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Regency On Climate Change

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Adaptation Strategies of Traditional Fishermen in Sutera Sub-District, Pesisir Selatan Regency on Climate Change

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ABSTRACT

Impact of climate change for traditional fisherman is very real, especially in term of availability of production resources. Some of climate changes such as weather change, flooding, and lack of haul are resulting in vulnerability for traditional fisherman. Fisherman will always have ways to face every those changes. This matter is to ensure their existence in life. Sutera sub-district in Pesisir Selatan Regency where some its society work as traditional fisherman. As a coastal area, it can be sure that they are also faced for climate change. Using qualitative descriptive method, this research in purpose to see some changes which happened in Sutera Sub-districts as effect of climate change. Others, what strategies that they have done to overcome thase changes. The results of this study indicate that some of the Sutera District fishermen still rely on 'pesakitan' even though they are no longer relevant. The majority of fishermen use mass media as a source of information about weather forecasts and climate change. By sharing information in a stall, this information can be known. Next they make other alternatives such as catching shrimp and crabs when the weather is bad or a storm comes. Generally they avoid natural events as much as possible and expand the area of capture if the catch is minimal

Keywords: traditional fisheries, adaptation strategy, climate change

INTRODUCTION

Lately, climate change has changed the ecological system around the earth. The global average surface temperature rises around 0.7°C. That increase affects all the chemical and biological processes of life in nature that change the Earth's surface ecosystem dramatically and complexly (Tambunan et al. 2012). Those changes can be seen from some indicators such as the melting of the poles that makes the sea level rises, *coral bleaching* (death and bleaching of coral reefs) which has an impact on the extinction of fish habitat, annual change rainfall volume that impact on storms, flash

floods and abrasion, inundation on land low and swamp, coastal erosion, extreme waves and floods, sea water intrusion into rivers and groundwater (Wibowo and Satria 2015; Diposaptono, et al 2009)

Environmental damage due to climate change is not only happened in the agricultural environment but also in the marine environment. Climate change affects the circumstances of the sea directly or in directly. Some negative impacts of climate change on the marine environment are rising sea surface temperature, extreme weather intensity, rainfall patterns change and large waves (Ulfa 2018). Other impacts are

physical changes in the environment in coastal areas and small islands including seawater intrusion, tidal waves, floods, drought, low inundation, and coastal erosion (Diposaptono et al. 2009).

These ecological changes also contribute to the reduced potential of marine products. Badjeck et al (2009) revealed that ecological changes in the sea can cause the change of availability of fishery products as the main capital of fishermen. It can also affect the income of fishermen and lead to increased costs in accessing resources (Helmi and Satria 2012). Thus, lost the potential of marine products are parallel with the fulfillment the daily needs of fishermen. The reduction in marine products will automatically eliminate the source of production needs of the fishing community. Adger et al (2003) revealed that ecological changes could result in the loss of mangrove ecosystems which would directly erode the livelihoods of available local fishermen (Helmi and Satria 2012).

Ecological changes in the sea area has resulted the scarcity of marine resources. Catch fish as life buffer is increasingly difficult to obtain. This scarcity is clearly due to the carrying capacity of the aquatic environment which has declined due to damage to the marine ecosystem (Hidayatina 2013). The clear evidence of this scarcity is the increasingly far away fishermen make arrests into the middle of the ocean. Ledee et al (2012), revealed, that changes in catchment areas can indicate several things including, a decrease in income, a decrease in profits in the fisheries business, decreased access to productive fishing areas and a decrease in the number of catches of fishery products (Helmi and Satria 2012).

Climate change has made it difficult for fishermen to determine the fishing season because of uncertain weather. This risks changing ecosystem stability, socio-economic society, and damaging the function of the planet as a means of supporting life (Kusnadi 2009; Satria 2009; Helmi and Satria 2012). As a result, the potential of marine resources is running low. The depletion of the potential of these marine resources clearly impacts the availability of resources to meet the needs of

the fishing community. Another impact is damage. Collectively, millions of households in coastal areas can be destroyed due to damage to infrastructure, settlements, and facilities needed for living and life, and the poverty and marginalization experienced by coastal communities throughout their history is expected to intensify in the future under climate change (Subair et al. 2014).

Estuary of various changes that occur is vulnerability for the community. Vulnerability is a condition of society that cannot adjust to the changes of ecosystem that caused by a particular threat (Fussel 2007). The impact of this vulnerability actually not only occurs to fishing communities, but also to all aspects of society such as communities in watersheds (DAS) (Efendi, et al 2012) coastal communities or fishermen (Santoso et al. 2011), farmers (Zen 2013).

Fishermen are communities whose lives are highly dependent on marine products, both how to make a living and work cycle (Zarida 2013). According to Law No. 31 of 2004 concerning fisheries, fishing communities are people who have a fishing livelihood. Becoming a fisherman is a hereditary job, and some even judge it as the only option (Zarida 2013).

Fishermen are activities utilizing sea products or other waters in the form of fishing. Traditional fishermen are fishermen who depend on their lives on fishing using simple fishing gear. Due to the utilization of simple tools, traditional fishermen rely on their activities to the natural conditions and the existence of fish, such as weather, waves and various other risks that may occur in fishing activities. Usually, because of dependence on natural conditions and catches, the amount of catch they get is also small. So, in general, the results of catching traditional fishermen can only be to fulfill subsistence needs.

Dependence on nature, when it is faced with climate change, seems to be a frightening specter in meeting needs. Not only difficult to meet their needs, fisherman will also push for far greater damage. Dahuri (2003) states, when human needs are increasing, while the carrying capacity of

nature is limited, the potential for damage to natural resources becomes greater. This certainly has a serious impact on the survival of fishermen, especially small scale fishermen(Satria 2009)including the poverty of fishermen. Fishermen's income is not regular and a lot of income, they get income depending on the catch of the fish in the sea, sometimes a lot and at other times a little and can even get nothing at all(Syahrizal, et al 2011).

