

Sustainable Fishery Management Effort Through Traditional Fishing, Case Study in Ujung Genteng, Sukabumi, Indonesia

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Abstract:

Due to the increase in investment in the fishery sector and demand for fish and fishery products, the growth of fishery fleets and technology are developed rapidly. However, every industry's economic and technological development should be parallel with the environmental measures because fish and fishery products are natural resources and prone to extinction and over-exploitation. Therefore, sustainable fisheries management is highly required globally to balance fisheries' economic and environmental aspects. This study discusses the case study of traditional fishing in Ujung Genteng Village in Sukabumi to be considered one of many efforts of sustainable fisheries management. The traditional fisheries in Ujung Genteng are in the form of spearfishing with the freediving method. The study subjects are the "Predator" fishermen community and the government officials of Ujung Genteng Village. The anglers' community is uniquely interconnected with the coast guard of tourism spots in Ujung Genteng. They also have conducted activities as a community besides diving to hunt for fish. The study uses qualitative methodology with data obtained from observation, in-depth interviews, and Forum Group Discussion (FGD) with the community. The result of the study displays how the traditional fishery in Ujung Genteng covers all three pillars of sustainable fisheries: environmental protection, economic development, and social development. They also have conducted activities as a community besides diving to hunt for fish. The study uses qualitative methodology with data obtained from observation, in-depth interviews, and Forum Group Discussion (FGD) with the community. The result of the study displays how the traditional fishery in Ujung Genteng covers all three pillars of sustainable fisheries: environmental protection, economic development, and social development. They also have conducted activities as a community besides diving to hunt for fish. The study uses qualitative methodology with data obtained from observation, in-depth interviews, and Forum Group Discussion (FGD) with the community. The result of the study displays how the traditional fishery in Ujung Genteng covers all three pillars of sustainable fisheries: environmental protection, economic development, and social development.

Keywords: sustainable fishery, traditional fishery, fishers community, spearfishing

1. INTRODUCTION

The growth of the Indonesian fishery sector in Indonesia has increased by 7.07 percent in the second quarter of 2021, despite the pandemic (data by KKP and BPS). The sector's contribution to Indonesian Gross Domestic Product (GDP) has also grown from 2.77 to 2.83 percent.

Not only the contribution to the GDP, but the fishery sector is also the most significant contributor to providing

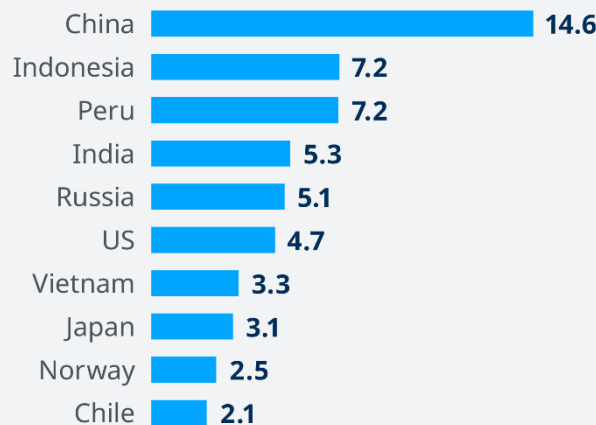
jobs, directly and indirectly. Moreover, fish and fishery products are 52 percent of the animal protein consumed by Indonesian people. This means fishery is one of Indonesia's most important economic sectors and a part of Indonesian families that cannot be separated from Indonesian lives in general. It is a fact that is not surprising considering that Indonesia is an archipelagic state with 99,083 km of coastal line, the second-longest coastal line owned by a country in the world.

With over 7 million tons of catch annually, Indonesia has one of the highest levels of marine biodiversity globally. It is the second-largest fishing nation after China. The country is also one of the top-10 fish-dependent nations globally, with fish consumption reaching 46.49 kg per year per capita (KKP, 2018). However, in the process, Indonesia must think ahead regarding how the sector could be

maintained and maintained in the long run. Fishes and fish products are living things, renewable commodities, but that does not mean that these products couldn't come to scarcity. Many factors may affect the population of fishes available to be harvested, such as climate change, over-exploitation, methods of fishing, and others.

