

# **Small-scale fishers' perception of risks in Indonesia's cross-border region of North Maluku**

## **Abstract**

This article assesses Indonesian small-scale fishers' perception of risk. Indonesia is the second largest fish producer globally, the largest tuna producing country, and one of the top ten fish and seafood exporters in the world. Small-scale fisheries sector in Indonesia is the greatest contributor of outputs to national and international seafood markets. Thus, fisheries risk in Indonesia's small-scale fisheries is of some import to the international community because it has direct effects on global food security and supply chains. Combining a survey of 300 fishers and semi-structured interviews, this article focuses on identifying and comparing the full range of fisheries risk as perceived by small-scale fishers working in Tobelo and Morotai regions of North Maluku, an Indonesian province located at the border between Indonesia and two neighbouring countries of the Philippines and Palau. These include risks posed by work accident, ocean crimes, and climate change. The findings show that fishers deemed that accident at work posed the most immediate threat to their livelihood and well-being. Climate change has been identified as second highest risks. Despite the presence of ocean crimes, fishers do not deem these crimes as posing immediate risks to them. However, fishers connect crimes that affect the environment with the decline of fish stocks and their income.

## **1. Introduction**

Indonesia is the second largest fish producer globally, the largest tuna producing country, and one of the top ten fish and seafood exporters in the world [105]. Despite the presence of industrial fishing operations, Indonesia's small-scale fisheries is the main sector that contributes the greatest volume of seafood products to national and global markets [71, 93]. It is estimated that 7.9 million fishers engaged in small-scale fishing produced 92-95 per cent of Indonesia's fisheries outputs for national and global markets – including but not limited to tunas, snappers, groupers, shrimp, and squid [71, 93, 78]. The fisheries sector in Indonesia provides 54% of animal protein consumed in the country and supports 2.7 million workers in the wild capture sector and 1.7 million fishers dependent on coral reef species, the highest number globally [105, 60].

Within the fisheries sector, small-scale fisheries that use low technology fishing gear, including hooks and line, nets and traps dominate coastal fisheries in Indonesia [3, 105]. In total there are over 2.2 million small-scale fishers in Indonesia and this accounts for 96 per cent of fishers in the archipelago [63]. The Indonesian Ministry of Marine Affairs and Fisheries Regulations No.25/2020 defined small-scale fishers as those who fish for daily subsistence needs either without fishing boat or with boats of  $\leq 10$  gross tons (GT) [40]. By national law small-scale fishers are exempted from the fisheries licencing system [3]. While small-scale fisheries underpin the economy of coastal communities and contributes significantly to food security and nutrition, most small-scale fishers, are lacking the resources and capital to cope with economic shocks, reliant on marine resources for food and income, and lacking adequate access to health care and social protection [105, 60, 81, 64]. Between 20 to 25 percent of Indonesia's poor are from fishing households [60, 90, 17]. The *Kesatuan Nelayan Tradisional Indonesia* (KNTI), an Indonesian traditional fishers' association, reported that the incomes of 53 per cent of families in Indonesia's coastal areas, the majority of whom are fishers and their communities, fall below the poverty line [60]. This precarious situation exacerbates the vulnerability of small-scale fishers and their communities to any shock associated with economic crisis, disasters, and climate change [81].

We select North Maluku as a case study in our research because it is one of the richest fishing grounds in Indonesia. It is located at Indonesia's northern border region, facing the Pacific Ocean between the southern part of the Philippines and Palau (see Figures 1 and 2). The province itself consists of over 395 islands, but less than 10 per cent of these islands are inhabited [17]. In this article, we explain the complexities of fisheries risks in Indonesia's province of North Maluku from the point of view of small-scale fishers living in an Indonesian peripheral cross-border regions, areas which are prone to natural disasters, rampant with criminal activities, and are deeply affected by changing climate. We start with a short explanation of methods used and then proceed with an overview of vulnerability of small-scale fishers to risk.

Focusing on Indonesia's border region of North Maluku, this article will explain small-scale fishers' perception of risk and assess their vulnerability to key risk that they identified. The United Nations Office for Disaster Risk Reduction (UNDRR) defines risk as "the probability of an outcome having a negative effect on people, systems or assets" [115]. Risk is portrayed as "a function of the combined effects of hazards, the assets or people exposed to hazards and

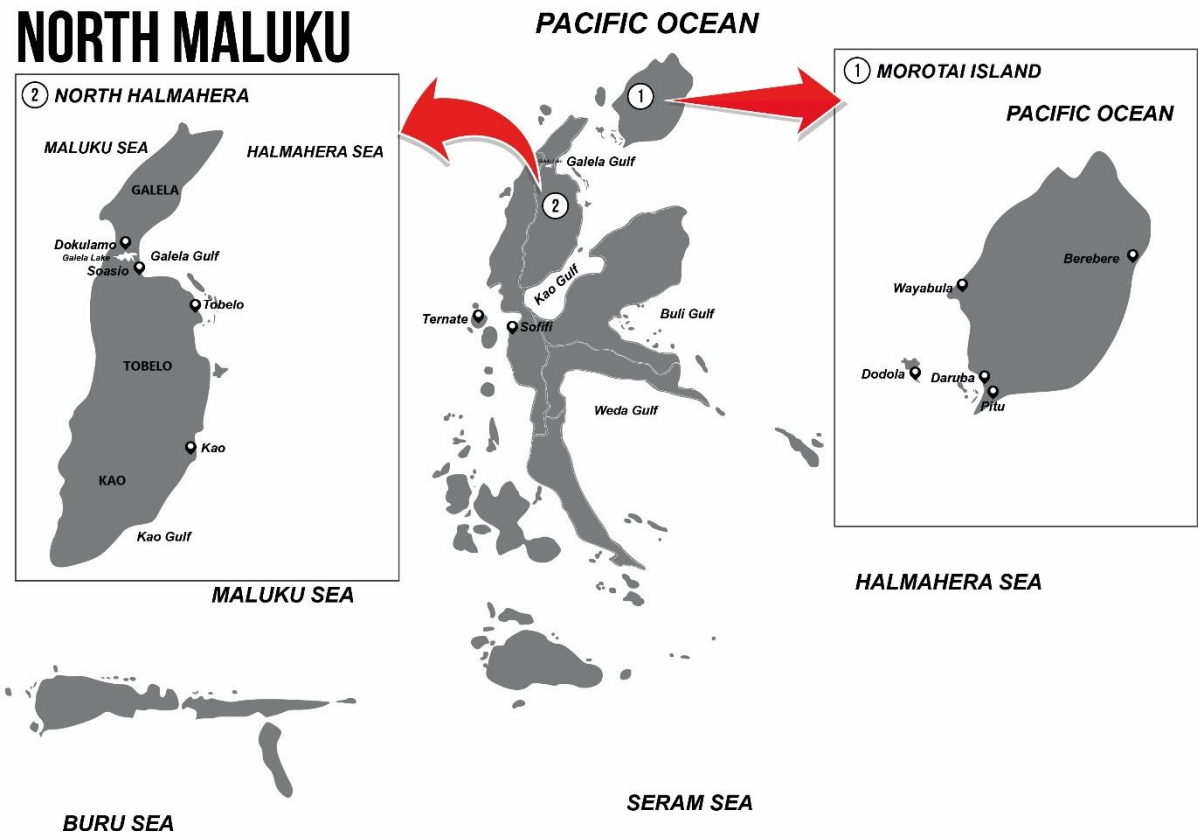
the vulnerability of those exposed elements” (UNDRR, 2023). Social science approaches deem that risk is a subjective notion that can be perceived differently across different groups of people, culture, and social context. Thus, challenging the objective conceptualisation of risk this article reveals small-scale fishers’ interpretation of risk and their view of risk mitigation measures. This is important to enable us to learn the culture and social context that informs fishers’ perception of risk and identify gaps, challenges, and ways to improve risk reduction and adaptation efforts that are not explicitly articulated by media or openly managed by government [22].