Poverty is also influenced by the condition of fishermen who cannot determine prices and markets for their catches(Marbun 2016).This poor condition then makes the fishing community dependent on money lenders(Syafrini 2014). This for cover their daily needs that cannot be met from the results of fishing.

For traditional fishermen, the long dry season 'add to the length' of the difficult time in getting catches. Long drought is a famine for fishermen. Instead the rainy season is a sign of the beginning of the fishing season, and a sign of the minimum needs will be met(Zarida 2013). In general, fishermen face a number of complex social, political and economic problems(Kusnadi 2009; Satria 2009). One of them is the issue of environmental resource degradation, both in coastal areas, the sea, and small islands(Kusnadi 2009). Ecological changes due to climate change affect the lives of fishermen in their socioeconomic life(Helmi and Satria 2012).

Drastic natural changes and difficult to anticipated will add to the panic of natural shocks that are ready to eliminate plants or their catches. Fishing communities live in uncertainty about their livelihoods, because they depend on nature (season and weather). The impact of climate change which has a direct effect on their environment, making that uncertainty is increasing towards livelihoods of fishermen(Wibowo and Satria 2015).

The utilization of production equipment is also become own challenge to the traditional fishermen. Simple fishing gear can only be relied upon in good weather, while in bad weather relying on simple fishing gear is risky for fishermen. Not only

loss of material, but also result in loss of life. So, generally in this condition fisherman prefer not to go out to sea or find another job. In the case of climate change, using of simple production equipment will be more risky and minimal opportunities for fishing.

Meanwhile, fishermen are always have so much needs, such as operational needs and for household, social, health and education needs. The lack of income not only adds to debt for fishermen, but also poverty. The ends will result in the ability to survive. Climate change will depress existing livelihood options, and even more importantly, make them unpredictable due to the instability of the impacts of climate change(Rosenzweig and Parry 1994).

When fishermen do not have the opportunity to catch fish, it clearly affects the lack of income. The large of communities that rely on as fishermen and the uncertain climate these days, it is important to know more deeply how the community strategy to maximize the potential of existing resources to meet their needs. This is to ensure that the potential of the sea and existing ways are able to sustain the fulfillment of family needs.

Coastal region of Indonesia is a region which is estimated vulnerable to the impacts of global climate change; especially the potential for *inundation* due to global sea level rise(Wibowo and Satria 2015; Santoso et al. 2011; Diposaptono et al. 2009). Pesisir Selatan Regency is an area in West Sumatra Province where most of the people work as fishermen. According to 2016 statistical data, the number of fishermen in West Sumatra Province is around 42,066 people.

Based on data from the Department of Maritime Affairs and Fisheries in the South Coastal District in 2016 that in the last three years there was a tendency to decrease the capture fisheries products from 37,081.00 tons in 2014 366,682.40 tons in 2015 and 34,013.80 tons in 2016(DKP KabupatenPesisir Selatan 2016). The amount includes capture fisheries production in SuteraSub-district of 6,119.25 tons with a value of Rp, 181,431,667.99. This is in contrast to the number of fishermen who tend to increase from year to year. The number of fishermen in Sutera Sub-district

itself in the last seven years has increased from 2234 in 2009 to 3504 in 2016 (BPS 2017).

One of the adaptation studies ever carried out in South Coast was in the tourist area of CarocokPainan Beach. The results of the study stated that there were two adaptations made, namely the form of trade and service business. The form of trading business conducted by fishermen is in the form of clothing and accessories business, snack food stall business, and restaurant business. While the form of business services carried out by fishermen are in the form of lodging, inter-island transportation, water game services, parking services and ticket sales services. The process of adaptation of fishermen in capturing business opportunities through the development of the CarocokPainan Beach tourism area is in the form of business locations, services and hospitality, networks, appearance and communication language(Jasman 2016).

In addition, one of the nagari in Pesisir Selatan, NagariAmpiang Perak, is the most populous nagari who works as a fisherman labor (60%) and most of the laboring fishing households in the nagari are categorized as poor households and have limited access to economic resources available in their environment(Zamzami 2012).

Based on the background above, the problem of this research is what the impacts of climate change that occur in the District of Sutera and what strategies traditional fishermen of the Sub-District of Sutera, South Coastal District do to maximize the potential of resources in the middle of the impact of climate change. This is very important, realized that there are many potential challenges for fishermen, especially for traditional fishermen, the fulfillment of their needs must continue to ensure their survival(Helmi and Satria 2012).

Research on adaptation has actually been done a lot, such as studies(Helmi and Satria 2012). Helmi and Satria (2012) conducted on Long Island fishermen in overcoming the effects of ecological changes are more dominated by adaptation patterns that are reactive in nature. The adaptation

strategies undertaken by PulauPanjang fishermen include: Diversification strategies for income sources; Diversification fishing gear strategy; Strategies to change the *fishing ground*; Strategies utilizing social relations; Strategy for mobilizing family members.

There is also Wibowo and Satria (2015)who examined the adaptation of fishermen on small islands. This study concludes several adaptation strategies, namely diversification of economic activities, diversification of fishing gear, changes in *fishing ground* areas or catching areas, and utilizing social networks and mobilizing family members to work. This study is in line with the research ofRindayati, et al (2013)on Moro Karimun Island, Riau Islands.

Syah (2012)has also conducted research on adaptation strategies of coastal communities in Bangkalan to Rob floods due to climate change. He concluded that the Bangkalan people had made a preventive effort by building walls in densely populated areas to stem sea water and prevent abrasion.

The ability adaptation of community is influenced by the quality of Human Resources (HR), economic capacity, health facilities and physical factors. There are still quite a lot of fishermen who have not been able to optimize their catches so that the income level does not increase and still live below the poverty line(Hidayatina 2013).

Subair et al. (2014)in his research on the North Coast of Ambon Island concluded that optimizing the ability of adaptation possessed through the practice of adaptation strategies is done by modifying the choices of knowledge, experience, local wisdom, skills and available social networks, capable of reducing vulnerability and increasing community resilience to negative impacts climate change.

