



Traditional fishing technology of fishermen community in Papua

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ABSTRACT

This paper aims to describe and analyze the types of traditional fishing technology equipment used by the Tobati Enggros fishermen community to manage and utilize coastal resources in Yotefa Bay, Papua. The research approach used descriptive qualitative. Data collection techniques used were observation and interviews. Then the data analysis includes the stage of data reduction, data description, and data interpretation. The results showed that the traditional fishing technology owned by fishermen Tobati Enggros was divided based on the fishing area, namely the fishing area within the bay, mangrove forest, and outside the bay. The traditional technology used is divided by gender and fishing area. There are three types of boats as transportation technology: semang-semang, kole-kole, and jonson boat, and then the fishing tools are kolowai, stabbing tools, molo glass, nets, and fishing rods. The traditional technology fishing equipment owned can be a cultural capital used as a foothold in development. On the other hand, the fishing pattern using traditional environmentally friendly technology with household-scale catches is linked to marine conservation with subsistence utilization of coastal resources.

1. Introduction

Technology is knowledge, invention, modification, application, tools, machines, techniques, crafts, organizational systems and methods which all play a role in solving and providing solutions to existing problems, or for the sake of achieving certain goals, handling the application of input/output relationship, or perform certain functions (Liliwari, 2014). Technology can also refer to a collection of tools, including machines, material modification, to arrangements and procedures. Technology significantly influences humans to control and adapt to their environment (Liliwari, 2014; Lampe et al, 2019), fishermen are no exception. Fishermen communities are a very important social element in the structure of coastal communities, their culture reflects the cultural characteristics or socio-cultural behavior of coastal communities in general (Kusnadi, 2009).

Technology in fishing communities can be observed from the state of natural resources

and their utilization, the available of raw materials, the equipment used from the existing natural resources, the tools to produce the equipment, and the livelihoods of the fishing community (Naping, 2017). This definition is based on the understanding that technology is seen as the application of ideas or knowledge, understanding, and someone's belief in the utilization of natural resources he knows, which are generally in the vicinity with the aim of meeting life necessities or solving problems. Therefore, technology as the fruit of the culture and power of a person or a fishing community is a reflection of the culture of a fishing community that produced it. Technology can be used as a measurement or a reflection of the level of culture and creativity of a fishing community. Besides, technology is also understood as a stimulant for a number of changes, including changes in the socio-culture of society (Naping, 2017; Lampe, et al, 2020).

According to Naping (2017) there are 4 variations of technology used by fishing communities, namely 1) technology used in fishing activities, 2) technology used to support transportation, 3) other technologies that function as a complement in fishing and distribution activities, and 4) all the methods that are consistently used by fishermen in fisheries activities. According to Sarapil, et al. (2018), the traditional fishing equipment owned by the local fishing community for fishing, resource utilization and management is characterized as an environmentally friendly fishing gear and tends to be operated in shallow shorelines. Another characteristic according to Kusnadi (2002) is that traditional fishing equipment is subsistence with household-scale production, this is also largely determined by the catch storage capacity that is owned, the bigger the storage, the more the catch that is stored.

The use and operation of fishing technology in the context of utilization and management of coastal and marine resources, has an impact that the operation of fishing equipment must be able to answer at least three main impacts, namely; impacts on the environment, impacts on resource abundance and, impacts on coastal and marine resource targets (Latuconsina, 2010). The results of studies on traditional fishing equipment or technology owned by traditional fishermen in Indonesia have been numerous and varied, but the results shown are also varied. However, a number of studies show that the average traditional fishing gear owned is environmentally friendly and has a subsistence production capacity (Berlianti, et al, 2016; Ermayanti, 2015; Bubun, 2010; Najamuddin, et al, 2015). Although there are also fishing equipment that has been modified to increase production volume. However, this is also done to increase fishermen's income in the face of changes and the ever-growing needs of life. Therefore, modification of fishing equipment has become one of the adaptation strategies developed by several fishing groups in various places (Mappigau & Ferrils, 2020; Damayanti, 2018; Sagala, et al, 2016). Therefore, looking at the dynamics of changes that occur in the fishing community, related to the fishing technology used.

This article aims to identify traditional fishing equipment used by the Tobati-Enggros fishing community in Yotefa Bay, and to see how daily activities and the impact of utilization and management of coastal resources by the Tobati-Enggros fishing community in the use of traditional fishing equipment.

