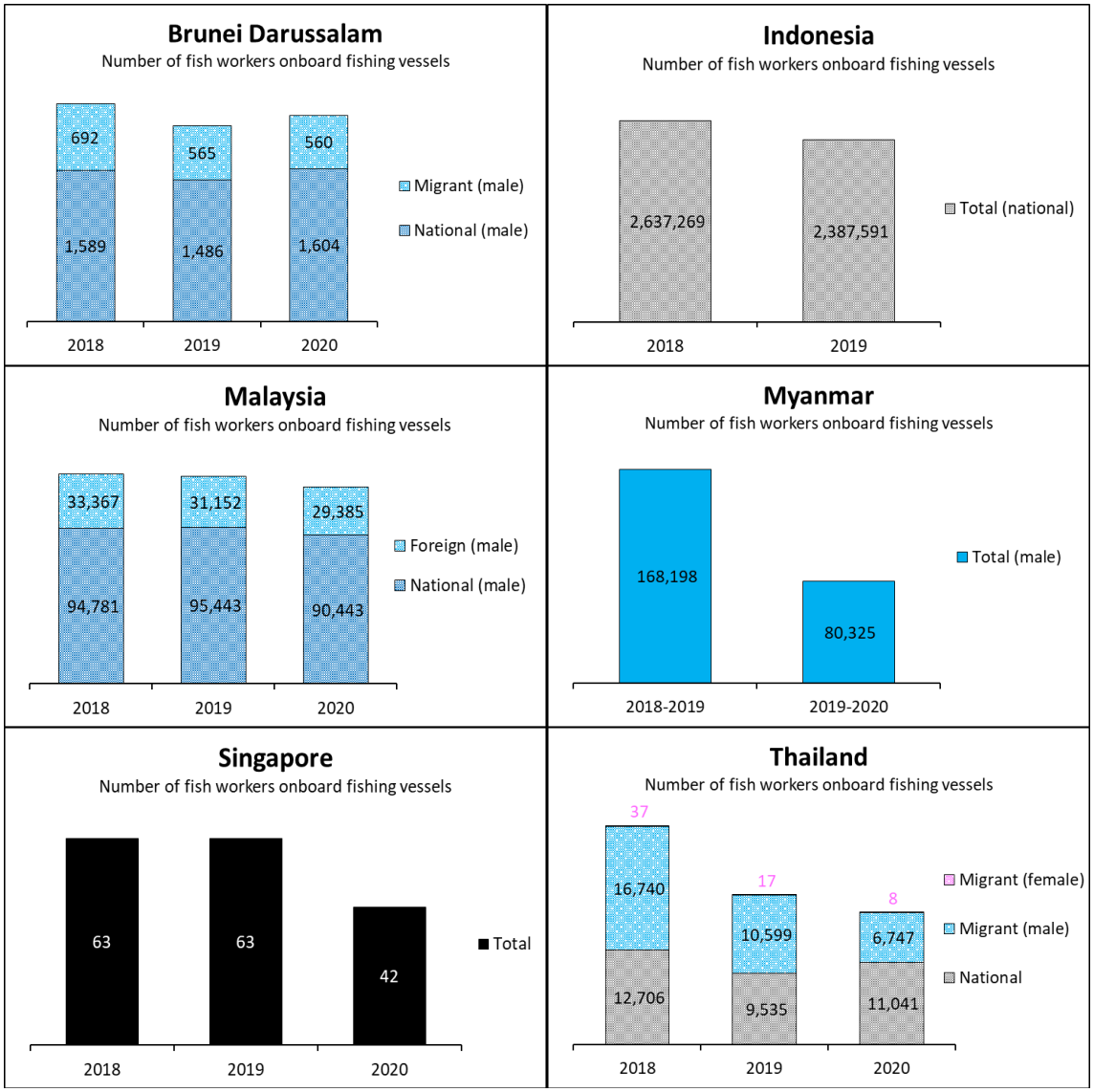


Figure 14. Number of fish workers onboard fishing vessels in Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020 disaggregated by nationality and sex

B.4.2 Aquaculture facilities

Figure 15 shows the number of fish workers in aquaculture facilities in Brunei Darussalam, Malaysia, Myanmar, and Thailand from 2018 to 2020 disaggregated by sex and nationality.

For Brunei Darussalam, the total number of fish workers decreased from 427 in 2018 to 403 in 2019 and increased to 462 in 2020. The increase in 2020 was due to the assistance of the Department of Fisheries extended to companies in expediting the re-entry and entry process of new migrant workers through the online entry travel pass application. Of the average total number of fish workers, around 65 % was migrant and 0.16 % was female.

For Cambodia, the fish workers in aquaculture facilities were composed of Cambodians only, and the total number significantly decreased from 143,879 in 2018 to 93,003 in 2019.

For Malaysia, the total number of fish workers in aquaculture facilities was composed of all males and had an increasing trend from 18,871 in 2018 to 20,258 in 2020.

For Myanmar, the total number of fish workers includes all males and had an increasing trend from 59,518 in 2018–2019 to 60,178 in 2019–2020.

For Singapore, the total number of fish workers in aquaculture facilities slightly decreased from 733 in 2018 to 692 in 2019 and increased to 746 in 2020.

For Thailand, the total number of fish workers increased from 523,849 (47 % female) in 2019 to 536,810 (48 % female) in 2020.

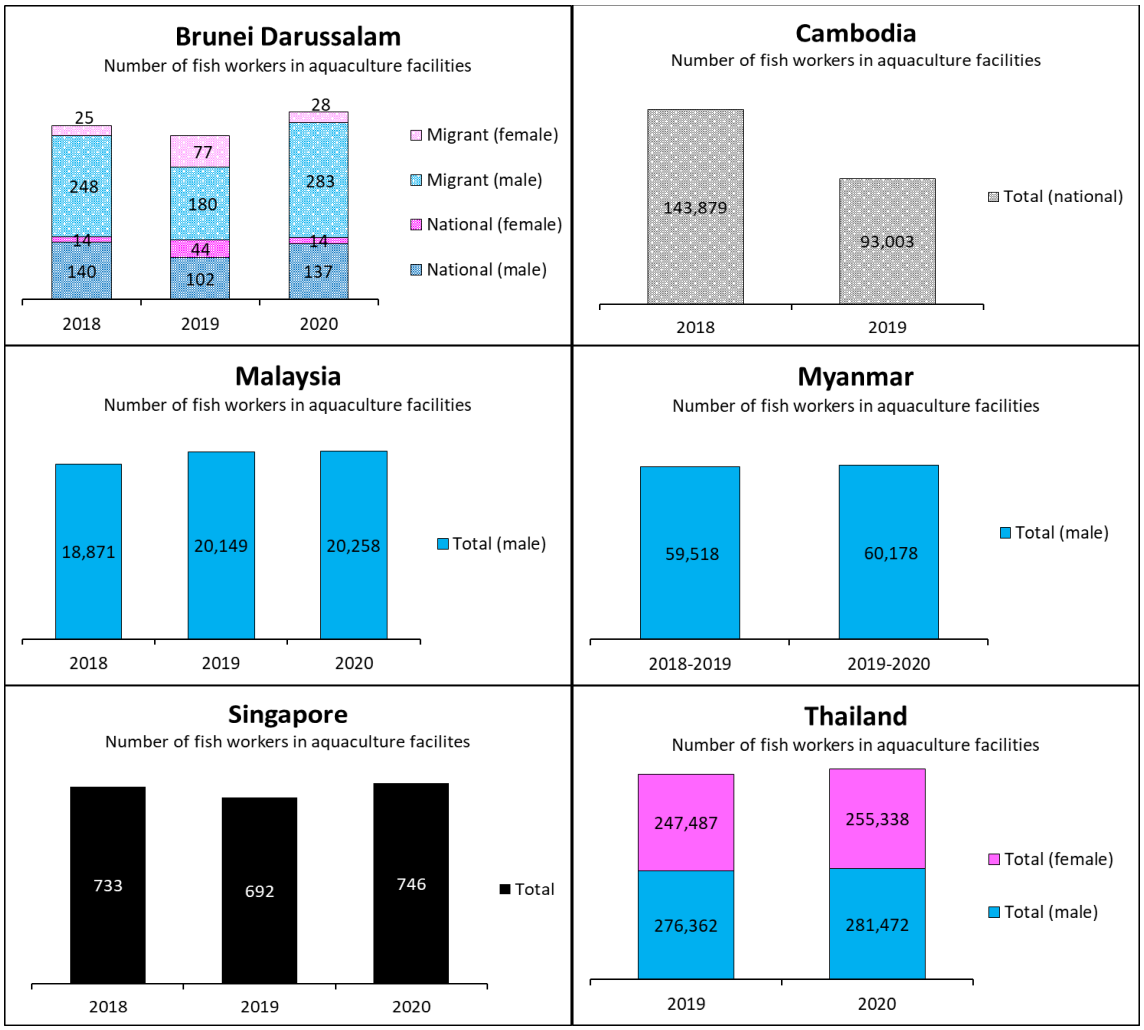


Figure 15. Number of fish workers in aquaculture facilities in Brunei Darussalam, Cambodia, Malaysia, Myanmar, Singapore, and Thailand from 2018 to 2020 disaggregated by nationality and sex

B.4.3 Fish processing facilities

The number of fish workers in fish processing facilities in Brunei Darussalam and Myanmar from 2018 to 2020 disaggregated by sex and nationality is shown in **Figure 16**.

In Brunei Darussalam, the total number of fish workers slightly increased from 528 in 2018 to 537 in 2019; however, there was a significant decrease to 433 in 2020. The Department of Fisheries of Brunei Darussalam assisted the companies in expediting the re-entry and entry process of new migrant workers

through the online entry travel pass application. From 2018 to 2020, around 0.16 % were female among the average total number of fish workers.

For Cambodia, the total number of fish workers in fish processing facilities significantly increased from 28,118 in 2018 to 47,172 in 2019, which was composed of national workers.

For Indonesia, the total number of fish workers in fish processing facilities decreased from 100,059 in 2019 to 90,353 in 2020.

For Myanmar, the total number of fish workers remained at 12,212 (61 % female) between 2018–2019 and 2019–2020. To comply with COVID-19 health protocols, the number of workers was limited in the processing area and workers were organized into working groups or teams for the rotation system.

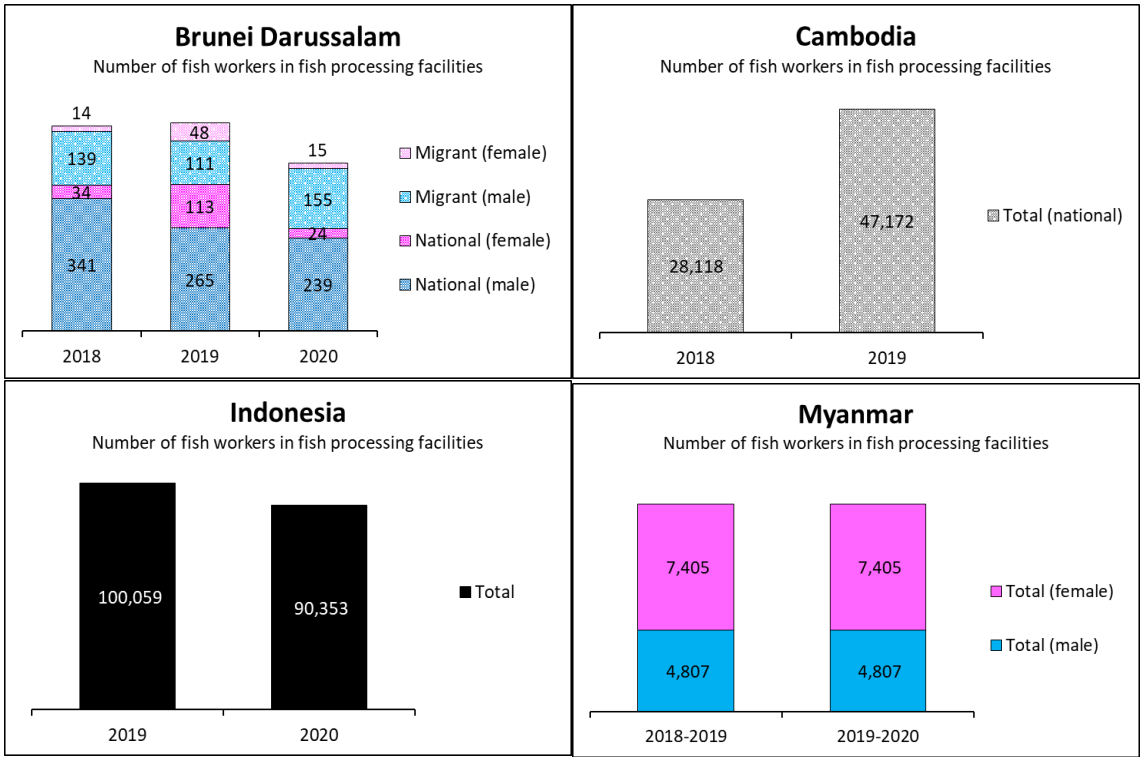


Figure 16. Number of fish workers in fish processing facilities in Brunei Darussalam, Cambodia, Indonesia, and Myanmar from 2018 to 2020 disaggregated by nationality and sex

C. Impacts of COVID-19

The impacts of COVID-19 on fisheries and aquaculture activities due to the restrictions implemented by the respective countries to prevent the spread of infection are described below according to a set of indicators as well as the corresponding adaptations of related stakeholders to such impacts.

C.1 Capture Fisheries

C.1.1 Marine capture fisheries

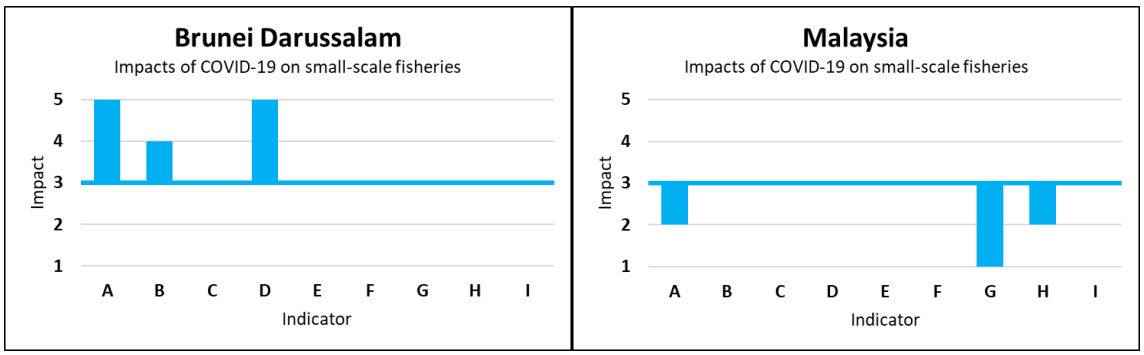
C.1.1.1 Small-scale capture fisheries

As shown in **Figure 17**, in Brunei Darussalam, the number of people engaged in small-scale fishing activities increased especially many young people who lost their job during the pandemic resorted to engaging in small-scale fishing activities to support their families; thus, the number of small-scale fishing vessels in operation slightly increased. The cost of fishing operations increased particularly for the imported fishing materials were limited and took a long time to be delivered. There were no changes in the duration/period of fishing activity, amount of catch per fishing trip, price of catch in wholesale markets/landing centers, the income of fishers from small-scale fishing activities, and liquidity and income of small-scale fishers from other activities. Besides, the logistics/access of fishers to markets was not affected but the regulations and guidelines set by the Ministry of Health were followed.

For Malaysia, the logistics/access of fishers to markets had decreased during the early stage of MCO, thus, the government-issued permit to allow essential services. The number of people engaged in small-scale capture fishing activities, as well as the income of fishers from small-scale fishing activities, slightly decreased, hence, an approval letter was issued by the government to small-scale fishers to allow them to go fishing and the fishers augmented their income by exploring online marketing through e-commerce platforms, respectively. Nevertheless, the cost of fishing operations and vessels, amount of catch per fishing trip, and price of catch in wholesale markets/landing centers remained stable.

For Myanmar, the number of people engaged in small-scale fishing activities, the number of small-scale fishing vessels in operation, and the duration/period of fishing activity had decreased due to lockdown and limited transportation in outbreak areas, thus, the issuance of pass/permit to small-scale fishers by the quarters/village administrator and Department of Fisheries allowed a limited number of small-scale fishers to go fishing. The cost of fishing operations had increased due to lockdown measures. There was a decrease in the amount of catch per fishing trip because of the limited fishing trips and restrictions on selling fish. The income of small-scale fishers from fishing and other activities decreased because of low fish prices, therefore, village administrators and the Department of Fisheries facilitated the flow of goods to alleviate the income of fishers. The logistics/access of fishers to markets decreased, while the price of catch in wholesale markets/landing centers was volatile.

For Thailand, there were no changes in the duration/period of fishing activity, cost of fishing operations, and amount of catch per fishing trip. To maintain the number of fish workers, the employers or fishing vessel owners monitored the health of fish workers including a 14-day quarantine period and COVID-19 test. The number of small-scale fishing vessels in operation decreased due to the decreased demand and price of fish. The price of catch in wholesale markets/landing centers decreased, therefore, small-scale fishers adopted direct selling and processing of their catch as well as reduced fishing efforts. The logistics/access of fishers to markets decreased, thus, travel documents were issued to allow fishers to travel to markets. The income of fishers from small-scale fishing activities decreased, hence, the families limited their household expenses.



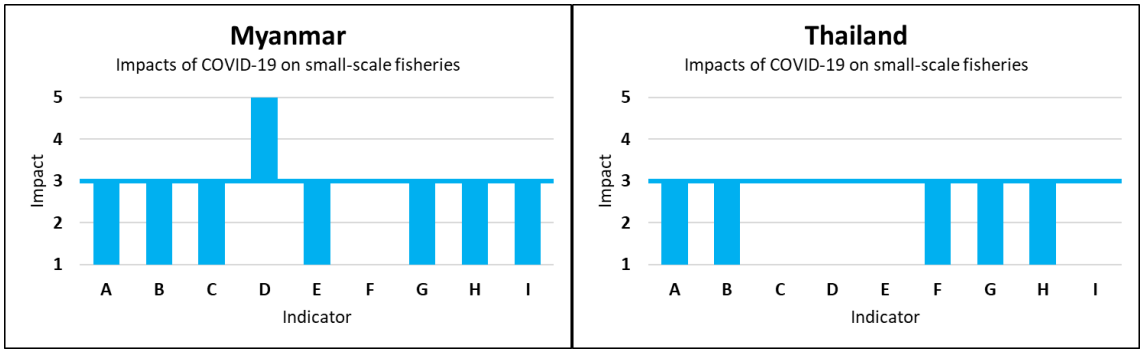


Figure 17. Impacts of COVID-19 on small-scale fisheries of Brunei Darussalam, Malaysia, Myanmar, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Number of people engaged in small-scale fishing activities; B-Number of small-scale fishing vessels in operation; C-Duration/period of fishing activity; D-Cost of fishing operation (fuel, ice, bait, equipment, maintenance, etc.); E-Amount of catch per fishing trip; F-Price of catch in wholesale markets/landing centers; G-Logistics/access of fishers to markets (transportation, buyers, etc.); H-Income of fishers from small-scale fishing activities; I-Liquidity and income of small-scale fishers from other activities.)

C.1.1.2 Commercial fisheries

Figure 18 shows the impacts of COVID-19 on commercial fisheries.

