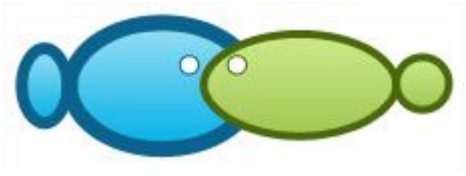

The reef fish trade chain before and during the Covid-19 pandemic in Central Buton District, Indonesia (case study of the coastal waters of the Spelman Strait)

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Abstract. Spelman Strait coastal waters are one of coral fish resource producers. Small-scale fishermen use reef fish to fulfill their household economic needs. Before the Covid-19 pandemic, the coral fisheries supply chain had run naturally in fulfilling Central Buton Regency's food and its surrounding areas. The Spelman Strait coastal reef fishery has also contributed to both domestic and global markets. During the Covid-19 pandemic, supply chain ended forever. This created problems for small-scale fishermen and local collectors. The aim of this study is how the supply chain of coral fisheries before and during the Covid-19 pandemic is and how involved local government is. The findings were collected before and after the Covid-19 outbreak. Local government action hasn't made a real impact yet. The solution proposed in this report, local governments, would make a great short- and long-term coral fishery management plan.
Key Words: coral reef, small-scale fishing, middlemen.

Introduction. The waters of the Spelman Strait are rich in coral reef ecosystem resources, characterized by many fishermen who rely on coral reef ecosystems for their lives. Almost all the villages on the coast of the Spelman Strait have fishermen catching reef fish (Muis et al 2019). The status of the Spelman Strait waters strongly promotes the preservation of coral reef habitats. These waters have outstanding hydrological characteristics, are well away from mainland contaminants and are not impaired by freshwater flows originating from the mainland. The types of reef fish captured by fishermen are mostly of export quality, including the Serranidae and Lutjanidae families (Muis et al 2020).

Before the outbreak of the Covid-19 pandemic, coral fishing in the coastal waters of the Spelman Strait, a supply chain system had been developed, namely reef fish captured by fishermen sold to local collectors (middlemen). Domestic buyers bought local containers, exported reef fish from internal vessels and exported to meet the needs of customers, in particular China, Singapore and Taiwan. The supply chain is a network of sales from the initial suppliers to the end consumers (Assauri 1999; Schroeder & Roger 2007; Pujawan & Mahendrawathi 2010; Probowati 2011; Triyanti & Yusuf 2015; Soeratno & Jan 2016).

The market has been established independently for a long time without local government interference. The outbreak of Covid-19 at the beginning of December 2019 in Wuhan Province, China, has not yet had an effect on fishing supply chains in Indonesia as a whole, including supply chains in the coastal waters of the Spelman Strait. The symptoms of Covid-19 started to spread in Indonesia in February 2020 and started to have an effect on the fishing supply chain at that time. As one of the producers of export-oriented reef fish, the Spelman Strait started to influence the marketing chain, where fish captured by fishermen were no longer purchased.

Local buyers (intermediates) are no longer purchasing (accommodating) fisherman's catch, as domestic containers are not temporarily supplied by exporters.

Conditions due to the outbreak of Covid-19 forced reef fish captured by fishermen to be sold on the local market. The local market, which is the final base of the fisherman, does not make a strong economic contribution. Pandemic Covid-19 appears to be a disease that will create confusion for the reef fishermen on the coast of the Spelman Strait to continue their lives. Such a situation is very concerned that it will lead to new unemployment, which will inevitably become the burden on the regional government of subsidizing their living needs in the form of social assistance.

Research on the coral fishery supply chain, particularly related to the Covid-19 pandemic, has never been done, so there is no data available on the effect of Covid-19 on reef fishers. This is because almost all of the world's communities are experiencing a Covid-19 epidemic, with the same relative impact in Indonesia, especially in the coastal waters of the Spelman Strait. This research is being performed for the first time in the coastal waters of the Spelman Strait after the Covid-19.

The purpose of this study was to determine the extent of the impact of the coral fishery supply chain and the export of commodity fish species prior to and during the lifetime of Covid-19. This research is therefore very relevant so that short-term and long-term solutions can be identified and the role of the local government of Central Buton Regency in coping with the coral supply chain during a pandemic.