The main objective of this article is to document and present evidence on fishers’ perception of risk and risk reduction in Indonesia. Understanding perception of risk is important because identification is the first step in the risk process – even prior to assessment, management, or communication [22]. Research has shown that fishers’ knowledge or understanding is as valid as other type of ocean knowledges and can be used to add or complement scientific assessment needed for both fisheries optimization and resource conservation [13, 108]. This is because fishers observe decline or increase in fish abundance and catch sizes and have firsthand experience of environmental changes, economic fluctuations, and regulatory shift [13, 108]. For data triangulation, the survey and interview data are supplemented by analysis of media articles and documents published by civil society, government authorities, and international bodies.

**Figure 1 Map of Indonesia**



**Figure 2 Map of North Maluku**



It is expected that fishers would deem the risks posed by accident at sea, climate change, and ocean crimes to be very high considering their high dependence on marine resources, the unique vulnerability to climatic change, and the presence of criminal activities at the border (e.g. armed robbery against ships, illegal, unreported and unregulated (IUU) fishing). Our research findings revealed that fishers categorised accident at work as the most pressing risk to their well-being. Climate change was identified as the second highest risk. Ocean crimes were not deemed as immediate risks. However, fishers connect acts of IUU fishing to the decline of fish stocks and their income. Understanding how small-scale fishers perceive risks posed by work accidents, climate change, and ocean crimes provides valuable insights into behavioural intentions and the support required for fisheries policies and management [61]. The term work accident used in this article refers to marine casualties and incidents that occur in all aspects of marine endeavours, including design, manufacture, management, operations, and maintenance [45]. Climate change is defined as change in the state of the climate including long-term shifts in temperatures and weather patterns that can be identified (e.g. by using statistical tests) by changes in the mean and/ or the variability of its properties and that persists for an extended period, typically decades or longer [41, 113]. Ocean crimes refer to a range of activities that contravenes legislation, treaty, or codes of conduct and are often organised, transnational, and multifaceted in nature such as armed robbery against ships, piracy, smuggling of migrants and firearms [103, 101, 102, 72, 117, 35, 116].

## **2. Fisheries risks: the current state of the art**

The burgeoning literature on risk in the fisheries sector can be categorised into two large groups. The first group of work describes the presence of uncertainty and risks in fisheries sector and identifies various models of fisheries insurance. Mumford et al. uses established methods of economic risk management from agriculture in developed North American and European countries and applies these to capture fisheries [55, 56]. Hotta, Parapuratthu et al. and Sainsbury et al. discuss fisheries insurance practices in both developed and developing countries in Asia [73, 106, 88]. These articles explore the scope to establish and further develop fisheries insurance schemes in the Global South and the challenges of extending insurance to fisheries. They identify the presence or absence of nation-wide fisheries insurance scheme and the reasons underpinning its success or poor performance.

The explanations suggested by the literature on risk perception describes how fishers from various parts of the world perceive risks and identify a series of mechanisms to address risks. Tingley et al. [22] comprehensively identify various risks in fisheries industry as perceived by different groups of stakeholders including fishers, government officials, scientists, and consumers. Aechson, Murray, Torner and Eklof, Lawrie, Matheson, Sweitzer et al., Morrison, and Anderson examine fishers' perception of risks and its relations to their health and safety [118, 74, 87, 110, 95, 99]. Although these articles provide useful accounts on how to evaluate fishers' perception of risks they focus on fishers and fisheries systems in developed European and North American countries. Tingley et al. examines fisheries risks across four European countries: Faroes, Iceland, Greece, and United Kingdom (UK). Acheson focuses on fishers who lived and worked on the West Coast of British Columbia, Canada. Torner and Eklof study the risk perception among Swedish fishers, whereas Murray focuses on New Foundland inshore fishers.

There is a small but growing literature that focuses on fisheries risks in developing countries. Articles by Sowman [83, 81], Pita et al. [39], Cinner et al. [57], and Lam et al. [119] focus on vulnerability assessment to the risks associated with climate variability and change, its value and limitations in countries located in Africa (e.g. Namibia and South Africa), the Mediterranean (e.g. Egypt and Tunisia), the Pacific (e.g. Papua New Guinea and Palau), and Southeast Asia (e.g. Indonesia and the Philippines).

Articles that specifically focus on fisheries risks in Indonesia address varying risks posed by ocean crimes, health and safety, and climate change. This work focuses on risks posed by ocean crimes highlights the impacts of illegal, unreported, and unregulated (IUU) fishing on fish stocks decline, fishers' livelihoods, government loss of income, and the sustainability of the marine environment [101, 70, 18, 19, 96, 67, 14, 62]. These works provide extensive overview on the risks posed by IUU fishing on marine species and communities' livelihoods and conflicting role of different stakeholders in the governance of marine resources, but do not address issues posed by climate change induced risks or safety risks at sea in the literature.

Scholarly articles that examine health and safety risks in Indonesian fisheries analyse different causes of illness and work accident faced by fishers and trace them to different factors including noise, lighting, the height of wave, consumption of alcohol, and exposure to sunshine and temperature at their place of work [4, 38, 92, 34, 37, 27, 69, 68]. These articles also provide

analysis of various capacity development activities to improve health and safety risks. However, the literature does not explore risks faced by fishers from ocean crimes or climate change.

The literature on climate change risks for fisheries in Indonesia documented impacts of climate change on fisheries such as extreme events, climate variability, change in species distribution, increase frequency of rainfall, sea level rise, and reduction of fisheries production and fishers' income. [97, 100, 25, 31, 32]. This body of research also provides in-depth analysis of different adaptive responses employed by fishers such as changing fishing location and time, use of traditional knowledge, livelihood diversification, and incorporation of technology [25, 32, 97, 100, 79]. The literature, however, does not take into account ocean crimes and safety risks to fishers.

This article contributes to the literature by studying Indonesian small-scale fishers' perception of safety, climate change, and ocean crimes risks. Although the existing literature does not map in detail how small-scale fishers in border regions of Indonesia perceive all the three categories of risks, they are, nonetheless, a valuable resource for this research because they account various ways to evaluate risks perception and fisheries practices in different countries to mitigate risks. We, therefore, use the existing literature on fisheries risks as a point of departure.

### **3. Methods**

This article is based primarily on survey results of small-scale fishers working in Tobelo and Morotai, the two main fisheries towns in the province in 2020. In each town we aimed to survey 100 small-scale fishers. Our survey results exceeded the targets, producing survey of 300 small-scale fishers in total. Data we collected as part of the survey was aimed as the first strategic effort to develop a database of small-scale fishers' risk perceptual data in North Maluku. Random sampling from fishers' associations list of small-scale fishers would not have been feasible. We found that fishers' associations in Tobelo and Morotai, were not active and most of them were founded by government. Therefore, we sought help from government to introduce us to fishers' leaders in the two areas who then introduced us to other research participants. In practice to trace suitable survey subjects a snowball sampling procedure was

useful to help us to select further participants. As we started the survey process some of the survey participants put us in contact with other small-scale fishers.