Indonesia among world's leading fishing nations

Capture in million tons, 2018



Picture 1. Fishing Nations (FAO, 2018)

Indonesia has set the goal to maintain the sustainability of the fishing industry by 2025. But a lack of monitoring coupled with the sector's vital role makes this goal a challenging target. It has wide-ranging consequences as most fish stocks in Indonesia are already overfished. 90% of Indonesian boats draw their catch from already overfished areas (KKP, 2018). In line, Indonesian waters are home to 37% of the world's marine species, many of which are endangered due to over-fishing (Brand, 2022). Thus, it reflects the importance of making a sustainable fishing industry.

Since Indonesia's fisheries sector plays a critical role in providing food security and employment, the industry's stakeholders should consider the risks that continued mismanagement poses to its fishery assets' long-term productivity and

economic value by implementing the principle of sustainable fisheries. There should be a management and provision on fisheries to achieve sustainable fishing. Fisheries management is about managing people, not fish (Grafton et al. in Pinsky et al., 2013). We are managing people who harvest fish and people who govern the fishers.

Sustainable fisheries management definition is maintaining a balance of all the main aspects of fisheries, including biological, environmental, economic, and social aspects (Voss & Schmidt, 2017). From the physical aspect, it is how to maintain fish resources for sustainable productivity. The environmental aspect is how to minimize the impact of fishing on the environment and natural resources, including non-target species and protected species. The economic aspect is how to

generate optimal economic benefits for business actors and the community and generate sustainable income for the state; the social aspect is maximizing job opportunities/livelihoods for anglers and the community, empowering women, and maintaining harmony between stakeholders. In short, the principle of sustainable fisheries resource management is meeting the current population's needs without compromising the needs of the people in the future.

Since historical and ongoing overfishing has depleted Indonesia's fish stock, it is a shared responsibility to avoid overfishing, including the responsibility of the anglers. This paper will discuss a method of the fishery which humans have known for years, a traditional way that is very far from overfishing, uses a very safe tool for the environment, and does not bring harm to and does not damage the coral reef and other sea creatures habitat.

This paper will discuss the motive and benefits the fishers population in Ujung Genteng get from conducting fishery with traditional tools and methods and how this method contributes to sustainability in the fishery. Ujung Genteng is a village in Ciracap Subdistrict in Sukabumi, West Java. Ujung Genteng is located along the seashore, and therefore the majority of the population has occupations as fishermen. Ujung Genteng is also a tourist spot famous for its white sand beach. Besides fishers, the population in Ujung Genteng also manages their own business to support tourism, such as guest houses and hotels, restaurants, souvenir shops, boats, diving equipment rental, etc.

The location is considered suitable for the study since it is a melting pot of fishers' community and tourism spot due to the abundant seashore. Both activities may intervene with the sea ecosystem, and both can damage the environment if not well managed. Moreover, Ujung Genteng is also home to the "Predator" fishermen community, which will be the main subject of this research.

2. THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY

This research is a qualitative research of a case study design. Qualitative research is a research procedure that produces descriptive data in written words or verbal from the observed objects (Bogdan and Taylor, 1975:5). Qualitative research aims to holistically understand the phenomenon experienced by research subjects, such as behavior, perception, motivation, action, and others, by describing in words and languages in a specific natural context that uses various scientific methods (Moleong, 2012).

This paper used a study case approach; this approach is suitable for this research because this research aims to discover questions around "how and why." Moreover, the researcher only has a small opportunity to regulate the phenomenon, which becomes the research focus. The research focus is located on the natural world in the present time (contemporary) (Cooper and White, 2012).

The main research question of this study will be: "how is the traditional fishery in Ujung Genteng, Sukabumi considered a sustainable fishery management effort?" The case study is selected because the focus of this research will be limited by a specific time and place where this research will discuss how a fishing method conducted by the community in Ujung Genteng contributed to sustainable fishing while also benefitting the fishers themselves.