RESEARCH METHODS

The research method used in this study is a qualitative descriptive method using primary and secondary data. This method is used to uncover adaptation strategies of traditional fishing communities as a response to climate change. Data collection techniques in this study use several

ways of *field study* and *library research*. Data collection techniques used in this field study are observation and in-depth interviews. Observation was carried out by witnessing various fishing activities such as catching and marketing the catch. The fishermen observed in this study are trawlers who are easier to reach because they work on the beach. Besides, trawlers can also work all day long so that they are easy to find.

While the interviews conducted in this study aim to dig deeper about the strategies that are usually carried out by fishermen in the Sutera Sub-district. The fishermen interviewed in this study were traditional fishermen who worked as fishing nets, *pukek tapi* fishermen and *pukek paying* fishermen. Some of the fishermen work as *anakpukek* (labor fishermen), fishing nets and *pukektapi* owners are still involved in fishing activities. In addition, researchers also interviewed several residents who worked as catchers, fish managers and fisheries instructors in Sutera Sub-district. Literature study conducted in this research is to explore statistical data, journals, books and other secondary data and various references that are relevant to the purpose of research.

RESULT AND DISCUSSION

An Overview of Sutera Fishermen

Sutera is one of the sub-districts in Pesisir Selatan Regency, West Sumatra. Geographically, it is located on the west coast of Sumatra, namely at $1^{\circ} 30' \text{LS} - 1^{\circ} 39' \text{LS}$ and $100^{\circ} 30' - 100^{\circ} 57'$ East. This area is dominant lowland with an altitude between 2-150 meters above sea level (above sea level). Administratively, Sutera is bordered to the north by BatangKapas Sub-district, east by Solok Regency, south by Lengayang Sub-district and west by Indian Ocean. The Sutera area is around 455.65 km², divided into 12 Nagari namely Amping Parak, Surantih, Taratak, Amping Parak Timur, Aur Duri, Rawang Mount Malelo, Koto Nan Tigo Selatan, Koto Nan Tigo Utara, Gantiang Mudiak Selatan, Gantiang Mudiak Utara, Lansano Taratak and Koto Taratak.

Until 2017, the total population of Sutera reached 50,516 people with details of 25,204 people including men and 25,312

women and around 11,643 families. Compared to the area of about 445.65 km², the population is at 113.35 people / km². The most densely populated Nagari is in Nagari Surantih which is 292.79 people / km² and the least densely populated in the North Mudik Ganting is 49.11 people / km². Nagari with the largest area is Rawang Gunung Malelo Selatan with an area of 61.81 km² (13.87%), while Nagari with the smallest area is Lansano Taratak with an area of 14.00 km² (3.14%) (BPS 2018).

The economy of the population of Sutera Sub-district is supported by agriculture, plantations, forest management, animal husbandry and fishermen. In the agricultural sector, people cultivate rice and cultivate horticulture such as corn, vegetables and beans. While the types of plantation commodities from Sutera include: rubber, coconut, cinnamon, cloves, gambier, nutmeg, coffee, palm oil, cocoa and areca nut. Other economic sources are raising livestock, and of course fishermen. Data for 2017 records, that the main commodity for agriculture is lowland rice with a production of around 37,937.9 tons of MPD. This figure was obtained from a planting area of 5,438 ha and a harvest area of 6,802 ha. While for plantation crops, the leading commodity in this sector is oil palm with a production of 5,115.4 tons. However, for planting areas, gambir commodity is the largest area, reaching 3,763 ha with a production of 1,183 tons (BPS 2018). Gambir plants are typical plants of Sutera and generally these gambirs are managed as public forests by the community.

Animal husbandry in the Sutera Sub-district produces several types of livestock such as beef cattle, buffalo, goats and poultry. There are around 10,103 beef cattle, 902 buffaloes and 2,858 goats. Of this amount, 167,263 kg of beef can be produced, 4,293 kg of buffalo meat and 3,139 kg of goat. While the poultry population reached 391,827 tails consisting of 33,800 broilers, 42,244 domestic chickens, 7,000 laying hens and 4,783 ducks. This amount can produce 106,352 kg of eggs with details of 26,984 kg of free-range chicken eggs, 53,970 kg of eggs and 25,398 kg of duck eggs (BPS 2018).

While for the fishermen sector, there has been a decline in the number of fishermen in the past year. From 3,504 people in 2016 to 3,306 in 2017. However, if seen in the last five years, the number is still increasing where in 2013 the number of fishermen was only 2,652 people. The number of fishermen was 3,306 consisting of 2,450 full-time fishermen and 856 part-time fishermen. In general, Sutera fishermen live as traditional fishermen and are scattered in the nagari on the coast. As traditional fishermen, the majority of fishermen use non-motorized boats or outboard motors. From 1223 fishing boat units in 2017, 432 people are fishermen without motorbike or motor temple (BPS 2018).

Sutera Traditional Fishermen

The West Sumatra coastline is potential enclave of structural poverty. Difficulties in overcoming the problem of poverty in coastal areas have made the population in this region have to bear the burden of life that cannot be ascertained its expiration period. Vulnerability in the socio-economic field can become fertile ground for the emergence of vulnerabilities in other fields of life (Zamzami 2011).

Fishing activities are basically a series of activities that require cost and energy. In general, marine fishing business involves three main factors. First, ships and fishing gear that act as a means, equipment and technology for fishing. Second, Human resources as the main energy for fishing business, Third, supplies consisting of fuel, preservatives captured (salt or ice), side dishes to eat the entire crew and other supplies which are the main means to support fishing business activities (Hidayatina 2013).

Fishing business for fishermen is a hunting art full of speculation. This means that hunting business causes uncertain fishing income. At one time, when a lot of catches, fishermen have a large income, conversely, at other times, fishermen do not earn any income (Zarida 2013). Based on fishing gear ownership, fishermen are categorized as labor fishermen, skipper

fishermen and individual fishermen (Zarida 2013).