For Brunei Darussalam, the cost of fishing operation increased particularly the price of imported equipment for fishing vessel maintenance which became higher. There was no change in the duration/period of fishing activity, amount of catch per fishing trip, and price of catch in wholesale markets/landing centers.

For Malaysia, the cost of the fishing operation, amount of catch per fishing trip, price of catch in wholesale markets/landing centers, cold chain system, access to fish ports, and capacity of cold storage facilities remained stable.

For Myanmar, the cost of fishing operations increased, while the price of the catch was volatile due to the unstable fish trade during the lockdown period. There was a decrease in the duration/period of fishing activity, amount of catch per fishing trip, access to fish ports, and liquidity and income of fishing operators from fishing which were due to lockdown measures. Moreover, there was no change in the transshipment at sea.

For Thailand, there was no change in the cost of fishing operation and the amount of catch per fishing trip. The price of catch in wholesale markets/landing centers and liquidity and income of fishing operators from fishing had decreased, thus, some commercial fishing vessel operators reduced the frequency of their fishing operations while some stopped fishing. Moreover, costs were shouldered by fishing operators for the expenses for COVID-19 (tests, quarantine, among others) of fish workers.

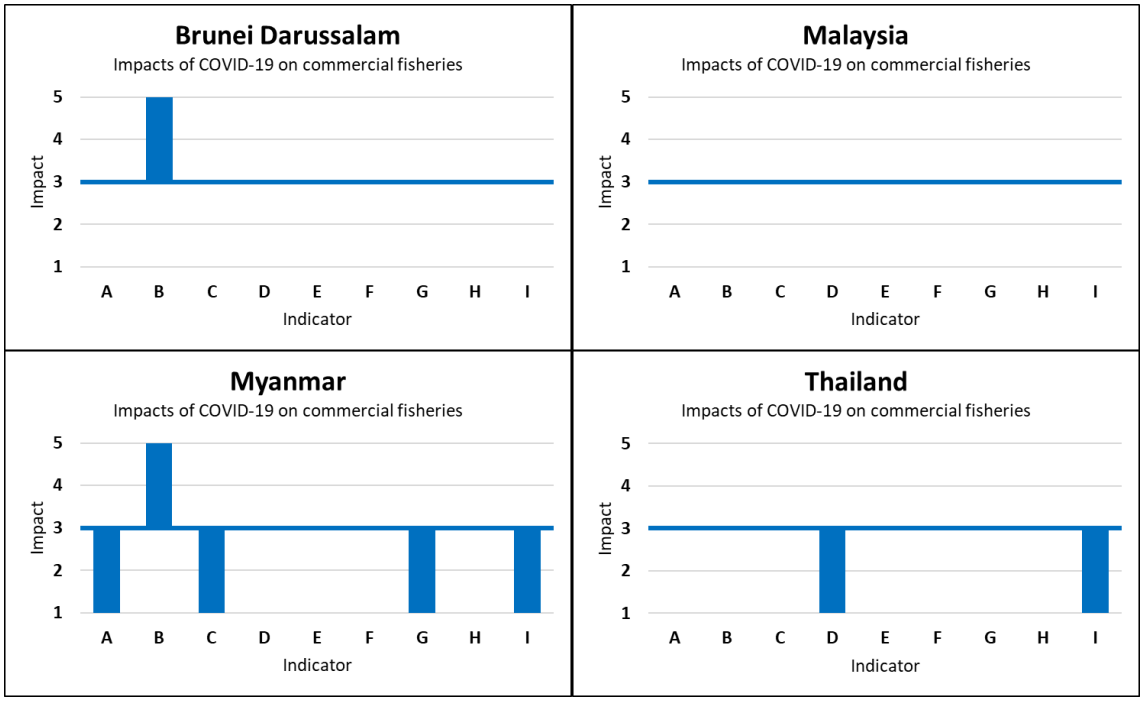


Figure 18. Impacts of COVID-19 on commercial fisheries of Brunei Darussalam, Malaysia, Myanmar, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Duration/period of fishing activity; B-Cost of fishing operation (fuel, ice, bait, equipment, maintenance, etc.); C-Amount of catch per fishing trip; D-Price of catch in wholesale markets/landing centers; E-Transshipment at sea; F-Cold chain system; G-Access to fish ports; H-Capacity of cold storage facilities; I-Liquidity and income of fishing operators from fishing.)

C.1.2 Inland capture fisheries

Figure 19 shows the impacts of COVID-19 on inland capture fisheries.

For Malaysia, there was no change in the cost of fishing operations, amount of catch per fishing trip, and price of catch in wholesale markets/landing centers. The logistics/access of fishers to markets slightly decreased during the early period of MCO, therefore, an approval letter/permit to carry out essential services was issued by the government to the fishers to allow them to travel. The income of fishers from inland fishing activities decreased so they explored online marketing through e-commerce platforms.

For Myanmar, there was an increase in the cost of fishing operations, while the price of the catch was volatile. Due to lockdown measures, there was a decrease in the number of active fishing vessels in operation, the number of people engaged in inland capture fishing activities, duration/period of fishing activity, amount of catch per fishing trip, logistics/access of fishers to markets, the income of fishers from fishing activities, and liquidity and income of fishers from other activities. Pass/permit was issued to fishers by the quarters/village administrator and Department of Fisheries to allow fishers to go fishing.

For Thailand, there was no change in the number of active fishing vessels in operation, cost of fishing operations, and logistics/access of fishers to markets. There was a decrease in the duration/period of fishing activity due to lockdown measures such as curfew, so fishers changed the time of their fishing activities. There was a slight increase in the price of catch in wholesale markets/landing centers. Moreover, the liquidity and income of fishers from other activities had decreased.

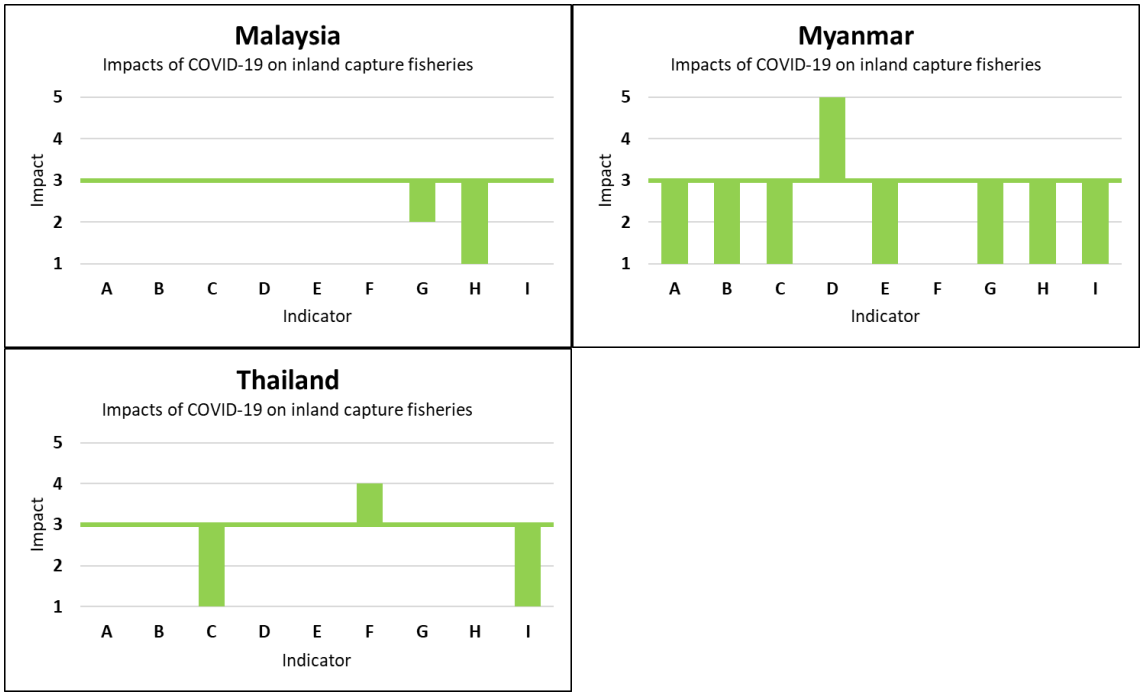


Figure 19. Impacts of COVID-19 on inland capture fisheries of Malaysia, Myanmar, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Number of fishing vessels in operation; B-Number of people engaged in inland capture fishing activities; C-Duration/period of fishing activity; D-Cost of fishing operations (fuel, ice, bait, equipment, maintenance, etc.); E-Amount of catch per fishing trip; F-Price of catch in wholesale markets/landing centers; G-Logistics/access of fishers to markets (transportation, buyers, etc.); H-Income of fishers from inland fishing activities; I-Liquidity and income of fishers from other activities.)

C.1.3 Fisheries management

Figure 20 shows the impacts of COVID-19 on fisheries management.

For Brunei Darussalam, there was no change in the application of innovative technologies to combat IUU fishing because the existing technology was adopted as usual. Also, since there were no requests from foreign fishing vessels to enter the country's fishing port during the pandemic, the port State measures were implemented normally. The MCS activities were conducted routinely but in compliance with the COVID-19 SOPs as advised by the Ministry of Health. Besides, the conduct of regular/routine data collection for fish stock assessment, monitoring of shared stocks/transboundary species, and conduct of research/project activities were not affected. There was no change in the conduct of physical meetings/workshops at international/regional/national levels where the usual activities were participated and conducted through the online platform or blended/hybrid meetings.

For Indonesia, there was an increase in the application of innovative technologies to combat IUU fishing due to the increased number of IUU fishing activities during the pandemic. Hence, the surveillance activities facilitated by the Ministry of Marine Affairs and Fisheries, Indonesia (MMAF), and other relevant agencies were intensified using the Vessel Transmitter Activation Certificate (SKAT) and SALMON. There was a decrease in the implementation of port State measures (PSM) due to the COVID-19 restriction measures, thus, the health protocols were observed to sustain the PSM implementation. The implementation of MCS was enhanced through airborne surveillance by hiring planes from a private aviation company. The conduct of regular/routine data collection for fish stock assessment was sustained by carrying it out in a hybrid manner by observing the COVID-19 restriction measures, and there was no change in the monitoring of shared stocks/transboundary species. The

conduct of physical meetings/workshops at international/regional/national levels was affected, hence, they were held online.

For Malaysia, there was no change in the application of innovative technologies to combat IUU fishing since the use of a vessel monitoring system (VMS) to monitor the movement of fishing vessels was continued through the cooperation and collaboration among relevant agencies under the NPOA-IUU. Also, the implementation of port State measures was not affected. MCS activity at sea was conducted vigilantly to combat IUU fishing by local fishing vessels and protect the national waters from encroachment by foreign vessels. However, for cases that involved foreign vessels, the vessels were escorted out of national waters to minimize the spread of COVID-19 at the detention centers. The operations among maritime enforcement agencies were integrated and focused on maximizing human resources and asset capacity. The conduct of regular/routine data collection for fish landing and the conduct of research/project activities were slightly affected due to movement restrictions imposed during the MCO; thus, approval letters/permits were issued to allow the government staff to go to work. There was a decrease in the conduct of physical meetings/workshops at international/regional/national levels due to MCO; therefore, virtual meetings were organized.

For Lao PDR, the time for patrolling and surveillance in inland waters of the country had been reduced due to COVID-19 travel restrictions implemented by the government.

For Myanmar, there was no change in the application of innovative technologies to combat IUU fishing and the implementation of port State measures. On the other hand, there was a decrease in the implementation of MCS because of travel restrictions and limitations to enter landing sites for data collection; hence, the information on MCS was exchanged between relevant agencies through virtual meetings, Email, and phone calls. The conduct of regular/routine data collection for fish stock assessment had decreased because of travel restrictions and limitations to entering landing sites for data collection; therefore, limited staff were allowed to go to landing sites and should follow COVID-19 prevention measures. There was a decrease in the monitoring of shared stocks/transboundary species due to travel restrictions; hence, the relevant staff participated in regional virtual meetings for the exchange of information. The conduct of physical meetings/workshops at international/regional/national levels had decreased because international and domestic travels were restricted, so virtual meetings were organized. The conduct of research/project activities also decreased because of travel restrictions; thus, regular regional/national virtual meetings were conducted.

For Singapore, the implementation of port State measures was not affected. However, the conduct of physical meetings/workshops at international/regional/national levels had decreased due to travel restrictions, so virtual meetings were conducted. For Thailand, some modifications were applied in the implementation of port State measures such as setting up a special area for inspection of documents to avoid the risk of COVID-19 infection among the inspection officers and crews. For the implementation of MCS, the inspection activities had decreased to prevent the infection among fisheries officers at inspection areas; besides, other modifications include inspection of fishing vessels with a reduced number of staff or remote inspection through teleconference and other mobile applications as well as inspection of aquatic animals using the Thai Flagged Catch Certificate (TFCC) information system instead of port inspection. The conduct of physical meetings/workshops at international/regional/national levels had decreased due to travel restrictions and social distancing measures, thus, teleconferences were held instead and hands-on workshops that require interaction were postponed until the COVID-19 situation is resolved.

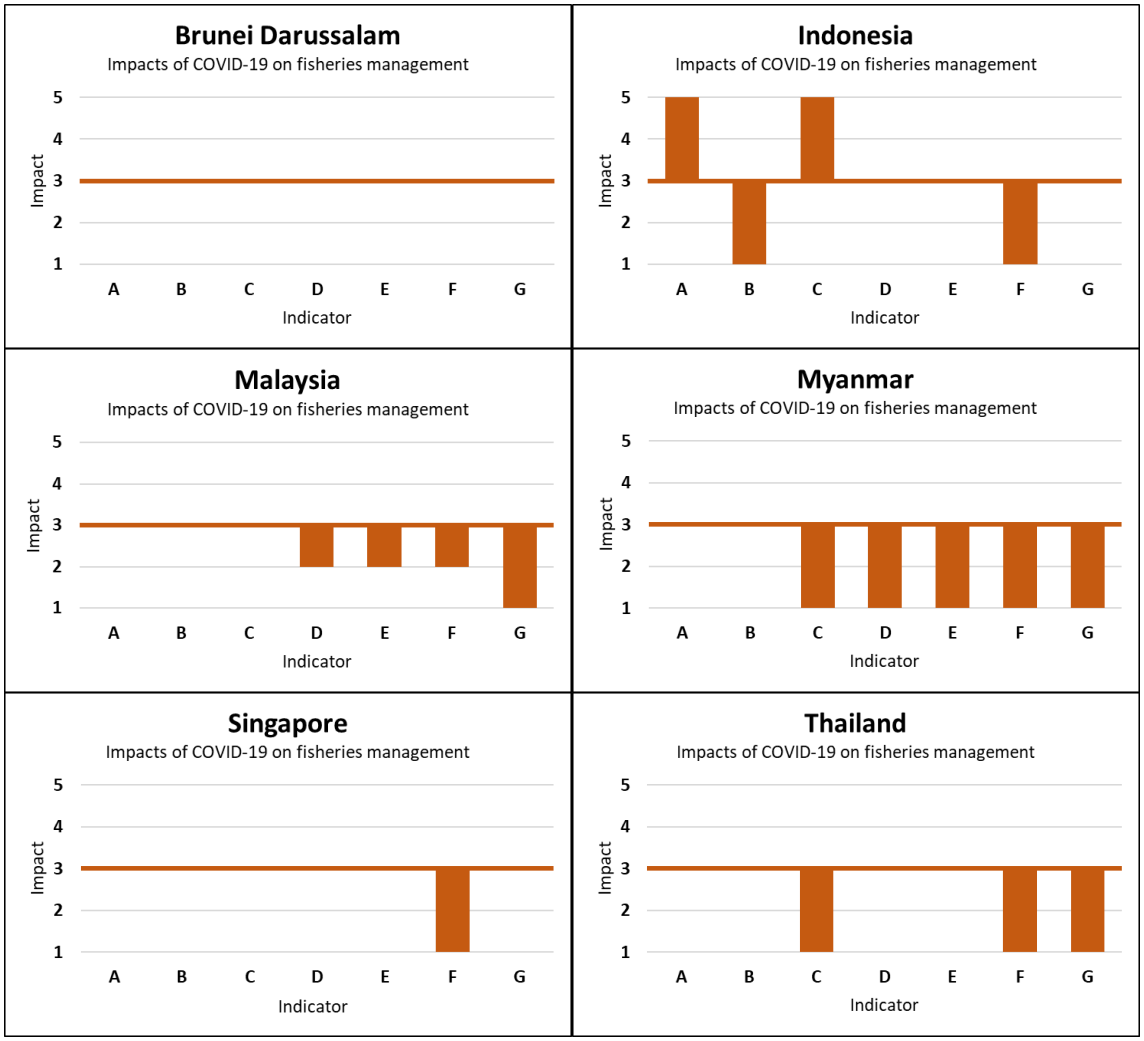


Figure 20. Impacts of COVID-19 on fisheries management of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Application of innovative technologies to combat IUU fishing (GIS, remote sensing, etc.); B-Frequency of implementation of port State measures; C-Implementation of MCS; D-Conduct of regular/routine data collection for fish stock assessment; E-Monitoring of shared stocks/transboundary species; F-Conduct of physical meetings/workshops at international/regional/national levels; G-Conduct of research/project activities)

C.1.4 Fishery resources and aquatic habitats

For Brunei Darussalam, the COVID-19 pandemic had no impact on fishery resources and aquatic habitats. In Malaysia, the assessment of fishery resources and aquatic habitats was conducted in July–September 2020. In coastal areas, the number of fish tends to be higher. For inland fishery resources and habitats, there were no significant impacts were observed as of September 2020; although fish seed restocking activities were carried out in inland waters during 2010–2020. There were no significant impacts on coral reefs and seagrass beds observed which could be due to the short period of assessment and relatively slow changes in the habitats. There was an increase in turtle nesting and hatchling due to reduced human activities. Moreover, the water quality at certain sites had improved.

For Myanmar, fishing pressures have increased in coastal areas, and illegal fishing practices continued in the mangroves and offshore areas. In inland waters, illegal fishing practices such as intensive usage of electric fishing gears had persisted. The illegal fishing practices continued to occur due to the poverty

of the dependent communities and travel restrictions. Therefore, the Government provided the fishers with about USD 16.00 support, while DOF Myanmar, in collaboration with the Maritime Police and local communities, is planning to apprehend illegal fishing practices.

For Singapore, the marine habitats remained stable due to the restrictions on the number of passengers on dive boats and decreased access to dive sites. There was an increase in the number of visitors on the beaches, but the negative impacts on beaches were slight or negligible because the crowds were well managed.

C.2 Aquaculture

Figure 21 shows the impacts of COVID-19 on the aquaculture of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand.

For Brunei Darussalam, there were no changes in the number of operational aquaculture farms, access of fish farmers to fish farms, duration of the cycle of aquaculture from rearing to harvest, the quantity of production, the quantity of production of ornamental fishes, farm gate prices of market-size cultured species, the income of fish farmers from aquaculture activities, and liquidity and income of fish farmers from other activities. Although the logistics/access of fish farmers to domestic markets was stable, farmers had to pay higher logistic costs for export and import. On the other hand, the cost of inputs specifically raw materials had increased due to the pandemic and reliance on importation; thus, the government provided top-up funds to bring in raw materials such as shrimp and fish fry by charter flight. While the quantity of seed production had decreased.