The data obtained for this research is sourced from primary and secondary data. The primary data is obtained from an in-depth interview, field observation, and Forum Group Discussion (FGD) with the "Predator" fishermen community. An in-depth interview is used to explore more profound topics and questions proposed in this study; henceforth, FGD is employed to obtain various points of view that may not be able to be discovered during one-on-one interviews. The research subjects were

determined based on connection to the traditional fishery as an effort of sustainable fishing in Ujung Genteng, Sukabumi, representatives from the "Predator" fishermen community, the Head of Ujung Genteng village, and the Head of Ciracap Subdistrict.

Based on Greenpeace, an international environmental organization, sustainable fisheries are defined as a practice that can be maintained indefinitely without reducing the targeted species' ability to maintain its population at healthy levels and without having an impact on other species within the ecosystem, including humans, by removing their source of food, killing them accidentally or damaging their environment (Abdullah, 2021). Practicing sustainable fisheries can minimize the threat of depletion of marine fisheries resources worldwide caused by persistent overexploitation. Achieving sustainable fisheries means emphasizing sustainable management of marine fisheries.

According to the United Nations, sustainable fisheries have three pillars: environmental protection, economic development, and social development (UN General Assembly, 2015). The three pillars cannot and should not stand alone, and the three should go hand in hand. The economic and social development of the fishery sector maintained while also protecting the environment remains questionable. Several scholars argued that the pursuance of financial benefits from fisheries might undermine the environmental and social aspects.

Three main arguments support how economic development in the fishery sector may harm fish ecological health. The first is the most common problem: access is not well regulated (or not regulated at all); individual fishers make personally beneficial decisions, leading to overfishing and ultimately losing profits. Second, short-term profit motives in controlled fishing can create unilateral political pressure to set unsustainable catch

levels. And lastly, the pursuit of economic development through the commercialization and industrialization of fish and market expansion is a driving force for overfishing. It may outweigh the weak institutions associated with the limited regulation of the commons problem (Asche, F et al. 2018).

In many cases, natural resources are not used in a biologically and socio-economically sustainable way. Recently, researchers have reported that most commercial fisheries in the United States suffer from overfishing, inefficient fishing, or both. Globally, using data from the United Nations Food and Agricultural Organization found that more than 35% of the cephalopod stock, 25% of the demersal fish stock, 5% of the pelagic fish stock, and shellfish stock. It is estimated that 25% are overfished (Karjalainen & Marjomaki, 2005). In Indonesia, 90% of boats draw their catch from areas that are already overfished (KKP, 2018). Though Indonesian waters are home to 37% of the world's marine species, many of which are endangered due to overfishing (Brand, 2022). Thus, it reflects the importance of making a sustainable fishing industry.

Fisheries management can be defined as the use of all kinds of information (environmental, economic, political, and social culture) in decision making to reach goals regarding the use of fish stocks (Krueger and Decker, 1999 in Karjalainen & Marjomaki, 2005). The general purpose of fisheries management is to maximize profits, avoid harmful changes to resources and the environment, and enable fisheries' stability. It is not possible to maximize all of these factors simultaneously, and there are some trade-offs between them.

The management of catch fisheries adjusts the level of fishing efforts to achieve sustainability, for example, maximum biomass, maximum fisheries employment, maximum sustainable production, maximum economic

production, or optimal sustainable production. These strategic fishery goals were achieved by coordinating the various plans of society (Charles, 2001 in Karjalainen & Marjomaki, 2005). Improving the physical health of fish stocks inevitably requires limiting fisherman behavior, which can reduce profitability in the short term. Fishers may prioritize short-term economic benefits over long-term resource integrity if they are not aware of the benefits of good management. When management allows anglers to make these long-term profits, the cycle breaks, and there are no trade-offs. There is increasing evidence that effective leadership is consistent with ecological and economic goals (Asche, F et al., 2018). Based on the facts above, effective fisheries management can be achieved by implementing sustainable fisheries management.

