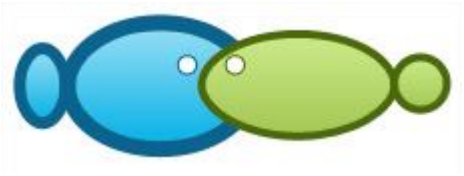

Covid-19 impacts on small-scale tuna fisheries operation in eastern Indonesia: a preliminary snapshot study of pole-and-line and handline tuna fishers' perceptions

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Abstract. This paper is a study of the Covid-19 pandemic impact on the small-scale tuna fisheries in eastern Indonesia. This is an important and on-going global problem because the Covid-19 pandemic has changed the entire normal life of human habits. The researchers surveyed 118 fishers as research respondents to investigate their perceptions of the way the Covid-19 pandemic affected their fishing efforts. The results indicate there are changes in fishing efforts and livelihood of tuna fishers in eastern Indonesia.

Key Words: Covid-19 pandemic, coastal communities livelihood, Indonesia, small-scale fisheries, tuna fishing.

Introduction. Covid-19 disease was firstly found in Wuhan, China in December 2019 and spread rapidly across the globe and become global pandemic ever since. According to the WHO & FAO (2020), this disease was caused by the SARS-CoV-2 virus, as the pandemic is an ongoing global pandemic (WFP FAO & UNICEF 2020). This outbreak affects not only the global economy and social welfare but also the environment aspects as well as the fisheries sector including tuna fisheries (Baihaki & Muawanah 2020; Campbell et al 2020; Kemp et al 2020). As Indonesia is an archipelagic country, it is more challenging and vulnerable amid the pandemic's outbreak (Schmidhuber & Qiao 2020). For more than a decade, Indonesia has been recognized as one of the largest tuna producers in global markets (Khan et al 2020c). Prior to the Covid-19 pandemic, the tuna production in Indonesia was fluctuated due to several factors (Khan et al 2019), including a policy released by the government related to tuna marketing, and supply chains (Khan et al 2018, 2020b). Furthermore, since the pandemic began, the fisheries sector including global tuna markets has declined (FAO 2020d). For example, in the Maldives, tuna export has declined about 20% (UNDP 2020) whilst in Mexico, the fisheries landings have declined between 30 and 80% due to the Covid-19 pandemic (COBI 2020) then the decline has also been faced by the blue swimming crab (*Portunus pelagicus*) demand from Indonesia to major export destinations, e.g. China, USA and EU (SFP 2020). Another example from Africa, the livelihood for 1.2 million Kenyans directly and indirectly related to the fisheries sector with its annual production of 24,709 metric tons of seafood has been disrupted amid of the pandemic (Amayo 2020). Furthermore, the disruption may happened in two ways: the reduced demand and the collapse of seafood price globally (Bennett et al 2020), meanwhile in the local market, the seafood producers have

modified their traditional market supply chains through several ways due to the Covid-19 pandemic (Bennett et al 2020; Schmidhuber et al 2020).

While it comes to the resources, in the Covid-19 outbreak, FAO (2020a) states that fish stocks in the sea are safe and tend to increase due to a decrease in the level of exploitation. On the other hand, marine capture fisheries during this pandemic have experienced a lot of decline in terms of surveillance (Saumweber et al 2020). It is apprehended that illegal, unreported, and unregulated (IUU) fishing practices will again bloom during the pandemic outbreak because the government's priorities were shifting more to pandemic control, and considerably reducing or even eliminating prevention and surveillance costs for IUU fishing. Gokkon (2020) and Watts (2020) already reported a potential escalation of IUU fishing in Indonesia during the shift of surveilence attention. Reflected from China's experience in combating the Covid-19 pandemic, the government is suggested to reduce the risks of the pandemic by implementing the short-term response measures and long-term improvement for the fisheries sector (Liu & Chang 2020) to ensure a safe and adequate seafood supply (WHO & FAO 2020). For example, to prevent the collapse of tuna production, the government of Indonesia (GoI) is continuously buying the fisheries product from fishers to maintain tuna price and production (Inayatillah & Bonaedy 2020). Furthermore, the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia released a stimulus of 474 billion rupiahs for tackling the pandemic outbreak's impact on the fisheries sector in Indonesia (Grahadyarini 2020). This study examines the perceptions of the small-scale tuna pole-and-line and hand-line fishers about the Covid-19 pandemic impact on their fishing operations e.g. number of fishing trip, day at sea, catch volumes, fuel consumption and tuna prices and livelihood e.g. income and household consumption and personal health issues.

