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Vulnerability of Flying Fish Roes Fishermen Households in South Sulawesi, Indonesia

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ABSTRACT

The instability caused by climate change and the Covid-19 outbreak has made the livelihood of flying fish egg fishermen vulnerable. The flying fish egg fishermen have tried a variety of income-generating strategies. Therefore, the present study aimed to evaluate the sources of vulnerability of the Flying Fish (*Torani*) Roes Fisherman household due to climate change and the Covid-19 pandemic. The study was done in Galesong District, Takalar Regency, South Sulawesi. This research used a qualitative method with a case study approach with the following participants: the labour fishermen (*sawi*), fishermen's wives, financier fishermen (*pinggawa*), and key informants. Data were collected using a literature review from government and academic research reports, formal and informal interviews, focus group discussions (FDGs) and researcher observations. Formal interviews were conducted with several key informants and stakeholders. Informal interviews were conducted with the *Torani* fishing community and the fishermen's wives. The results indicated fishermen have struggled to cover their family's expenses due to reduced income during the Covid-19 pandemic. Furthermore, limiting gas consumption, uncertain weather, and fluctuating egg prices have impacted fishermen financially. This vulnerability threatens the welfare of fishermen as flying fish. Therefore, environmental factors, fishing technology, business capital, and government policies to increase fuel prices are the sources of vulnerability for Torani fishermen.

INTRODUCTION

The dynamic change and unpredictable coastal conditions are the major issues for the flying fish roe fishermen. The flying fish is commonly known as *Torani*. Climate change **(Subair *et al*., 2014; Pinkerton, 2015;)**, and Covid 19 Pandemic are the major cause of

the vulnerability of the fishermen household's livelihood **(Shaffril *et al.*, 2017; Susanto, 2017)**. Flying fish and flying fish roes are the primary source of income for *Torani* fishermen in the Galesong, Takalar, South Sulawesi. The environmental change and characteristics of fishery resources adversely affected their efforts to maintain their basic income. The fishermen's community must be prepared to adapt to change and the threat of a dynamic environment **(Mustafa & Arief, 2017; Demmallino and Ali, 2018; Yusuf *et al.*, 2018)**. Since the 19th century, *Torani* Fishermen have preferred the Makassar Strait and Banda Sea for catching flying fish and its roes **(Mustafa & Arief, 2017; Halik *et al.*, 2020)**. Understanding the environment is essential for developing a positive perspective toward appropriate behavior **(Sabri *et al.*, 2022)**. The most common problems fishermen face are seasons, wind direction, monsoon wind, spawning time, migration, and mobility of flying fish **(Yahya, 2006; Fitrianti *et al.*, 2014; Deswandi, 2017; Suwarso *et al.*, 2017)**. Tropical storms frequently occur, which makes sailing and fishing more challenging. The *Torani* Fisherman begin the difficult phase of catching the fish and the roes during monsoon season. The catch is inadequate to meet family needs. This condition makes it increasingly difficult for flying fish roe fishermen to support their families.

The fishermen often sailed from Galesong South Sulawesi to Pangkep, Fakfak Papua, and Dobo Maluku in April and May before returning to Galesong South Sulawesi in September. The boats are then anchored for several months until the next trip. The anchored boats are docked for maintenance, such as painting and patching cracks or holes. Income earned during the waiting period will be reduced or possibly lost. The Covid 19 Epidemic is the next problem facing the fisherman after the natural disasters. In Perpres No. 12 Year 2020, the Pandemic has been deemed a national disaster. Covid-19 Task Force was established to manage the negative impacts of Covid 19 and to integrate the central and local abilities. The fisherman must remain home due to seasonal changes, severe weather, and natural disasters. When income is temporarily postponed, this causes a problem for households. In this situation, the fishermen's households will develop the strength and durability to overcome the situation **(Muswar and Satria, 2011; Wibowo and Satria, 2016; Sayginer and Kurtsan, 2022)**. Agriculture and non-agriculture are the two major sources of income for the community **(Azzahra and Dharmawan, 2015; Kasmiati *et al.*, 2016)**.