Material and Method

Description of the study sites. Research was conducted along the coastal village of the Spelman Strait (Figure 1), Central Buton District, from November 2019 to April 2020. Respondents to this study were reef fishers who settled in Mawasangka Village, Watolo Village, Kancebungi Village and Wakambangura Village.

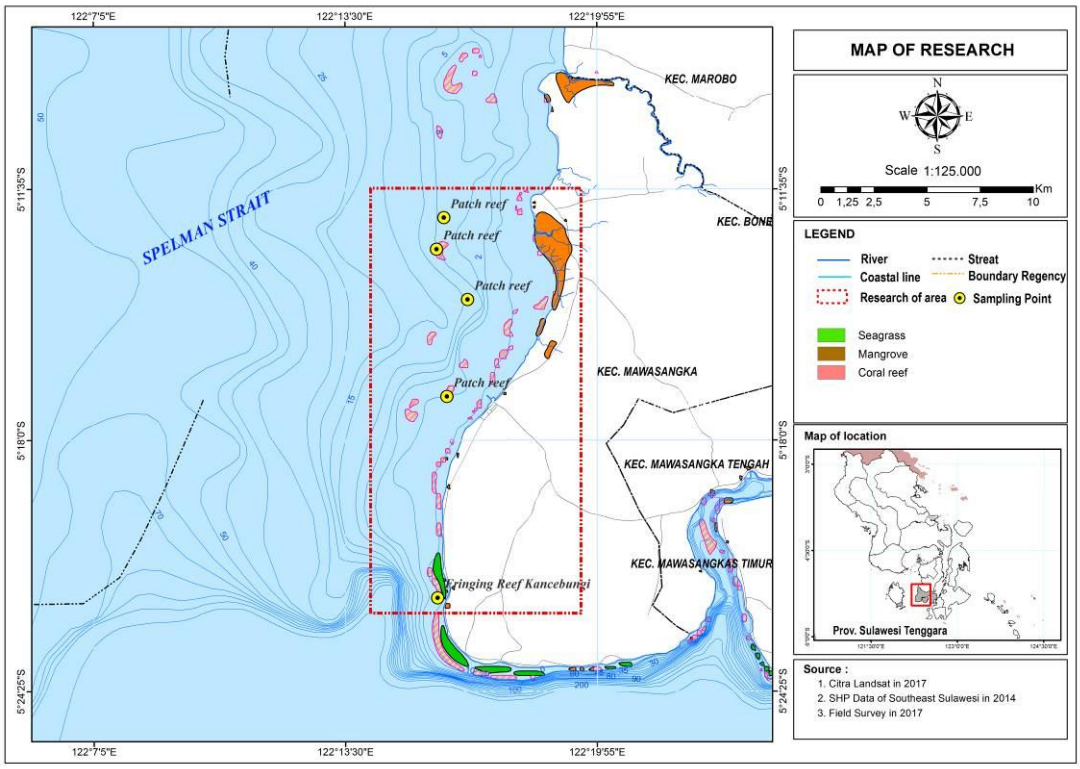

Figure 1. The location of coastal village's, Mawasangka Sub-District.

Data collection procedure. Data collected through direct observation to respondents in the study region, namely through direct interviews with reef fishers of 53 individuals, consisting of 50 fishermen and three middlemen.

Data analysis. The data analysis was carried out using the updated Spidergram approach (Wildenberg 2005) via the Social-Ecological System (SES) communication network. The level of connectivity is marked in color, namely red means no connectivity, orange means low connectivity, yellow means medium connectivity, green means strong connectivity, blue means very strong connectivity, thick lines mean a lot, medium lines mean medium, thin lines means little, and dashed line means complement (Muliani 2017). The connectivity level assessment is based on the results of the observations, interviews and the Logical Framework Analysis (LFA).

Results and Discussion

Supply chain of coral fish. Conceptually, the supply chain is the initial phase of delivering goods, services and information from the first source before the final step becomes the finished product (goods sold) (Baatz 1995; Lambert et al 1998). Golicic et al (2002) clarified that the supply chain is a group / individual relationship involving simple and more complicated transactions. The identification results at the location of the reef fisherman's study showed a supply chain relationship between reef fishers and collectors (middlemen), local middlemen and domestic collectors, and domestic containers with exporters stalled due to the Covid-19 pandemic. The most impacted reef fish species are the grouper and the red snapper. Both forms of reef fish are important economic species whose marketing has reached national and foreign markets. This condition makes both types of reef fish to be the mainstay of fishermen in improving their household economy.