Material and Method

Research sites. Selected research sites for this study were located at Bitung (North Sulawesi Province), Masohi (Maluku Province), Kendari (Southeast Sulawesi), and Ternate (North Maluku Province) in the eastern part of Indonesia (Figure 1) as the eastern part of Indonesia is known to have the most of tuna landings in nation's scale (Yuniarta et al 2017; Khan et al 2020a). The research was surveyed by local surveyors from June 9th to July 10th, 2020 taking up 32 days.

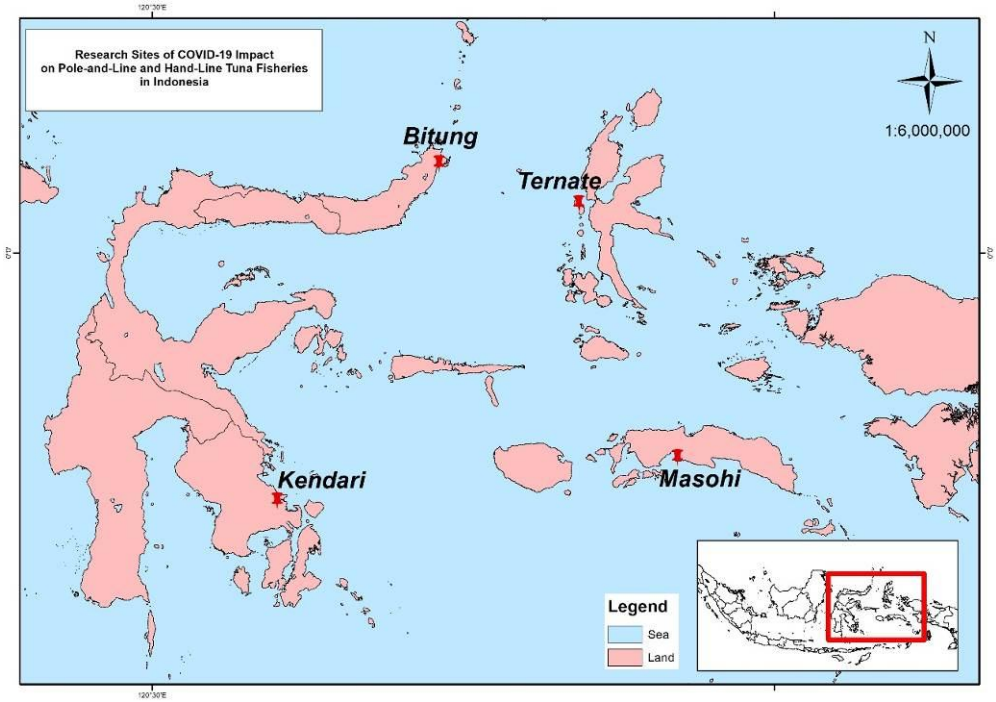

Figure 1. Research sites.