1. Fishing technology

In the Sutera Sub-district there are several differences in fishing gear. Fishermen in Nagari Lansano Taratak, for example, generally use *robin* canoes with gill nets, as an adaptation of their fishing territory which is only in the shallow sea. The robin canoe is a small canoe with a propulsion motor attached to its deck. Commonly used motor with a capacity of 5 PK with the brand 'Robin'. So they call it the robin sampan. The size of the canoe is also the smallest of the canoes in the Sutera Sub-district, which is 5 meters x 0.5 meters. In accordance with the size of the canoe and the capacity of the engine, the range of robin canoes is also not so far. The usual mileage of the robin canoe is 3 miles from the coast. In addition, this canoe also contains a maximum of two people.

Nagari Ampiang Parak and Ujung Air, fishermen using trawl fishing gear bag. But this gillnets operated particularly around the beach or the shallow sea, so called also with *pukektapi* (edge). *Pukektapi* is a fishing gear with a smooth net and it is able to catch small fish such as anchovies. In its operations, trawl uses a fleet of *Boleang* canoes that are not motorize canoes, and are driven manually using oars. Even so, lately there has been a robin canoe that is used as a fleet to help spread trawl. This canoe is also used to facilitate the mobility of the *piawangin* guiding team members to pull the stretched net. The numbers of team member are needed to operate trawl around six or more people and cannot be less.

Furthermore, there are *pukekpayang* found in almost all of the Sutera Sub-district. We found some differences between the *pukektapi* with *pukekpayang* that is the size of the net, the catch region, the fleet size and number of employees. *Pukekpayang* uses longer net size than *pukektapi*. *Pukekpayang* catching area is also much wider to the middle of the ocean because its fleet capacity is also much greater. The fleet used has a capacity of 15 PK with sizes ranging from 7 meters x 1-1.5 distances compared to the

Boleang canoes which only rely on oars or robin canoes that are only driven by a five PK outboard engine. The number of team members in the trawler is around 11-13 people.

In addition to the three types of fishing gear, the Sutera Sub-district fishermen actually know a number of fleets that often appear to be catching at sea, namely: (1) *Bagan Ships*, ships that are large enough to use engines as boat movers, and have lights as fish towers. Typically, charters can be found in the Suranti area; (2) *Tondoor* boat, which are ships with diesel engines such as boats; (3) *Pompong*, ships using tents; (4) *Payang*, which is a *biduakor* a boat with a stick; (5) *Robin*, which is a boat using a robin engine or outboard engine such as a speedboat, usually only for 2 people; and (6) *Boleang* canoes, they are small canoes using oars as movers.

The traditional fishermen (*robin*, *tapi* and *payang*) generally only rely on very simple technology in conducting fishing operations. Fishing gear only limited to nets, trawl or fishing line. Generally they also only rely on the ability to read nature in their sea process. So there is no sophisticated technology that accompanies their fleet such as GPS to see the direction and tools make it easier to see fish populations.

Robin fishermen in Sutera Sub-district generally only have one to two canoes. They were directly involved in arresting, distributing their own results and enjoying the results themselves. Workers in the robin boat 15PK, maximum only two people. These robin fishermen meet their own needs for fishing, ranging from fuel, repairing nets to consumption. However, the engine size for this boat is not always the same. There is a 5PK size machine which is often called the *kukuakarambia* machine (coconut *grater* machine). In addition, there are canoes that use two motors at the same time, trawl namely outboard engines on the right and left sampan decks. The use of these two engines is for a larger canoe size that can hold six people.

Payang is a boat that is bigger than a robin boat. Capital to get a *payang* boat along with supporting fishing gear is also greater.

The boat for *payang* has a bigger size than *Boleang* canoe and Robin boat. So, those who make arrests can also reach longer distances. However, the size of the trawlers used is not much different from the *pukektapi*. The number of workers in *payang* fishermen is around 11-13 people.

2. Fishing Pattern

The fishing pattern prevailing in Sutera Sub-district is generally located in an area not far from the coast. There are several causes of this capture only around the coast, namely, a simple fishing gear and a small boat size. As explained above, most of the fishermen in Sutera Sub-district are traditional fishermen who work as laborers and owner fishermen. But the boats that are generally owned are only *boleang* / *robin* canoes and *payang* boats. Besides the range not far from the coast, the potential for catching is also very small, because it is only around the coast. These conditions also require them fishing every day. Usually leave early in the morning before dawn and return home at 8:00 a.m. The types of fish they get are usually *maco*, *baledang*, *bloating*, and others.

That conditions applicable for robin fishermen or robin nets, for the fishermen who work as fishermen *pukektapi* or *pukektapi* fishermen, routine as it does not apply. For *pukektapi* fishermen, they can catch for a full day, from morning to evening. Once pulled the *pukek*, they need two to three hours, then, can be repeated later. However, the greater number of fishermen resulted in them having to make a turn for catch. So after they pull the net, they will retire first while the other friends are pulling. Thus they take turns in one day. So, in a day they can catch up to two or three times.

Pukektapi is one form of fishing activities carried out by the Sutera Sub-district fishermen. It is called *pukektapi* because the capture process is carried out along the shallow seas on the coast, by stretching trawls of a certain length and then pulled from both ends of the beach. The length of those net ranges from 300 meters, with a width of 1.5 meters. This long net is stretched in the sea about 500 meters from

the beach. These nets, both of its ends are added the rope to be pulled by *anakpukek* from the beach. The number of fishermen needed to attract *pukektapi* at least six people. The six people then divided into the task that is one person by holding the rope, which is in the midst of one person, three as oarsman, one person as *tukanglomba*, one person as *tukangkaja* (feed *pukek*), and one person as *tukangkua* canoe. When reach the middle, the *piawang* will go to the middle.