2. Method

This research uses a descriptive qualitative approach, which describes and analyzes the traditional fishing technology in the Tobati-Enggros fishermen community. This research was conducted in Tobati-Enggros Village, Entrop-Abepura District, Jayapura City, Papua Province, Indonesia. Afterwards, the researchers traced the fishing grounds around Youtefa Bay and the surrounding area. The selection of informants will be carried out by Snowball sampling, with the search pattern being guided by the key informant. The key informant planned is the village head who guided the researchers to determine who had the appropriate capacity to serve as informants in this study. The data collection techniques used were in-depth interviews and active participation observation. In-depth interviews are used to explore experiences and reveal the meaning behind the point of view of the Tobati Enggros community. Then participation observation is planned to be carried out by involving researchers to participate in the fishing tradition events to catch flying fish which only takes place in June each year. Afterwards, the data analysis includes the data reduction stage, data description, and data interpretation (Cresswel, 2012).

3. Result and discussion

Tobati-Enggros Fishermen Community are traditional fishermen who still use traditional technology in carrying out fishing activities. The fishing equipment technology used is adapted to the fishing grounds, gender entities, and the rules set by *Ondoafi* (Jakarimilena, 1993). This is due to the strong adherence and existence of a local institutional system that regulates fishing patterns and the fishing equipment used.



Picture 1. Tobati-Enggros Fishermen Community Settlement

The results showed that the fishing technology used by the Tobati-Enggros fishermen was divided into 3 classifications based on the environment of the fishing area, the first was waters and bays. Second, the mangrove forest area, and the third is the outer bay area. Specifically, the description of the fishing technology used in accordance to fishing area is explained as follows:

- **Gulf area**

Fishermen who are allowed to catch in Yotefa bay are only from the Tobati- Enggros tribe, outside fishermen (migrants) are not allowed to enter and carry out fishing activities. Based on Manjo's customary teachings, from the Tobati-Enggros tribe itself only men are allowed to carry out fishing activities in Yotefa Bay which is the customary right of the Tobati tribe (Wanggay, 2011; Tebaiy, 2015), which is also used as a national marine park by the government. The first fishing equipment that is prepared during fishing activities is a boat as a means of transportation technology used to go to the fishing location. The boat used is called *semang-semang*, this boat is a type of boat with one outrigger, generally on the left, and the boat is equipped with oars on the right.

This *semang-semang* boat is made from blackboard trees that are taken by them on the coast of their land gardens. This boat construction is made by cutting a tree, then chiseling it to form a cavity on the inside and becomes a boat. The outrigger of the boat can be varied, it can be made of bamboo, wood or the same material as the boat. The length of the boat ranges from 2 to 3 meters, with an outrigger of 1 to 1.5 meters in length. This boat is specifically used as a means of transportation for fishing activities in the bay, and this boat is for men only, and is only used to catch fish. Although the Tobati-Enggros people are familiar with the types of speed boats that use motorized engines, fishing activities are not permitted (by customary rules or instructions from *Ondoafi* or large tribal chiefs), to use motorized boats to carry out fishing activities. Male boats are used for fishing in the bay, and women are not allowed to board the *semang-semang* boat without a man accompanying them. The boat can only be used if there are men on the boat.



Picture 2. *Semang-semang Boat and it's paddle*

If, for example, there are women and men in the same boat, then women are obliged to row the boat and sit in the back, while the men are in front to direct. Men and women are allowed to board the boat when the boat is only used to deliver to a place, for example from a village to the mainland, because for fishing activities only men are allowed to use this type of boat. However, with the motorized speedboat made of fiber, most members of the Tobati-Enggros community prefer to use the boat compared to the *semang-semang* boat which uses oars, because in terms of speed, fast travel distance, and also allowed by the *Ondoafi*, so they can save the required time. Moreover, the use of these

motor boats is only as a means of transportation for mobility, not for natural resource exploration.

Then, the second is the tools used to catch fish, there are three variations of fishing gear, namely nets, fishing rods and *kolowai*. For fishing activities in the area around Yotefa Bay, the fishermen who go to sea are usually 2 to 3 people, groups that carry out fishing activities are still in one kinship group, such as son-father, cousin, brother, or clan group. In carrying out fishing activities, there are those who act as rowers and those who carry out fishing activities, which then the roles that are carried out can be exchanged according to the type of fishing gear being carried, the position on the boat is divided into the rear position which is in charge of rowing, while those who carry out fishing activities is on the front, if the fishing is done on a boat, because there are variations in the form of fishing, especially for those who fish at a spot on the edge of the bay and then fish in that area. The fishing rod used varies, it can use modern fishing rods or traditional fishing rods assembled by the community, using wood or bamboo with nylon rope and fishing hook. Then, the net used is made of nylon rope with a net width of about 50 meters - 100 meters.