Sustainable fisheries management definition is maintaining a balance of all the main aspects of fisheries, including biological, environmental, economic, and social aspects (Voss & Schmidt, 2017). From the physical aspect, it is how to maintain fish resources for sustainable productivity. The environmental aspect is how to minimize the impact of fishing on the environment and natural resources, including non-target species and protected species. The economic aspect is how to generate optimal economic benefits for business actors and the community and generate sustainable income for the state. The social aspect is maximizing job opportunities/livelihoods for anglers and the community, empowering women, and maintaining harmony between stakeholders. In short, the principle of sustainable fisheries resource management is meeting the current population's needs without compromising the needs of the people in the future.

This research is written based on three states of the art. First, a study by Kyvelou and Ierapetitis in 2020 entitled Fisheries Sustainability through Soft

Multi-Use Maritime Spatial Planning and Local Development Co-Management: Potentials and Challenges in Greece. The key conclusion of this study is that sustainable livelihood from small-scale fisheries depends on the correlation between fishing and other marine activities. This correlation can boost sustainable local development and be a unique pattern of a "win-win" and soft multi-use marine spatial planning (MSP), with economic, social, environmental, cultural, and governance-related benefits for the coastal communities. This research has a similar research object which is Fishery Sustainability.

Further, the concept will be used in this research on the coastal communities' role in implementing sustainable fisheries. Aside from similarities, it also has vast differences in the research subject and research's main focus, aside from similarities. Researchers focus on the traditional fishing effort in achieving sustainable fisheries. In contrast, this research focuses on discussing the potential and challenges for the coastal communities (Kyvelou and Ierapetitis, 2020).

Second, research by Nilsson in 2019 entitled How to Sustain Fisheries: Expert Knowledge from 34 Nations. The study reveals that by utilizing data gained from a survey of marine experts from 34 nations, the researchers found that the main challenges perceived by fisheries experts were overfishing, climate change, habitat destruction, and a lack of political will. Measures to address these challenges did not demand any radical change but included extant approaches, including ecosystem-based fisheries management with attention to closures, individual transferable quotas, gear restrictions, and improved compliance, monitoring, and control (Nilsson, 2019). The similarities of both types of research are in the research object, sustainable fisheries. This research has broad pictures of fishing in 34 nations, which can capture the main problem in

implementing sustainable fisheries and the solutions as well. The differences are clear enough about the research subject and research focus.

Third, research by Fahrurnnisa in 2015 entitled Coastal Agrarian Problem (Case Study of Coastal Communities Dusun Ujung Genteng and Sukabumi). This research points out that the problems in coastal communities are concentrated in marine issues. Still, the coastal communities' region of residence and economic activities also has friction (Fahrurnnisa, 2015). This research has similarities to the research subject: coastal communities in Ujung Genteng, Sukabumi, but has a different research object and focus. This research was used as initial research that captures the condition of the coastal communities of Ujung Genteng, Sukabumi and its specific problem. We continue to analyze further the situation that occurred and its possible solutions.

3. RESULTS AND DISCUSSION

Ujung Genteng is a village located at Ciracap Subdistrict, Sukabumi, West Java. The village area is 1,870 hectares and has a total population of 3,815, with 647 out of 1,058 families living under the poverty line (Ciracap Subdistrict Profile, 2021). Ujung Genteng village is an expansion of Gunung Batu village based on the Regional Regulation of Sukabumi Regency No. 10 the year 2008. Administratively, Ujung Genteng is bordering with Pangumbahan and Gunung Batu Village on the north, and Cikangkung Village on the east.

In terms of access, Ujung Genteng Village is reasonably accessible. This is due to the provincial road, which is built from Sukabumi until the village entrance. Therefore, people from Ujung Genteng only need 23 minutes to reach the capital of Ciracap Subdistrict, 3.5 hours to go to Sukabumi, and 8 hours to get to Bandung, the capital of West Java province. Ujung Genteng is blessed with abundant natural

resources, namely the touristic seashores, fishery products, and coconut plantations. The total area of its coconut plantation amounts to 200 hectares or 57.14% of Ujung Genteng's total plantation area (350 hectares) (Rokhani et al.:2015). The touristic region of Ujung Genteng is also blessed with the white sand beach and pleasant sceneries, which attracts local and international tourists. Ujung Genteng community benefits from tourism by creating enterprises to provide facilities for tourists visiting their village. Ujung Genteng village offers a lot of guest houses and motels for tourists to stay in, restaurants and stalls for tourists to eat, and shops for tourists to buy their needs.