The effect of Covid-19 on the fishermen's economy and the local collectors' economy has been felt in recent months, this year. Now, all local reef fish buyers have started purchasing reef fish from fishermen. Fishermen, all of whom depend on economic support from the selling of reef fish, have no choice but to live in uncertainty. The findings of the SES connectivity and reef fish supply chain analysis and issues at this study site prior to the Covid-19 event are shown in Figure 2 and when the Covid-19 event is shown in Figure 3.

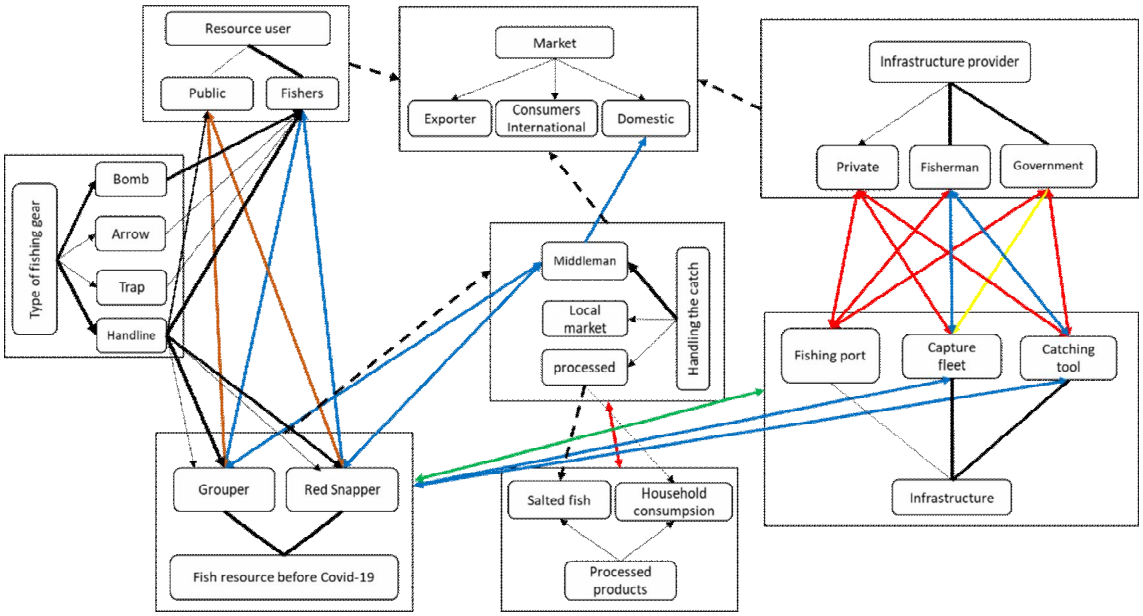

Figure 2. SES connectivity of grouper and red snapper fisheries before Covid-19 in the coastal waters of the Spelman Strait in November 2019.