Questionnaires were written by Senia Febrica in Bahasa Indonesia. Piloting, and interviewing was carried out by a team of ten researchers from the Universitas Halmahera, North Maluku under the direction of Herson Keradjaan. The questionnaire contained 50 fully structured questions.

We collected a range of information that could inform fishers' perception of risk including: (a) information associated with the different characteristics of risk, for example accident at work, storms and attack at sea by criminals, and fishers' experience facing these risks. It is expected that risks factor will inform individual's view on the likelihood of a highly hazardous incident occurring [33]. (b). Data related to the source and degree of information fishers received. These include explanations offered by media, government officials, representatives of civil society, and experts in the field of fisheries risks and risk management. We asked fishers about their level of trust in information provided by government authorities, experts, and civil society organisations. It is expected that individuals who have never experienced a hazardous incident are likely to make their interpretation of a risk based on information they obtain externally [33]. (c) Information related to individual and contextual factors including age, level of income, and number of dependents. We combined the use of survey with direct observation and a series of 16 semi-structured interviews with small-scale fishers in Tobelo and Morotai that we carried out in 2022, 2023, and 2024. The survey and interview data are supplemented by analysis of media articles and documents published by civil society and government relevant to the issue addressed in this article.

#### **4. Findings: overview of vulnerability of small-scale fisheries in North Maluku to crisis, shocks, and stressors**

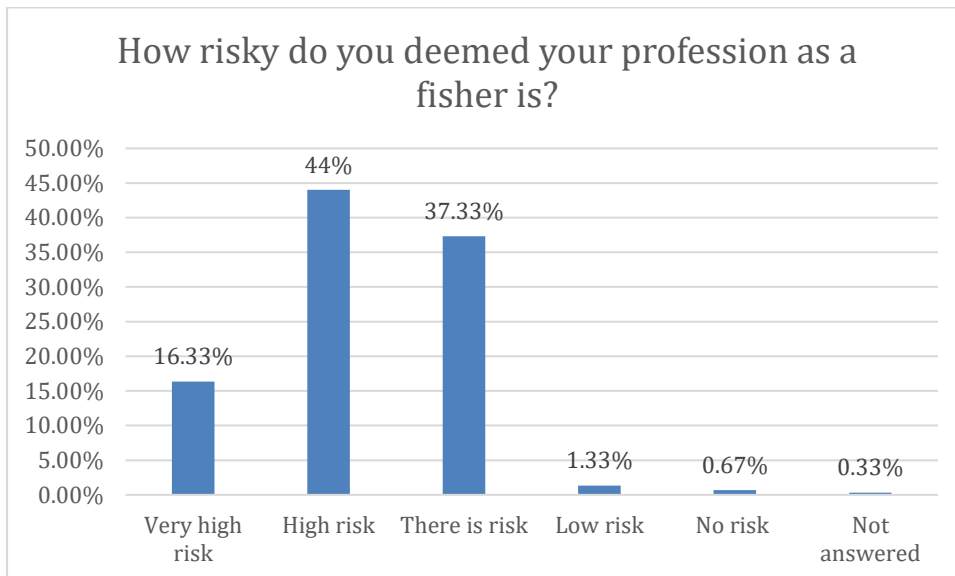
The majority of fishers (73%) that we surveyed had an average income between Rp 1-4 million a month (USD 63.73 - USD 254.92) The level of income earned by small-scale fishers could be categorised as low. This is in line with the Indonesian Central Bureau of Statistics data that revealed an average monthly income of poor household in Indonesia is Rp 2,187,756 (USD 139.43) [10]. The low level of income earned by fishers is also used to support their family members, including children. Most of the fishers we surveyed have children under 18 years old

(81.3%). Findings from our survey and interviews with fishers are sorted into three categories of risks including work related accident, ocean crimes, and climate change. We address each category of risk in turn below.

#### 4.1. Safety first: work-related accident as the highest risk

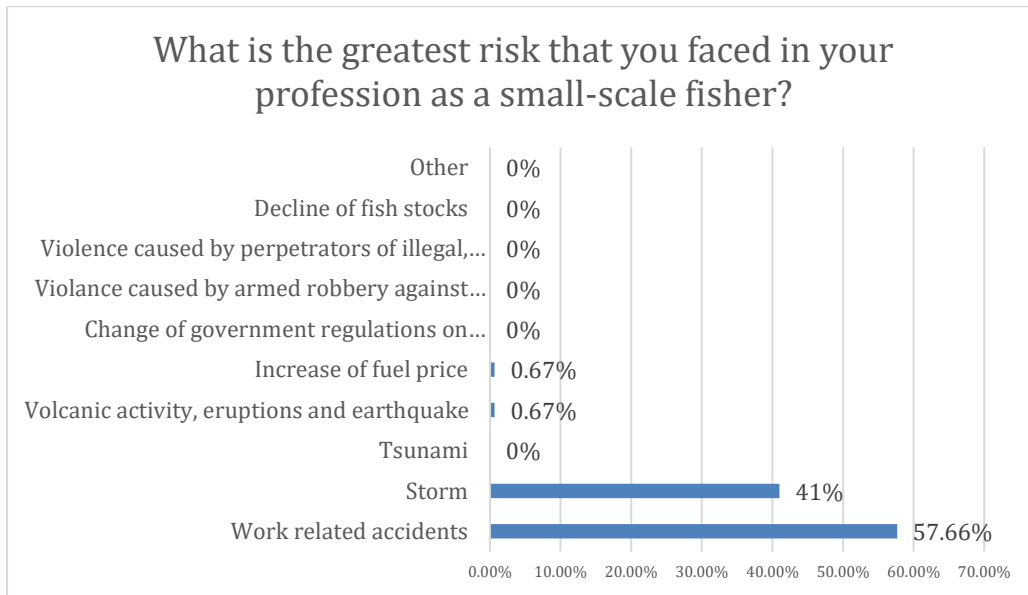
Small-scale fishers fully recognised the risks that they face in their profession. We asked fishers how risky they deemed their profession as a fisher is. As shown in Figure 3 over 60 per cent of small-scale fishers categorised the magnitude of risks that they face as either high risks (44%) or very high risks (16.3%).