For Indonesia, there was no change in the access of fish farmers to fish farms since the location of their ponds is close to their settlement. However, the quantity of production and income of fish farmers from aquaculture activities had decreased. There was an increase in the duration of the cycle of aquaculture from rearing to harvest due to transportation restrictions where the delivery of seed, feed, and harvested fish was hampered; hence, the people who transport basic needs and food for the community were exempted. Also, the cost of inputs had increased because of lengthy maintenance periods and disrupted supply chains; thus, the farmers reduced the amount of production and opted for commodities with lower production costs. The seed production declined due to decreasing demand from cultivators who decreased their production quantity because of supply chain disruptions; therefore, farmers decided to produce seeds that are still stable in the market such as ornamental fish and fish species that are mostly consumed by local people (*e.g.* catfish). The quantity of production of ornamental fishes increased as a result of the increasing demand to fill spare time and as a new hobby for people affected by social restrictions. The farm gate prices of market-size cultured species declined due to stockpiling caused by disruption of the supply chain; so, the farmers reduced the costs to stabilize market prices.

For Lao PDR, there was a decrease in the access of fish farmers to domestic markets. In addition, there was a shortage in the supply of fish feed and laborers.

For Malaysia, the access of fish farmers to fish farms was not affected because the aquaculture operators were issued a permit to travel by the government. The cost of inputs was stable the monthly electricity bills were discounted to support aquaculture operators to relieve financial pressure. The farm gate prices of market-size cultured species were maintained by exploring online marketing. The duration of the cycle of aquaculture from rearing to harvest had increased due to a lack of market and export demand; thus, fish trade was not restricted to facilitate export/import activities. The logistics/access of fish farmers to domestic/international markets (transportation, buyers, etc.) had slightly decreased. Furthermore, the quantity of production, the quantity of seed production, the quantity of production of ornamental fishes, and the income of fish farmers from aquaculture activities had decreased; thus, the aquaculture operators were issued a permit to travel by the government.

For Myanmar, the duration of the cycle of aquaculture from rearing to harvest had increased specifically harvest time was delayed because of a lack of market demand; thus, the local government promoted fish consumption to enhance market demand for fish. There was an increase in the cost of inputs because of the prolonged culture period; hence, it was proposed to provide loans or lower the interest rate of loans and allow tax exemption to fishpond owners. The quantity of seed production and quantity of production of ornamental fishes had decreased as a result of limited distribution due to travel restrictions; so, the government lifted the restriction of transportation for trade. Also, the logistics/access of fish farmers to domestic/international markets had decreased because of the reduced workforce and limited hours of wholesale and local markets; hence, the transportation restriction for trade was lifted by the government. Moreover, the quantity of production and farm gate prices of market-size cultured species had decreased. The income of fish farmers from aquaculture activities had decreased because of unsold stocks, so providing loans to fish farmers was proposed.

For Singapore, there was a decrease in the access of fish farmers to fish farms specifically physical interactions/visitations of other fish farms were allowed during the circuit breaker period (nationwide partial lockdown); thus, safe entry check-in systems were implemented at jetties and in some farms. The quantity of production of ornamental fishes had decreased due to uncertainty of logistics in cargo flights and freight space although the overall demand for ornamental fishes is still present; so, when the situation with cargo flights has improved, fish farms were ready to step up production. The logistics/access of fish farmers to domestic/international markets had slightly decreased specifically international markets; hence, fish farmers channeled their products to domestic sales. There was a decrease in the income of fish farmers from aquaculture activities due to a significant drop in demand from the tourism industry including MICE activities (*i.e*. meetings, incentives, conventions, and exhibitions). On the other hand, the cost of inputs (feeds, chemicals, power, equipment, maintenance, etc.) had increased. The number of operational aquaculture farms, duration of the cycle of aquaculture from rearing to harvest, the quantity of production, and farm gate prices of market-size cultured species remained stable.

For Thailand, the access of fish farmers to fish farms was not affected. The duration of the cycle of aquaculture from rearing to harvest had increased due to reduced demand for fish; thus, fish farmers harvest a small number of their products and sell them at the market and online platforms, and the Department of Fisheries (DOF) of Thailand had assisted the fish farmers in selling online and arranged sales and pickup sites to enhance domestic consumption. The cost of inputs had increased due to low demand for fish resulting in higher expenses in feed, energy, tools, and maintenance; therefore, the government launched the program to help registered farmers by providing them with the financial assistance of THB 5,000 (USD 160) per person per month for three months as well as developed a multi-channel market to distribute accessible products as early as possible. Also, the farm gate prices of market-size cultured species had decreased because fish farmers were unable to bring their products to market promptly, causing the price of aquatic animals to fall and consumers reduced their spending; thus, the DOF Thailand supported the distribution of aquatic products the provincial level and established new marketplaces were across the country to allow fish farmers to sell their products as well as fish farmers reduced the production of low-value species. There was a decrease in the logistics/access of fish farmers to domestic/international markets because traveling across the country was prohibited. The income of fish farmers from aquaculture activities had decreased as a result of a low price of aquatic animals, a reduction in production, and a decrease in consumer demand. The quantity of production of ornamental fishes was stable because more people have become interested in ornamental fish, and the online trading of ornamental fish had become popular. There was a decrease in the quantity of production as a result of the restriction measures implemented by trading partners (*e.g*. intensive COVID-19 measures for imported products); thus, the government advocated the adoption of steps to generate confidence in the production of aquatic animal products throughout the value chain to ensure safety and COVID-19 free products by granting a certification to the manufacturing process for trading partners to purchase aquatic products from Thailand. The quantity of seed production had decreased as a result of the reduction in export of specific aquatic species leading to fewer seeds purchased.

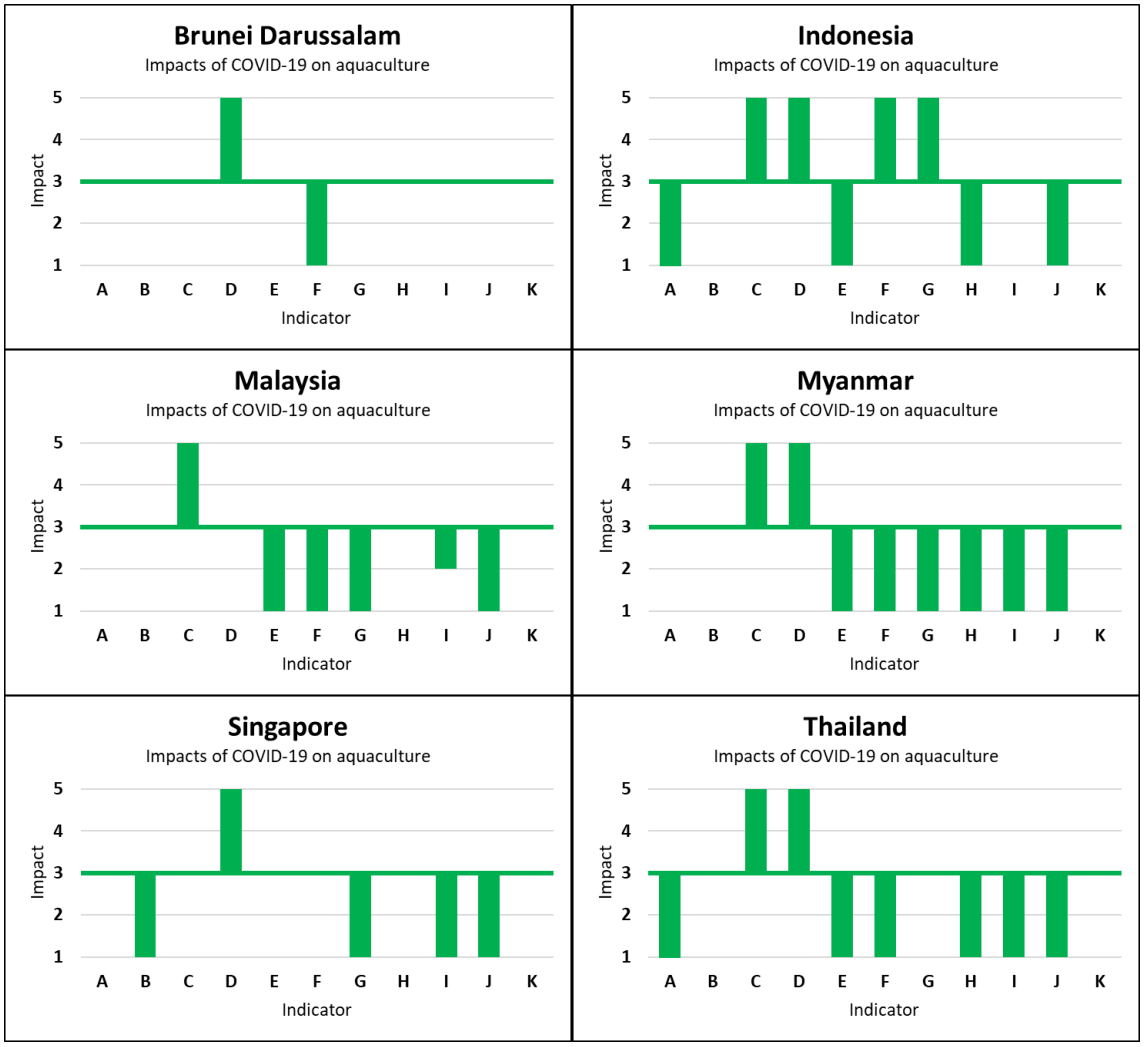


Figure 21. Impacts of COVID-19 on aquaculture of Brunei Darussalam, Indonesia, Malaysia, Myanmar, Singapore, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Number of operational aquaculture farms; B-Access of fish farmers to fish farms; C-Duration of the cycle of aquaculture from rearing to harvest; D-Cost of inputs (feeds, chemicals, power, equipment, maintenance, etc.); E-Quantity of production; F-Quantity of seed production; G-Quantity of production of ornamental fishes; H-Farm gate prices of market-size cultured species; I-Logistics/access of fish farmers to domestic/international markets (transportation, buyers, etc.); J-Income of fish farmers from aquaculture activities; K-Liquidity and income of fish farmers from other activities)

C.3 Fish Processing Industry

Figure 22 shows the impacts of COVID-19 on the fish processing industry of Brunei Darussalam, Indonesia, Malaysia, Myanmar, and Thailand.

For Brunei Darussalam, the duration of fish processing operations was not badly affected by the pandemic since the companies comply with COVID-19 measures following the guidelines of MOH including physical distancing, not allowing workers with fever/flu symptoms to come to work, and requiring a 3-day quarantine for workers with fever/flu symptoms. The availability of raw materials had decreased since the processing plants mainly rely on the capture fisheries subsector where some fishing vessels were not operational during COVID-19 due to travel restrictions on migrant workers working as vessel captain/crew; thus, the Department of Fisheries assisted the companies to facilitate the recruitment of new and re-entry of foreign workers through the online Entry Travel Pass Application to

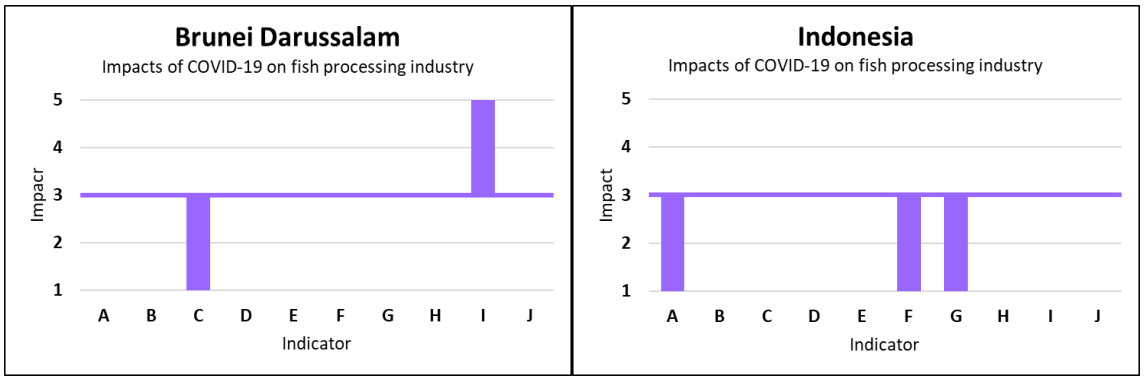
expedite the process. The storage capacity of plants/factories had increased to accommodate the storage of processed frozen shrimp that were meant for export. Nevertheless, there were no changes in the number of operational plants/factories, processing lines, the quantity of production, and the price of processed fish and fishery products.

For Indonesia, there was a decrease in the number of operational plants/factories where some have stopped their operations temporarily while some have stopped completely because they cannot meet business targets. The types of processed fish and fishery products and quantity of production had decreased. Moreover, there were no changes in the price of processed fish and fishery products, the storage capacity of plants/factories, and the application of product certification schemes.

For Malaysia, there was a slight decrease in the number of operational plants/factories and duration of fish processing operations due to MCO and an insufficient number of foreign workers. The availability of raw materials had slightly increased because the local government issued approval letters/permits to essential services and facilitated the trade (export/import activities) and fish processing companies limited their production to cater to the demand only. The operation cost had increased; therefore, the companies were supported by other agencies through discounts on monthly electricity bills to relieve financial pressure and benefited from the recovery plans, in short, medium, and long-term development plans of the government. The quantity of production had decreased so the companies limited their production to cater to demand only. The price of processed fish and fishery products was maintained by utilizing the online market facilities. Also, the processing lines, types of processed fish and fishery products, and application of product certification schemes were not affected by the pandemic.

For Myanmar, there was a decrease in the number of operational plants/factories after inspection of the Ministry of Sport and Health and Ministry of Labor, Immigration and Manpower; thus, the companies should comply with the Food Safety Management Systems including good hygiene practices, cleaning and sanitation, process control, storage, distribution, and transportation as well as with the guidance for food businesses to prevent and control COVID-19. There was a decrease in the availability of raw materials because of provincial lockdown; hence, the local authority issuance of pass/permit or Health Certificate for workers involved in fishery activities. Also, the duration of fish processing operations and processing lines had decreased; hence, workers were organized into groups for the rotation system. There was a decrease in the quantity of production due to low consumer demand; so, the production depended upon the demand from consumers.

For Thailand, the number of operational plants/factories was not affected by the pandemic and continued to operate.



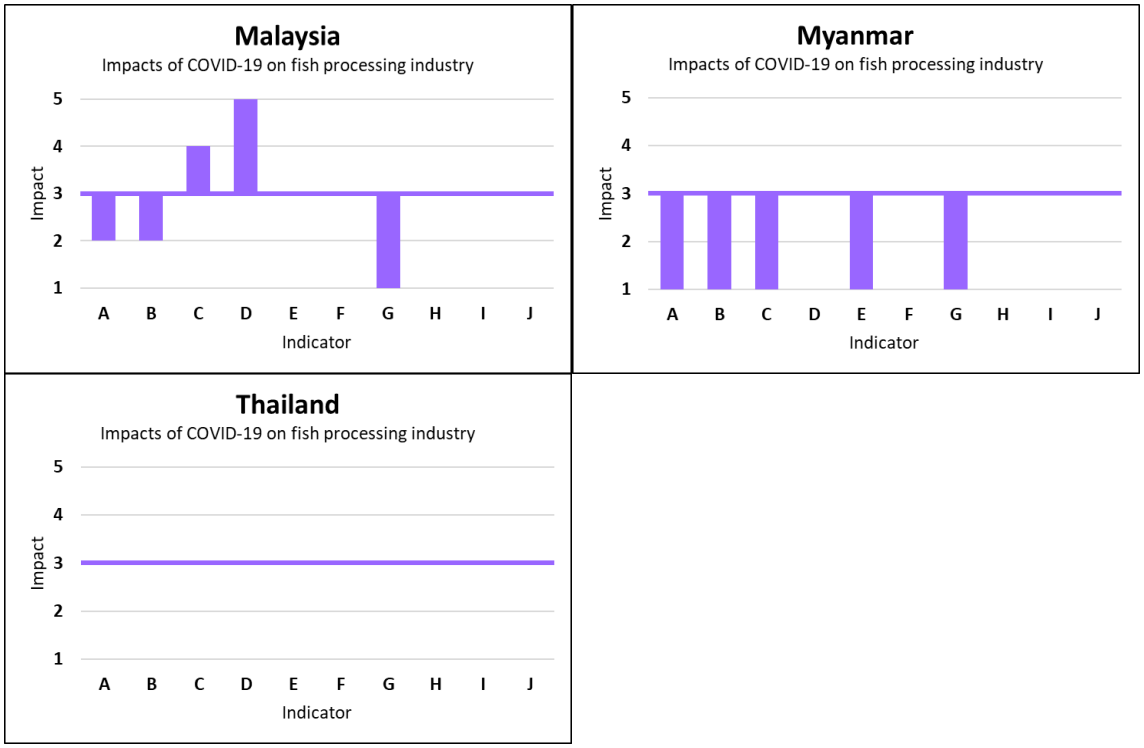


Figure 22. Impacts of COVID-19 on the fish processing industry of Brunei Darussalam, Indonesia, Malaysia, Myanmar, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Number of operational fish processing plants/factories; B-Duration of fish processing operations; C-Availability of raw materials; D-Operation cost (equipment, power, etc.); E-Processing lines; F-Types of processed fish and fishery products; G-Quantity of production; H-Price of processed fish and fishery products; I-Storage capacity of plants/factories; J-Application of product certification schemes)

C.4 Fisheries Trade

C.4.1 Domestic fish trade

Figure 23 shows the impacts of COVID-19 on the domestic fish trade of Brunei Darussalam, Indonesia, Malaysia, Singapore, and Thailand.

For Brunei Darussalam, the number of operational markets, duration of operation of markets, number of fish traders, supply of fish and fishery products, demand for fish and fishery products, selling price of fish and fishery products, logistics/access of traders to markets, logistics/access of consumers to markets, and liquidity and income of fish traders were not affected by the pandemic. However, the demand from restaurants had decreased; therefore, suppliers have opted for the online marketing platform to increase the demand from the local markets.

For Indonesia, the number of operational markets, duration of operation of markets, and the number of fish traders had decreased due to the PSBB and PPKM regulations that limited the market operating hours and number of sellers and consumers in markets; thus, the stakeholders opted for online marketing. The supply of fish and fishery products in fish markets was stable because there was a steady demand for fish and fishery products, although sellers switched from selling fresh to processed fish to cater to the preference of consumers for ready-to-cook and ready-to-eat foods; hence, the Indonesian Food Service Providers Association (PPJI) collaborated with fishery MSMEs to market fish, sellers and consumers utilized online marketing, and the seller carried out direct marketing. Besides, the selling price of fish and fishery products was not affected by the pandemic. The liquidity and income of fish

traders remained stable because the government aided the MSME actors. The logistics/access of traders to markets was disrupted due to travel restrictions; hence, MMAF coordinated with relevant agencies for efficient distribution of fish and fishery products such as providing refrigerated vehicles. Moreover, there was a decrease in the logistics/access of consumers to markets due to measures on social distancing; so, consumers utilized online marketing.

For Lao PDR, the access of traders to markets had decreased when the time of delivery of supply of products to markets was extended due to travel restrictions.