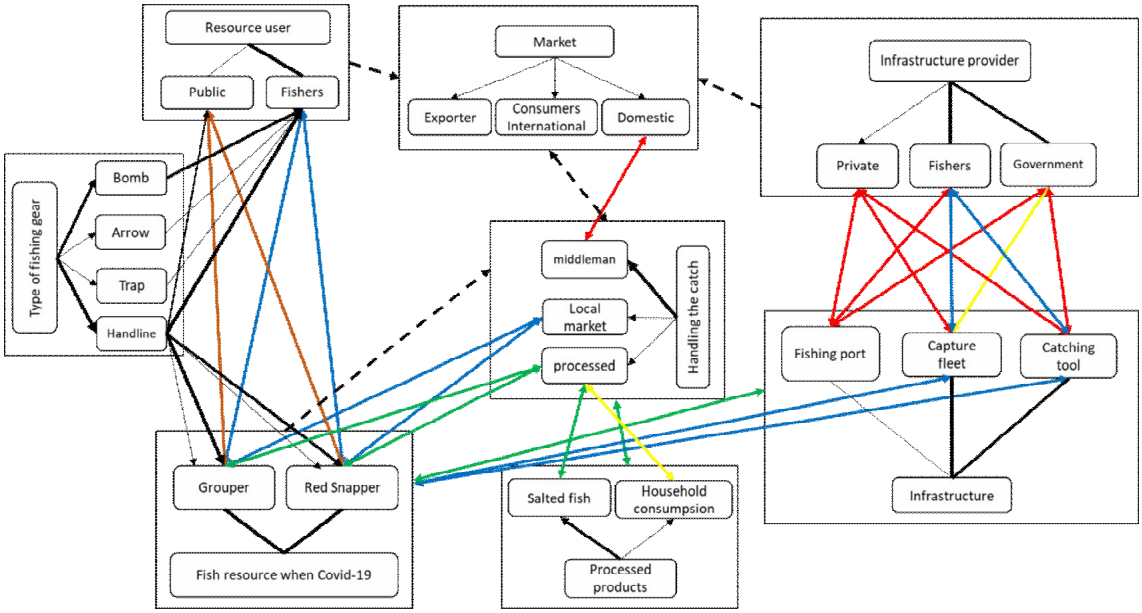

Figure 3. Connectivity SES of grouper and red snapper fisheries during Covid-19 in the coastal waters of Spelman Strait.

The Social-Ecological System (SES) study based on Figure 2 (before Covid-19) shows that reef fishers have strong market certainty since the reef fish supply chain begins as a local container as the last market for fishermen, as a local container as the last market for domestic collectors, as well as domestic collectors as the last market for exporters, and so on.

The economic conditions for fishermen to meet their household needs and the savings ratios are adequately available. This situation is different after the emergence of the Covid-19 pandemic, in which all business networks are disrupted and disturbed. Until now, this phenomenon has started to occur in February.

According to Orlowski (2020), in developing countries, Covid-19 fishermen, as post-harvest suppliers, have encountered a troubling situation, beginning with small-scale fishermen and aquaculture production as the first supply to consumers impacted by the Covid-19 epidemic (FAO 2020).

If one of the supply chains is disrupted, the other supply chains would have an effect on small-scale fishermen and farmers (FAO 2020). In addition, the potential problems are the loss of income and the possibility of disease transmission due to Covid-19 (Orlowski 2020). When the COVID 19 pandemic hit the area, the last route taken by the reef fishers of the Spelman Strait was to sell their catch on the local market, either along the road or around the village, at a very low price compared to the previous Covid-19.

Based on the results of the interview, the sales price of the grouper in the local market is around Rp. 25.000/kg - Rp. 30.000/kg (equivalent to US$ 1.73/kg-2.08/ kg), whereas the price of red snapper is around Rp 20.000/kg-IDR 30.000/kg (equivalent to US$ 1.38 / kg-2.08/kg). Compared to the price of the grouper before the Covid-19 pandemic, around Rp 35.000/kg – Rp. 250,000 / kg (equivalent to US$ 2.43 / kg-US$ 17.35 / kg) and red snappers range from Rp 45,000-Rp 50,000 (equivalent to US$ 3.12 / kg-US$ 3.47 / kg) (Table 1).

Price sizes of more than 1 kg are sold per tail, depending on the consumer's offer. The following are the types of reef fish in the coastal waters of the Spelman Strait that have penetrated national and international markets (Figure 4).

It should be noted that the reef fishers in the coastal waters of the Spelman Strait all this time have very strong connectivity to tools, including the use of hand lines using medium connectivity bombs using traps and low connectivity arrows (Figures 2 and 3). The handline is an environmentally friendly tool and is generally used by small-scale fishermen.

Table 1

Prices of reef fish (dead fish) by middlemen on fishermen before and during Covid-19 in the Spelman Strait coastal waters

Size (kg)	*Fish species price (Rp kg^{-1})*					
	MG	*RG*	*YG*	*RN*	*MG*,RG*,YG**	*RN**
1 - 1.9	35.000	-	-	-		
2 - 2.9	50.000	-	-	-		
0.5 - 2.9	-	-	-	50.000		
3 - > 7	-	-	-	45.000		
1.5 - 3.9	-	120.000	110.000	-	120.000/tail	
1 - 1.4	-	170.000	-	-	50.000/tail	
4 - > 5	-	100.000	90.000	-	150.000/tail	
0.5 - 0.9	-	250.000	150.000	-		
0.5 - 1.4					50.000	35.000

Mud grouper (MG) = *E. polyhekadion & E. fuscoguttatus*, red grouper (RG) = *P. leopardus*, yellow grouper (YG) = *P. marculatus*, red snapper (RN) = *L. bitaeniatus*; * = during Covid-19.