Data analysis. Perceptions of the fishing operation, livelihood, and personal health issues were gathered from both pole-and-line and hand-line fishers using prepared questionnaires with open-ended and closed questions following a method applied by Gubrium & Koro-Ljungberg (2005). These fishers were visited at the above four sites and were contacted employing the snowball technique, whereby one respondent suggested other potential respondents (Gubrium & Koro-Ljungberg 2005). The research locations for the fishers' questionnaires were chosen to determine the impact of Covid-19 on the small-scale tuna fisheries in eastern Indonesia. The respondents were asked for their opinions on the information regarding their fishing activities and their income from fishieries activities as well as their awareness on personal hygiene and social protection before and amid the pandemic outbreak. The questionaires were designed to obtain data and information pertaining to (1) respondents' demographics information e.g. name; gender; age; fishing's experience; main fishing gear; boat ownership and onboard's roles; (2) fishing operations, e.g. number of fishing trip; day at sea per trip; catch volumes, fuel consumption and tuna prices; (3) daily household expenses e.g. income from fishing activities, number of dependents; household consumption and (4) personal health issues e.g. personal hygiene awareness. The reasons for the research and the intended use of the findings were discussed with respondents in advance (Turner et al 2014) and responses were stored in a Microsoft Excel Spreadsheet. The respondent's responses then quatifying in percertage based on the formula:

$$\text{Response (\%)} = \frac{\text{Response returned}}{\text{Total respondent}} \times 100$$

The result from the interviews were divided into three categories: (1) respondents' assessment of the fishing operations before and during Covid-19 pandemic; (2) respondents' livelihood of their own income from fishing activities and household consumption before and during Covid-19 pandemic; and (3) respondents' perception of the personal health and hygiene related to Covid-19 pandemic.

Resuts. A total of 118 respondents consisting of 70 pole-and-line and 48 hand-line fishers were interviewed at the four research sites. The age range was from 18 to 68 years old and the years of working experience ranged from 1 to 45 years. Most respondents worked as suppliers to a processing company or middlemen who supported their daily personal and fishing logistics (Table 1).

Table 1

Respondents' charateristics

No.	*Characteristics*	*Location*			
		Bitung	*Masohi*	*Kendari*	*Ternate*
A	Questionnaires participant				
1.	Total number of pole-and-line fishers	47	0	8	15
2.	Total number of hand-line fishers	15	20	13	0
	Total number of fisher	62	20	21	15
B	Age				
3.	Age of fishers ≤30 years old (%)	19	15	33	33
4.	Age of fishers ≥31 - ≤49 years old (%)	55	70	62	53
5.	Age of fishers ≥50 (%)	26	15	5	13
C	Working experience				
6.	Experience as fishers ≤10 years (%)	40	35	48	93
7.	Experience as fishers ≥11-≤29 years (%)	34	45	38	7
8.	Experience as fishers ≥30 years (%)	26	20	14	0
D	Boat ownership				
9.	Fishers own their boat (%)	0	90	10	0
10.	Fishers not own their boat (%)	100	10	90	100
E	Fishers' status onboard				
11.	Fishers' status as captain (%)	19	95	29	0
12.	Fishers' status as crew (%)	81	5	71	100

F	Insurance				
13.	Fishers hold an insurance (%)	10	80	81	0
G	Fisher group membership				
14.	Member of company's supplier (%)	100	0	0	0
15.	Independent fishers (%)	0	100	0	0
16.	Member of fishers' group (%)	0	0	0	100
17.	Member of middlemen's supplier (%)	0	0	100	0