**Figure 3. Small-scale fishers’ assessment of degree of risks posed by their profession**



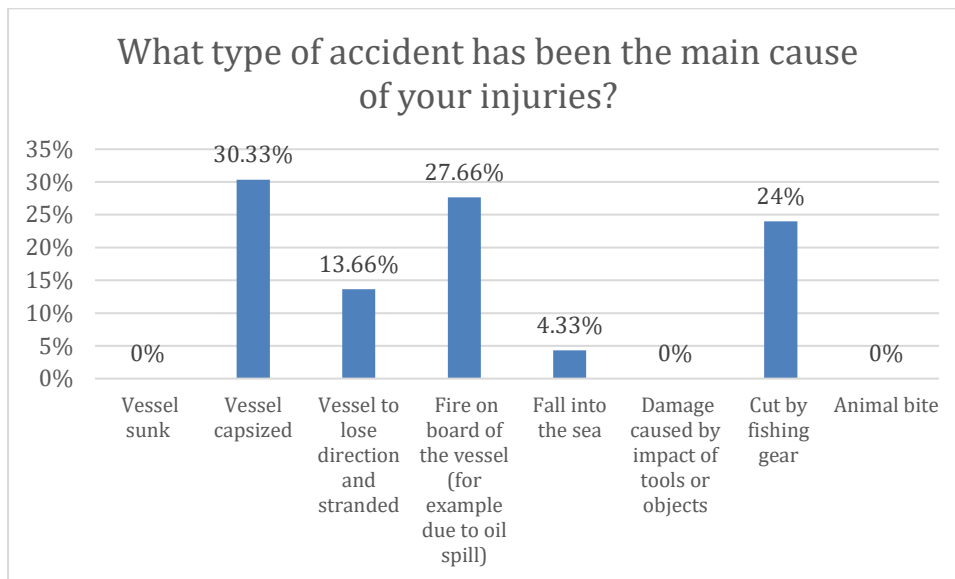
Over one third of respondents claimed that they have personally experienced a dangerous or a very detrimental incident that impacted their safety and wellbeing in their work (34%). Around 64% of respondents who have not experience work-related accident first-hand claimed that they know members of family, neighbours, and colleagues who have had experienced dangerous incidents as part of their profession as fishers.

**Figure 4. Small-scale fishers' identification of the greatest risk that they faced**



When we asked fishers to identify the greatest risk that they faced in their profession, as noted in Figure 4 the majority of fishers (57.66%) deemed work accident as posing the greatest risk to them. This finding is in line with the result of various studies conducted on work related injuries in the fishing sector that point to fishing as “a hazardous occupation worldwide with a poor health and safety record” [21, 66, 107]. This condition highlights the pressing need for the enforcement of occupational health and safety measures in the fisheries sector [21, 66, 107]. As shown in Figure 5 the most common cause of injuries among small-scale fishers in Tobelo and Morotai are vessel capsized during extreme weather conditions (30.33%), fire caused by the spill of oil following vessels being hit with high wave (27.66%), cut by fishing gear (24%), a storm causing the vessel to drift away to another island and stranded (13.66%), and fall into the sea (4.33%) [46, 52].

**Figure 5. The main cause of small-scale fishers' injuries**



Fishers directly linked these causes of injuries to the impacts of climate change to ocean ecosystems. One of them noted that “the majority of accident took place because of extreme weather caused by climate change” [51]. The high concern over accident by our respondents was further exacerbated the lack of safety prevention plans on board of small-scale fishing vessels in our focus region, lack of resources among fishers to obtain medical treatment to treat injuries, high costs of maintaining safety equipment (e.g. the costs to purchase radio and extend its license are deemed as very high by fishers), and the absence of help from local authorities when call for help were issued during accident [52]. Fishers noted that when an accident took place, they were primarily assisted by fellow fishers, and rarely sought professional medical care to treat injuries [52].

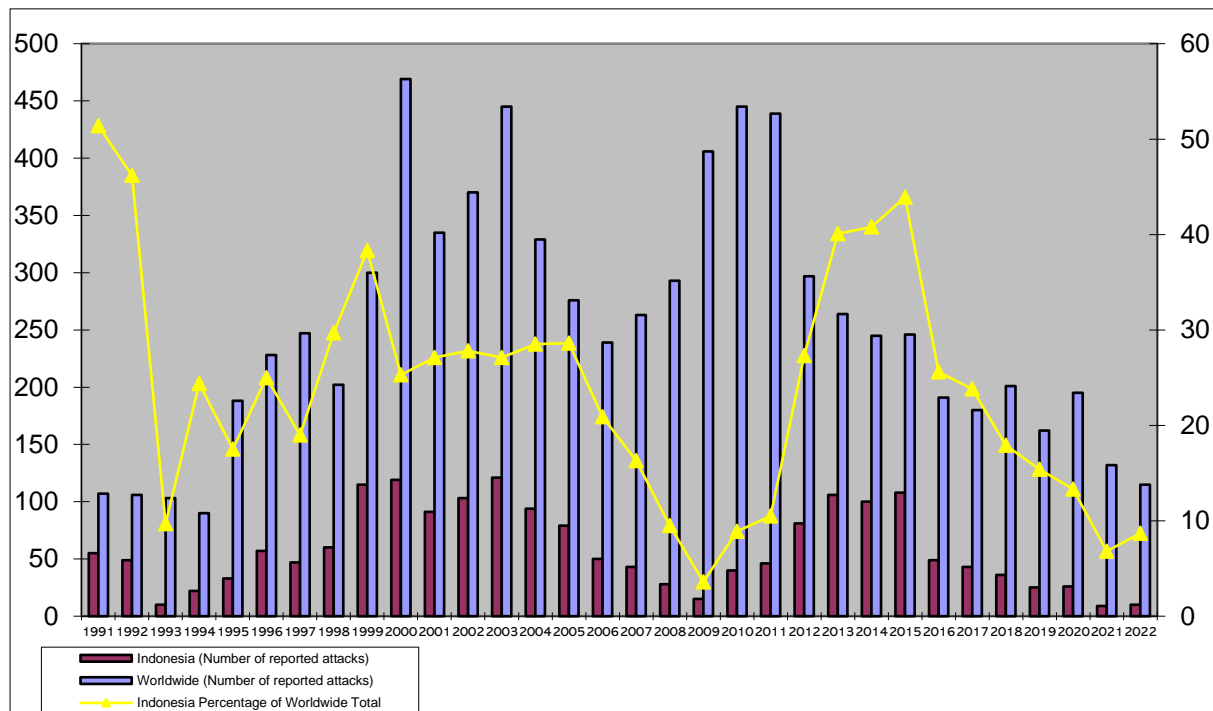
#### **4.2. Ocean crimes**

Due to the intensified sovereignty struggles and geopolitical sensitivity surrounding regions such as the Indo-Pacific, fishing in coastal waters can significantly intersect with state ‘s maritime security efforts [12]. Illegal fishing cases, operation of fishing militia, and armed robbery against ships in these regions have shown how fisheries and the mobility of fishing boats can trigger complex crime operations and frequent diplomatic tensions and inter-state conflicts. Small-scale fishers are often finding themselves at the centre of fishing entanglement with maritime security. They suffer decline of catch due to destructive and illegal fishing, harassment from security authorities and crime perpetrators, and in some cases recruited to step

up surveillance or guarding maritime boundaries [101, 6, 76, 77]. However, the current discussion of these topics is “largely episodic, scattered, and state-centric, risking poorly informed policy or naval responses based on a partial understanding of security dynamics involving fishers and fishing boats” [5]. By examining intersection between fisheries and ocean crimes from fishers’ perspective, this article bridges the gap and provides useful knowledge to coastal states, particularly Indonesia, committed to securing their maritime boundaries to make research informed decisions.

Small-scale fishers working in North Maluku are facing additional risks of encountering criminals that operate at the borders. The waters adjacent to North Maluku are rampant with ocean crimes such as armed robbery against ships, maritime terrorism, and illegal, unreported, and unregulated (IUU) fishing. Media has reported hijacking and armed robbery attacks against ships in the waters adjacent to North Maluku, particularly in the area north of Morotai [65, 109]. Fishing vessels are among those targeted in the attacks in this area. The International Commercial Crimes Services of the International Maritime Bureau reported in 2022 that “Pirates/ militants in the southern Philippines conduct attacks on vessels in/ off Sibutu passage/ off Sibutu island/ Tawi Tawi/ Sulu Sea/ Celebes Sea [or known as Sulawesi Sea] /off eastern Sabah. They attacked tugs/ barges/ fishing vessels/ yachts/ merchant ships to rob and kidnap crews for ransom” [44]. Figure 6 below reveals that despite a sharp decline of armed robbery attacks against ships since 2016, armed robbery against ships continues to take place.