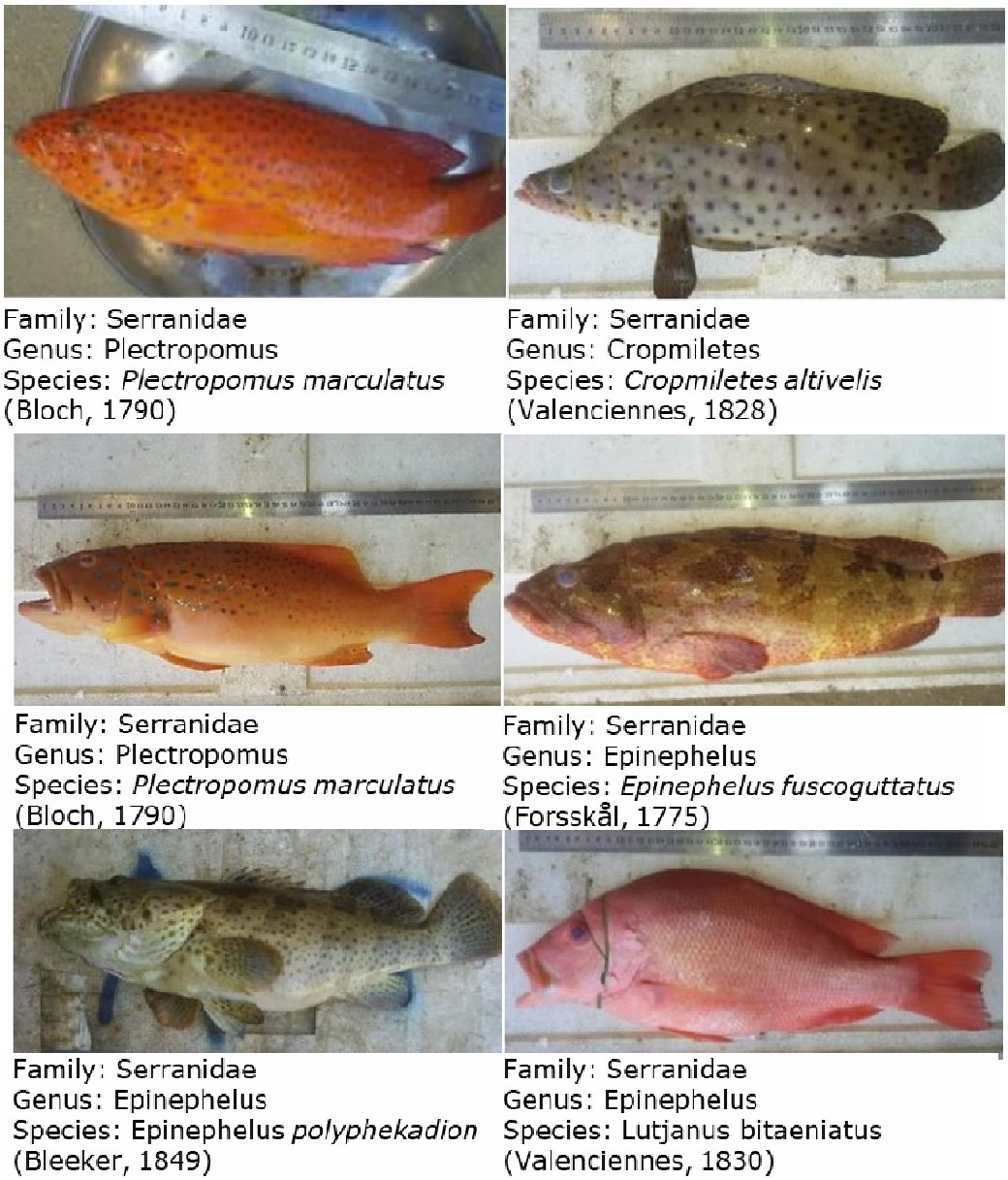

Figure 4. Types of reef fish caught by fishermen in the Spelman Strait.

Small fishermen are suppliers of raw materials that have been pioneers in the food needs of the Central Buton Regency and the surrounding area. We therefore need special attention from the local government.