Piawang is a person who has many experiences. *Piawang's duties are to push trawl to the middle of the sea and spread it. Pukek* members are on duty: pulling the rope, drying the *pukek*, putting the *pukek* in to the boat. If the landlady is not a *piawang* then he will be a member of the *pukek*. His ration is as *anakpukek* and owner of canoe. Rowing is the duty of three *anakpukek*. *Tukangkaja* is the task of *piawang*. The other job of the *anakpukek* is the *tukanglomba* and to follow canoe.

"After the pukek is stretched to the middle, the pukek in the water (two sides), two people are already in use, now there are only 2 left to draw it. If there is no person, there will no more give help. That's why we need not less than six people. But if there is no one to help, how pity, will get trouble when the piawang is already in the middle. Pulled slowly and the losing side will be given a code by raising the hand. That piawang will show where the loss part is. If the tukangtarikpukek has seen which part is the loser then some of the loser will move to the winning side".
(Interview with Mr. Kamel)

The fishing community in the Sutera Sub-district often faces a situation where the catch is very minimal. These signs are called the *anggao* season. The signs of the *anggao* season are uncertain, but generally occur in the dry season. When the summer prolongs until it reaches more than three months, sea water is also clear but the currents below are very heavy, it is called the *anggao* season. In this *anggao* season, fishermen usually get nothing or very little. Usually when the *anggao* season arrives, it can take up to more than three months. At this time, fishermen will be confused to fulfill their daily needs.

When the *anggao* season arrives, they often go the extra mile to help pull *somepukektapi* other fishermen. In addition, those who have expertise in other fields will look for opportunities to find odd jobs to fulfill their daily needs.

In accordance with the ownership of fishing gear, the fishermen in Sutera Sub-district have differences in capital in fishing. Labor fishermen / fishing fishermen, generally only offer labor or some skills in fishing. For fishermen who only have labor, then they work as *anakpukek*. The duty of *anakpukek*, generally only pull the net that has been stretched. Those who have expertise in fishing are positioned as *piawang*. *Piawang* has expertise in catching, understanding when to pull the net, when to hold to get the maximum catch. As laborers, they do not have working tools, because the working tools they use are provided by the owner of the fishing gear.

3. Sharing Pattern of Catch Profit

The production sharing system established in the Sutera Sub-district usually applies to the agreement between the owner of the fishing gear and the *anakpukek*. Usually fishing gear owners first calculate the costs incurred during fishing and fishing equipment maintenance costs, then the rest of the reduction will be shared equally among all members including the owner. But that only applies to fishermen who involved in catching *pukektapi* or *pukekpayang*. While specifically for robin nets, because the owner is a fisherman at the same time, the cost obtained is only reduced by the fuel costs incurred. The rest will be brought home to meet daily needs. For robin fishermen, their average income is between Rp. 20,000 to Rp. 100,000. Sometimes, can be less than that amount.

"Sometimes yes, get around thirty thousand". Thirty thousand is nothing. Buying oil around twenty thousand, the rest ten thousand, that's picture of life "
(interview with Riki'30)

In the *pukektapi*, which usually consists of at least seven people, the result of the catch will be divided by seven after issuing a portion to the *pukek* owner. For

example, if in one fishing season, team gets a sale of Rp. 500,000, - then Rp. 150,000 is submitted in advance for fuel costs and maintenance of fishing gear. Then, the rest of the money will be divided seven members. So the members will get income from the fishing around Rp. 50,000 per person.

Profit sharing between the *piawang* and the *anakpukek* is different. Profit as a *piawang* is separated with the profit as *anakpukek*. For example, when in one fishing get Rp. 1,500,000 - , then Rp. 1,000,000 divided for *anakpukek*, and Rp. 500,000, - part of employer. Then, for example, if one fishing time has seven members, the money of one million rupiahs divided by seven, each will get around Rp.150,000, then the less Rp.50,000, is taken from Rp.500,000, which is the portion of employer, so that all members can get Rp.150,000. And for the *piawang*, it is the willingness of the employer to divide his own portion. If the income above 1 million, it can be divided into 3 sections, that are employer, *piawang*, and *anakpukek*. While for income under 1 million, it is divided just as much. Part as *piawang* is taken from the part of the employer not from the part of members. If there is something to be done, take it from a friend's part, then the incident will only be seen and the only one who is reprimanded can remind him, for example my niece. It was advised not to do that because it was not good. It could be that there was no wind, no rain, no accident, but the money will run out by its self.

"So whatever ... the first skill is not there ... yes there is learning, it takes a long time, there can be three months to four months, so what use of young children to live. The capital for Maneri is ten million to twenty million, while the annual allowance is only Rp.5,000,000 Sometimes seeing Rp.5,000,000 in cash is difficult. Now it is fortunate that there is a net boat, so for activities to the sea it's enough. For example, you can get Rp.40,000 in cash, go home at 9, later if you go back to sea, sneak, get money, get Rp.20,000, that's how. Continue living again. Who wants school children, school too".

Workers for fishermen in Sutera Sub-district are fishermen who work as team

members in fishing. This team member in *pukektapi* or *pukek payang* called as *anakpukek*. Those who work as *anakpukek* do not have working tools or capital. They only offer the energy to the *pukekowner*. Those who become laborers usually get jobs from the *pukekowner* when it is needed. For example when it is fish season, they are called to help. Meanwhile fishing gear owners usually keep their members for a long time. Comfort in work and continuity in fulfillment of needs, make the *anakpukek* feel at home for a long time. In this case, the aspect of trust becomes important between the *anakpukek* and the *pukek* owner.

Ecological Change in Sutera Sub-district

Some indications of the impact of climate change on Sutera fishermen are erratic weather, frequent storms and large sea waves. Although there are no statistical data related to the intensity of the waves, most fishermen admit that the changes in these three things in the present are most striking than the past. In the past for example, weather at sea can be read from natural signs that occurred before. Rain can be predicted to come when clouds come, and usually the changes occurred permanently. So based on continuous experience, fishermen can understand the weather changes that will occur from the symptoms that appear before.