**Figure 6. Armed Robbery Attacks and Attempted Attacks in Indonesian Waters (Excluding the Straits of Malacca and Singapore) 1991-2022**

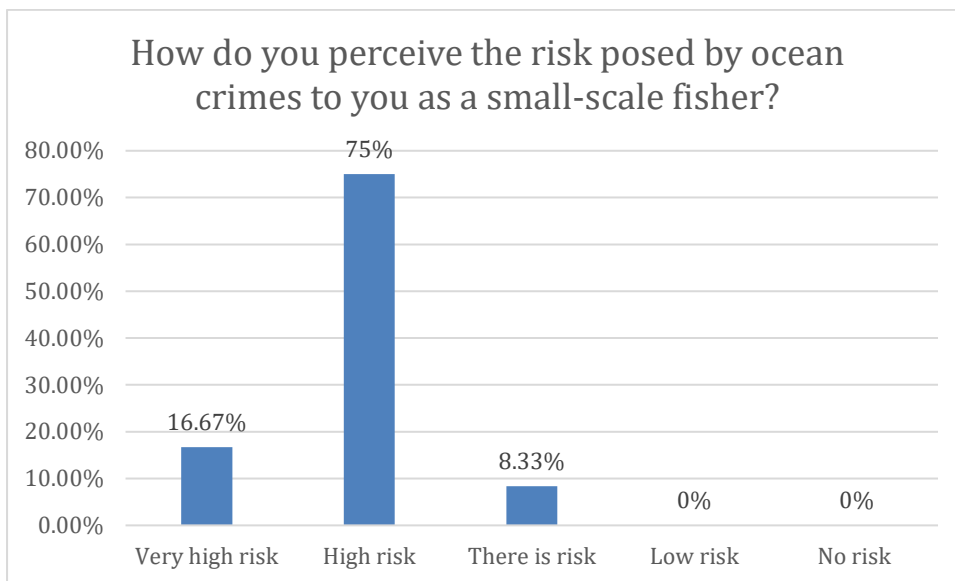


Source: ICC-IMB, 2001; 2006; 2009; 2010; 2014; 2020; 2021 as cited in Febrica, 2023.

High-profile armed robbery attacks against ships such as KM Rehobot in 2015 and KM Mina in 2019 led to hot-pursuit carried out by the Indonesian authorities from North Maluku waters to Indonesia-Philippines maritime boundaries [65, 109]. Ships from China, Taiwan, Thailand, and the Philippines frequently conduct IUU fishing in Indonesian waters close to the chains of islands of North Maluku [9, 16]. Illegal fishers do not hesitate to use violence against local fishers that they encounter at sea to prevent them from reporting IUU fishing activities to law enforcement agencies. Acts of violence towards small-scale fishers including destruction of vessels, kidnap, being left on a deserted island, and murder are not uncommon. Two retired fishers who used to fish in the Sulawesi Sea and Maluku Sea explained in an interview that at least twenty of their fellow fishers had been killed by illegal fishers [47]. Scholarly works and media reports confirmed the activities of illegal fishers in areas reserved for small-scale and artisanal fishers in Indonesia and their use of violence including shooting at local fishers or ramming their boats [8, 86, 54]. According to the Indonesian fisheries law the area reserved for small-scale fishers comprises the 12-nautical-mile (22-kilometer) zone off an island’s coast [86, 20]. Despite the presence of a real danger of encountering criminals at sea, when we asked

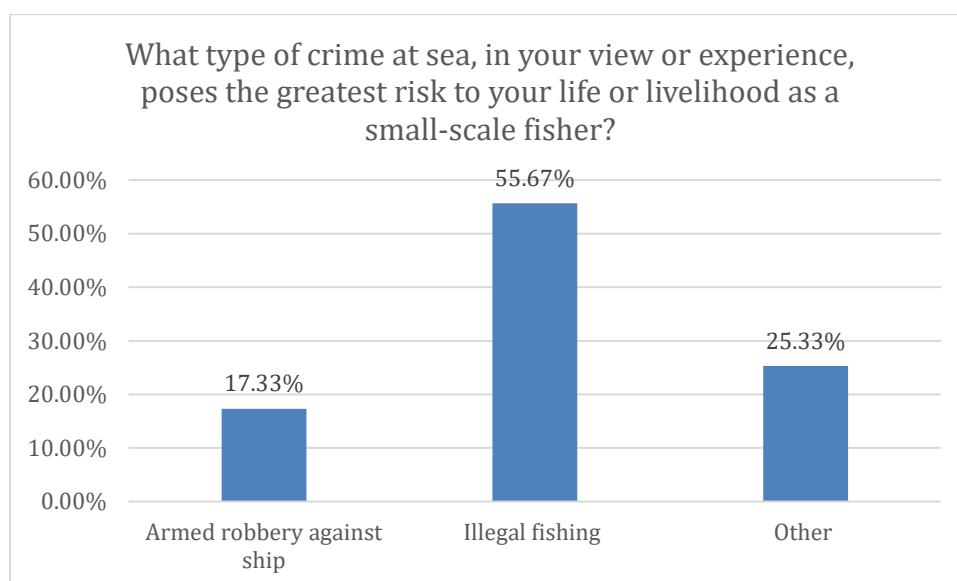
300 fishers that we surveyed what they think the greatest risk in their profession is, no fisher (0%) identified acts of violence by pirates or perpetrators of illegal fishing as the most pressing risk that they faced (see Figure 4). Rather, they viewed that risks posed by work related accident and climate change as more pressing matters. Having said this, our survey results as indicated in Figure 7 below reveals that a large majority of small-scale fishers (91.67%) answered that “they are facing very high” or “high risk” from ocean crimes.

**Figure 7. Small-scale fishers’ perception of risk posed by crime at sea**



As shown in Figure 8, the majority of small-scale fishers we surveyed identified two types of ocean crimes in their waters that are detrimental to their life and livelihood: illegal fishing (55.67%) and armed robbery against ships (17.33%).

**Figure 8. Types of crime at sea as identified by small-scale fishers**



Over a quarter of small-scale fishers surveyed who selected ‘other’ identified a range of ocean crimes that posed risks to them including “fishing using banned fishing gear, dynamite or bomb,” “fishing outside of a country maritime boundary,” “selling of fisheries products to foreign vessels” and “purchasing of illegal fuels.” Some of these activities could be categorised as crimes that affect the environment (such as destructive or IUU fishing). Small-scale fishers made direct links between reduction of their income and IUU fishing activities. For instance, one of the fishers noted how “the presence of foreign vessels that fish in our waters also increase competition over fisheries resources. Our income is declining because of this” [48].