Covid-19 pandemic influences on fishing operations. Most of the respondents from Kendari stated that the days spent on one fishing trip declined to $\bar{x}$ = 14 days trip^{-1} prior to Covid-19 pandemic ($\bar{x}$ = 16 days trip^{-1}) whilst in other locations it did not change. Furthermore, respondent in Masohi stated that the number of trips in one month declined to $\bar{x}$ = 11 trip month^{-1} during pandemic ($\bar{x}$ = 23 trip month^{-1} before pandemic) and in Kendari was declined to $\bar{x}$ = 1 trip month^{-1} amid the pandemic (before pandemic, $\bar{x}$ = 2 trips month^{-1}). Hand-line and pole-and-line fishers involved as research respondents in Masohi (n = 20) said that fuel consumption decreased to $\bar{x}$ = 40 liters trip^{-1} compared to fuel consumption before pandemic, $\bar{x}$ = 72 liters trip^{-1}. Respondents in Kendari (n = 21) explained that their fuel consumption decreased to $\bar{x}$ = 1,560 liters trip^{-1} compared to fuel consumption before pandemic, $\bar{x}$ = 2,172 liters trip^{-1}. The respondents agreed that the catches per trip decreased to $\bar{x}$ = 8.3 kg trip^{-1} (before pandemic $\bar{x}$ = 29 kg trip^{-1}) in Masohi, $\bar{x}$ = 2,652 kg trip^{-1} (before pandemic, $\bar{x}$ = 5,833 kg trip^{-1}) in Kendari and $\bar{x}$ = 2,917 kg trip^{-1} (before pandemic, $\bar{x}$ = 3,000 kg trip^{-1}) in Ternate. Similarly decreased in tuna price was also found in Bitung (during pandemic, $\bar{x}$ = Rp. 19,727 kg^{-1}; before pandemic, $\bar{x}$ = Rp. 25,454 kg^{-1}), Masohi (during pandemic, $\bar{x}$ = Rp. 46,000 kg^{-1}; before pandemic, $\bar{x}$ = Rp. 86,500 kg^{-1}) and Kendari (during pandemic, $\bar{x}$ = Rp. 15,937 kg^{-1}; before pandemic, $\bar{x}$ = Rp. 18,375 kg^{-1}); only in Ternate the tuna price at the dockside seemed stable amid the Covid-19 pandemic.

Covid-19 pandemic impact on fishers' livelihood. The majority of fishers (87%; n = 103) in Bitung, Masohi and Kendari claimed that their income from fishing activities per trip declined during the Covid-19 pandemic. The decline in income form fishing activities varied from each location; for example, in Bitung slightly decline $\bar{x}$ = Rp. 723,000 trip^{-1} (before pandemic, $\bar{x}$ = Rp. 732,000 trip^{-1}) whilst in Masohi huge dedline was stated by fisher, $\bar{x}$ = Rp. 484,100 trip^{-1} (before pandemic, $\bar{x}$ = Rp. 2,407,000 trip^{-1}) and in Kendari was, $\bar{x}$ = Rp. 835,714 trip^{-1} (before pandemic, $\bar{x}$ = Rp. 1,383,000 trip^{-1}). The last information from fishers in Ternate there was no changed in fisher income amid the pandemic ourbreak. Subsequently, their household consumption seemed to decline during the pandemic, as the fishers in Masohi found that the household consumption during pandemic was $\bar{x}$ = Rp. 3,525,000 month^{-1} compared to before pandemic, $\bar{x}$ = Rp. 4,107,500 month^{-1}, whilst interestingly the household consumption was increased in Kendari $\bar{x}$ = Rp. 1,547,619 month^{-1} (before pandemic, $\bar{x}$ = Rp. 1,542,857 month^{-1}) and in Ternate $\bar{x}$ = Rp. 435,714 month^{-1} (before pandemic, $\bar{x}$ = Rp. 385,714 month^{-1}). Only fishers in Bitung (52%; n = 61) agreed that their household consumptions were still at the same level prior to Covid-19 pandemic.

The fisher's perceptions of personal hygiene and Covid-19 pandemic. Most of the fishers (98%; n = 116 said that they were in a perfect healthy condition amid the Covid-19 pandemic while only small nuber of fishers (2%; n = 2) were not. Moreover, the majority of fishers (64%; n = 76) were worried about the Covid-19 infections during the fishing operations and maintain the health potocols by always wash their hands with soap, wearing face mask and keep distance with other fishers to avoid the infectious during the fishing operations. Furthermore, approximately 99% (n = 117) of respondents claimed that they maintained the personal and working area cleanliness during the fishing operations amid the pandemic outbreak more strictly than ever. More than 57% (n = 67) of fishers stated that they were covered by the government's health insurance whilst the remain 43% (n = 51) of fishers were not.