The social vulnerability occurs when people or communities suffer stress due to changing social and environmental conditions. The sudden change and disruption of daily activities characterize stress. This concept emphasizes the social aspect of vulnerability, as opposed to the common opinion concerning climate change-related vulnerability, which focuses more on the physical aspect of the problem. Vulnerability is frequently applied to studying disaster management, ecological systems, public health, poverty and development, livelihoods and hunger, sustainable science, and climate and environmental changes **(Noy and Yonson, 2018)**. **Petiwale (2013)** stated that vulnerability could be caused by two factors, such as external (climate change) and internal aspect. The instability caused by climate change and the impact of the Covid-19 outbreak has made the household livelihood of fishing for flying fish eggs vulnerable. To solve this problem, flying fish egg fishing households have tried a variety of income-generating strategies. Extreme climate change has destroyed the income and primary assets of fishermen. Therefore, the present study aimed to evaluate the sources of vulnerability of the Flying

Fish (*Torani*) Roes Fisherman household due to climate change and the Covid-19 pandemic.

MATERIALS AND METHODS

1. Study area and sampling

A case study was conducted in Galesong, South Sulawesi, Indonesia, where *Torani*, the flying fish fishermen community, mostly spread (Fig. 1). Indonesia has the highest number of Flying Fish (*Torani*) Roe Fishermen. There were 200 Torani catching boats with 1000 fishermen. The fishermen used the traditional method with modest equipment to catch the fish. These fishermen created a new community in their mobile fishing grounds.

*Toran*i is a local term for flying fish, this type of fish became the catch target of fishermen in the early 1980s, but when the market demand for flying fish roes was high, fishermen made flying fish roes their catch targets. *Pinggawa*, for the fishing community in the research location, the leader of the fishing group is usually called the *pinggawa*. The existence of *pinggawa* serves as the work protector as well as the owner of production equipment such as boats and fishing gear, and this gives the signal of 1) the protector of financial capital, which means financially protects the Sawis of all the financial needs of the families left behind while going to sea looking for flying fish roes (*Torani*), 2) the *pinggawa* providing technology capital, by which all equipment and fishing equipment is the responsibility of the *pinggawa*, and 3) the protector of social capital. Functionally, *pinggawa* is a respected group in society because of its position. Therefore, the role of *pinggawa*, in *pinggawa-sawi* relations, includes 1) providing fishing boats or boats, 2) leading and organizing groups in production activities, 3) providing fishing gear, and 4) providing financial capital **(Leasiwal, 2017; Pahlevi *et al.*, 2021)**.

Sawi is a group of followers or fishermen who labors in catching flying fish (*Torani*) and or flying fish roes. *Sawi* as a laborer relies on the expertise or ability of his energy and knowledge in fishing. Skills needed by a *Sawi* include cook, machinist, and stonemason. *Pappalele* is known by the *Torani* working group (*pattorani*) as the owner of large capital. Almost all *pinggawa* use *pappalele* services to obtain operational loan funds for catching flying fish roes (*Torani*). *Pakkaja* or drifting traps are cylindrical fishing gear made of bamboo, and in both mouths are given coconut leaves and *Sargassum* as a place to lay roes. *Pakkaja* serves to catch fish and roes at the same time. *Sargassum*, a type of seaweed that functions as a place to lay fish roes, also has an aroma preferred by flying fish to make them come to spawn. *Balebale* or *rumpon* is a special tool for collecting flying fish roes. *Bale-bale* is a rectangular raft made of bamboo 2.5 meters long and 1.5 meters wide, equipped with coconut leaves on the top. *Kalomping* is a betel leaf that is folded in such a way as to form a triangle **(Leasiwal, 2017; Pahlevi *et al.*, 2021)**.