For Malaysia, the number of operational markets had slightly decreased due to COVID-19 measures, and the duration of operation of markets was reduced in compliance with MCO; thus, the government issuance of approval letters/permits to local markets. The number of traders had slightly increased since many people from other industries who lost their job due to COVID-19 shifted to the marketing of food including fish; therefore, there were alternative marketing and distribution avenues and more options for consumers. The demand for fish and fishery products had slightly decreased due to changes in daily diet intake and the preferences of consumers. There was no change in the supply of fish and fishery products, selling price of fish and fishery products, and liquidity and income of fish traders. On the other hand, the logistics/access of traders to markets and logistics/access of consumers to markets had slightly decreased due to MCO.

For Singapore, there was a decrease in the demand for fish and fishery products because the demand from restaurants had dropped; therefore, e-commerce was utilized.

For Thailand, the number of operational markets had decreased due to strict implementation of COVID-19 measures, while the supply of fish and fishery products had slightly increased particularly shrimp products due to unsold supply; thus, the Department of Fisheries of Thailand in collaboration with the Department of Internal Trade of Thailand and TaladThai launched the project "Safety Fish Market-GAP" to provide a free place for fish farmers to sell their products in TaladThai, Pathum Thani Province, and Department of Fisheries developed the market online system "Fisheries Shop" as an online platform for selling seafood products. The duration of operation of markets had decreased; so, fish farmers sold their fish within their respective areas and through online platforms instead of going to the seafood market. The demand for fish and fishery products had slightly decreased due to the fear of consumers that infected traders could transfer COVID-19 to fish and fishery products; therefore, consumers shifted to online platforms and buy certified fish and fishery products, activities such as raising awareness to build confidence on the consumption of fish and fishery products were carried out in collaboration among public-private sectors, and Department of Fisheries promoted the standard certification logo "Thaicarp" to build the confidence of consumers. The selling price of fish and fishery products had slightly decreased due to low demand; hence, fishers and farmers changed the way of selling their products such as selling products within their respective areas and utilizing online platforms and delivery services. Moreover, there was a decrease in the logistics/access of traders to markets and logistics/access of consumers to markets due to travel restrictions; thus, public health sectors in collaboration with fish traders agreed to implement COVID-19 preventive measures such as spraying disinfectants in the market, body temperature checking, providing alcohol, and social distancing, and traders/consumers used online platforms to sell/buy fish and fishery products.

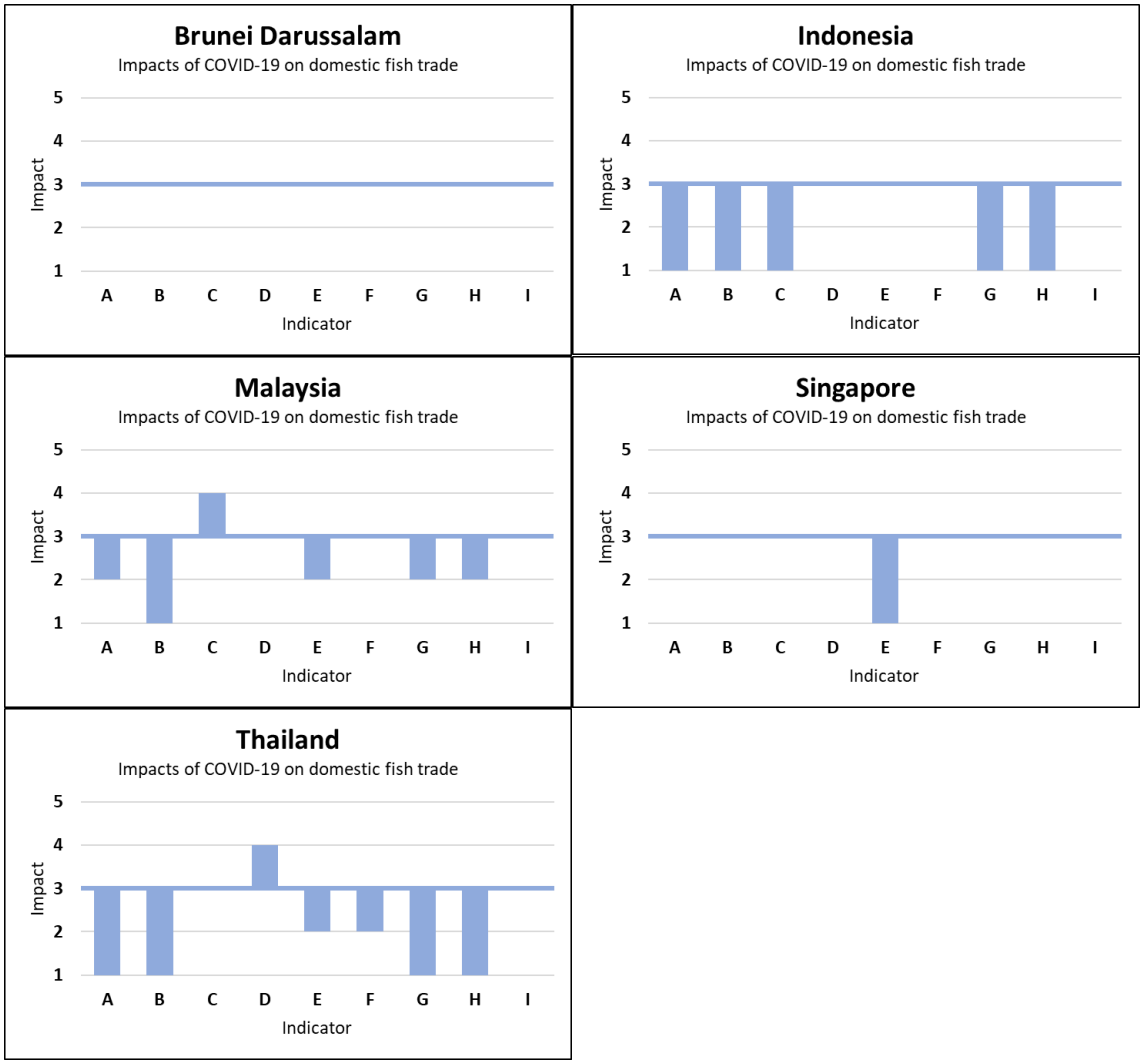


Figure 23. Impacts of COVID-19 on domestic fish trade of Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Singapore, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Number of operational markets; B-Duration of operation of markets; C-Number of fish traders; D-Supply of fish and fishery products; E-Demand for fish and fishery products; F-Selling price of fish and fishery products; G-Logistics/access of traders to markets (transportation, etc.); H-Logistics/access of consumers to markets (transportation, etc.); I-Liquidity and income of fish traders)

C.4.2 International fish trade

Figure 24 shows the impacts of COVID-19 on the international fish trade of Brunei Darussalam, Indonesia, Japan, Malaysia, Myanmar, and Thailand.

For Brunei Darussalam, the traceability of exported/imported fish and fishery products and the application of product certification schemes did not change. For the logistics/access to international markets, there was a decrease in the imports of fish due to travel restrictions but there was an increase in the exports due to an increase in shrimp production; thus, the Department of Fisheries escorted the import/export transports to and from border following the guidelines of the Ministry of Health. The types of exported processed fish and fishery products had slightly decreased, while the demand from international markets and types of imported processed fish and fishery products had increased.

For Indonesia, there was a decrease in the logistics/access to international markets due to travel restrictions on international flights and strict requirements from countries for fish and fishery products free from COVID-19; thus, the stakeholders utilized the national flight carriers to export the fish and fishery products and warehouses were provided for storage of pending fish and fishery products. The demand from international markets was not affected except that there was a decrease in the demand from Hongkong and China for live reef fish. There was no change in the types of exported processed fish and fishery products, types of imported processed fish and fishery products, traceability of exported/imported fish and fishery products, and application of product certification schemes.

For Japan, the logistics/access to international markets had decreased due to the reduction of domestic and international flights. There was a decrease in the demand from international markets due to lockdown measures by foreign governments and local authorities, and the cancellation of international jewelry events affected the export of cultured pearls. The types of exported processed fish and fishery products had decreased, particularly frozen fillets of finfish such as farmed Japanese amberjack which are mainly exported for restaurants, due to sluggish demand from the restaurant industry. Moreover, the types of imported processed fish and fishery products had decreased, except for bigeye tuna due to growing demand for household consumption.

For Lao PDR, there was an intensified application of product certification schemes when the required paper works (*e.g.* certification of COVID-19-free fish and fishery products) had become more arduous for imported fish and fishery products.

For Malaysia, there was a slight decrease in the logistics/access to international markets due to limited connecting flights/shipping; thus, for exporting to Singapore, the "reciprocal green lane" was launched by Singapore to allow essential travel for business or official purposes between two countries. The demand from international markets had slightly decreased; thus, the supply was shifted to the domestic market and the cycle of production was reduced. At the early stage of MCO, the types of exported processed fish and fishery products had slightly decreased, while the types of imported processed fish and fishery products had slightly increased. The traceability of exported/imported fish and fishery products remained stable. The application of product certification schemes had slightly decreased due to the delay in the auditing process during MCO; thus, there was a modification of SOPs relating to farm certification, HACCP, and GMP certification schemes by the local government. Moreover, the other indicators include protocol and guidelines, certification, and monitoring and surveillance. For the protocol and guidelines, Malaysia through MOH signed two protocols ensuring that fish and fishery products are free from COVID-19 including 1) Protocol on Inspection, Quarantine and Sanitary Requirements for Aquaculture Aquatic Products to be Exported from Malaysia to China; and 2) Protocol on Inspection, Quarantine and Sanitary Requirements for Wild Marine Fishing Aquatic Products to be Exported from Malaysia to China. For certification, the auditing programs for myGAP Certification and Fish Quality Certificate (FQC) were reduced and limited; hence, self-verification and declaration by farmers were applied and verified through laboratory testing of contaminants such as antibiotics and hormones. The monitoring and surveillance program was maintained.

For Myanmar, the logistics/access to international markets had decreased due to difficulties in connecting container lines and increasing freight charges; thus, stakeholders cooperated with shipping lines and logistic services. The demand from the international market had decreased due to the global COVID-19 outbreak especially the border trade with China; thus, the market was extended to other countries such as Bangladesh and India for freshwater fishes.

For Thailand, the logistics/access to international markets were negatively impacted during the COVID-19 pandemic due to the cancellation of international flights and strict sanitary measures at ports and border checkpoints. Besides, the cancellation of international flights made the export of live aquatic animals almost impossible. Due to the declined exports of fresh, chilled, and frozen fish and fishery products to international markets, the producers in Thailand focused on domestic sales especially online and direct selling to consumers. Meanwhile, exports of canned and processed fish and fishery products increased during the pandemic because it was convenient and safe to consume and have a longer shelf

life. In addition, aquatic products have been developed, including the packaging in order to respond to the needs of consumers in the international markets in accordance with the new normal consumption patterns. Nonetheless, there was no change in the types of exported and imported fish and fishery products.

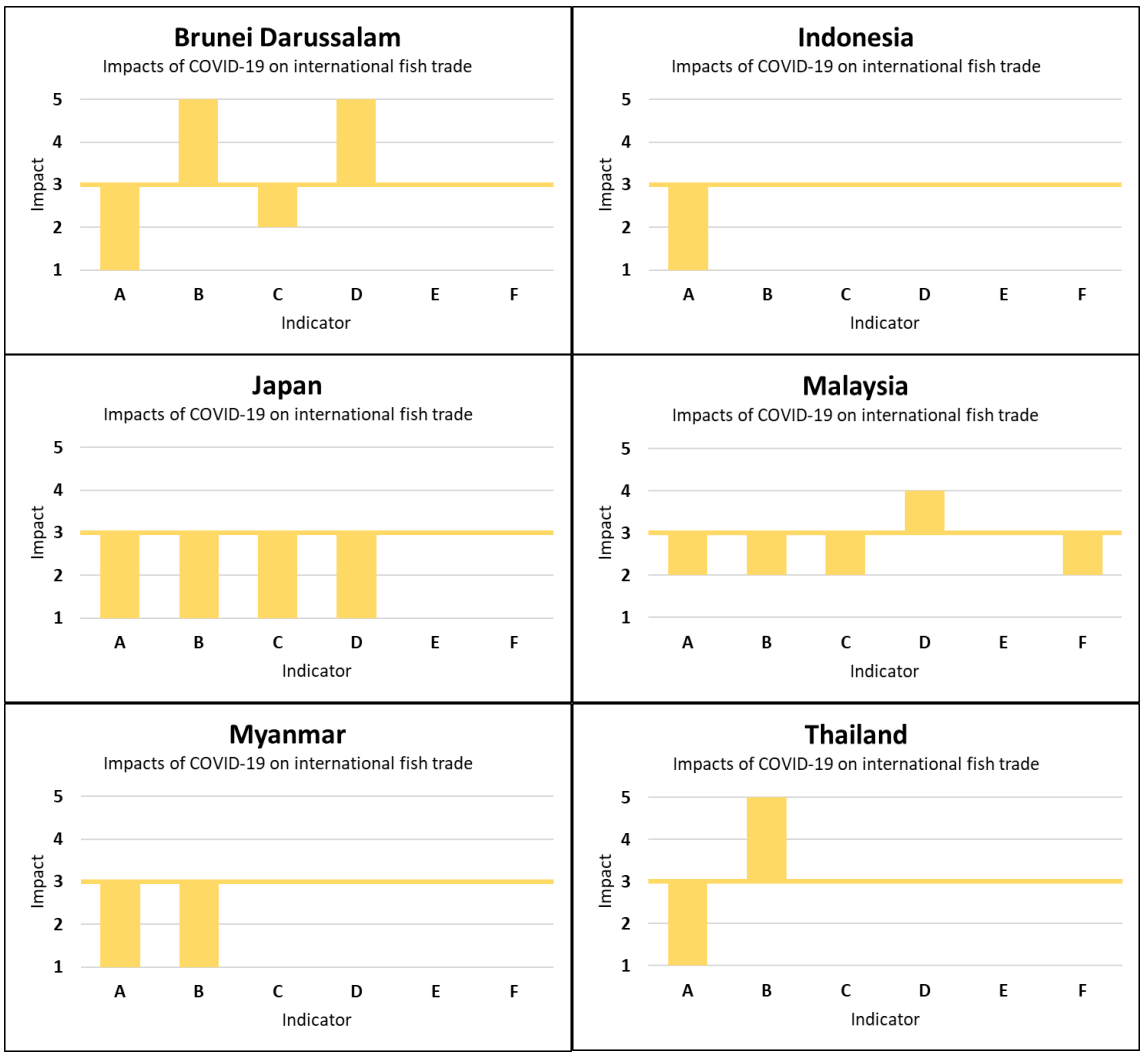


Figure 24. Impacts of COVID-19 on international fish trade of Brunei Darussalam, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, and Thailand (Impact: 1-Decreased; 2-Slightly decreased; 3-Stable/no change; 4-Slightly increased; and 5-Increased. Indicators: A-Logistics/access to international markets; B-Demand from the international market; C-Types of exported processed fish and fishery products; D-Types of imported processed fish and fishery products; E-Traceability of exported/imported fish and fishery products; F-Application of product certification schemes)

C.5 Gender Roles

For Brunei Darussalam, there were no changes in gender roles before and during the COVID-19 pandemic. The men, youth, and elderly still managed and operated fishing boats; but the elderly had lesser involvement in fishing activities during the COVID-19. For commercial fisheries, men continued to manage and operate the fishing vessel and maintain fishing nets.

For Myanmar, there was no change in the roles of women and men in capture fisheries including small-scale fisheries, commercial fisheries, and inland capture fisheries. Women continued processing and selling fish, while men continued to go fishing.

For Thailand, the same small-scale fishing activities were carried out before and during COVID-19, but with more caution during COVID-19. Women continued processing and selling fish and fishing, while men and youth continued fishing. The elderly people still do the housework and look after the children. For commercial fisheries, women continued to process fish and men continued fishing. For inland capture fishing activities, the fishing activities of men were intensified during the COVID-19.

D. Mitigation Measures and Support Programs

In response to the impacts of the COVID-19 pandemic, **Table 2** shows the support programs and mitigation measures provided by the government, non-government, and other sectors to the fisheries and aquaculture
stakeholders

Table 2. Mitigation measures and support programs of the government of the respective countries for the fisheries and aquaculture sector in response to the COVID-19 pandemic

Country	Mitigation measures and support programs
Brunei Darussalam	• Top-up Fund: chartered flights for aquaculture operators for the importation of raw materials (*e.g.* fish fry) • Aid for Foreign Workers: assistance for foreign workers on the application for entry permits • Fisheries industry, as one of the essential industries, was allowed to continue operation to ensure food security • The Department of Fisheries has developed SOP and relevant guidelines to mitigate the impacts of the COVID-19 pandemic on operators to prevent further disruptions to production
Indonesia	• Help the fishers (2020–2024): groceries and personal protective equipment for fishers • Indonesia Coral Reef Garden (2020–2024): labor-intensive coral reef restoration program for thousands of workers who have lost their jobs due to the COVID-19 pandemic • Mangrove restoration program: labor-intensive program involving the local government and community in managing mangrove ecosystems • Government Aid: provision of portable and mobile cold storage and ice-making machinery • Ministry of Marine Affairs and Fisheries (MMAF) programs: development of advanced and well-developed fishers' villages, revitalization of fishing ports, and development of food estate • Capacity building and women empowerment: in fishing communities National NGOs also provided • Ocean for Prosperity Infrastructures in Coral Reef Areas: World Bank provided the financial support of USD 200 billion for improving the management of coral reef ecosystems, mangroves, and conservation areas

Country	Mitigation measures and support programs
Japan	• Employment adjustment subsidy: support for employers who suffered from the business downturn but maintained employment by paying leave allowance and letting employees take partly paid leave rather than firing them • Support for sustaining businesses: subsidies were provided to companies facing severe conditions to sustain or revive their businesses • Business support for continuity for agriculture, forestry, and fisheries sectors: emergency projects to maintain business continuity including restoration and development of sales channels in Japan and abroad, establishment and conversion of production and sales methods, and promotion of smooth consensus building and measures to prevent infection based on operation guidelines classified by industry • Business support for fishers: emergency projects to stabilize the livelihood of fishers by providing funds and provisional payment of the self-reserves of fishers and extension of the deadline of making self-reserves at the time of contract • Ministry of Agriculture, Forestry and Fisheries (2020) - business support for continuity (USD 185 million); business support for fishermen who suffered from reduced income due to the decline in fish price (USD 650 million); securing employment in fisheries and marine products processors (USD 8.3 million); stabilizing Sales of marine products (USD 231 million); interim storage of marine products (USD 34 million); financial support (USD 148 million); and conservation of fishing grounds and fishery resources research (USD 15.7 million) • Ministry of Health, Labor and Welfare (May 2021) - support for employment adjustment (USD 32 billion) for companies that suffered more than a 5 % decline in revenue compared to the same period of last year • Ministry of Economy, Trade and Industry (April 2021) - support for sustaining businesses (USD 51 billion) for companies that suffered more than 50 % decline in revenue compared to the same period of last month
Lao PDR	• The government had postponed the payment schedule for farmers who cannot pay back the loan due to the COVID-19 pandemic (May–July 2021)