The same impact also occurs on storms that are increasingly common at sea. In addition to the intensity that is increasingly common, even a storm in the Sutera Sub-district had happened in six consecutive months. There is nothing can do by a fisherman when the storm happens, because it will make losing everything. Not only losing the fishing gear, but it can also taking lives. Other than that, storms often occur at unexpected times. Often, storms occur when fishermen are in the middle of the sea. If this happens then fishermen can only escape and leave the net. If not, then lives are at stake.

Every June to August, Sutera fishermen suffered jellyfish season. Jellyfish season is a barrier for fishermen to go to sea. Besides causing itching, the income in jellyfish season also decreases considerably. Even Sutera fishermen consider the jellyfish

season is a poor fisherman season. They had already got a small daily income and complete with the jellyfish seasons, it will obviously make them poorer, because surely their income will be greatly reduced.

Anggao Season is a season that is avoided by fishermen. This season is marked by a long dry, sunny weather, but the sea water is bumpy. *Anggao* season is one season that is highly avoided by fishermen in the Coastal District, especially in the Sutera Sub-district. When this season arrives, we can be sure that fishermen will get fewer fish. In fact, fishermen often don't get any results. In the past, this season is an annual cycle, but in recent years the season *anggao* is happened in the time period longer than usual. In the year in which this research was conducted, Sutera fishermen were facing the *anggao* season. According to them that season has been going on since the beginning of the year. During that time, the fishing communities in Sutera District earned only Rp. 20,000 on average, even lot of them did not get any catch.

Realize or not, the changes that occur in the sea both in terms of weather, storms, jelly fish and *anggao* seasons have many implications for fishermen such as uncertain fishing time and not being able to go to sea at all. The result is that fishing income is erratic and greatly reduced because the quantity of fishing is very minimal. Sometimes a day's income cannot meet daily needs when fishermen are faced with these conditions, so they have to find other sources of income just to meet subsistence needs.

As traditional fishermen, they have long life experiences during fishing. Not only experience in fishing, but also experience in reading natural phenomena. The purpose of reading nature is intended not only as a guide to the direction of fishing but also as guide to determine the best time for fishing, determine the location of fish and avoid the consequences of natural events. They usually use their experience to avoid the big risks they might face when natural events occur. This knowledge they refer to as *pesakitan*.

According to fishermen, in the past the knowledge of the *pesakitan* could be relied as a guide for fishing. Each fishermen, before

going to sea they will first see the *pesakitan*. Seeing the *pesakitan*, they can feel safe and comfortable at work and go home with satisfying results. However, different conditions are actually seen in the present. *Pesakitan's* knowledge is no longer a basic guide to predict what happens at sea. In fact most of the fishermen no longer make *pesakitan* as a guide in fishing, although some others still rely on them.

According to some fishermen, at present weather is no longer in accordance with the signs that appear in nature as before. Sometimes, in the morning the weather can be sunny, suddenly it turns into an overcast or storm. Traditional fishermen who rely on simple fishing equipment often become victims because they are no longer able to read natural phenomena. Natural phenomena no longer correspond to the reality that ensues. The changes make fishermen often feel cheated. Finally they chose not using the knowledge of the *pesakitan* anymore or the reading of these natural phenomena.

"... Now the signs are a lot of misses. Now with sophisticated technology, 3-7 days before the storm, it can be predicted. It is different with traditional fishermen, who can be in a fog when the storm comes at sea"(Interview with Siar60 years old, nets fisherman in LansanoTaratak)

This is also shared by Iman Mudir'53th, who states that:

"Signs of natural conditions were predictable before, but not anymore. Understanding of going to sea in the past, the month of Zulkaidah (approaching the month of Hajj) was the big wave at the time, now is unpredictable. The pesakitan falls to the south, the wind to the west. The moon collides with a falling star in the rain and storm. Now it is unpredictable because many people lie. Nature changes because of human doings ". (Interview with Iman Mudir '53, fisherman *pukektapi* in Padang Tae)

Traditional fishermen in the Sutera sub-district are indeed the most vulnerable victims to uncertain weather changes. The absence of technology that can read natural phenomena makes them prefer to surrender to what happens in the middle of the sea. It is

often among them to choose run away from the sea when a storm suddenly comes in the middle of the sea. Often when storms come, they must tear their nets in order to save themselves. Simple small boats further aggravate the condition of fishermen when faced with storms. They are often faced with choosing to stay alive with losing their fishing gear or dying to save their fishing gear.

"Now, there are many fishermens, including ceken fishermen, (the poorest fishermen) . The condition of fishermen is getting worse if there is no assistance from the government. Fishermen are in debt to support their families, for example taking rice and pay once a week. Go to the sea, fishing, mamukek and mambagan. Badayuang income is not settled. There are so many holidays, because of obstacles such as strong winds ".(Interview with ImanMudir '53, fisherman pukektapi in Padang tae).

Knowledge of *pesakitan* in the past can predict the weather and season but now it is no longer. Although there are still some people who use it, but often missed estimates. It is precisely now that technology has made it possible to detect weather changes through the weather forecast application. This is what some fishermen use to predict nature.

Sutera Traditional Fishermen Adaptation Strategy

1. Strategies for dealing with weather change

There are times when fishermen in SuteraSub-district has unexpected events when fishing. Climate change is uncertain and weather changes increasingly extreme. Often changes can appear suddenly such as rain, strong winds without any prior signs. In the past, events like this can still be predicted by just looking at the *pesakitan*, which is reading of the meeting between the moon and stars and other natural phenomena that they associate. *Pesakitan* has been the main guide for traditional fishermen in the past to determine when to go to sea and when to rest, when to start and when to end. Based on years of experience at sea, *pesakitan* are

quite reliable so that there is an expression for the *local* community ' *laibalaiye* '. This means seeing and understanding the *pesakitan* before going to sea or making a voyage.