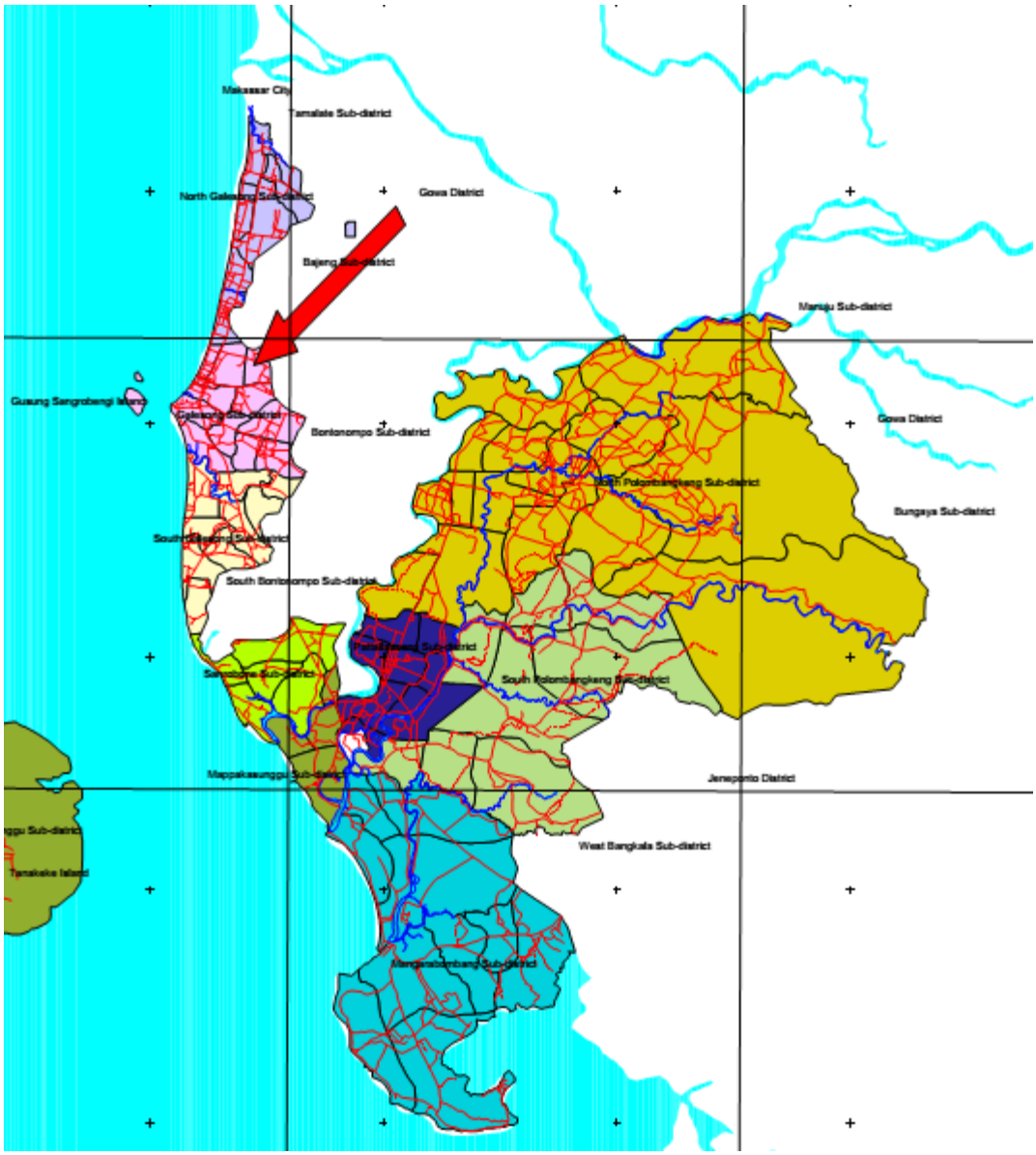

Fig. 1. The study area is located in Galesong Sub Regency, Regency of Takalar, South Sulawesi Province, Indonesia (red arrow)

2. Data collection

Qualitative data were collected through a non-experimental process that facilitates the interpretation of the quality, intensity and values of real-life events and situations and then analyzed descriptively. Data collection methods closely related to qualitative research include a literature review of government and academic research reports, formal and informal interviews, Focus Group Discussions (FDGs) and researcher observations. This data type contextualizes a phenomenon or problem that requires understanding the multi-stakeholder perspectives. Qualitative data were collected through a non-experimental process that facilitates the interpretation of the quality, intensity and values of real-life events and situations and then analyzed descriptively.