Country	Mitigation measures and support programs
Malaysia	• Classification of the fisheries value chain aspects as essential services: fishing and aquaculture activities were allowed since the enforcement of the Movement Control Order in March 2020 to ensure that food security is not compromised and mitigate the impacts of the COVID-19 pandemic on the livelihood of fishers and fish farmers • Standard Operating Procedures (SOPs): Updated and clear SOPs and relevant guidelines were disseminated proactively through the Fisheries State Office, Fisheries District Office as well as through social media to avoid miscommunication and ensure timely actions • Alternative marketing and distribution avenues: establishment of the Joint Inter-Ministerial Committee to facilitate logistic services related to fresh produce and food, establish a new supply chain from producers to hypermarkets (wet markets, night markets, and some wholesale markets that were closed), and establish collaboration among online shopping platforms to for marketing of fresh produce • Increment of Cost-of-Living Allowance for Fishers: government approval of the increment of monthly cost-of-living allowance for small-scale and inland water fishers through the Ministry of Finance • Recovery Plans: short-, medium-, and long-term development plans to revive the fisheries and aquaculture sector including Economic Stimulus Package, Short-Term Economic Recovery Plan, Food Security Fund, 12th Malaysia Plan, National Agrofood Policy 2.0 • Cabins for fisheries transformation centers, fishnets, and aquaculture inputs through the DOF Malaysia • Fish landing ports and fishing gears upgraded by the Fisheries Development Authority of Malaysia • Tax exemption/reduction for fisheries entrepreneurs through the Ministry of Finance • Controlled Fresh Markets (CFMs) established by the Federal Agricultural Marketing Authority as essential outlets for SMEs to market their products directly to consumers • Discounted electricity bills
Myanmar	• Fish seeds for fish farmers (July–September 2020): allocation of USD 4 million national budget by the government for fish seeds and fingerlings • Safety at Sea Training (July–August 2020): allocation of around USD 40,000 to support the training for fish workers onboard fishing vessels
Singapore	• Temporary Bridging Loan Programme (Apr 2020–Sept 2021): business owners could borrow up to USD 3.7 million as working capital payable for five years • Jobs Support Scheme (February 2020–March 2021): support for employers to retain local employees (Singapore citizens/permanent residents) during the period of economic uncertainty by co-funding a proportion of the first USD 3,400 gross monthly wages paid to each employee • Foreign Worker Levy Rebate (April–May 2020): a waiver for the monthly Foreign Worker Levy Fee by providing the businesses with around USD 500 rebate for levies paid for each Work Permit/ Special Pass Holder

Country	Mitigation measures and support programs
Thailand	• Distribution Channels (December 2020–present): established by the Department of Fisheries (DOF) Thailand for the direct sale of prawn, white-leg shrimp, and Nile tilapia from fish farmers to consumers in 20 provinces where the selling prices were lower than the market prices • Issuance of Certificate (December 2020–present): issued by the DOF to the operators who follow the measures to prevent COVID-19 contamination in fish and fishery products including aquaculture farms, fishing vessels, fish markets, quays, and central markets to build consumers' confidence in domestic and foreign markets • Issuance of Certification on Fish and Fishery Products (December 2020–present): implementation of good practices to prevent the virus contamination to build confidence in domestic and foreign markets • New market channel (December 2020–April 2021): distribution of the excess supply of fish and fishery products • Fisheries Shop (December 2020–present): online market platform developed by the DOF where fishers and fish farmers sell their products to avoid risky fresh markets and directly contact customers without dealing with middle persons • Strengthening the collaboration among fisheries stakeholders (December 2020–April 2021): factories inform fish farmers about the required amount of raw materials so that fish farmers could manage their production capacity and avoid oversupply • No One is Left Behind: provision of USD 160/fisher per month (April to June 2020) by the government • Exemption of the license fee for cage culture in public waters (October 2020–December 2022) • Extension for the validity of the registration, license documents, and certificates pursuant to the official announcements and orders of the Department of Fisheries applicable to certificates and licenses expiring from March 2020–present

E. Contribution of the Fisheries and Aquaculture Sector

The contribution of the fisheries and aquaculture sector of the respective countries to alleviate the impacts of the COVID-19 pandemic are shown in **Table 3**.

Table 3. Contribution of the fisheries and aquaculture sector to alleviate the impacts of the COVID-19 pandemic

Country	Contribution of the fisheries and aquaculture sector
Indonesia	• Increasing protein intake and enhancing physical wellness (April–May 2020) - provision of meals (rice with fish) to non-fishing communities and donation of fish and fishery products to health workers • Raising public awareness and understanding of preserving the ecosystem and fishery resources • Reducing the logging of mangrove forests for land use as well as increasing independent field supervision (2020)
Malaysia	• Ensuring continuous supply of fish and fish products which are among the most important source of protein for Malaysians through the utilization of online platforms during the enforcement of the MCO • Developing human resources through various training programs to encourage the local younger generation to engage in the fishing industry to reduce the dependency on foreign workers • Donating extra produce (unsold fish) to the needy by fishers and fish farmers

Country	Contribution of the fisheries and aquaculture sector
Myanmar	• Selling of fish and fishery products by fishers to local people at a decreased price to ensure food availability and protein intake (May–October 2020) • Donating fish by fish farmers to monasteries and charities to ensure food availability and protein intake (May–October 2020)

IV. CONCLUSION AND RECOMMENDATIONS

A. Fishery Statistics

The trends in the fishery statistics among the countries were varied when the data and information in 2020 (during the COVID-19 pandemic) were compared to 2018 and 2019 (before the COVID-19 pandemic). For the capture fishery production, there was a decrease in Brunei Darussalam and Malaysia; but there was an increase in Lao PDR, Myanmar, Singapore, and Thailand. For the total number of registered fishing vessels, there was a decrease in Brunei Darussalam, Malaysia, Myanmar, and Thailand; but there was no change in Singapore. For the aquaculture production, there was a decrease in Malaysia, Myanmar, and Thailand; but there was a significant increase in Brunei Darussalam and Lao PDR. For the trade of fish and fishery products, there was an increase in the quantity and value of total exports from Brunei Darussalam, Indonesia, Malaysia, Myanmar, and Thailand; but there was a decrease in Japan. For the total imports, the quantity and value increased in Brunei Darussalam and Malaysia; but decreased in Indonesia, Japan, Myanmar, and Thailand. In terms of human resources, the number of fish workers onboard fishing vessels increased in Brunei Darussalam and Singapore; but decreased in Malaysia, Myanmar, and Thailand. For the fish workers in aquaculture facilities, the number increased in Brunei Darussalam, Malaysia, Myanmar, and Thailand. The number of fish workers in fish processing facilities decreased in Brunei Darussalam but there was no change in Myanmar.

B. Impacts of the COVID-19 Pandemic and Recommended Mitigation Measures

The results of this study revealed that the respective countries had experienced a wide range of impacts of the COVID-19 pandemic on their respective fisheries and aquaculture sector. Such impacts could probably magnify to either positive or negative consequences. Therefore, the recommendations for the relevant stakeholders including fishers, fish farmers, fishery workers, fishing operators, fish traders, consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others to mitigate the impacts of the COVID-19 pandemic are provided below, as appropriate. These recommendations are also intended to revive the fisheries and aquaculture sector of the ASEAN-SEAFDEC Member Countries after the COVID-19 pandemic as well as mitigate the impacts of other pandemics and disasters in the future.

B.1 Capture Fisheries

B.1.1 Marine capture fisheries

B.1.1.1 Small-scale fisheries

For the small-scale marine capture fisheries subsector, the number of people engaged in small-scale fishing activities had increased in Brunei Darussalam, while it slightly decreased in Malaysia and decreased in Myanmar and Thailand. For the number of small-scale fishing vessels in operation, there was a slight increase in Brunei Darussalam and a decrease in Myanmar and Thailand. The duration/period of fishing activity was not affected in Brunei Darussalam and Thailand but decreased in Myanmar. The cost of fishing operations had increased in Brunei Darussalam and Myanmar but there was no change in Malaysia and Thailand. The amount of catch per fishing trip was not affected in Brunei Darussalam, Malaysia, and Thailand but had decreased in Myanmar. The price of catch in wholesale markets/landing centers was stable in Brunei Darussalam and Malaysia but decreased in Thailand. The logistics/access of fishers to markets was not affected in Brunei Darussalam but had

decreased in Malaysia, Myanmar, and Thailand. The income of fishers from small-scale fishing activities was not affected in Brunei Darussalam but slightly decreased in Malaysia and decreased in Myanmar and Thailand. The liquidity and income of small-scale fishers from other activities were stable in Brunei Darussalam but decreased in Myanmar. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 1**.

Box 1. Recommendations to mitigate the impacts of the COVID-19 pandemic on small-scale capture fisheries

Impacts of COVID-19/Probable consequences	Recommendations
➢ Increased number of people engaged in small-scale fishing activities • Increase in the awareness of the importance of small-scale fisheries as a safety net for those who lost jobs in the cities • Increase in the number of small-scale fishers who gained income from fishing activities • Excess in the supply of fish and fishery products • Degradation of fishery and natural resources due to increased fishing pressure	**Fisheries management** • Raise the awareness of the local people who went back to their hometowns and engaged in small-scale fishing activities of the existing fisheries laws and regulations • Enhance fisheries management (*e.g*. promoting EAFM, habitat protection, responsible fishing practices) • Enhance the fishing skills including safety at sea of the local people who went back to their hometowns and engaged in small-scale fishing activities
➢ Increased number of small-scale fishing vessels in operation • Increase in post-harvest losses • Excess in the supply of fish and fishery products • Decrease in CPUE • Degradation of fishery and natural resources due to increased fishing pressure	**Fisheries management** • Issue license/permit to regulate the number of fishing vessels in operation • Conduct research on stock assessment as the basis for issuance of license/permit for fishing vessels • Conduct research on the impacts of the increased number of small-scale fishing vessels • Develop harvest control rule

Box 1. Recommendations to mitigate the impacts of the COVID-19 pandemic on small-scale capture fisheries	
Impacts of COVID-19/Probable consequences	**Recommendations**
➢ Decreased number of people engaged in small-scale fishing activities • Increase in the number of small-scale fishers who lost income from fishing activities • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased number of small-scale fishing vessels in operation • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased duration/period of fishing activity • Decrease in the income of small-scale fishers • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased amount of catch per fishing trip (due to decreased duration of fishing operations) • Decrease in the income of small-scale fishers • Shortage in the supply of fish and fishery products	**Facilitating movement during curfew/lockdown** • Issue a special permit for small-scale fishers to sustain fishing activities during curfew/lockdown • Review procedures to enable fishing activities during curfew/lockdown **Fisheries management** • Implementing programs on the stock enhancement of appropriate species to ensure food security

Box 1. Recommendations to mitigate the impacts of the COVID-19 pandemic on small-scale capture fisheries	
Impacts of COVID-19/Probable consequences	**Recommendations**
➢ Decreased price of catch in wholesale markets/landing centers • Decrease in the income of small-scale fishers ➢ Decreased logistics/access of fishers to markets • Decrease in the income of small-scale fishers • Shortage in the supply of fish and fishery products in the markets	**Facilitating movement during curfew/lockdown** • Issue a special permit to small-scale fishers to sustain fish trade activities in markets during curfew/lockdown **Improving cold storage and processing** • Develop geographically strategic cold storage facilities to preserve the excess supply of fish and fishery products until the supply and demand are stable • Develop mobile cold storage facilities to facilitate the efficient marketing of fish and fishery products • Develop sufficient post-harvest facilities (*e.g.* cold storage, fish processing) • Promote the development of processed/value-added fish and fishery products to small-scale fishers **Market and trade intervention** • Stabilize the prices of fish and fishery products (*e.g.* local government to buy and sell the catch at good prices) • Promote the expansion of market channels (*e.g.* online market, special market) • Build the capacity of small-scale fishers to engage in other marketing strategies (*e.g.* online marketing) • Establish a group or network of stakeholders in the value chain through virtual and/or physical platforms (small-scale fishers, fish traders, consumers, among others)

Box 1. Recommendations to mitigate the impacts of the COVID-19 pandemic on small-scale capture fisheries	
Impacts of COVID-19/Probable consequences	**Recommendations**
➢ Increased cost of fishing operations • Additional financial burden for small-scale fishers ➢ Decreased income of fishers from small-scale fishing activities ➢ Decreased liquidity and income of small-scale fishers from other activities • Worsened economic condition of small-scale fishers	**Financial intervention** • Provide financial support to small-scale fishers (*e.g*. allowance from the government, low-interest loans from the government/commercial banks, cooperatives) • Provide subsidies to small-scale fishers (*e.g*. fuel, ice, bait, fishing gear, fishing vessel) • Enhance the access of small-scale fishers to financial services **Enhancing livelihoods** • Organize community-based initiatives to sustain the basic needs of small-scale fishers (*e.g.* facilitating the collection and distribution of donated subsistence supplies) • Build the capacity and promote of small-scale fishers to engage in alternative and diversified livelihoods (*e.g*. developing processed/value-added fish and fishery products) • Institutionalize the social security system for small-scale fishers as informal workers

B.1.1.2 Commercial fisheries

For the commercial marine fisheries subsector, the duration/period of fishing activity was not affected in Brunei Darussalam but decreased in Myanmar. The cost of fishing operations had increased in Brunei Darussalam and Myanmar but there was no change in Malaysia and Thailand (Figure 2). The amount of catch per fishing trip had not changed in Brunei Darussalam, Malaysia, and Thailand but decreased in Myanmar. The price of catch in wholesale markets/landing centers had been stable in Brunei Darussalam and Malaysia but decreased in Thailand. The transshipment at sea and cold chain systems were not affected in Myanmar and Malaysia, respectively. The access to fish ports was not affected in Malaysia but decreased in Myanmar. The capacity of cold storage facilities had been stable in Malaysia. The liquidity and income of fishing operators from fishing had decreased in Myanmar and Thailand. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 2**.

Box 2. Recommendations to mitigate the impacts of the COVID-19 pandemic on commercial capture fisheries	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Decreased duration/period of fishing activity • Decrease in the income of fishing operators and fish workers • Increase in the number of unemployed onboard fish workers • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased amount of catch per fishing trip (due to decreased number of fishing operations) • Decrease in the income of fishing operators and fish workers • Shortage in the supply of fish and fishery products	**Facilitating movement during curfew/lockdown** • Issue a special permit to fishing operators and fish workers to sustain commercial fishing activities during curfew/lockdown **Facilitating employment and welfare of fish workers** • Facilitate the employment of national and migrant fish workers • Develop the capacity of fishing companies to provide onboard healthcare services (*e.g.* health care staff and facilities) • Raise the awareness of health care of onboard fish workers
➢ Increased cost of fishing operations • Additional financial burden for fishing operators • Worsened economic condition of onboard fish workers ➢ Decreased liquidity and income of fishing operators from fishing • Increase in the number of unemployed onboard fish workers • Bankruptcy of fishing operators	**Financial intervention** • Provide financial support to fishing operators (*e.g.* low-interest loans from the government/commercial banks, cooperatives) • Provide subsidies to fishing operators (*e.g.* fuel, ice, bait, fishing gear, fishing vessel) • Enhance the access of fishing operators to financial services **Fisheries management** • Government and authorities to consider issuing a Special Permit for transshipment at sea only during the pandemic to strictly follow procedures to combat IUU fishing, which is not allowed at all levels under normal situations **Enhancing livelihoods** • Develop the capacity of migrant onboard fish workers to engage in alternative livelihoods
➢ Decreased price of catch in wholesale markets/landing centers • Decrease in the income of fishing operators and fish workers	**Improving cold storage and processing** • Develop sufficient post-harvest facilities (*e.g.* cold storage at markets/landing centers) **Market and trade intervention** • Stabilize the prices of fish and fishery products (*e.g.* local government to buy the catch at good prices)

Box 2. Recommendations to mitigate the impacts of the COVID-19 pandemic on commercial capture fisheries	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Decreased access to fish ports • Spoilage of catch onboard fishing vessels	**Fisheries management** • Facilitate the port-in port-out (PIPO) control measures (*e.g.* use of an electronic system for the reporting of catch) **Improving cold storage and processing** • Improve and expand the onboard storage facilities of fishing vessels **Implementing COVID-19 prevention measures** • Maintain the implementation of COVID-19 health and safety protocols at fish ports (*e.g.* social distancing, mask-wearing, disinfecting, vaccination)
➢ Shortage in the number of migrant onboard fish workers • Decrease in the number of fishing operations • Decrease in the income of fishing operators • Decrease in the supply of fish and fishery products	**Facilitating employment and welfare of fish workers** • Facilitate the employment of migrant onboard fish workers (*e.g.* government to government employment) • Implement skills development programs for incoming migrant onboard fish workers • Educate the migrant onboard fish workers on good financial management (*e.g.* opening a bank account) • Institutionalize the social security system for the insurance of incoming migrant onboard fish workers **Implementing COVID-19 prevention measures** • Implement the COVID-19 health and safety protocols for incoming migrant onboard fish workers (*e.g.* social distancing, mask-wearing, disinfecting, vaccination)

B.1.2 Inland fisheries

For the inland capture fisheries subsector, the number of active fishing vessels in operation had decreased in Myanmar but remained stable in Thailand. The number of people engaged in inland capture fishing activities had decreased in Myanmar but increased in Thailand. The duration/period of fishing activity had decreased in Myanmar and Thailand. The cost of fishing operations was not affected in Malaysia and Thailand but had increased in Myanmar. There was no change in the amount of catch per fishing trip in Malaysia but there was a decrease in Myanmar. The price of catch in wholesale markets/landing centers was stable in Malaysia but slightly increased in Thailand. The logistics/access of fishers to markets had slightly decreased in Malaysia and decreased in Myanmar but has not been affected in Thailand. The income of fishers from inland fishing activities had decreased in Malaysia and Myanmar. The liquidity and income of fishers from other activities had decreased in Myanmar and Thailand. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 3**.