#### **4.3 Climate change: a pressing concern**

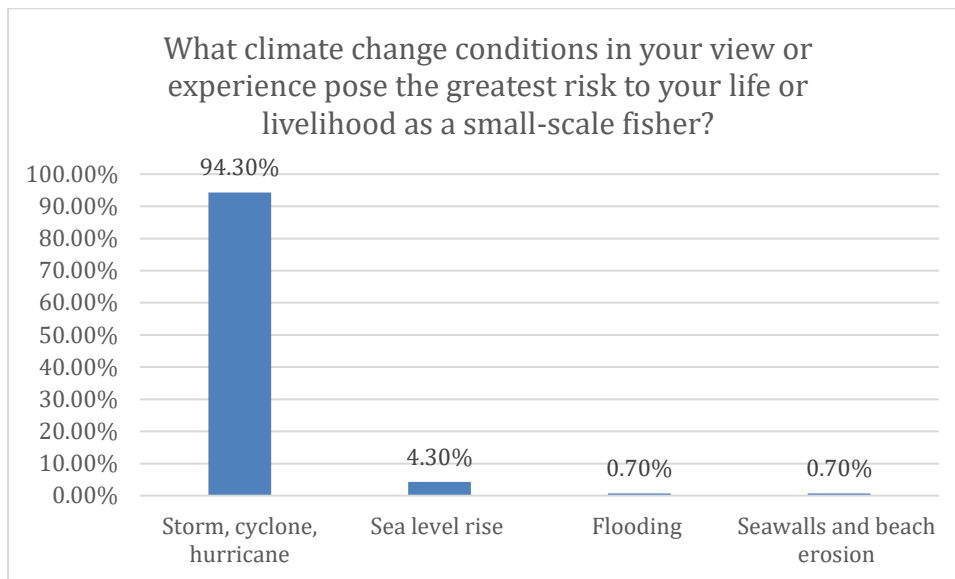
The second highest risks identified by fishers (48.3%) are climate-change induced risks, particularly storm. This finding is interesting because despite the growing crimes at sea, the 300 fishers that we surveyed deemed that the changing ocean caused by climate change posed a more immediate risk to their livelihood and well-being in comparison to ocean crimes. They also made direct connection between work accident and the impacts of climate change.

Fishers that we interviewed further highlighted how declining fish stocks caused by the changing climate and ocean contributes directly to the reduction of their revenue and increase in costs for fishing [53]. During interviews fishers highlighted overlapping environmental and governance factors, that exacerbated their vulnerability to climate change. For instance, fishers explained how the failure of subsidised fuel reaching fishers living in remote areas contributes to increasing their vulnerability to climate change induced risks. As one of the fishers put it:

The decline of fish stocks from time to time caused the reduction of income. Our fishing location become much further away from the shore, and this increases our operational costs to fish. This is made worse by the absence of subsidised fuel policy at regency (*kabupaten*) level. Subsidised fuel policy is only implemented at provincial level. Fishers in the end has to purchase 'industrial fuel' (*pertamax*) that is much more expensive than the subsidised one. The subsidised fuel is also only sold at gas stations, and we have to go through a long and time-consuming queue to get them [48].

The majority of fishers (over 55 per cent) working in Tobelo and Morotai pointed out the presence of high risks posed by climate change to their safety at work, food security, and livelihoods. These include over 15 per cent respondents that categorised the risk posed by climate change to be very high, and more than 40 per cent of respondents that noted high risks of climate change to their livelihood and well-being. We asked small-scale fishers to identify climate change induced phenomena that they categorised as immediate risks to them and their community's well-being.

**Figure 9. Climate change conditions that pose the greatest risk to small-scale fishers**



As shown in Figure 9 more than 90 per cent of small-scale fishers noted that storm and cyclones are the most immediate impact of climate change and posed high risk to fishers and their communities. Others also observed sea level rise and flooding (5 per cent) and seawalls and beach erosion (1 per cent) as the main impacts of climate change that they felt. This shows that although climate change is a global phenomenon, its impacts are both observed and felt directly at local level by small-scale fishers and their communities who are dependent to ocean [82, 80].

#### **4.4 Risks adaptation and mitigation**

We ask fishers about their access to information and their decision-making processes related to fisheries risks adaptation and mitigation. The findings from our survey pointed out how small-scale fishers experience a lack of access to information and decision-making processes on policy, law, and efforts to improve their resilience, adaptation, or mitigation to various fisheries risks. Around 78 per cent of small-scale fishers that we surveyed claimed that they either rarely or never heard information on fisheries risks and existing measures to adapt and mitigate these risks. All small-scale fishers (100%) that participated in our study answered that they have never participated in decision-making process related to conservation and sustainable use of fisheries resources. Over 96 per cent of respondents answered that any information that they have received on safety at sea, ocean crimes and climate change risks, adaptation, and

mitigation efforts came from media, particularly television rather than representatives of government, non-governmental organisations (NGOs) or academics.

Our research findings reveal that small-scale fishers have more limited access to information on fisheries risks related to climate change and ocean crimes in comparison to work accidents. Although fishers are facing direct impacts of climate change on a day-to-day basis, 78% of fishers noted that they either rarely/not too often or have never heard, read or watched information about the risks of climate change to fishers and efforts to improve climate adaptation and mitigation. An overwhelming majority of fishers (82.66%) also answered 'rarely/not too often' or 'never' when asked about how often they have heard, watched or read information on the risks of ocean crimes to fishers and efforts to address them. In comparison, all fishers answered that they are either 'very often' (32.67%), 'often enough' (60%) or often (7.33%) exposed to information related to work accidents experienced by small-scale fishers and measures to address them.

Despite small-scale fishers' limited access on fisheries risks, particularly on climate change and ocean crimes, through this study we found that the majority of small-scale fishers to some extent trust the government, NGOs, academic, and media's assessment about climate change, ocean crimes, and work accident induced risks and measures to mitigate them. The degree of fishers' trust on information provided by different stakeholders varied. For instance, only 19% of respondents claimed that they really trust what the government said related to climate change. A higher degree of trust was shown towards NGOs, where 34.7% of respondents claimed that they have high degree of trust on what the NGOs representative says about risks posed by climate change and strategies for climate adaptation and mitigation. Over 40% of respondents claimed that they trust what academics and experts said about climate change risks, adaptation and mitigation efforts. Similarly, more than 40% said that they trust the media reporting on climate change.

Although less than one fifth of small-scale fishers interviewed displayed high degree of trust in government information on climate adaptation and mitigation measures, the government fisheries risk mitigation measure, called *Kusuka*, was well known among the respondents. In 2019 the Indonesian Ministry of Fisheries launched a fisheries insurance called *Kusuka* to manage risks. In Morotai we found that the level of fishers' participation in this insurance scheme as a way to mitigate fisheries risks was high. As of July 2020, from 3,756 fishers over

63% of them have joined the scheme (2,324 persons). The majority of respondents of our study (60%) claimed that they have confidence that the government fisheries insurance can give them protection against any loss and damage caused by an accident, an act of crime or extreme climate impact. These findings show that there are opportunities for different stakeholders to reach out, start dialogue, increase the capacity of small-scale fishers, and at the same time learn from small-scale fishers on how different risks are perceived at local level.

One sticking points remains in terms of risks adaptation and mitigation is small-scale fishers' access to financial means. Whilst small-scale fishers' high participation in *Kusuka* insurance could be deemed as a progress, only 14 per cent of respondents said the process to participate in fisheries insurance was very easy. Over 20 per cent of small-scale fishers claimed that the process was not easy for them. We also asked fishers how easy it is for them to access loans to deal with the consequences of extreme events such as work accident, act of violence by sea robbers or IUU fishers, or climate change induced disasters (e.g. storm, cyclone, flood, sea-level rise) that caused substantial financial loss and damage to them. The result was striking as a large majority of the respondents claimed that it was not easy or difficult for them to access loan or other financial resources when crisis or shocks took place due to work accident (100%), climate change (98.90%), and crimes (76.66%).