3. Formal interview

Formal interviews were conducted with several key informants and stakeholders, including the Head of the Department of Fisheries and Marine Affairs, the Head of the Catching Division of the Fisheries and Marine Service, and the Sub-district Head.

4. Informal interview

Informal interviews were conducted with the Torani fishing community and the fishermen's wives. This interview was not voice recorded, and no interview transcript. This interview serves the readiness to deviate from the structured survey questionnaire, which helps capture the spontaneity of involvement with participants who seek to express their emotions and feel the necessity of a pre-determined topic in greater depth.

RESULTS AND DISCUSSION

Vulnerability is influenced by the environment, social structures, economics, politics, risk and adaptation. Environmental, social, economic, and political factors exerted the most dominant pressure in the Torani fishing community. Fishermen must adapt to changes in the aquatic environment. Dg Gassing, a 52-year-old Torani fisherman, shared his experience by saying:

"The catching areas of Torani fishermen were initially not too far away, limited to the waters of Kalimantan, Pangkep and Takalar. But nowadays, fishermen frequently need to find new fishing spots, even if they are far away. Recently, it has reached Fakfak (Papua), Dobu (Maluku), and the Indonesian-Australian border waters. Flying fish roes are caught in huge quantities. Torani fishermen with enough travel capital choose to search those far areas compared to Takalar. Flying fish roes had been caught in massive quantities by fishermen. Because the roes are continuously taken, there may be fewer fish because there are no longer any young fish to mature and lay roes. Fishermen had taken countless tons of flying fish roes. All commodities are taken to be sale as they are linked to the Pakajaka or Bale-Bale."

The social status of the *Torani* fishermen group was very dynamic. Nothing prevents a person from leaving their current social status or changing it in the Torani fishing community. For instance, a Sawi fisherman in the *Patorani* working group could employ his financial resources due to his courage and tenacity. Some Sawi fishermen would change their status to Pinggawa, allowing them to obtain financial capital to buy or build their boats. This case happened to Dg Pali' (47 years old), which said:

"I am a Sawi fisherman who is on my uncle's boat. My uncle has several boats for catching flying fish roes in Papua waters. Since I was single in junior high school, I have been with them for a long time. Now, I'm married with 2 children. Finally, intending to have my boat, I dared to borrow money from my uncle and had a little gold in my wife's savings. When I became a Pinggawa, it wasn't easy to find Sawi. Most of the Sawi work currently don't come from Pallakkang Village. There are 3 people from Makassar and 1 person from the Jeneponto area. The four of them have been friends for a long time, and my father is still part of the family."

Torani fish roes fishery is a large business with a very high level of risk. Financial capital is one of the economic pressures on the *Torani* fisherman working groups. The average business capital required for boat assets, fishing gear, fuel, and fishing operations requires a large amount of capital. As stated by Dg Pali (47 years old);

"Every time you go to sea, you need around 80-120 million rupiah for 4-5 months overseas. This cost is huge for someone like me. Where is the cost to buy materials for coconut leaf bales, and boat repairs may come at any time. This makes it difficult for Patorani because we do not have strong capital. That is why every time we go to sea, we must be in touch with Pappalele in this village. Pappalele already has billions in the capital, so he can help some of the seniors in this village. My boss does not demand us to pay off from one catching period. If it can't be paid off, it can be postponed until the next catching period, and he would give us new capital again. That is how we do our work, we are the Patorani workers. Our destiny is like this from God, and we are grateful that we are still given health and age to try."