Box 3. Recommendations to mitigate the impacts of the COVID-19 pandemic on inland capture fisheries	
Impacts of COVID-19/ Consequences	**Recommendations**
➢ Increased number of people engaged in inland capture fishing activities • Increase in the awareness of the importance of inland fisheries as a safety net for those who lost jobs in the cities • Increase in the number of fishers who gained income from inland fishing activities • Excess in the supply of fish and fishery products • Degradation of fishery and natural resources due to increased fishing pressure	**Fisheries management** • Raise the awareness of the local people who went back to their hometowns and engaged in inland fishing activities of the existing fisheries laws and regulations • Enhance fisheries management (*e.g.* promoting EAFM, habitat protection, responsible fishing practices)
➢ Decreased number of people engaged in inland capture fishing activities • Increase in the number of fishers who lost income from inland fishing activities • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased number of fishing vessels in operation • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased duration/period of fishing activity • Decrease in the income of fishers • Shortage in the supply of fish and fishery products • Recovery of fishery and natural resources due to decreased fishing pressure ➢ Decreased amount of catch per fishing trip (due to decreased duration of fishing operations) • Decrease in the income of fishers • Shortage in the supply of fish and fishery products	**Facilitating movement during curfew/lockdown** • Issue a special permit to fishers to sustain inland fishing activities during curfew/lockdown • Review procedures to enable fishing activities during curfew/lockdown **Fisheries management** • Implementing programs on the stock enhancement of appropriate species to ensure food security

Box 3. Recommendations to mitigate the impacts of the COVID-19 pandemic on inland capture fisheries	
Impacts of COVID-19/ Consequences	**Recommendations**
➢ Increased price of catch in wholesale markets/landing centers • Additional financial burden for consumers • Increase in the income for inland fishers	**Market and trade intervention** • Stabilize the prices of fish and fishery products (*e.g*. local government to buy and sell the catch at good prices) • Provide discounts to consumers so they can afford to buy fish and fishery products
➢ Decreased logistics/access of fishers to markets • Decrease in the income of small-scale fishers • Shortage in the supply of fish and fishery products in the markets	**Facilitating movement during curfew/lockdown** • Issue a special permit to small-scale fishers to sustain fish trade activities in markets during curfew/lockdown **Market and trade intervention** • Promote the expansion of market channels (*e.g*. online market, special market) • Build the capacity of small-scale fishers to engage in other marketing strategies (*e.g*. online marketing) • Establish a group or network of stakeholders in the value chain through virtual and/or physical platforms (small-scale fishers, fish traders, consumers, among others) **Improving cold storage and processing** • Develop geographically strategic cold storage facilities to preserve the excess supply of fish and fishery products until the supply and demand are stable • Develop sufficient post-harvest facilities (*e.g*. cold storage, fish processing) • Promote the development of processed/value-added fish and fishery products to fishers

Box 3. Recommendations to mitigate the impacts of the COVID-19 pandemic on inland capture fisheries	
Impacts of COVID-19/ Consequences	**Recommendations**
➢ Increased cost of fishing operations • Additional financial burden for fishers ➢ Decreased income of fishers from inland fishing activities • Worsened economic condition of small-scale fishers ➢ Decreased liquidity and income of fishers from other activities • Worsened economic condition of small-scale fishers	**Financial intervention** • Provide financial support to small-scale fishers (*e.g.* allowance from the government, low-interest loans from the government/commercial banks, cooperatives) • Provide subsidies to small-scale fishers (*e.g.* fuel, ice, bait, fishing gear, fishing vessel) • Enhance the access of small-scale fishers to financial services **Enhancing livelihoods** • Organize community-based initiatives to sustain the basic needs of fishers (*e.g.* facilitating the collection and distribution of donated subsistence supplies) • Build the capacity and promote of small-scale fishers to engage in alternative/diversified livelihoods (*e.g.* developing processed/value-added fish and fishery products) • Institutionalize the social security system for inland capture fishers as informal workers

B.1.3 Fisheries management

For fisheries management, the impacts of COVID-19 varied among the countries. The application of innovative technologies to combat IUU fishing was not affected in Brunei Darussalam, Malaysia, and Myanmar while it had increased in Indonesia. The frequency of implementation of port State measures had been stable in Brunei Darussalam, Malaysia, Myanmar, Singapore, and Thailand, but decreased in Indonesia. The implementation of MCS was not changed in Brunei Darussalam, increased in Indonesia, slightly decreased in Malaysia, and decreased in Myanmar and Thailand. The conduct of regular/routine data collection for fish stock assessment and monitoring of shared stocks/transboundary species had been stable in Brunei Darussalam and Indonesia, slightly decreased in Malaysia, and decreased in Myanmar. The conduct of physical meetings/workshops at international/regional/national levels was not affected in Brunei Darussalam, but had slightly decreased in Malaysia and decreased in Indonesia, Myanmar, Singapore, and Thailand. The conduct of research/project activities was stable in Brunei Darussalam but had decreased in Malaysia, Myanmar, and Thailand. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 4**.

Box 4. Recommendations to mitigate the impacts of the COVID-19 pandemic on fisheries management	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Increased application of innovative technologies to combat IUU fishing ○ Increase in the number of apprehensions of IUU fishing activities ➢ Decreased frequency of implementation of port State measures ○ Increase in the number of occurrences of IUU fishing activities ➢ Increased implementation of MCS ○ Enhancement of the monitoring of the activities of fishing vessels ➢ Decreased implementation of MCS ○ Disruption in the monitoring of the activities of fishing vessels	**Enhancing application of technology** • Enhance the engagement of the private sector and relevant international agencies/organizations in the application of cost-effective innovative technologies to combat IUU fishing activities **Enhancing application of technology** • Adopt remote PSM implementation by using online platforms • Enhance the utilization of advanced and cost-effective technologies to sustain the conduct of MCS activities
➢ Decreased conduct of regular/routine data collection for fish stock assessment and monitoring of transboundary species ○ Gaps in data series ➢ Decreased conduct of research/project activities ○ Decrease in the availability of information to support and sustain fisheries management ➢ Decreased conduct of physical meetings/workshops at international/regional/national levels ○ Disruption in the decision-making process to address fisheries-related issues	**Enhancing application of technology** • Explore innovative technologies and techniques to sustain the monitoring of transboundary species • Establish/enhance the mechanism among government authorities and enumerators (*e.g.* online communication) • Utilize the available electronic platforms (*e.g*. e-logbooks, eACDS) • Conduct online or hybrid meetings **Fisheries management** • Enhance the participation of the community in reporting catch to the fisheries agencies (*e.g*. capacity building, provision of incentives)

B.1.4 Fishery resources and aquatic habitats

On the status of fishery resources and aquatic habitats, the COVID-19 pandemic had no impact on fishery resources and aquatic habitats in Brunei Darussalam. In Malaysia, the assessment of fishery resources and aquatic habitats showed that the number of fish tends to increase in coastal areas. For inland fishery resources and habitats, there were no significant impacts while fish seed restocking activities were carried out. There were no significant impacts on coral reefs and seagrass beds. Due to reduced human activities, there was an increase in turtle nesting and hatchling and an improvement in the water quality at certain sites. For Myanmar, fishing pressures have increased in coastal areas, and illegal fishing practices continued in the mangroves and offshore areas. In inland waters, illegal fishing practices such as intensive usage of electric fishing gears had persisted. The illegal fishing practices continued to occur due to the poverty of the dependent communities and travel restrictions. For Singapore, the marine habitats remained stable due to the restrictions on the number of passengers on dive boats and decreased access to dive sites. There was an increase in the number of visitors on the beaches, but the negative impacts on beaches were slight or negligible because the crowds were well managed. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 5**.

Box 5. Recommendations to mitigate the impacts of the COVID-19 pandemic on fishery resources and aquatic habitats	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Increased fisheries biodiversity/biomass in coastal areas ○ Recovery of fishery resources and habitats	**Fisheries management** • Sustain the implementation of fisheries management measures to allow the recovery of fishery resources and aquatic habitats (*e.g.* closed seasons, closed areas)
➢ Increased fishing pressure in coastal areas ○ Degradation of fishery resources and habitats ➢ Continued illegal fishing activities in the mangrove and offshore areas ○ Degradation of fishery resources and habitats ➢ Continued illegal fishing practices (*e.g.* electric fishing, blast fishing, cyanide fishing) ○ Degradation of fishery resources and habitats	**Fisheries management** • Raise the awareness of fishers and relevant stakeholders of fisheries laws and regulations • Sustain the issuance of fishing licenses/permits to regulate the number of fishers • Enhance the collaboration among fisheries agencies and fishing communities for monitoring and surveillance
➢ Stable condition of marine habitats ○ Sustainable fishery resources and habitats	**Boosting cooperation among responsible agencies** • Promote environment-friendly tourism activities (*e.g.* responsible snorkeling or diving, use of environment-friendly sunscreen in coral reef areas)

B.2 Aquaculture

For aquaculture, the number of operational aquaculture farms was stable in Brunei Darussalam and Singapore. The access of fish farmers to fish farms was not affected in Brunei Darussalam, Indonesia, Malaysia, and Thailand, but had decreased in Singapore. The duration of the cycle of aquaculture from rearing to harvest had not changed in Brunei Darussalam and Singapore but increased in Indonesia, Malaysia, Myanmar, and Thailand. The cost of inputs had increased in Brunei Darussalam, Indonesia, Myanmar, Singapore, and Thailand but had not been affected in Malaysia. The quantity of production was stable in Brunei Darussalam and Singapore but had decreased in Indonesia, Malaysia, Myanmar, and Thailand. The quantity of seed production had decreased in Brunei Darussalam, Malaysia, Myanmar, and Thailand, but increased in Indonesia. The quantity of production of ornamental fishes was stable in Brunei Darussalam and Thailand, increased in Indonesia, but decreased in Malaysia, Myanmar, and Singapore. The farm gate prices of market-size cultured species were not affected in Brunei Darussalam, Malaysia, and Singapore, but had decreased in Indonesia, Myanmar, and Thailand. The logistics/access of fish farmers to domestic/international markets were not affected in Brunei Darussalam, had slightly decreased in Malaysia, and decreased in Lao PDR, Myanmar, Singapore, and Thailand. The income of fish farmers from aquaculture activities was stable in Brunei Darussalam but had decreased in Indonesia, Malaysia, Myanmar, Singapore, and Thailand. The liquidity and income of fish farmers from other activities were not affected in Brunei Darussalam. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 6**.

Box 6. Recommendations to mitigate the impacts and consequences of the COVID-19 pandemic on aquaculture	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Decreased access of fish farmers to fish farms ○ Disruption in aquaculture activities ➢ Increased duration of the cycle of aquaculture from rearing to harvest ○ Additional cost of inputs ○ Congestion of cultured species in fish farms ➢ Increased cost of inputs ○ Additional financial burden for fish farmers ➢ Decreased quantity of production ○ Decrease in the income of fish farmers ○ Shortage in the supply of aquaculture products ➢ Decreased quantity of seed production ○ Decrease in the income of fish farmers ○ Shortage in the supply of seeds ➢ Decreased quantity of production of ornamental fishes ○ Decrease in the income of fish farmers ○ Shortage in the supply of ornamental fishes ➢ Decreased farm gate prices of market-size cultured species ○ Decrease in the income of fish farmers ➢ Decreased logistics/access of fish farmers to domestic/international markets ○ Decrease in the income of fish farmers ➢ Decreased income of fish farmers from aquaculture activities ○ Worsened economic condition of fish farmers	**Facilitating movement during curfew/lockdown** • Issue a special permit to fish farmers to sustain aquaculture activities during curfew/lockdown **Financial intervention** • Provide financial support to fish farmers (e.g. low-interest loans from the government/commercial banks, cooperatives) • Provide subsidies to fish farmers (e.g. utility bills, feeds, chemicals, equipment) • Enhance the access of fish farmers to financial services **Market and trade intervention** • Promote the expansion of market channels (e.g. online market, special market) • Build the capacity of fish farmers to engage in other marketing strategies (e.g. online marketing) • Establish a group or network of stakeholders in the value chain through virtual and/or physical platforms (fish farmers, fish traders, consumers, among others) **Improving cold storage and processing** • Develop geographically strategic cold storage facilities to preserve the excess supply of aquaculture products until the supply and demand are stable • Develop mobile cold storage facilities to facilitate the efficient marketing of aquaculture products • Develop sufficient post-harvest facilities (e.g. cold storage, fish processing) **Promoting cost-effective aquaculture inputs** • Establish geographically strategic feed mill facilities • Develop low-cost feeds (e.g. using locally available plant-based raw materials, agricultural byproducts, among others) **Enhancing livelihoods** • Build the capacity and promote on diversified livelihoods to fish farmers (e.g. developing processed/value-added aquaculture products)

Box 6. Recommendations to mitigate the impacts and consequences of the COVID-19 pandemic on aquaculture	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Increased quantity of seed production ○ Excess in the supply of seeds	**Market and trade intervention** • Establish a group or network of stakeholders in the value chain through virtual and/or physical platforms (fish farmers, fish traders, consumers, among others)

B.3 Fish Processing

For fish processing, the number of operational plants/factories was still the same in Brunei Darussalam and Thailand, but had slightly decreased in Malaysia and decreased in Indonesia and Myanmar. The duration of fish processing operations was not affected in Brunei Darussalam, but had slightly decreased in Malaysia and decreased in Myanmar. The availability of raw materials had decreased in Brunei Darussalam and Myanmar and slightly decreased in Malaysia. The operation cost had increased in Brunei Darussalam and Malaysia. The processing lines were not affected in Brunei Darussalam and Malaysia but had decreased in Myanmar. The types of processed fish and fishery products had decreased in Brunei Darussalam and Indonesia but remained the same in Malaysia. The quantity of production was stable in Brunei Darussalam but decreased in Indonesia, Malaysia, and Myanmar. The price of processed fish and fishery products was stable in Brunei Darussalam, Indonesia, and Malaysia. The storage capacity of plants/factories had increased in Brunei Darussalam and remained the same in Indonesia. The application of product certification schemes was not affected in Indonesia and Malaysia. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 7**.

Box 7. Recommendations to mitigate the impacts of the COVID-19 pandemic on the fish processing industry	
Impacts of COVID-19/ Probable consequences	**Recommendations**
➢ Decreased number of operational fish processing plants ○ Increase in the number of unemployed fish workers ○ Shortage in the supply of processed fish and fishery products ➢ Decreased duration of fish processing operations ○ Disruption of fish processing activities ○ Increase in the number of unemployed fish workers ○ Shortage in the supply of processed fish and fishery products ➢ Decreased processing lines ○ Disruption of fish processing activities ○ Increase in the number of unemployed fish workers ○ Shortage in the supply of processed fish and fishery products ➢ Decreased quantity of production ○ Increase in the number of unemployed fish workers ○ Decrease in the income of fish processing plant operators ○ Shortage in the supply of processed fish and fishery products	**Facilitating movement during curfew/lockdown** • Issue a special permit to fish workers to sustain fish processing activities during curfew/lockdown **Facilitating employment and welfare of fish workers** • Facilitate the employment of national and migrant fish workers **Enhancing application of technology** • Optimize the utilization of machinery to address the shortage of fish workers **Implementing COVID-19 prevention measures** • Implement the COVID-19 health and safety protocols (*e.g.* social distancing, mask-wearing, disinfecting, vaccination) among fish workers at fish processing plants
➢ Decreased availability of raw materials ○ Disruption of fish processing activities ○ Shortage in the supply of processed fish and fishery products ➢ Decreased types of processed fish and fishery products ○ Limited choices of types of processed fish and fishery products for consumers	**Facilitating movement during curfew/lockdown** • Issue a special permit for stakeholders along the fisheries value chain during curfew/lockdown to sustain the balance between supply and demand of raw materials for fish processing
➢ Increased operation cost ○ Additional financial burden for fish processing plant operators	**Financial intervention** • Provide financial support to fish processing plant operators (*e.g.* low-interest loans from the government/commercial banks, cooperatives) • Provide subsidies to fish processing plant operators (*e.g.* utility bills, equipment)

B.4 Fisheries Trade

B.4.1 Domestic fish trade

For domestic trade and marketing, the number of operational markets had remained the same in Brunei Darussalam, but had slightly decreased in Malaysia and decreased in Indonesia and Thailand. The duration of operation of markets was unchanged in Brunei Darussalam but had decreased in Indonesia,

Malaysia, and Thailand. The number of fish traders was not affected in Brunei Darussalam but had decreased in Indonesia and slightly increased in Malaysia. The supply of fish and fishery products had been stable in Brunei Darussalam, Indonesia, and Malaysia and slightly increased in Thailand. The demand for fish and fishery products was not affected in Brunei Darussalam and Indonesia, but had slightly decreased in Malaysia and Thailand and decreased in Singapore. There was no change in the selling price of fish and fishery products in Brunei Darussalam, Indonesia, and Malaysia, but there was a slight decrease in Thailand. The logistics/access of traders and consumers to markets was not affected in Brunei Darussalam, but had slightly decreased in Malaysia and decreased in Indonesia and Thailand. The liquidity and income of fish traders were not affected in Brunei Darussalam, Indonesia, and Malaysia. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 8**.

Box 8. Recommendations to mitigate the impacts of the COVID-19 pandemic on fish trade in domestic markets

Impacts of COVID-19/ Probable consequences	Recommendations
➢ Decreased number of operational markets ○ Decrease in the income of fish traders ○ Decrease in the access of consumers to fish and fishery products ➢ Decreased duration of operation of markets ○ Decrease in the income of fish traders ○ Decrease in the access of consumers to fish and fishery products ➢ Decreased number of fish traders ○ Decrease in the access of consumers to fish and fishery products ➢ Increased number of fish traders ○ Increase in the access of consumers to fish and fishery products ➢ Increased supply of fish and fishery products ○ Increase in the availability of healthy food to consumers ○ Excess in the supply of fish and fishery products ➢ Decreased demand for fish and fishery products ○ Decrease in the income of fishers and traders ○ Excess in the supply of fish and fishery products ➢ Decreased selling price of fish and fishery products ○ Decrease in the income of fishers and traders ➢ Decreased logistics/access of traders and consumers to markets ○ Decrease in the income of fishers and traders ○ Decrease in the access of consumers to fish and fishery products	**Facilitating movement during curfew/lockdown** • Issue a special permit to stakeholders (fishers, fish traders, consumers, among others) in the fisheries value chain to sustain fish trade activities in domestic markets during curfew/lockdown **Implementing COVID-19 prevention measures** • Implement the COVID-19 health and safety protocols (*e.g*. social distancing, mask-wearing, disinfecting, vaccination) at domestic fish markets **Market and trade intervention** • Promote the expansion of market channels (*e.g*. online market, special market) • Build the capacity of fishers to engage in other marketing strategies (*e.g*. online marketing) • Establish a group or network of stakeholders (fishers, fish traders, consumers, among others) in the fisheries value chain through virtual and/or physical platforms **Improving cold storage and processing** • Develop geographically strategic cold storage facilities to preserve the excess supply of fish and fishery products until the supply and demand are stable • Develop mobile cold storage facilities to facilitate the efficient marketing of fish and fishery products • Develop sufficient post-harvest facilities (*e.g*. cold storage, fish processing) • Promote the development of processed/value-added fish and fishery products to fishers

B.4.2 International market

For international trade and marketing, the logistics/access to international markets had decreased in Brunei Darussalam, Indonesia, Myanmar, and Thailand. The demand from the international market had increased in Brunei Darussalam and Thailand, not affected in Indonesia, slightly decreased in Malaysia, and decreased in Myanmar. The types of exported processed fish and fishery products had slightly decreased in Brunei Darussalam and Malaysia, not changed in Indonesia, and decreased in Thailand. The types of imported processed fish and fishery products had increased in Brunei Darussalam, no change in Indonesia and Thailand, and slightly increased in Malaysia. The traceability of exported/imported fish and fishery products remained stable in Brunei Darussalam and Indonesia, slightly decreased in Malaysia. The application of product certification schemes was not affected in Brunei Darussalam and Indonesia, slightly decreased in Malaysia, and increased in Lao PDR. The recommendations to mitigate the impacts of the COVID-19 pandemic are summarized in **Box 9**.

Box 9. Recommendations to mitigate the impacts of the COVID-19 pandemic on fish trade in international markets

Impacts of COVID-19/ Consequences	Recommendations
➢ Decreased logistics/access to international markets ○ Decrease in the income of fishers and traders ○ Decrease in the access of consumers to fish and fishery products ➢ Decreased demand from the international market ○ Decrease in the income of fishers and traders ➢ Decreased types of exported processed fish and fishery products ○ Limited choices of processed fish and fishery products for consumers ➢ Increased types of imported processed fish and fishery products ○ More choices of processed fish and fishery products consumers	**Market and trade intervention** • Enhance the demand from domestic markets (*e.g.* promoting "one town, one product (OTOP)", organizing special markets, among others) • Develop more types of processed fish and fishery products according to the preferences/needs of consumers **Improving cold storage and processing** • Develop geographically strategic cold storage facilities to preserve the excess supply of fish and fishery products until the supply and demand are stable
➢ Decreased application of product certification schemes ○ Distrust of consumers in the quality of fish and fishery products ○ Decrease in the demand for fish and fishery products ➢ Increased application of product certification schemes ○ Increase in the trust of consumers in the quality of fish and fishery products ○ Increase in the demand for fish and fishery products	**Enhancing application of traceability schemes** • Promote the application of traceability schemes for fish and fishery products (*e.g.* eACDS) • Promote and sustain the application of certification schemes for fish and fishery products (*e.g.* COVID-19 free, eco-labeling)

B.5 Gender Roles

Regarding gender roles, there were no changes in gender roles before and during the COVID-19 pandemic in small-scale and commercial fisheries; although, the elderly had reduced engaging in fishing

activities during the COVID-19 in Brunei Darussalam. In Myanmar, there was no change in the roles of women and men in capture fisheries including small-scale fisheries, commercial fisheries, and inland capture fisheries. For Thailand, the gender roles in small-scale fishing activities were the same before and during COVID-19; but inland capture fishing activities of men were intensified during the COVID-19.