Discussion. How far does the Covid-19 pandemic impact the tuna fisheries operations in Indonesia? On the state of the tuna fishing efforts, the Covid-19 pandemic perceived by tuna fishers respondents in eastern Indonesia is consistent with an opinion by Hudson (2020) which stated that the global fisheries sector activities decreased to approximately 10.4% amid the Covid-19 pandemic due to a decline in market demand (Smith et al 2020) for shrimp, octopus (*Octopoda*), crab, snapper (Lutjanidae), grouper (Epinephelinae), squid (*Loligo* sp.), and mahi-mahi (*Coryphaena hippurus*) (Hudson 2020). The impact can also be reflected from the supply chains of various products and the availability of workers (FAO 2020c; Stokes et al 2020). Covid-19 pandemic has impacted the number of fishing trips, the number of catches and product's price (Anna 2020) at the dockside level, demand from global markets, and fisheries product distribution and logistics systems (Aura et al 2020). For example, during the Covid-19 pandemic, the tuna export from Indonesia has declined by up to 75%, there is an oversupply of frozen tuna on the canning industry, there are increases in tuna exporting cost and overcapacity of tuna cold-storage due to decreases on demand (Yunanda 2020). According to a comment from Cullen (2020), the governments around the world have to implement some policy measures aimed at avoiding the collapse of food supply and stocks. Another rational suggestion released by FAO (2020e) in response to the Covid-19 pandemic to prevent the collapse of food supply chains including seafood supply chains is by promoting direct and short supply channels between small-scale producers to consumers. For example, in Senegal, the government launched the household food basket initiative to respond to Covid-19 pandemic to protect local food supply chains and supporting local food producers in keeping their businesses (FAO 2020e) and helping vulnerable livelihood (FAO 2020a).

El Masry et al (2020) pointed out that exposure of humans to SARS-CoV-2 from the wild, livestock, companion, and aquatic animals currently cannot be assessed. At this early stage, the prevention measures are the best way to avoid the spread of the Covid-19 pandemic (FAO 2020b). For example, in this study, the respondents stated that to prevent the infections from Covid-19, they maintained the personal hygiene and working environment during fishing operations amid the Covid-19 pandemic. Thus, extraordinary measures, long-term transformation in the form of new-normal adaptation, and strengthening the tuna small-scale and industrial fisheries levels resilience against those challenges are needed to prevent them from losses and collapse (Knight et al 2020). Despite the above efforts, tuna fishers in eastern Indonesia are still struggling to protect themselves from the Covid-19 disease (Inayatillah & Bonaedy 2020) and from the collapse on the demand of fisheries products (Sartin 2020).

Conclusions. The demand and price on seafood products have been declined including for tuna in Indonesia. These conditions have been compounded by the Covid-19 pandemic across the globe. Furthermore, tuna fishers in eastern Indonesia also claimed that their fishing efforts, including their fishing trips, fuel consumption for fishing activities, and tuna catches declined amid the Covid-19 pandemic. It is important for the Indonesian government to successfully overcome this global pandemic and to protect the livelihoods of tuna fishers as tuna pole-and-line and handline fisheries in Indonesia are still struggling for survival during the Covid-19 pandemic.

Declaration of competing interest. This is a short statement to confirm that there is no conflict of interest for this piece of work. All authors agree with the terms and the name order places in the paper.

Credit authorship contribution statement. Zuzy Anna: research idea, conceptualization, writing original draft, writing review and editing, visualization. Janti Djuari: conceptualization, writing original draft, writing review and editing. Alexander M. A. Khan: conceptualization, methodology, formal analysis, data curation, writing review and editing.

Acknowledgements. The authors would like to thank the Indonesian Pole-and-Line and Hand-line Fisheries Association's [AP2HI] members for research survey, data and the permission for publishing this study. Authors are grateful to the tuna fishers in Bitung, Masohi, Kendari and Ternate for their contributions during field survey. The last but not the least, the authors also want to thank anonymous reviewers for comments on this manuscript and to the journal for publishing this research.

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Received: 16 May 2021. Accepted: 09 June 2021. Published online: 30 June 2021.
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How to cite this article:
Anna Z., Djuari J., Khan A. M. A., 2021 Covid-19 impacts on small-scale tuna fisheries operation in eastern Indonesia: a preliminary snapshot study of pole-and-line and handline tuna fishers' perceptions. AACL Bioflux 14(3):1778-1785.