Picture 3. tools of Fishing, *kolowai*, fishing nets, and cage

The traditional fishing gear which is the typical fishing tool for the Tobati Enggros fishermen is *kolowai*. *Kolowai* is a traditional fishing tool that has been passed down from generation to generation by the Tobati Enggros people. *Kolowai* is a traditional fishing tool that is used by means of *molo*, which means diving and then stabbing fish under the sea, but this is done at night. Diving is done because the depth of the bay waters only reaches 5 to 8 meters, the longest diving time can be 10 to 15 minutes. *Kolowai* fishing gear, made of bamboo for the handle, while the tip of the spear which is the main weapon is made of brass, iron and concrete. On the pointed side of the hook (stabbing side), the bamboo handle is 1.5 meters long, which is tied using a rope and wire. There are 8 stabbing scales on the tip of the *kolowai* spear which are wound to stab and hook the catch.

The bay waters fishing time has been traditionally determined, that is during the dry season, fishing is not allowed in the rainy season because the fishing gear used is very simple, which increases the risk of fishing, therefore, during the rainy season, men do not carry out fishing activities at all, but only gardening, repairing houses, and repairing boats and fishing equipment. During the dry season, fishermen are given the opportunity to carry out fishing activities by customary rules, the time for catching is only around 3-4 hours a day. The fishing time usually starts at 4 am to 7 am, or starts in the morning at 10

am to 1 pm. There are several restrictions that should not be done when men want to go to sea, first there should be no quarrels in the house before leaving to go to sea, then the night before going to sea it is strictly prohibited to have husband-wife sex for men who already have a wife, the prohibition must be are shunned before carrying out fishing activities, because otherwise it is believed that it will bring bad luck to the crew who go to sea, the fish will stay away and become aware of the fishermen's presence.

Then, the length of time to catch fish is limited due to established customary rules, so that they catch only as needed. The tools and materials that are prepared during fishing activities in the waters of the bay include flashlights or *pelita* (fire lamps fueled by oil) for lighting when the horizon is still dark, then they prepare the tubers as additional energy, because the motor that drives the boat is the paddle that comes from the human source, not the engine. Then, water and coffee must remain available to maintain concentration while fishing.

The types of catches obtained are small pelagic fish or estuary fish, such as samandar fish, julung fish, red fish, deho fish, crab, and squid. The range of catch that is obtained every time they go down to sea is 10-20 fish in non-fishing season and in fishing season fishermen can get up to 30 to 50 fish in just a few hours, then if the fishermen get large fish which is more than 2 meters long, then the fish was brought and presented to the *Ondoafi* (Chief of the Big Tribe) as a form of respect for the chief. The catch obtained is divided fairly based on the number of crews who go to sea. The catch obtained, partially set aside for food, then part of it is sold on the market or sold directly, so they can get money to buy other basic needs.



Picture 4. fish caught from fishermen

At certain times if there is an *Ondoafi* order to limit the use of the bay area, fishing activities may not be held, this can last from 2 weeks to 1 month (Kadir, et al, 2021). Usually this is done when a traditional party, banquet, or certain ritual will be held, so that the sea is in *sasi* (customary restriction), after the *sasi* is opened, the fishermen will come in droves to catch as many fish as needed to hold a party or traditional ceremonial ritual, such as weddings and other accidental activities. As for the annual routine activities that are often held, namely the annual event every January, where the Tobati-Enggros people invite all the native tribal chiefs of Port Numbay to celebrate a traditional party, usually the guests come from Kayu Pulo, Kayu Batu, Skow, Nafri, and Waena.

- **Mangrove Forest Area**

The mangrove forest area in Yotefa Bay is often referred to as the *mama-mama* forest, this is based on customary rules that only women are allowed to enter the mangrove forest. Customary rules strictly prohibit men from entering the area, because the area is specifically designated for women. Therefore, only women can carry out fishing activities (Poli, et al, 2020). The same thing happens with the division of labor and fishing activities in general in several places in Papua, the results of Maryone's research (2017) show the same thing, that Waropen women also carry out fishing activities in mangroves, as well as Kemong (2015) in the Comoros tribe, where women also carry out activities in the mangrove forest. This also shows that in coastal fishing communities in Papua, women are also active in fishing activities but are limited to mangrove forest areas in coastal areas close to fishing villages. The meaning behind this phenomenon is that women are equated with the natural surroundings, namely women are the same as mangroves which is a symbol of fertility and a home and a source of life.



Picture 5. Mangrove Forest in Youtefa Bay

Then, traditional technology tools used in traditional fishermen are generally very simple and environmentally friendly and their production capacity is subsistence (Sormin, et al., 2014; Manurung. 2014; Pratiwi, 2016; Hijjang, et al, 2018). In the context of Tobati-Enggros fishermen, there are several equipment used, both for transportation and fishing. First is the boat as a transportation technology used to take fishermen to the fishing areas. There are special boats intended for women regarding how the community uses coastal resources in mangrove forests. The boat for women is known as *kole-kole* or *hud*.