In the political field, the state policy for the people's livelihood greatly influences and impacts the community. As in the Covid-19 pandemic, the government issued a policy for large-scale social restrictions, a ban on travelling outside the region, and a policy to limit purchases and increase fuel prices. These policies put enormous pressure on non-formal sector workers, especially the Torani fishermen. In 2019-2021, restrictions on people's movements greatly affected the Torani fishermen. The Fakfak district government firmly rejected the arrival of fishermen from Galesong, Takalar. Dg Nakku' revealed that:

"During the Covid-19 pandemic, the fishermen felt the impact. We are prohibited from entering the other territories, including Fakfak. So, many fishermen prefer to stay at home while repairing their boats that need repairs. I did not dare to go because it was heard that Corona was very dangerous for its transmission feature. I feared this disease would also affect my wife and children if we left the village for fish catching. In 2020, very few roes were obtained, so the price was high, and even once it touched the price of up to 1.2 million per kg."

Previously, in 2022, the government policy limiting the purchase of diesel fuel at fuel-filling stations had a real impact on the Torani working group. As a result, some fishermen could not catch fish and/or fly fish roes because the fuel supply was insufficient. Dg Gassing (52 years old) described the situation as follows:

"This year, the fuel price hike is very noticeable; many people do not go to sea because their fuel needs are unmet. Usually, fishermen need between 2-3 tons of fuel, but because Pertamina's rule of fuel purchasing limits it, it is better to look for a close place. For example, a Pinggawa with 3 units of Ships may only have two units ready for fishing in a sufficient area, while the last one only operates near Pangkep waters, Kalukalukuang. Fuel must be fully prepared from Gelesong because there are many gas stations to fill our fuel on land, and it is very difficult at sea to find a place to fill and fuel sellers."

Vulnerabilities of the fishermen community of flying fish and/or flying fish roes were widely found based on the capital level in the Galesong, Takalar fishing community. The contribution of vulnerability from environmental factors, social structures, economics and politics mutually influenced the livelihood system of *Torani* fishermen. Exposure to risk and adaptation are two factors that contribute to vulnerability **(Islam, 2013; Rahman, 2015)**. The vulnerability of *Torani* fishermen to environmental factors was more external such as climate, weather, fish resources, and conditions of sea waters. Climate and weather for fishermen must receive the main attention, in addition to work safety reasons, also influenced the catch of fish or flying fish roes. Based on the catch of flying fish roes showed a decreasing figure due to overexploitation without control in the Makassar Strait, Flores Sea. Therefore, many Makassar fishermen conducted their catching in the waters of West Papua. While waiting for the cruise to Papua, there was no activity to find flying fish roes; thus, the family's income was lost. Vulnerability due to the natural environment on the livelihood system of fishermen's families had a direct impact. Internally, due to the strong local culture still strongly held in the local community, improving natural resources is difficult to change.

The lifespan of flying fish is very short, not more than two years and only once spawned with a partial spawning pattern during the spawning season. *Torani* fishermen go to sea in the east monsoon, the fishing period for flying fish roes is in March–November. According to **Ali *et al*. (2004) and Shakhovskoy (2018)** the waters of Sulawesi, Maluku and Papua are the distribution areas of flying fish from March to December (Fig. 2 and 3). Flying fish start spawning in February-March, with peak spawning in June-July (eastern season) and ending in September-October **(Ali *et al*., 2004; Wicaksana, 2016)** in the east season every year. This was indicated by the spawned roes attached to the *bale-bale* installed by fishermen.

The shortage of human resources experienced by the *Torani* fisherman has become a new source of vulnerability. Regarding human capital, the vulnerabilities often encountered by *Pinggawa* were in the recruitment pattern of Sawi workers. People willing to become *Sawi* were getting harder and harder to find. *Pinggawa* has been looking for and recruiting *Sawi* candidates outside the Galesong area. *Pinggawa* had a lot of difficulties recruiting Sawi workers. *Pinggawa* prioritized the closest family, neighbours and distant relatives. Acceptance of *Sawi* from the family element was based on trust. *Pinggawa* had difficulty recruiting *Sawi* fishermen (boat crew) to catch flying fish roes who were domiciled in the Palalakkan Village. Some *pinggawa* argued that many *Sawi* were dishonest when catching flying fish roes by selling their products without knowing the *Pinggawa*.