When the Covid-19 pandemic forced reef fishers to sell their catch at low prices in order to continue their home life, apart from being sold on the local market, some reef fish are distributed to families and some are processed or stored in salted fish for a long time. FAO (2020) explains that the supply chain from small-scale fishermen, aquaculture, to larger markets has been disrupted due to the Covid-19 pandemic. Countries in the fisheries supply chain are experiencing disruptions such as Africa, Asia and Europe (FAO 2020). This fact, if the Covid-19 pandemic continues to strike, is almost certain that reef fish fishing households will suffer an economic downturn. This issue will have a social impact on the community if there is no solution to the sustainability of fishing households.

Solutions offered. The effect of the Covid-19 epidemic has made the economy of the country a mess felt by all citizens of all parts of the world. The Covid-19 epidemic is distinct from other outbreaks that have plagued the world, such as the Ebola outbreak in Africa, the flu outbreak in Spain, the Bird Flu and Cholera outbreak in Indonesia and other nations. Nearly all of these outbreaks have not really affected the global economy.

Covid-19, after several months of human life, has felt pressure, particularly on people who rely on the use of natural resources for their lives. One of them is a reef fisherman in the coastal waters of the Spelman Strait. In comparison to large corporations that are already prepared to manage risks, the organization has planned supply chain risks and plans for the survival of its business (Fadiyah 2020). This phenomenon would be catastrophic if no solution is provided and new unemployment is produced.

Everyone requires nutritional needs from fish to improve their immunity or immune system. The regional government, as the highest authority in the country, must take the initiative to ensure that the issues faced by the community do not have to wait for the rules or policies of the central government. The approach that needs to be sought is to address the short-term and long-term needs of the society.

The short-term solution is that all catch of reef fishers must be purchased by the local government through the Regional-Owned Enterprise (ROE), although the price is not as usual, there is a saving ratio. In addition, priority needs to be given to the online sales system in order to reduce the volume of meetings while preserving the quality of products. Social assistance to communities impacted by Covid-19 has also been offered by many other countries in the world, such as Alaska, and the government has provided assistance to fish farmers in the amount of US$ 50 million from US$ 300 million in fisheries assistance to Covid-19 (Welch 2020).

Security and special consideration for small-scale fishermen must be sustained since they are the main producers in the fishing supply chain. This is the case in Alaska, the stakeholders. In this case, the state government has developed regulations for the safety of local workers and fishermen (Brehmer 2020). Such government action is intended to protect the lives of families of fishermen and the food security of the region or country.

Local governments will need to partner with university scientists on post-harvest handling and technical advancement so that goods can last longer and reach export quality. The provision of cold storage for the handling and quality of longer-lasting capture goods remains the key requirement at this period, while at the same time improving information technology and preparing markets at fair prices.

The role of technology in the supply chain is, according to (Fadiyah 2020), very useful and time-efficient. Supply chains often require protection through the identification of each point, from planning to minimized effect, so that the trade process continues as an evaluation of the supply chain related to shipping disturbances or delays, good communication with the manufacturer, identification of suppliers so that operations continue to operate, and communication of mitigation measures (BSSN 2020). When the Covid-19 pandemic comes to an end or decrease, the infrastructure that is being

developed will be functional, so that every local government is ready if the incident occurs.

In the midst of the Covid-19 pandemic, it is also hoped that small-scale fishermen will continue to comply with the government's guidelines on social distancing, so that they can continue to catch fish so that food security is sustained. According to (Alfatiyah 2020), socialization must be carried out in a coordinated and comprehensive manner by local governments, so that government policies for the introduction of large-scale social controls (PSBB) can be effectively implemented (MENKES 2020). The Contact and Information Office (OCI) carries out the work of the local government to disseminate PSBB to the public. These efforts are going to keep the fishermen safe. Catches remain hygienic until they are used by customers.

Conclusions. In the coastal waters of the Spelman Strait before the Covid-19 pandemic, the supply chain extended from upstream to downstream, reaching domestic and foreign markets. Unlike the Covid-19 pandemic, the supply chain has been halted, causing small-scale fishermen and local collectors to be threatened by the household economy and anticipating new unemployment. Local government participation has not yet made a significant contribution to the supply chain, both prior to and during the Covid-19 pandemic.

Acknowledgements. The value of local governments partnering with universities to innovate so that fish can survive for a long time and quality is maintained, as a contingency in the future if the same tragedy happens, so that small-scale fishermen can sustain their supply chain.

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