The boat is very different from the man's boat, which uses *semang-semang* (outrigger boat), *kole-kole* do not have the outrigger like on the man's boat. Like the *semang-semang*, the *kole-kole* boat is also made of a blackboard tree and is equipped with an oar. The making of this boat is also cut and then chiseled into the middle to form a cavity to become a boat. This boat is used as transportation to take people from the village to the mangrove forest location.

The fishing equipment used was a stabbing spear as the main tool for catching, then

molo glass as a support for diving, so that their eyes wouldn't hurt. *Molo* glass is shaped like a box and is made from sieves as filter. When catching shells, the women who carry out the fishing activity do not wear any clothes. In ancient times, women who were catching shells did not wear any clothes on their bodies. However, now there has been a change, now they are wearing clothes when they catch shells in the mangrove forest. However, the clothes used are only outer clothing, such as house dress, while for underwear, they don't wear it at all. It is believed that carrying out fishing activities without wearing clothes (underwear) can make shells and crabs unaware of the presence of the *mama-mama* who are fishing in the mangrove forest area, it is believed that in this way it can even lure the marine biota to get close.

The method of catching shellfish and crabs by the *mama-mama* of the Tobati- Enggros begins by looking for the marine biota with their feet, then stabbing them under the bottom, then pounding them down until they hear a "crack" sound indicating their piercing tool has hit the shells of the biota that are the object of their prey. After the sound "crack", then they stab it in again, if it's a crab then they will hold it then catch it and put it in a sack. Catching crabs and shellfish is carried out during low tide or 'meti' water around 10 to 12 noon, the activity of catching shellfish and crabs takes place especially during the rainy season, because men do not go to sea during the rainy season. The average number of catches obtained is 1 sack (20 kg), then the results are partially set aside for food and some are sold, the price range set is Rp. 50,000 per 40 shells. As for the crab, it will also be sold if it is a lot, at a price of Rp. 50,000 per 2. The rarer the catches are, the higher the price offered.



Picture 6. shellfish catches *Mama-mama*

- **Outer Bay Territory**

In addition to fishing activities in the waters of the bay, the male fishermen also catch in the waters outside the Yotefa Bay around Yos Sudarso Bay and the surrounding waters, fishermen do not carry out fishing activities on the high seas, because the technology used cannot ensure their safety to survive in the high seas for a long time with risks that will be faced. The means of transportation used to go to sea in the waters outside the bay is called johson boats, this johson boat is different from semang-semang which is only about 3 meters long, johson boat is more than 5 meters long, and can fit 5-6 people in the boat, besides that the boat is also equipped with a 15-40 PK motorized engine and a speed boat. Fishing tools that are carried in the form of stabbers, fishing rods, scoops and nets, scoops function to help reach large catches obtained from fishing rods or nets and stabber. The fish they catch include, bubara fish, deho fish, red fish, tuna, mackerel and skipjack fish which are located outside Yotefa Bay. There is no limit to fishing outside the bay, but before going to sea, groups of fishermen come to *Ondoafi*, so that they can receive the blessings and approval of *Ondoafi* and their ancestors so that they can avoid calamity. The supplies that they carry during fishing trips are coffee, water, sweet potatoes, and gasoline as fuel for the motorized boats they use.



Picture 7. Jonson Boat

Traditional fishing equipment and technology used by the Tobati-Enggros Fisherman Community, which has been described previously, based on the fishing area, indicates that these traditional tools are made from natural materials provided by nature and are used naturally and subsistently. Then from the production point of view, the catch with a very small capacity vessel shows a household scale production pattern, although sometimes if the results are excessive, the community also sells it to meet other needs. From these results it can be said that, the technology used in the fishing area in the bay and the mangrove forests in the vicinity is very environmentally friendly and the tools used are not harmful to both fishermen and the surrounding environment. Then, it does not damage the physical environment of the water, because the fishing gear used is aimed to catch fish directly which has no effect on the surrounding environment. Then, due to

strict customary regulations, their catch is also limited, only fish of a suitable size for consumption can be caught and release of small fish to support the regeneration process and the level of resource availability.

4. Conclusion

The use of traditional technology for catching and fishing activities in the waters of Yotefa Bay is a manifestation of the strong local institutional system and manjo as customary rules in the management of coastal resources in Yotefa Bay. Traditional technology that is owned, both in the form of traditional outrigger boats called *semang-semang*, and non-outrigger boat which is called *kole-kole* as a means of sea transportation, as well as traditional fishing equipment known as *kolowai*, and the division of catchment areas is a cultural heritage owned by Tobati-Enggros fishermen as Papuan people which must be continuously developed and preserved to become the identity of the Tobati-Enggros people. This also shows that the use of traditional fishing technology by the Tobati-Enggros fishing community is environmentally friendly. It is intertwined to conserve coastal and marine areas to carry out fishing without damaging the existing ecosystem.

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Conflict of Interest:

The authors declare that they have no conflict of interest.

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