Flying fish and fish roes are the main choices for fishermen in Galesong, Takalar. If it is not the season for catching flying fish roes, the fishermen seek temporary family sources of income, such as masons, motorcycle taxis, and selling fish. Generally, the *Sawi* (boat crew) of the crew of the *patorani* ship does not have a certificate of proficiency. The crew only relies on experience. Lack of knowledge, work experience and skills in fish processing can be a serious cause of vulnerability for the sustainability of the livelihood system of *Torani* fishermen.

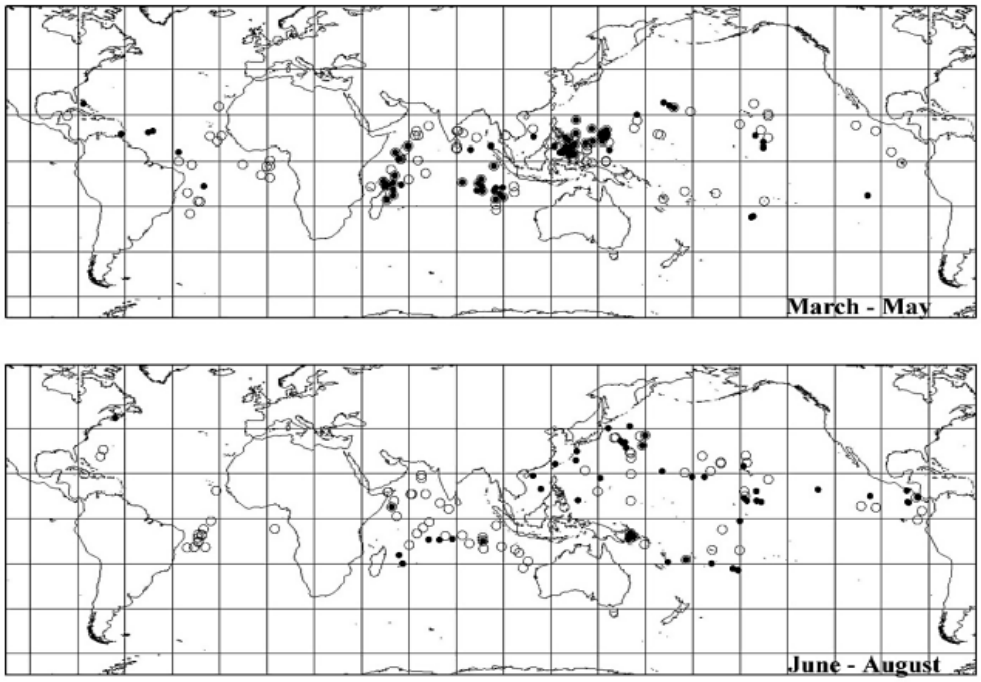

Fig. 2. Distribution of flying fishes from genera Hirundichthys and Cypselurus **(Shakhovskoy, 2018)**