C. Mitigation measures and support programs

Moreover, the study characterized the mitigation measures and support programs of the government of the respective countries to mitigate the impacts of the COVID-19 pandemic, which include financial aid for fishers and entrepreneurs (increased subsidies, low-interest loans), assistance to foreign workers, provision of basic necessities to fishers, capacity building on online marketing, women empowerment, alternative livelihoods, improvement of fisheries infrastructures and facilities (*e.g.* fishing ports, cold storage, etc.), provision of fishing gears, enhanced fishery resources and habitats management, facilitating other marketing channels (special fish market, online market), discounted utility bills, provision of fish seeds and fingerlings, issuance of COVID-19 free certification for establishments and fish and fishery products.

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Annex 1

Study on the Impacts of COVID-19 Pandemic on the Fisheries Sector of the ASEAN–SEAFDEC Member Countries
(as of 24 February 2021)

QUESTIONNAIRE

Introduction

The COVID-19 pandemic is a global health crisis and its impacts resulting from national measures (*e.g.* lockdown, people's social distancing, transport/movement of goods/people within countries and between borders, etc.) comprise the major causes of both temporary and/or long-term needs/changes throughout fish and fishery products supply chain. The Southeast Asian countries, many of which have been providing considerable quantities of fish and fishery products to the world market, have been encountering a number of hindrances not only in terms of the health of their people, but also the increased threats that risk the social and economic conditions of those who are engaged in fisheries and aquaculture.

This questionnaire was prepared by SEAFDEC Secretariat in collaboration with the SEAFDEC Departments. The main purpose of this questionnaire is to gather the key issues and measures (current, medium and long-term if applicable) taken by the private sector (small and commercial fisheries organizations), financial institutions, and government, related to the impacts of COVID-19 pandemic to the fisheries and aquaculture sector of the respective ASEAN–SEAFDEC Member Countries. The outputs of this study would include the key issues on the impacts of COVID-19 pandemic together with a set of policy recommendations on possible actions to be taken by the respective sectors.

Program Period

It is planned that this questionnaire will be released to SEAFDEC Member Countries[1] in early 2021, through the National Focal Points nominated by their respective countries. The compiled information and report of the results of this study will be presented to the SEAFDEC Program Committee Meeting tentatively scheduled in November 2021.

Instruction for the National Focal Points

- The National Focal Points are requested to preliminary communicate with their relevant agencies/institutions in order to prepare feedbacks to the questionnaire, and subsequently conduct a national workshop (optional) to discuss the necessary information that would serve as inputs to this questionnaire. Internal processes to obtain information/feedback would be subject to the situation and resources of respective countries. In addition, other available information such as results from studies conducted, data collected, secondary data, and others are also useful inputs.
- The National Focal Points should facilitate the accomplishment and submission of the questionnaire to SEAFDEC Secretariat by email to **pattaratjit@seafdec.org on 30 May 2021**.

Keywords: capture fisheries, commercial-scale fisheries and aquaculture, COVID-19 pandemic, distributor, financial obligations, fish stocks, fishing vessels, fisheries manager, loans and payback, lockdown measures, migrant workers, post COVID-19 recovery period, small-scale fisheries and aquaculture, socio-economic, social distancing measures, working conditions, food value chain.

Country	
Name of National Focal Point	
Position/designation	

[1] SEAFDEC Member Countries: Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam. The rationale to include Japan in this study is because Japan is an important country not only as importer but also as exporter of fish and fishery products.

Unit/Office	
Contact Address	
Telephone	
Email	

PART I. GENERAL INFORMATION

In this part, the focus is given to obtain overview information on fisheries and aquaculture of your country in recent years. The data inputs are mainly from secondary data of fisheries management/technical authorities.

1. Please provide data on quantity (t) and value (USD) of fisheries and aquaculture production in 2018–2020

	Quantity (t)			Value (USD)		
	2018	**2019**	2020	2018	**2019**	2020
Total capture fisheries						
Marine capture						
Inland capture						
Total aquaculture						
Inland aquaculture						
Brackishwater culture						
Mariculture						
Ornamental fishes (pcs.)						

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

2. Please provide data on the international trade of fish and fishery products (top five commodities) of your country in 2018–2020

Note:
- *First, provide the data on the top five commodities based on quantity or value in 2019, then provide the data on such top commodities in 2018 and 2020*
- *Information can also be provided by using the 6-digit HS code for commodity depending on convenient of the country*

	Quantity (t)			Value (USD)		
	2018	**2019**	2020	2018	**2019**	2020
Total export						
Commodity 1						
Commodity 2						
Commodity 3						
Commodity 4						
Commodity 5						
Total import						
Commodity 1						
Commodity 2						
Commodity 3						

Commodity 4						
Commodity 5						

*Official data
**Unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

3. Please provide data on number of active/registered fishing vessels by gear type of your country in 2018–2020

	No. of fishing vessels		
	2018	2019	2020
Total (all fishing vessels)			
Trawl			
Purse seine			
Gillnet			
Hook and line			

*official data by national fishing vessel registration system
**unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

4. Please provide data on the number of fishery workers in your country in 2018–2020

Note:

- *Migrant workers refer to workers from other countries*
- *If numerical data on both sexes is not available, indicate "stable," "decreased," or "increased"*
- *If numerical sex-disaggregated data is not available, indicate the level of participation of female or male ("more" or "lesser")*

	No. of workers (persons)					
	2018		2019		2020	
	Female	Male	Female	Male	Female	Male
Total (all fishery workers)						
Onboard fishing vessels						
National workers						
Migrant workers						
Aquaculture facilities						
National workers						
Migrant workers						
Fish processing plants/factories						
National workers						
Migrant workers						

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

5. Please provide data on aquaculture production including top three species of your country in 2018–2020

Note:

- *First, provide the data on the top three species based on value in 2019, then provide the data on such species in 2018 and 2020*
- *Provide the scientific or English/common names of the species*

	Quantity (t)			Value (USD)		
	2018	**2019**	2020	2018	**2019**	2020
Total (all aquaculture production)						
Species 1						
Species 2						
Species 3						

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source of official and unofficial data)

6. Please provide data on aquaculture production of top three ornamental fishes of your country in 2018-2020

Note:
- *First, provide the data on the top three species based on value in 2019, then provide the data on such species in 2018 and 2020*
- *Provide the scientific or English/common names of the species*

	Quantity (pcs.)			Value (USD)		
	2018	**2019**	2020	2018	**2019**	2020
Total (all ornamental fish production)						
Species 1						
Species 2						
Species 3						

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source of official and unofficial data)

7. Please provide data on aquaculture seed production of your country in 2018-2020

Note:
- *First, provide the data on the top three species based on value in 2019, then provide the data on such species in 2018 and 2020*
- *Provide the scientific or English/common names of the species*

	Quantity (million pcs.)			Value (USD)		
	2018	**2019**	2020	2018	**2019**	2020
Total (all aquaculture seed production)						
Species 1						
Species 2						
Species 3						

*official data

**unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

8. Please provide data on domestic producer price (at wholesale markets or landing centers) of top three species from capture fisheries of your country in 2018-2020

Note:

- *First, provide the data on the top three species based on value in 2019, then provide the data on such species in 2018 and 2020*
- *Provide the scientific and English/common names of the species*
- *Please specify the price at wholesale markets or landing centers*

	Value (USD/kg)		
	2018	**2019**	2020
Species 1			
Species 2			
Species 3			

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source(s) of official and unofficial data)

9. Please provide data on farm gate prices of top three aquaculture species of your country in 2018-2020.

Note:

- *First, provide the data on the top three species based on value in 2019, then provide the data on such species in 2018 and 2020*
- *Provide the scientific or English/common names of the species*

	Value (USD/kg)		
	2018	**2019**	2020
Species 1			
Species 2			
Species 3			

*official data
**unofficial data
NA: not available
Source(s): (Please provide the source of official and unofficial data)

PART II. CAPTURE FISHERIES

A. Marine capture fisheries

A.1 Small-scale fisheries

Note:

- *The definition of small-scale fisheries may vary in the respective countries*
- *Generally, small-scale fisheries may include subsistence/artisanal/traditional fisheries operating in coastal areas with or without motorized/non-motorized fishing vessels (based on updated SEAFDEC Fishery Statistical Bulletin of Southeast Asia)*

1. What are the COVID-19 restriction measures applied by your country that made impacts on small-scale capture fisheries? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of COVID-19 to the small-scale capture fisheries of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Number of people engaged in small-scale capture fishing activities	Sample answer: Decreased due to - Provincial lockdown - Reason 2 - Reason 3 - Reason …	Sample answer: - Issuance of pass/permit by the local government to small-scale fishers - Adaptation 2 - Adaptation 3 - Adaptation …
Number of small-scale fishing vessels in operation		
Duration/period of fishing activity		
Cost of fishing operations and vessel (including fuel, ice, bait, fishing materials, equipment, and maintenance cost, etc.)		
Amount of catch per fishing trip		
Price of catch in wholesale markets/landing centers		

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Logistics/access of fishers to markets (transportation, buyers, etc.)		
Income of fishers from fishing activities		
Liquidity and income of fishers from other activities		
Access of fishers to financial assistance		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures
[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in small-scale fishing activities? Please describe their major roles before and during the COVID-19 situations

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

A.2 Commercial fisheries

1. What are the COVID-19 restriction measures applied by your country that made impacts on commercial capture fisheries? Please provide the list and brief descriptions of restriction measures and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of COVID-19 to the commercial fisheries of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Availability of onboard fishing crew/fish workers		
Number of commercial fishing vessels in operation		
Duration/period of fishing activity		
Cost of fishing operations and vessels (including fuel, ice, bait, fishing materials, equipment, and maintenance cost, etc.)		
Amount of catch per fishing trip		
Price of catch in wholesale markets/landing centers		
Transshipment at sea		
Cold chain system		
Access to fishing ports		
Capacity of cold storage facilities		
Liquidity and income of fishing operators from fishing		
Access of fishing operators to financial assistance		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures
[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in commercial fishing activities? Please describe their major roles before and during the COVID-19 situations.

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

B. Inland capture fisheries

1. What are the COVID-19 restriction measures applied by your country that made impacts on inland capture fisheries? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of COVID-19 to the inland capture fisheries of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Number of active fishing vessels in operation		
Number of people engaged in inland capture fishing activities		
Duration/period of fishing activity		
Cost of fishing operations and vessel (including fuel, ice, bait, fishing materials, equipment, and maintenance cost, etc.)		
Amount of catch per fishing trip		
Price of catch in wholesale markets/landing centers		
Logistics/access of fishers to markets (transportation, buyers, etc.)		
Income of fishers from fishing activities		
Liquidity and income of fishers from other activities		
Access of fishers to financial assistance		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures
[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries

officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in inland capture fishing activities? Please describe their major roles before and during the COVID-19 situations.

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

C. Fisheries Management (Combating IUU Fishing and Fish Stock Assessment)

1. What are the apparent impacts of the COVID-19 pandemic on the implementation of fisheries management measures, particularly on activities to combat IUU fishing and data collection for fish stock assessment of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of national fisheries agencies
Application of innovative technologies to combat IUU fishing (including GIS, remote sensing, etc.)		
Implementation of port State measures		
Implementation of MCS		
Conduct of regular/routine data collection for fish stock assessment		
Monitoring of shared stocks/transboundary species		
Conduct of meetings/workshops (international/regional/national)		
Conduct of research/project activities		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures

PART III. AQUACULTURE

1. What are the COVID-19 restriction measures applied by your country that made impacts on aquaculture? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of COVID-19 to aquaculture of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Number of people engaged in aquaculture activities		
National workers		
Migrant workers		
Number of operational aquaculture farms		
Access of fish farmers to fish farms		
Duration of cycle of aquaculture (from rearing to harvest)		
Cost and availability of inputs (feeds, fertilizers, chemicals, power, equipment, maintenance, etc.)		
Quantity of production		
Seed production from aquaculture in overall		
Overall production of ornamental fishes		
Farm gate prices of market-size fish, seeds, and ornamental fish (indicate separately)		
Logistics/access of fish farmers to domestic/international markets (transportation, buyers, etc.)		
Income of fish farmers from aquaculture activities		

Liquidity and income of fish farmers from other activities		
Access of fish farmers to financial/technical/extension assistance		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures
[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in aquaculture activities? Please describe their major roles before and during the COVID-19 situations

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

PART IV. FISH PROCESSING INDUSTRY

1. What are the COVID-19 restriction measures applied by your country that made impacts on fish processing industries? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of the COVID-19 pandemic to the fish processing industry of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Number of operational fish processing plants/factories		
Availability of workers		
National Workers		
Migrant workers		
Duration of fish processing operations		
Availability of raw materials		
Operation cost (including equipment, power, etc.)		
Processing lines		
Varieties/types/forms/fish commodities of processed fish and fishery products		
Quantity of production		
Price of processed fish and fishery products		
Storage capacity of plants/factories		
Application of product certification schemes		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations

[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)

[3]Refer to the COVID-19 restriction measures

[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in activities in fish processing industries? Please describe their major roles before and during the COVID-19 situations.

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

PART V. FISHERIES TRADE

A. Domestic Fisheries Trade

Note: Domestic fisheries trade includes any form of trade of fish and fishery products within the country.

1. What are the COVID-19 restriction measures applied by your country that made impacts on the domestic fisheries trade? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of the COVID-19 pandemic to the domestic fisheries trade of your country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Number of operational in domestic markets		
Duration of operation of domestic markets		
Number of fish traders in domestic markets		
Supply of fish and fishery products in domestic markets		
Demand for fish and fishery products in domestic markets		
Selling price of fish and fishery products in domestic markets		
Liquidity and income of fish traders		
Access of fish traders to financial assistance		
Logistics/access of traders to domestic markets (transportation, etc.)		
Logistics/access of consumers to domestic markets (transportation, etc.)		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures

[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the changes in the major roles of different gender and marginalized people in terms of their involvement in domestic fisheries trade activities? Please describe their major roles before and during the COVID-19 situations.

Note: If not applicable, indicate "NA"

	Major roles before COVID-19	Major roles during COVID-19
Women		
Men		
Youth*		
Elderly*		
Marginalized people** (specify)		

*Depending on your country's definition of age ranges for youth and elderly (specify)
**Including indigenous communities, migrant workers, temporary workers, persons with disabilities, and others

B. International Fisheries Trade

1. What are the COVID-19 restriction measures applied by your country that made impacts on the international fisheries trade? Please provide the list and brief descriptions of restriction measures, and period of effectivity.

COVID-19 restriction measures	Brief description	Period of effectivity (start–end)
1.		
2.		
3.		
…		

2. What are the apparent impacts of the COVID-19 pandemic to the international fisheries trade of your country?

Note:
- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Logistics/access to international markets		
Demand of international markets (please also specify if there are any changes in demand of fish commodities or volume for export)		
Quantity of exported fish and fishery products		

Value of exported fish and fishery products		
Variety/types/forms/fish commodities of exported fish and fishery products		
Quantity of imported fish and fishery products		
Value of imported fish and fishery products		
Variety/types/forms/fish commodities of imported fish and fishery products		
Traceability of exported/imported fish and fishery products		
Application of product certification schemes		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations
[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)
[3]Refer to the COVID-19 restriction measures
[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

PART VI. STATUS OF FISHERY RESOURCES AND AQUATIC HABITATS

1. What are the apparent impacts of the COVID-19 pandemic on the status of fishery resources and aquatic habitats of the country?

Note:

- *For each indicator, describe the impacts of COVID-19 and reasons as well as the adaptations undertaken by the stakeholders in response to such impacts*
- *Other indicators may be added, as appropriate*

Indicators[1]	Impacts[2] and reasons[3]	Adaptations of stakeholders[4]
Fishery resources		
Marine (specify)		
Inland (specify)		
Habitats		
Marine (specify)		
Inland (specify)		
Water quality index[5]		
Endangered aquatic species (specify)		
Others (specify)		

[1]Refer to the signs of changes or trends before and during COVID-19 situations

[2]Due to COVID-19 (may be described as stable, increased, or decreased, as appropriate)

[3]Refer to the COVID-19 restriction measures

[4]Stakeholders include fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

[5] Water quality index refers to one or mixture of these parameters, but not limited to: Category I: Degree of nutrient enrichment (1. Total Nitrogen; and 2. Total Phosphorus; Category II: Direct of nutrient enrichment (Chlorophyll a); Category III: Indirect effects nutrient enrichment (1. Dissolved Oxygen saturation; and 2. Biochemical Oxygen Demand); and Category IV: Human health hazards (*Escherichia coli*). The answer can be described as one of these parameters, or by "improved, stable, getting worst".

PART VII. MITIGATION MEASURES AND SUPPORT PROGRAMS

1. What are the national mitigation measures and support programs of the government of your country, which were intended for the fisheries and aquaculture sector in response to COVID-19 pandemic? Please specify and provide brief description for each measure/program, and period of effectivity.

Mitigation measures/support programs	Brief description	Period of effectivity (start–end)
1.		
2		
3		
…		

2. What are the major forms of mitigation measures (*e.g.* financial and others) provided by the government, non-government, and other sectors to the fisheries and aquaculture stakeholders?

Sources and support programs	Mitigation measures		Beneficiaries**
	Financial (USD)*	Others	
A. Government agency			
Sample answer: DOF provided financial support under the program "No One is Left Behind"	USD 1,000/fisher for three months	NA	Registered fishers and farmers all over the country
Sample answer: DOF program on fisheries infrastructure	NA	• Improved/ repaired fishing ports •	Commercial fishers in X, Y, and Z Provinces
DOF program on fishing technology extension	NA	• Provide fishing gears that abide by the regulations	Small-scale fishers in X, Y, and Z Villages
B. National non-government agency			
…			
C. Others			
…			

*Convert national currency to US dollars (USD)

**Refer to stakeholders including fishers, fishery workers, fishing operators, fishers' groups, labor groups, traders (wholesalers, retailers, etc.), consumers, national and local government, fisheries agencies, fisheries officers, NGOs, academe, research institutions, financial institutions, relevant non-fisheries sectors, and others, as appropriate

3. What are the contributions of the fisheries and aquaculture sector to alleviate the impacts of the COVID-19 pandemic in the country, and period of effectivity?

Contributions	Brief description	Period of effectivity (start–end)
Example: Fishers donate fish to health workers		

Example: Fishers donate extra produce to the needy		
1.		
2.		
…		

----------END----------

Thank you for your kind cooperation.