Knowledge of *pesakitan* in the past, can enough give comfort in the sea. Using very simple technology and manual work patterns makes them only rely on *feeling* and *pesakitan* as a guide in fishing. Interestingly, according to the fishermen, this *pesakitan* are very helpful in doing their jobs. Without this knowledge, fishing will more harm to fishermen. This is because without a guide at all, fishermen will be confused in determining the time to go to sea, choosing an ideal location for catching and time to avoid potential storms.

The reading process of the *pesakitan* is carried out by studying the position of the stars and natural phenomena, then linking them to occurrence in the middle of the sea when they are at sea. Experience in advanced and continuously is kept as a traditional knowledge, then passed down through the generations. Until now by some, knowledge about *pesakitan* still relied on especially the old fishermen.

As explained above, only some fishermen still rely on *pesakitan* as a fishing guide. For some others, especially younger fishermen, this *pesakitan* has begun to be abandoned. There are several reasons why younger fishermen no longer rely on *pesakitan*. Some of them feel that the *pesakitan*'s knowledge often misses expectations. It is contrast to the past which is still reliable. Others are caused by ignorance of the *pesakitan*. In this case there seems to be a disconnected transfer of knowledge between the older generation and the younger generation about how to read *pesakitan*.

Regardless of can or not the *pesakitan* be relied as a guide to fish, fishermen surely needs something as a handle to make them feel comfortable when at sea. Fishermen are also well aware that there is more sophisticated technology that can facilitate their fishing work. But the small capital makes them unable to hold sophisticated equipment. Even just to hold the main fishing

gear such as nets and canoes, they actually have to pay in installments only for *second* goods.

Most fishermen use non-motorized boats or motorized temples. When facing the bad weather, this simple tools of course no not reliable in the middle of the sea. Thus, their boats are only used in shallow waters near the coast, due to face the small waves they have felt overwhelmed. Under these conditions, the boat will move slowly to the coast if one day the weather changes suddenly. This small boat will also be so easy to shake when big waves arrive. This boat also generally does not have a tent or roof that can protect from heat or rain. So with such a fishing boat it will be very vulnerable when weather changes arise. This is what makes weather forecasts becomes very important before leaving to the sea.

If in the past the effort to adjust to the weather was more dependent on the knowledge of the *pesakitan* they had, but now it is different. Even though some still rely on *pesakitan* as a guide for fishing, but according to fishermen, the weather at the present time cannot be predicted only by relying on this knowledge. Weather changes can change at any time without prior signs. It could be a good weather based on sign of nature, according to the knowledge of the *pesakitan* that they memorized before, but when at sea it changes instantly for the worse. Sometimes also according to the position of the stars they know that the weather will be bad, but in reality it is not. The things, where the knowledge of the *pesakitan* is often opposite to the actually weather have been felt by traditional fishermen today.

One of their strategies is to ensure weather conditions before they go to sea. There are two guidelines in predicting the weather that will emerge. First, for a small number of small fishermen, especially those who are old, they still believe in the knowledge of *pesakitan* that they understood so far. The slogan' *caliak pesakitan Sabalun belayar*' is still applied when going to sea. Although, the knowledge is contradictory often, they still depart when the weather is good at the time of departure. Meanwhile,

when the weather changes instantly at sea, they will choose to flee to land.

Second, for most young fishermen especially those who do not trust *pesakitan* will see various weather forecasts through television broadcasts at home. Weather forecast information via television does not have to be obtained through watching television directly. They obtained some of this information while they were taking a break at a stall where they used to gather, then one of the fishermen who had watched television informed the others. Even though some fishermen know about the *pesakitan*, they no longer follow it because of the reason that the *pesakitan* is not in accordance with the actual conditions. Next, when they already at sea and the weather changed suddenly, they will remain as they can be endured. However, if the weather is no longer able to survive, then they will escape to the mainland.

2. Strategy for dealing with storm

Not only the uncertainty of the weather, storms due to changes in sea temperatures are also a frightening specter for fishermen. The emergence of this storm is more caused by rising sea surface temperatures. Storm at sea not only cause the material losses for fishermen but can also cause the death. Fishermen in Sutera Sub-district admit that storms and big waves that occur lately are not only bigger but also more frequent when compared to similar incidents in the past. In addition, it is very difficult to predict storm nowadays, even it is often fall short from estimates when only by looking at the position of the stars in the previous nights. In the present, though some *pesakitan* are still relied on by some people, it is undeniable that the reality is often missed.

Natural conditions, especially storms that are unpredictable, make fishermen in Sutera Sub-district try look for some ways to stay at sea and get the minimum risk if they cannot avoid the risk. The common way to be done is to ensure in advance information that related to natural events from various sources such as TV, newspapers and other media. Information from the Meteorology Climatology and Geophysics Agency (BMKG)

by some people is often used as a reference, but not all fishermen understand how to access BMKG information. Usually the stalls where fishermen rest are multifunctional. Besides resting, they also usually talk about things that develop in the sea, including about the storm that will arrive and have passed. Sharing this information is actually done by fishermen for all information, ranging from natural conditions, fish populations to market prices. Information sharing is not only done through chatting in stalls but also using communication tools such as mobile phones.

The strategy carried out by fishermen in Sutera Sub-district is generally more prevention by gathering information first. This information is also often supported by looking at weather conditions before descending into the sea, seeing the presence of clouds and wave height. When they feel safe enough, they will leave. However, when the fishermen are at sea and are working and then a sudden storm comes, their response is to avoid as soon as possible.

When a sudden storm comes, they will speed up rowing the boat to the nearest island. It is often among fishermen to be stranded because of a sudden storm when they are in the middle of the sea. Lot of the fishermen had to damage the nets that they have just to avoid the effects of storms that appear immediately. This was told by one of the fishermen who had to cut the net when he attacked to spread the net, suddenly a storm came. To avoid the storm, he had to cut the net.