## **5 Discussion and way forward**

The findings from our research point to the vulnerability of small-scale fishers in North Maluku to the risks posed by work accident, acts of crimes at sea, and climate change induced risks. Fishers' vulnerability to these risks is exacerbated by their lack of financial means and access to decision-making processes to increase resilience and mitigate risks. In terms of financial means, as Macusi et al. noted despite the hard work that small-scale fishers delivered daily, fisheries and farming remain the lowest paid profession in agriculture [24]. The low revenue for small-scale fishers trickles down to other aspects of small-scale fishers' socio-economic life including non-existent social welfare and pension systems, poor health, and living standards for their families [11, 24]. These have knock-on effects on their ability to deal with shocks and crisis. Our finding reveals that fishers' access to financial measures such as insurance and loans are needed to increase resilience and mitigate risks. To maximise fishers' ability to use these financial measures access to information to such measures is essential [78]. For instance, although *Kusuka* fisheries insurance was introduced by the Indonesian

government in 2019, not all small-scale fishers are aware of this. As one of the fishers claimed “I have never heard of it. The local government (*Pemda*) has never notified us about this [insurance]” [50]. This finding points to the need to improve fishers’ access to information on risks adaptation and mitigation measures. The FAO pointed out that the realisation of small-scale fishers’ rights depends on the right of access to information which implies the provision of information in an objective, understandable, affordable, and timely manner to ensure a real opportunity for fishers to decide and participate in decision-making process affecting them [29]. Access to information is deemed as “essential procedural right that bolster the guarantees on tenure, control over natural resources, as well as protection of fishers’ traditional knowledge” [26]. The SSF Guidelines (sec. 11.4) recognises the importance of access to information for helping SSF communities “to cope with existing problems and empower them to improve their livelihoods” [26]. Access to information needed by small-scale fishers is not limited to financial measures. The SSF Guidelines (sec. 11.5 & 11.6) emphasises the need for information that ensure sustainability of small-scale fisheries including data on IUU fishing, disaster risks, climate change, livelihoods and food security, and the need to develop information systems for data-poor conditions [26].

Access to information supports fishers’ participation in informing decisions affecting them. Our findings show that despite the overwhelming evidence of the impacts of climate change on fisheries and the extensive knowledge that small-scale fishers have on the changing climate and ocean, fishers are often excluded from decision-making processes at local, national, and international levels. Their marginalisation from decision-making process on ocean and climate at local, national or international levels could exacerbate their vulnerability. Small-scale fishers we interviewed claimed that they have never been included in any decision-making process related to fisheries governance or climate change adaptation. Their interactions with government in this area is limited to receiving weather warning from the Indonesian government Meteorology, Climatology and Geophysical agency (*Badan Meteorologi, Klimatologi, dan Geofisika* or often abbreviated as BMKG) [53]. As a small-scale fisher noted: “We have never been involved decision-making process. We only receive weather information through warnings issued by the BMKG office” [49]. This is problematic because consultation and meaningful participation in decision-making are among the key safeguard measures for the respect and protection of the small-scale fishers’ rights to land tenure (including fishing grounds) and natural resources as recognised by the UN Declaration on Peasants ‘Rights and the UN Food and Agriculture Organization (FAO)’s Voluntary Guidelines for Securing

Sustainable Fisheries in the context of food security and poverty eradication (SSF Guidelines) [26].

|   |   |
|---|---|
| <p><b>Safety first – Work accidents</b></p> <ul style="list-style-type: none"> <li>● Vessel sunk or capsized during extreme weather conditions.</li> <li>● Storm causing the vessel to drift away to another island.</li> <li>● Fire caused by the spill of oil following vessels encountered with high wave.</li> <li>● Boat drifting to other islands due to storms.</li> </ul> | <p><b>Ocean Crimes</b></p> <ul style="list-style-type: none"> <li>● Armed robbery against ships</li> <li>● Illegal, unreported, unregulated fishing</li> </ul>  |
| <p><b>Climate Change</b></p> <ul style="list-style-type: none"> <li>● Storms</li> <li>● Coastal erosion</li> <li>● Sea level rise</li> <li>● Flooding</li> </ul>  | <p><b>Adaptation Measures</b></p> <ul style="list-style-type: none"> <li>● Getting insurance</li> <li>● Observing weather report</li> <li>● Adjusting fishing time in line with the weather report</li> <li>● Supplementary livelihoods: farm labourers, farming, running a small shop</li> </ul> |

Given the lack of small-scale fishers’ participation in decision-making processes, particularly in the context of climate change, the Food and Agriculture Organization of the United Nations (FAO) has urged the need for “recognition and greater visibility for fisheries in national and international climate policies and action” [114]. Yet, the lack of attention to small-scale fisheries in climate change discussion has been a persistent issue. For example, the Intergovernmental Panel on Climate Change, in its Summary for Policymakers of the Synthesis Report of its 6<sup>th</sup> assessment cycle published in 2023, made more references to ‘land’ (93 times) in comparison to ocean (25 times) [42]. The document (C.4.3, C.6.2, C.7.3) noted varied and relevant stakeholders including governments; businesses; children; youth; women; labour; media; financial actors, including investors, financial intermediaries, central banks and financial regulators; and Indigenous Peoples and local communities [42]. However, it fails to mention small-scale fishers. This led to the growing coalition among civil society, academics,

and international organisations to advance small-scale fishers' human rights in the context of changing climate from outside of the United Nations climate regime [91, 58, 104].

In North Maluku climate change induced natural disasters have brought devastating effects for small-scale fisheries due to the region's vulnerability to storms, earthquake, tsunami, sea level rise, and flooding [112, 15]. In total, there are 115 medium and small islands in Indonesia that are threatened with disappearance or sinking due to flooding and rising sea levels. Some of these small islands such as Pagama Island, Moari Island, and Sidanga Island are located in various parts of North Maluku including in Halmahera Utara, Morotai, Halmahera Tengah, and Sula. In the past ten years, the sea level rise in some of these islands has reached 1.5 metres [75].

Our research also shows that fishers in Tobelo and Morotai have valuable knowledge on climate induced changes in their environment. Their knowledge should be integrated into decision-making and strategies for climate adaptation and mitigation. One of the small-scale fishers we interviewed in Morotai, for example, explained how:

the change in weather pattern has taken place in recent years. This is very different from 10-20 years ago. In the past we normally experienced extreme weather during the East Monsoon season that took place from April to September. West monsoon season, from October to March, was normally much calmer. However, now the weather pattern has become less certain, storms take place both during East Monsoon or West Monsoon season [48].

This view was also confirmed by a small-scale fisher from Tobelo who explained the uncertainty in weather or seasonal prediction. To quote him: "This month falls under dry season, but it has been raining. It is because of climate change" [49]. A fisher stressed that "the ocean becomes stormier. Ocean currents are speeding up due to stronger winds. Wave heights hitting the boat increases over the past years. This is a challenge because my boat is small" [50]. The knowledge that they shared is compatible with scientific findings regarding impacts of climate change in contributing to unpredictability of weather, accelerating ocean currents and winds as well as increasing the most-severe wave heights [94, 36, 59].