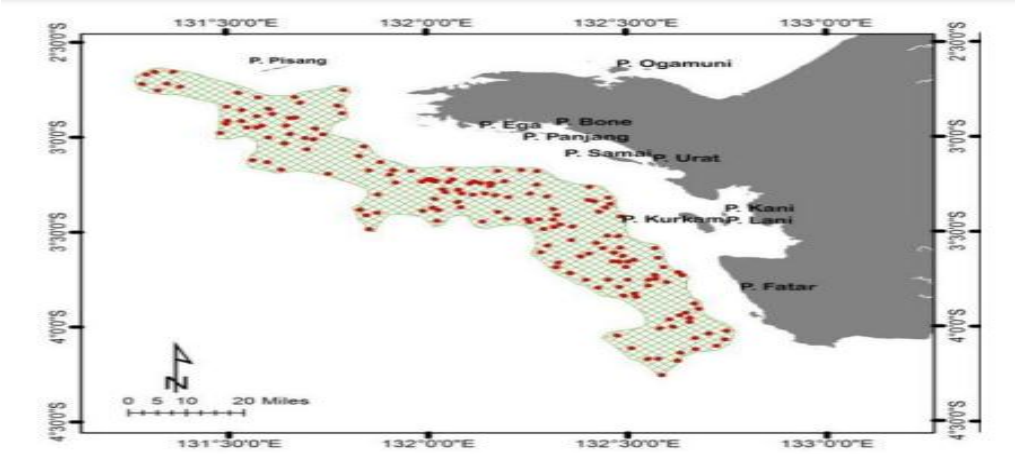

Fig. 3. Flying fish roes catching area in West Papua Province **(Wicaksana, 2016)**

Fishing facilities in the form of a fleet of boats, engines, and fishing gear generally have the status of loan capital **(Azzahra and Dharmawan, 2015)**. Fishing equipment such as the traditional *Pakkaja* or *Bale-bale* still contribute to the vulnerability of fishermen. The existence of formal financial institutions such as banks and cooperatives **(Anwar, 2013)** does not contribute to the fulfilment of fishing financial capital. The absence of fishermen's savings as a source of financial capital forced fishermen to obtain financial capital on *Pappalele* with a debt pattern, and the catch was collected by the *Pappalele* **(Anwar, 2013; Tebaiy *et al*., 2019).**

Sources of financial capital originating from loans are vulnerable for fishermen **(Ridwan and In'am, 2021)**. *Pinggawa* obtains a capital loan with a verbal agreement pattern; namely, 5% of the total fisherman's income will be allocated to Pappalele (the owner of the capital). In this phase, the capital loan **(Leasiwal, 2017; Pahlevi *et al.*, 2021)** provides a way out for the *Torani* fisherman working group to continue their fishing operations for flying fish and the roes. If it cannot be returned to the owner of the capital in one fishing season, it will become a debt status for the next fishing season. Large financial capital and small catches may cause *Torani* fishermen to be in debt to the owners of capital **(Halik *et al.*, 2020)**. The production factors, the amount of output/production, is related to income and highly dependent on financial capital. Two contradictory conditions determine the desire of fishermen to work; first, fishermen have a strong will to increase their fishing effort, but on the other hand, fishermen are powerless to access the capital resources needed by fishermen to exploit natural resources.

The government policy contributes to vulnerabilities for Torani fishermen. Government policies directly impact the sustainability of the fisheries-catching business. The increase in fuel prices and restrictions on fuel purchase is a policy that directly impacts the fishery business. Fisheries catching is one of the sectors that has felt a heavy burden due to the increase in fuel prices **(Hamzah et al., 2017)**, with subsidized diesel prices from Rp 5,150 per litre to Rp 6,800 per litre. Fisheries catching business is very dependent on the availability of fuel oil supply at affordable prices. Since the government imposed restrictions on the purchase of fuel oil, the fishermen of Torani had difficulty accommodating large quantities of fuel. The need for diesel fuel by Torani fishermen for Fakfak Papua was 2-3 tons litres, depending on the type of engine and the number of machines used. Fuel oil is the largest component in the operational cost structure of fishing businesses **(Fitrianti *et al.*, 2014)**. Unsurprisingly, any increase in fuel prices will have a major impact on small, medium and large-scale fisheries businesses. Most fisheries business actors agree that the rise in fuel prices is a serious blow that can endanger the long-term viability of the fishery business **(Laila and Amanah, 2015; Simatauw *et al.*, 2019)**.

CONCLUSION

Environmental factors, fishing technology, business capital, and government policies on fuel prices are the sources of vulnerability for Torani fishermen. The increase in fuel prices and restrictions on fuel purchase is a policy that directly impacts the fishery business. Sources of financial capital originating from loans and accounts payable contributed to the low income of Torani fishing families.

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