The village's topography is dominated by seashores, with a total length of more than 5 kilometers and an altitude of 16 meters above the sea surface (Ciracap Subdistrict Profile, 2021) and located on the Southwest edge of Java Island, the village borders directly with the Indian Ocean on the west and the south. Therefore, it is no wonder that many Ujung Genteng residents work as fishermen; around 80 percent of the total population of Ujung Genteng are fishermen (Fahrurnnisa, 2015).

Like other coastal communities across Indonesia, fishermen in Ujung Genteng are divided into two main groups: "the owner" fishermen and "the labor" fishermen. "The owner" fishermen own capital and equipment to catch fish, such as boats, fishing nets, fuel, and money. Meanwhile, "the labor" fishermen do not own this and only depend on their energy to work. "The labor" fishermen in Ujung Genteng have two categories: partaker labor and independent labor. The partaker labor fishermen work for "the owner" fishermen. They follow and lend their energy to help "the owner" catch fish and get paid afterward. The independent labor fishermen work independently by borrowing or renting the boat and equipment from "the owner" fishermen and then spend the rent and fuel by

themselves after selling their harvest result (Fahrnunisa, 2015).

This study focuses on the "Predator" fishermen community, which belongs to the independent labor fishermen category according to the explanation above. However, the "Predator" community in Ujung Genteng does not need to rent anything or have money and fuel to catch fish. The equipment required is only a diving suit and a specific spear. The rest are the things they do not buy: a healthy body, diving skills, and pleasant weather. Therefore, because they do not need to rent or buy a boat and fuel, they can take the full payment from selling the fish home without paying for anything.

The "Predator" community is one of many fishermen's communities in Ujung Genteng. Besides them, there is also a community called "Octopus," named after the animal they usually catch. The "Predator" community has around forty members, and all of them use the same method to catch fish using the spear. This

activity is called free diving spearfishing and is a sport. Freediving means the action of diving without carrying oxygen can. The freedivers will need to hold their breath under the water and appear on the surface when they need another breath of air. Therefore free diving spearfishing is catching fish using a spear by free diving. Even though the free diving spearfishing is considered a sport in other parts of the world,

The tool used is in the form of a gun, which can shoot out a spear. The spear itself is connected to a rope; therefore, whenever the spear is shot, it will be restrained by the rope to avoid it missing or being brought by the current. The tool is similar to the one used by people who conduct free diving spearfishing. The "Predator" community obtained the device by purchasing the parts from abroad and then assembling it, mainly done by the chairman of the community.



Picture.2. Spearguns used by "Predator" fishermen

Like the other fishermen, "Predator" fishermen need to monitor the weather before the sea. This is very important because the weather impacts the activities in the ocean, especially the size of the wave and the water clarity. Anglers need to make sure that the size of the lock

is not dangerous for them to dive and the water clarity is adequate to see underwater.

The "Predator" fishermen have been using technology to monitor the weather. They track the temperature by using a mobile application called "Wiki." The application displays the speed of the

wind and the height of waves in a particular area to determine the exact time they will dive. As their benchmark, spearfishermen will not attack if the wave

height reaches more than 1.2 meters. Below is the display of the "Wisuki" application.



Picture.3. "Wisuki" application used to monitor the weather by fishermen.

In a good season, the anglers can dive 2-3 times a day, in the morning, afternoon, and night, while when the rainfall and the tide are high, they do not go to the sea at all. Besides the mobile app, fishermen usually observe the water directly since the fishing spots are not too far. They can reach it by riding a bike or a motorbike. The preferred time for spearfishermen to dive is at night because fish movement is slower than during the day. Fishers usually equipped themselves with a flashlight to help them see under the water at night.