Avoiding it when a storm comes is the most rational choice given remembering that working tools are very simple. Even cutting the net (not curling) is the most profitable option when facing a storm. Although loss materially by the disappearance of the net, at least lives can be saved. Their boat cruising ability cannot be relied on to avoid faster hurricane speed. When storms occur, many of the fishermen have to buy new nets. Usually they buy by adding debt. Because they have to meet their daily needs.

However, storm conditions for fishermen in Sutera are more commonly felt by *payang* and net fishermen, but not for *tapi*

fishermen, because they work on the beach or shallow sea. If a sudden storm comes, they only need to isolate themselves to the available hut. However, when the storm arrives it will cause damage and even lose their fishing gear or trawl they use. Some of the consequences that have been experienced by traditional Sutera fishermen when storms come include: 1) losing fishing nets, 2) stranded on small islands, 3) losing stakes and 4) losing lives.

The strategy that they did to deal with when a sudden storm came was to escape as soon as possible from the fishing location to the place farthest from the possibility of a storm coming. They also generally try to anchor their boat to the nearest islands or reefs. Lot of them who are able to escape quickly must damage the net, so it does not cause more fatal consequences, namely loss of life.

Weather change or storms that come suddenly make fishermen cannot go to sea. In this condition, the fishermen are looking for other alternatives to meet daily needs is by catching shrimp and crab. In catching crab, they called it as *melukah*. Those activities are side job while helping the economy when the weather and storms do not support work. Catching shrimp and crabbing is usually done on the banks of river mouths or swampy areas on the beach. This activity is very helpful because besides its small capital, the price of shrimp and crabs is also pretty good. It's just only that the results of catching shrimp and crab not so much and it is only in certain seasons.

3. Strategies for dealing with the lack of catches

Various changes in the sea of Sutera Sub-district have implications for the reduction in fish resource. This can be seen from the reduced of catch of the fishermen. In fact, there are two causes of reduced fish resources, namely *overfishing* and climate change. The development of fishing technology contributes significantly to the exploitation of fish and allows the reduction of fish stocks. On the other hand, climate change also has a real impact on coastal

damage which results in damage to ecosystems and decreasing fish resources.

Based on data from the Department of Maritime Affairs and Fisheries in the South Coastal District in 2016 that in the last three years there was a tendency to decrease the catch fisheries products from 37,081.00 tons in 2014, 366,682.40 tons in 2015 and 34,013.80 tons in 2016 (DKP Regency Pesisir Selatan 2016). The amount includes catch fisheries production in Sutera Sub-district of 6,119.25 tons with a value of Rp. 181,431,667.99.(BPS 2017).

Climate factors have caused not only in reduced fish species, but also in number. When the source of catch is reduced, it is certain that the source of income of fishermen will decrease. In Sutera Sub-district, Lack of potential of fish resources is evident from the catches they have obtained. Every day they both catch nets fishermen, *pukektapi* and *pukekpayang* can only bring a small amount of catch to the house. It is normal for them to only bring home Rp.10,000 up to Rp.50,000. Sometimes they have to settle for carrying fish just for dishes at home, even other times they don't bring anything at all. So it is not wrong for them to refer to as 'ceken' fishermen, the poorest fishermen.

This decline in fish production and income was recognized by fishermen in Sutera Sub-district.

"In the past, if we were only a few miles to the sea we had a lot of fishing and we pulled over again. If you are satisfied now that you are looking for fish, you will not be able to bring it back. It is still hard too. And that's how difficult and different from the past." (interview with Kamel'48)

Furthermore Kamel asserted that the fish was indeed markedly reduced, although not exhausted.

"The number of fish is reduced. It doesn't run out because any kind of fish still exists today, it's just that the number has decreased." (Interview with Kamel'48)

Facing these conditions, the effort they have made is to expand the area of fishing. Efforts to expand the area of fishing carried out by *jariang* fishermen and *pukek* fishermen, both *pukektapi* or *pukek payang*.

But this strategy is not without risk. For *Jariang* fishermen with small boat capacity, this strategy has implications for the danger of facing greater waves than shallow seas. Risks for *Pukektapi* fishermen is increasingly difficult to attract *Pukek* because it is heavier. The result is the power to attract the *pukek* must be added. While for *payang* fishermen, the operational costs are inflated because the longer distance will extend the time. Expansion of the fishing area will give a risk for material loss and life threat aspects. But to stay at the boundary of the catch area, it must be prepared to go home with nothing.

CONCLUSION

Uncertain weather changes, the intensity of storms more frequent and reduced catch levels, give a real picture of the impact of the climate changes. Conditions that directly have implications for the economy of fishermen who are increasingly down. To deal with these issues, fisherman always looking for ways how to exist, convenient and can meet their daily needs. Some of the strategies that they have done are to ensure there is a good weather before leaving for the sea, or predictions of a storm. The main sources they use are media and applications. They also establish communication with fellow fishermen for this information.

The use of media as the main source of information about weather and climate or the potential for storms indicates that *pesakitan* knowledge is no longer relevant using in the present. This is because *pesakitan* knowledge often misses expectations. So although some fishermen still use *pesakitan*, many of the fishermen do not believe it and then turn to the media which can continuously predict more accurately. The same thing actually happens in other regions or countries. (<https://sains.kompas.com/read/2009/11/10/10552170/Ketika..quot.Pranata.Mangsa.quot..Tak.Lag.i.Bisa.Dibaca...>)

Furthermore, fishermen in Sutera Sub-district when faced with natural events that suddenly appear like a storm, then their response is avoid toward various coral or nearby islands. The limitations of working

tools such as the boats they use are quite risky when faced with such conditions. So, the effort they can do is to avoid as quickly as possible to save lives. Often, when this condition occurs, their working tools such as nets will become victims. While their strategy to deal with scarcity of resources is to expand the area of catch even though they have to face greater risks such as big waves. The costs needed when expanding the area of catch are also increasingly large.

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