Annex 2

Capture Fishery Production of the ASEAN-SEAFDEC Member Countries

Country		Quantity (t)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	13,566	13,725	13,074	55.34	55.55	55.19
	Marine	13,566	13,725	13,074	55.34	55.55	55.19
Cambodia	Total	656,105	601,100	-	-	-	-
	Marine	121,100	122,250	-	-	-	-
	Inland	535,005	478,850	-	-	-	-
Indonesia	Total	7,355,854	8,550,522	1,698,953[a]	-	-	-
	Marine	6,696,336	7,813,550	1,549,963[a]	-	-	-
	Inland	659,518	736,972	148,990[a]	-	-	-
Lao PDR	Inland	-	67,000	122,000	-	15.97	16.16
Malaysia	Total	1,458,951	1,461,015	1,388,924	2,756	2,855	2,589
	Marine	1,452,862	1,455,446	1,383,299	2,726	2,765	2,506
	Inland	6,089.00	5,569.00	5,625.14	29.97	90.17	83.18
Myanmar	Total	4,849,750	4,872,890	-	-	-	-
	Marine	3,249,700[b]	3,264,830[c]	-	-	-	-
	Inland	1,600,050	1,608,060	-	-	-	-
Singapore	Marine	1,310	1,418	-	9.08	9.00	-
Thailand	Total	1,536,756	1,527,182	1,588,859	2,192	2,355	2,264
	Marine	1,392,931	1,410,717	1,472,009	1,919	2,129	2,026
	Inland	143,825	116,465	116,850	273	226	238

[a]Partial and unofficial data
[b]Fiscal year 2018–2019
[c]Fiscal year 2019–2020

Annex 3

Aquaculture Production of the ASEAN-SEAFDEC Member Countries

Country		Quantity (t)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	1,248.25	973.99	3,501.38	10.33	7.98	24.26
	Brackishwater	417.64	371.57	339.24	2.06	1.76	2.51
	Inland	724.30	590.90	3,045.78	4.89	4.13	19.56
	Marine	106.31	11.52	116.36	0.81	0.08	1.13
Cambodia	Total	254,048.00	307,408.00	-	-	-	-
	Inland	237,092.00	290,012.00	-	-	-	-
	Marine	16,956.00	17,396.00	-	-	-	-
Indonesia	Total	15,771,804	15,425,624	14,845,015	-	-	-
	Brackishwater	3,537,737	3,010,606	2,959,400	-	-	-
	Inland	9,268,216	8,617,168	8,499,281	-	-	-
	Marine	2,965,851	3,797,850	3,386,334	-	-	-
Lao PDR	Inland	-	67,000	122,000	-	33.58	33.97
Malaysia	Total	391,465.00	411,783.00	400,017.57	736.63	806.01	772.89
	Brackishwater	290,195.00	307,181.00	302,807.25	565.28	615.64	582.70
	Inland	101,270.00	104,602.00	97,210.32	171.35	190.37	190.19
Myanmar	Total	1,130,350[a]	1,121,350[b]	-	-	-	-
Singapore	Brackishwater	395.00	369.00	-	6.31	5.86	-
	Inland	854.00	1,014.00	-	6.11	7.86	-
	Marine	4,453.00	4,448.00	-	20.99	22.43	-
Thailand	Brackishwater	496,036.00	536,466.00	556,810	2,225.73	2,357.21	2,191.40
	Inland	425,840.00	426,949.00	471,238.00	806.03	836.10	880.54

[a]Fiscal year 2018–2019
[b]Fiscal year 2019–2020

Annex 4

Production of the top three cultured species (ranking based on the value in 2019) of the ASEAN-SEAFDEC Member Countries

Country	Species	Quantity (t)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Blue shrimp	724.32	538.54	142.19	4.89	3.64	0.96
	Groupers *nei*	214.00	158.71	53.20	2.25	1.67	0.59
	Seabass	83.20	104.21	125.00	0.62	0.78	0.93
Malaysia	White shrimp	36,007.25	38,767.11	35,148.65	192.29	208.37	193.87
	Catfish	33,419.58	28,464.07	29,012.77	36.40	31.36	32.17
	Seaweeds	174,083.20	188,111.10	182,061.00	12.58	16.06	14.61
Myanmar	Rohu	548,961.70[a]	361,344.71[b]	-	658,754.04[a]	614,286.00[b]	-
	Mrigal carp	10,924.57[a]	4,025.11[b]	-	48,123.91[a]	12,075.33[b]	-
	Catla	24,808.81[a]	4,922.34[b]	-	39,694.09[a]	6,399.12[b]	-
Singapore	Barramundi	844.43	1,247.82	-	6.71	9.80	-
	Groupers nei	351.31	311.05	-	3.91	3.91	-
	Milkfish	2,020.47	1,570.94	-	3.40	2.88	-
Thailand	White leg shrimp	358,947.00	378,508.00	373,633.00	1,768.05	1,839.25	1,766.62
	Nile tilapia	216,602.00	228,601.00	262,090.00	308.92	367.74	394.32
	Walking catfish	106,201.00	97,151.00	101,578	144.45	144.19	143.27

[a]Fiscal year 2018–2019
[b]Fiscal year 2019–2020

Annex 5

Total seed production and the top three species (ranking based on the value in 2019) of the ASEAN-SEAFDEC Member Countries

Country	Species	Quantity (million pcs)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	110.39	52.76	40.42	1.55	0.63	0.88
	Blue shrimp	109.9	52.20	4.82	1.33	0.48	0.06
	White shrimp	-	-	34.91	-	-	0.42
	Tilapia	0.052	0.11	0.202	0.031	0.065	0.12
Cambodia	Total	210.00	222.00	-	-	-	-
Indonesia	Total	-	-	-	-	-	-
	Catfish	51,719.39	374,836.40	-	687.66	2,605.35	-
	Tilapia	31,513.27	29,256.10	-	494.61	1,900.50	-
	Shrimp	69,456.22	35,859.14	-	235.21	33.39	-
Malaysia	Total	8,461.46	6,649.94	6,938.78	-	-	-
	White shrimp	3,898.76	2,721.83	5,545.13	17.85	21.69	41.28
	Tiger shrimp	2,443.25	2,448.95	1,386.78	26.82	19.95	27.53
	Freshwater catfish	1,149.86	805.21	475.06	14.61	9.91	1.18
Singapore	Total	19.95	10.28	-	-	-	-
	Barramundi	1.82	0.24	-	-	-	-
	Groupers nei	0.21	0.14	-	-	-	-
	Milkfish	7.13	4.69	-	-	-	-
Thailand	Total	11,144.14	12,118.70	13,667.34	177.97	201.41	225.35
	Nile tilapia	5,536.06	5,909.58	6,037.60	102.80	114.21	115.75
	Giant freshwater prawn	2,631.90	3,084.00	3,335.70	16.29	19.87	21.32
	Catfishes	1,812.58	1,961.72	2,981.66	14.02	15.80	23.82

Annex 6

Total production of cultured ornamental fishes and the top three species (ranking based on the value in 2019) of the ASEAN-SEAFDEC Member Countries

Country	Species	Quantity (million pcs)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	2,862[a]	25,711[a]	2,862[a]	15,000[b]	22,000[b]	15,000[b]
	Goldfish	467[a]	85[a]	467[a]	10,500[b]	75[b]	10,500[b]
	Guppy	1,560[a]	19,113[a]	1,560[a]	1,200[b]	13,000[b]	1,200[b]
	Angelfish	315[a]	90[a]	315[a]	1,200[b]	75[b]	1,200[b]
Indonesia	Total	410.82	398.91	-	-	-	-
	Koi	404.05	396.61	-	-	-	-
	Arowana	5.38	1.80	-	-	-	-
	Clownfish	1.38	0.50	-	-	-	-
Malaysia	Total	325.33	287.53	227.94	84.42	123.52	122.72
	Characins	27.60	21.52	23.41	5.75	4.91	5.69
	Cypynids	100.10	99.65	82.51	27.01	23.92	34.07
	Poecilids	45.24	44.60	24.53	3.14	5.38	1.91
Myanmar	Total	680.03[c]	718.01[d]	-	13,600.64[c]	16,569.50[d]	-
	Labeo rohita	445.53[c]	184.26[d]	-	8,910.62[c]	4,252.22[d]	-
	Punctius gonionotus	106.90[c]	73.95[d]	-	2,137.94[c]	1,706.51[d]	-
	Cyprinus carpio	49.50[c]	48.63[d]	-	990.04[c]	1,122.18[d]	-
Singapore	Total	123.85	122.54	109.75	39.64	38.42	35.36
	Catfishes	10.69	10.82	9.55	4.26	4.22	4.06
	Tetras	18.87	19.49	18.23	3.52	3.67	3.52
	Mollies	13.61	13.19	11.26	2.48	2.43	2.02
Thailand	Total	103.00	81.35	150.87	58.03	20.60	36.67
	Betta splendens	22.77	19.88	39.67	5.65	6.71	13.26
	Poecilia reticulata	15.14	13.45	25.91	1.59	1.70	2.69
	Gyrinocheilus aymonieri	4.98	4.05	8.50	0.56	0.52	0.97

[a] pcs
[b] USD
[c] Fiscal year 2018–2019
[d] Fiscal year 2019–2020

Annex 7

Total and major exported fish and fishery products (ranking based on the value in 2019) of the ASEAN-SEAFDEC Member Countries

Country	Species	Quantity (t)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	1,763.55	2,455.03	3,419.25	7.90	6.71	15.22
	Tuna	1,016.12	1,859.52	1,294.22	0.95	2.43	2.08
	Grouper	207.62	122.62	17.39	1.79	1.37	0.13
	Shrimp	381.22	176.91	1,960.07	2.72	1.12	11.56
	Pompano	20.20	88.20	-	0.06	0.19	-
	Round scad	-	60.95	-	-	0.05	-
Cambodia	Total	41,969.00	-	-	85.31	-	-
	Fish	40,783.00	-	-	82.97	-	-
	Crustaceans	35.00	-	-	0.50	-	-
	Mollusks	2.00	-	-	0.03	-	-
	Others	1,149.00	-	-	1.81	-	-
Indonesia	Total	1,126,068.40	1,184,195.69	1,262,847.99	4,860.90	4,935.96	5,205.21
	Shrimp	197,433.61	207,702.65	239,282.01	1,742.12	1,719.17	2,040.18
	Tuna	168,433.76	184,130.23	195,759.30	713.92	747.54	724.10
	Squid	152,108.58	143,847.34	140,036.31	554.59	556.29	509.22
	Crabs	27,791.62	25,942.91	27,616.33	472.96	393.50	367.52
	Seaweeds	212,961.52	209,241.30	195,573.60	291.84	324.85	279.58
Japan	Total	749,791.00	635,106.00	629,684.00	2.75	2.64	2.14
	Scallops	64,984.00	70,730.00	63,530.00	0.35	0.35	0.24
	Cultured pearls	26.00	24.00	6.00	0.27	0.24	0.05
	Sea cucumbers	627.00	613.00	671.00	0.19	0.19	0.17
	Mackerels	248,758.00	169,279.00	171,327.00	0.24	0.19	0.19
	Fish fillet	7,600.00	8,793.00	6,095.00	0.12	0.15	0.10
Malaysia	Total	275,898.13	316,290.56	340,141.95[a]	759.71	921.19	1,007.87[a]
	Shrimps	33,667.00	55,882.00	38,074.37[a]	241.28	319.57	236.62[a]
	Fish	32,974.00	37,776.00	38,212.13[a]	121.88	144.94	149.16[a]
	Aquatic invertebrates	27,646.00	44,165.00	50,541.68[a]	81.44	136.22	158.58[a]
Myanmar	Total	135,492.12[b]	194,533.13[c]	-	204.55[b]	266.95[c]	-
	Rohu	57,783.53[b]	58,838.11[c]	-	58.62[b]	61.00[c]	-
	Fish meal	44,057.24[b]	58,694.01[c]	-	43.11[b]	56.16[c]	-
	Squid	-	32,753.96[c]	-	-	56.04[c]	-
	Ribbon fish	-	30,477.64[c]	-	-	54.63[c]	-
	Hilsa	-	13,769.42[c]	-	-	39.12[c]	-
Thailand	Total	1,560,663.75	1,546,150.32	1,646,537.89	7,101.22	6,586.11	6,559.52
	Processed tuna	514,524.65	532,880.37	582,689.68	2,432.75	2,255.53	2,461.64
	Frozen shrimp	71,256.78	67,245.12	55,306.64	749.46	685.52	586.69
	Processed shrimp	36,132.41	40,535.36	41,360.65	407.91	429.39	462.14
	Pet food	86,294.64	85,210.78	93,093.18	319.97	317.63	352.43
	Other processed fishery products	72,372.20	76,258.77	79,595.39	268.49	277.73	289.69

[a]Unofficial data
[b]Fiscal year 2018–2019
[c]Fiscal year 2019–2020

Annex 8

Total and major imported fish and fishery products (ranking based on the value in 2019) of the ASEAN-SEAFDEC Member Countries

Country	Species	Quantity (t)			Value (USD million)		
		2018	2019	2020	2018	2019	2020
Brunei Darussalam	Total	5,469.07	5,565.78	7,140.70	25.00	24.67	29.94
	Shrimp	579.57	557.33	766.70	3.34	4.39	6.46
	Fresh fish	-	918.70	-	-	2.89	-
	Spanish mackerel	1,010.24	771.53	548.13	3.23	2.42	2.13
	Red snapper	891.07	341.13	-	5.53	1.55	-
	Squid	405.21	439.54	719.19	1.36	1.51	2.11
Cambodia	Total	18,222.00	-	-	26.42	-	-
	Fish	7,893.00	-	-	10.49	-	-
	Crustaceans	152.00	-	-	1.67	-	-
	Mollusks	5,744.00	-	-	7.36	-	-
	Others	4,433.00	-	-	6.90	-	-
Indonesia	Total	304,117.03	296,068.05	277,513.67	459.99	476.65	428.18
	Fish meal	129,609.71	150,883.26	143,068.56	97.78	98.30	105.77
	Crabs	5,624.13	6,595.68	5,423.25	68.95	71.93	56.05
	Mackerel	79,579.10	52,647.59	27,587.96	75.38	56.96	35.87
	Salmon	6,190.69	7,320.32	5,468.51	50.26	55.40	35.36
	Fish fats and oils	13,052.88	13,654.66	9,502.67	22.95	20.59	16.12
Japan	Total	2,383,690.00	2,467,722.00	2,253,805.00	16.20	15.97	13.73
	Frozen shrimps	142,485.00	143,913.00	137,751.00	1.50	1.45	1.33
	Tuna fillet	52,471.00	51,721.00	48,882.00	0.80	0.81	0.72
	Pacific salmon	101,539.00	113,589.00	116,161.00	0.65	0.72	0.56
	Preserved shrimps	64,018.00	65,689.00	61,849.00	0.68	0.68	0.64
	Other fish fillet	106,607.00	107,690.00	90,200.00	0.55	0.59	0.50
Malaysia	Total	466,399.41	473,866.48	1,058.87[a]	1,182.59	1,313.05	1,058.87[a]
	Fish	224,321.00	221,581.00	407.01[a]	437.31	428.82	407.0[a]
	Aquatic invertebrates	34,840.00	48,712.00	138.05[a]	181.86	207.77	138.05[a]
	Shrimps	33,427.00	39,161.00	126.67[a]	155.19	125.70	126.67[a]
Myanmar	Total	285.33[b]	104.63[c]	-	0.12[b]	0.06[c]	-
	Dried fish	124.23[b]	62.65[c]	-	0.07[b]	0.030[c]	-
	Atlantic salmon	35.33[b]	12.99[c]	-	0.03[b]	0.013[c]	-
	Salmon	-	12.50[c]	-	-	0.013[c]	-
	Mussel	-	10.49[c]	-	-	0.004[c]	-
	Mackerel	-	6.00[c]	-	-	0.002[c]	-
Thailand	Total	2,145,985.18	2,140,415.09	2,166,153.56	4,432.15	4,146.04	4,004.24
	Frozen skipjack tuna	577,142.06	598,700.74	559,013.25	1,019.80	868.13	865.92
	Frozen squid	114,922.12	126,086.23	143,594.98	380.88	404.72	402.89
	Frozen fish	182,607.12	154,086.67	131,645.81	331.27	269.37	246.76
	Frozen albacore	46,636.09	52,590.32	62,854.77	169.10	215.45	229.90
	Frozen yellowfin tuna	112,025.37	105,347.67	107,329.86	235.81	207.15	199.98

[a]Unofficial data
[b]Fiscal year 2018–2019
[c]Fiscal year 2019–2020

Annex 9

Producer price (USD/kg) of the top three species from capture fisheries of the ASEAN-SEAFDEC Member Countries

Country	Species	Value (USD/kg)		
		2018	2019	2020
Brunei Darussalam	Yellowfin tuna	1.58	1.41	1.40
	Tuna like species	2.01	2.35	1.53
	Marine shrimp	6.58	5.18	7.93
Indonesia	Skipjack tuna	2.21	2.21	1.73[a]
	Mackerel tuna	1.35	2.07	1.38[a]
	Indian mackerel	2.76	2.76	2.42[a]
Lao PDR	*Labeo chrysophekadion*	-	4.51	5.39
	Cyclocheilichthys enoplos	-	3.94	4.31
	Cirrhinus microlepis	-	3.94	4.31
Malaysia	Indian mackerel	2.18	2.00	1.78
	Short bodied mackerel	1.57	1.76	1.19
	Sardines	1.31	1.34	1.20
Myanmar	Mrigal carp	2.50[b]	3.00[c]	2.80[d]
	Common carp	1.20[b]	1.70[c]	1.70[d]
	Rohu	1.30[b]	1.30[c]	1.40[d]
Singapore	Tropical spiny lobsters nei	19.69	19.39	-
	Threadfins	15.71	15.55	-
	Natantian decapods nei	12.80	12.57	-
Thailand	Green tiger shrimp	10.87	12.36	9.54
	Silver pomfret	8.73	11.00	10.88
	Giant tiger prawn	11.04	10.88	10.20

[a]Unofficial data
[b]Fiscal year 2018–2019
[c]Fiscal year 2019–2020
[d]Fiscal year 2020–2021

Annex 10

Farm gate price (USD/kg) of the top three cultured species of the ASEAN-SEAFDEC Member Countries

Country	Species	Value (USD/kg)		
		2018	2019	2020
Brunei Darussalam	Blue shrimp	7.50	7.50	7.50
	Groupers nei	9.00	9.00	9.00
	Seabass	7.50	7.50	7.50
Indonesia	Shrimp	4.63	4.63	4.63
	Tilapia	1.66	1.66	1.66
	Catfish	1.42	1.42	1.42
Lao PDR	Silver barb	-	1.69	1.94
	Tilapia	-	1.58	1.72
	Catfish	-	1.35	1.51
Malaysia	Tiger shrimp	7.30	6.97	7.40
	White shrimp	5.46	5.48	5.70
	Freshwater catfish	1.18	1.17	1.20
Myanmar	Mrigal carp	2.50[a]	3.00[b]	2.80[c]
	Catla	2.60[a]	2.70[b]	3.20[c]
	Rohu	1.30[a]	1.30[b]	1.40[c]
Singapore	Groupers *nei*	15.39	16.93	-
	Barramundi	10.52	9.93	-
	Milkfish	2.30	2.47	-
Thailand	White leg shrimp	4.93	4.86	4.73
	Nile tilapia	1.43	1.61	1.50
	Walking catfish	1.36	1.48	1.41

[a]Fiscal year 2018–2019
[b]Fiscal year 2019–2020
[c]Fiscal year 2020–2021