The Intergovernmental Panel on Climate Change has reported that small-scale fisheries livelihoods and jobs are the most vulnerable to climate-driven changes in marine resources and

ecosystem services and that rebuilding overexploited or depleted fisheries reduces negative climate change impacts on fisheries and supports food security, biodiversity, human health and well-being [42, 43]. As articulated by small-scale fishers the effects of climate change coupled with the continuous practices of IUU fishing in areas exclusively reserved for small-scale fisheries, high risk of accidents, and financial pressures including lack of access to loan, subsidised fuel, and increased of operational costs have created less incentives for small-scale fishers to pass down their knowledge and train their children to be the next generation of fishers [20, 11, 98, 24, 63]. All fishers that we interviewed claimed that they do not want their children to work as small-scale fishers. As one of the fishers described it: “We do not want our children to continue our line of work and become fishers. We want them to gain better education and get a more decent job” [48]. The lack of appeal of small-scale fishers in North Maluku to encourage younger generation to take up this profession is in line with the declining trend in the number of fishers in Indonesia. The worsening storms and reef losses in Indonesia caused by global warming make fishing in Indonesia “becoming less productive, more dangerous” and drives the number of fishers to decline by more than 10 per cent in last decade [1, 2].

Despite the limited resources that they have small-scale fishers have proactively taken approaches in responding to climate change [84, 85, 89, 23]. This is also the case in terms of small-scale fishers in North Maluku. In response to the changing ocean, the majority of small-scale fishers have actively observe weather report and adjust their fishing time in line with the report, explore a range of supplementary livelihoods including working as motorcycle driver (*ojek*), agriculture labour, opening a small shop or food stall (*warung sederhana*) at their house, and/or planting crops that could be easily harvested in every three months to meet their daily food needs and to be sold at the local market such as corn and spices. A small-scale fisher noted as follow:

My daily job is fishing. Apart from that, I am also a farm labourer. I help people carry their coconuts, copra... I do not expect the government to help our life. We earn our own money. If we only earn Rp 1,000 (USD 0.063), we save our money to buy food...In a good fishing day we can earn up to Rp 150,000 (USD 9.49). It is difficult to earn more than that [50].

The Indonesian government has recognised that there are challenges and risks facing small-scale fishers with respect to changing environments and different sources of

uncertainty. Therefore, the government enacted a law to protect and empower the small-scale fishers. Law No 7/2016 on the Protection and Empowerment of Small Scale Fishers, Fish farmers and Salt farmers noted that the government needs to provide infrastructure to develop small-scale fisheries business; create certainty of business in fisheries, improve the capacity of small-scale fishers, develop system and institution that gives loans to the fishers to protect the small-scale fishers from natural disasters, climate change and pollution, and provide the guarantee of security, safety and legal aids (Article 3 Law No 7/2016).

In addition, the Indonesian government could provide fuel subsidy to the small-scale fishers, fish farmers, and salt farmers (Article 24 Law No 7/2016). Article 30 of Law No 7/2016 noted government obligations to provide protection to fishers through fisheries insurance to cover damage or loss of fishing equipment, accidents at work, and deaths (Article 30(1) and 30(6) of Law No 7/2016). It also noted explicitly that the risks faced by fishers, fish farmers, and salt farmers include natural disasters, outbreak of fish disease, impacts of climate change, and/or pollution. By doing so, the government explicitly recognise the risks posed by climate change to fisheries sector (Article 30 (3) Law No 7/2016). However, according to the fishers' association, the KNTI, government's commitment to protect small-scale fishers against damage or loss of fishing gears, accidents, and deaths was not deemed sufficient. KNTI demanded the government to provide health insurance for small-scale fishers as part of fishers' social safety nets. With a total of 2.2 million of small-scale fishers, the government is expected to subsidise around Rp 400 billion [USD 25,568,840] for the fishers' health insurance [7].

Addressing the challenges faced by fishers in changing climate calls for adequate law for mitigation and adaptation to climate change, especially for small scale fisheries. Indonesia, however, does not have a specific legislation on climate change. A more holistic approach is needed to address poverty among small-scale fishers, restore ecosystem, and enhance fishers' ability to build resilience, and provide loss and damage insurance to reduce risks posed by climate change induced disasters. For example, sea level rise may cause permanent loss of fish farming or habitation or mooring. Extreme weather events will pose risks to vessels, gear, and lives. Long-term impacts on the distribution and productivity of fish stocks may harm livelihoods and food security [28].

The current National Disaster Law, Law No. 24/2007, does not cover this type of loss and damage. It also does not define sea level rise as a disaster. Therefore, the response from the government to sea level rise only takes place when the sea level rise is causing major flooding and forced migration. This is problematic because sea level rise occurs on a daily basis in some coastal areas. Experts such as the Director of Yayasan Madani Berkelanjutan, Nadia Hadad, predicted that 2,000 small islands in Indonesia --- around 1,450 of which located in Maluku --- and a third of the capital Jakarta would be submerged due to rising sea levels caused by climate change by 2050 [30, 111]. A holistic protection of small-scale fishers against climate change is urgently needed in domestic legislation in Indonesia.

## **Conclusion**

This review of fisheries risks faced by small-scale fishers living in Morotai and Tobelo, North Maluku has revealed varying degrees of risks posed by accidents at work, climate change, and ocean crimes as perceived by fishers. Fishers that we surveyed overwhelmingly answered that accidents at work posed the most immediate threat to their livelihood and well-being. They also have higher exposure to information related to risks posed by work accidents and ways to address them compared to risks related to climate change and ocean crimes. Climate change has been identified as posing serious risks to fishers, second only after accidents at work. Fishers are aware of the impacts of climate change on weather pattern, height of wave, and declining fish stocks, and have actively made various adaptation measures to adapt to the changing climate. Despite the presence of varied and relevant ocean crimes, fishers do not deem these crimes as posing immediate risks to them. However, fishers do make connections between acts of IUU fishing in their surrounding waterways with the decline of fish stocks and subsequently, their income.

Despite the Indonesian government's efforts to support fishers, for example through the implementation of nation-wide fisheries insurance and enactment of laws to protect and empower fishers, more could be done to ensure protection of fishers from various fisheries risks. These include:

- (1) providing more information and capacity building initiatives for fishers to strengthen fishers' resilience and improve risk mitigation measures against climate change and ocean crimes.

- (2) enabling provision of health insurance for fishers and introduction of climate change legislation that address concerns over loss and damage caused by climate induced disaster, such as sea-level rise.
- (3) providing fishers with access to meaningful participation in consultation and decision-making processes related to improving fishing safety, climate change and ocean crimes.
- (4) building capacity of fishers to participate in consultation and decision-making processes.
- (5) ensuring better implementation of government policies such as distribution of subsidised fuel and socialisation of the government Kusuka's marine insurance to reach more fishers.
- (6) providing access to information to small-scale fishers related to fishing safety, climate change impacts, adaptation and mitigation measures, and ocean crimes.
- (7) improving coordination among Indonesian maritime authorities such as the Indonesian Maritime Security Agency (*Bakamla*), marine police, navy, coast guard units of the Indonesian Ministry of Marine Affairs and Fisheries, the Indonesian Ministry of Transportation, national search and rescue agency (*Basarnas*) to provide timely assistance to fishers when they are in distress at sea.

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