Spearfishing is conducted by doing a free dive, without any oxygen cans, to a certain level of depth. The spearfishers then position their bodies on the floor of the coral to monitor and target fishes. Spear fishers always target fishes that already reach a certain level of size, which will have the highest price when sold. Spearfishermen mainly target fishes such as flat-tailed triggerfish (*Aballistes Stellaris*) and grouper fish (*Epinephelus marginatus*) because the two fish meat is

popular to consume. They can also reach the weight of 4-5 kilograms.

The tricky part of this fishing method is that the anglers need to swim up to the surface to breathe air while simultaneously having to monitor and target fish. This is the reason why spearfishermen need to have extraordinary free diving skills. They need to train to hold their breath as long as possible underwater so they will not waste any time or movement. They need to see clearly under the water. That is why spearfishermen constantly monitor the weather. After reaching the floor of a coral, they will position their body horizontally and then look for a target. They need to be as still as possible and put their spear gun on standby to be ready to shoot the spear anytime. Every time a fish is caught, they will set them free from the spear and put them in their multi-hook tied to a rope. The rope of multi hook is very long and connected to the peg on the shore. The multi-hook functioned as the

place to put caught fish temporarily before being pulled to the beach.



Picture.4. Caught fishes on multi-hook

"Predator" fishermen community has around forty members; the head of society initiates this community. The head of the community was the pioneer of spearfishing in Ujung Genteng. At first, this community only consists of several anglers who have the intention to look for fish independently. There were only several people trying the new method of spearfishing to save the cost of renting/buying boats and fuel. The motive which drove them to conduct spearfishing is economy because the spearfishing equipment is affordable. They only need one purchase in the beginning: freediving equipment and a spear gun.

Most "predator" fishermen are already equipped with diving and swimming skills because they were born and raised in a coastal community. However, the technic of spearfishing is quite different from free diving alone. Therefore they also need to concentrate on targeting fish and using a spear gun. The community regularly conducts a meeting at least once a week. The conference usually discusses obstacles and issues they faced during spearfishing and shares safety tips for freediving and spearfishing.

Besides the benefit of saving cost, we should also look at the weakness of this method, which is regarding human safety. The spearfishers dive to the sea without complete safety equipment for freediving. They usually only wear minimum safety equipment such as a wetsuit/dive suit and

Google. Due to the limitation of access and capital, they learn free diving technics autodidact without specific certification and standardization. Their activities in the sea are hazardous. They have to dive into the waters of many corals because it is where the fish habitat is. Not infrequently, they are carried away by currents and exposed to coral when diving, causing them to be injured. Another risk is experiencing cramping while diving unattended, which is in the worst state. They may also get drowned.

Therefore, the "Predator" community is interconnected with safeguarding tourist spots in Ujung Genteng. Safeguard in Ujung Genteng is a part of "Balawista" (National Water Tourism Rescue Organization). Some spearfishermen also work as a safeguard; therefore, "Predator" and "Balawista" in Ujung Genteng are related to each other, and every "Predator" community meeting will also invite members of "Balawista" to share about survival and safety measures during free diving and spearfishing activities. Currently, the "Predator" community, "Balawista," and "Octopus" community are united, and their members are interrelated. Besides the regular meeting, the community also conducts social activities together. The first and the latest move is coral reef planting to commemorate Indonesian Independence day on August 17th, 2020. Even though massive waves already destroyed the coral

reef they grew during the La Nina season in 2020, this activity showed that the community is actively conserving the environment. They have the awareness that preserving the environment will also benefit them because if the fish habitat is healthy, then the fish population will be maintained.

Due to the increasing investment in the fishery sector and the increasing demand for fish and fish products, the development of fishing fleets and companies is experiencing vast growth in terms of technology and process. Unfortunately, this advancement does not go hand in hand with the proper management of sustainable fisheries to prevent fish depletion worldwide. The long-term sustainability of fishing is threatened by overfishing, ecosystem changes, and management conflicts (Ariadno, 2011).

Indonesia is recognized as one of the wealthiest regions with the most marine biodiversity globally, and the fishing industry accounts for more than 37% of the world's species. Indonesia has the second-longest coastline globally after Canada, which is about 17,508 islands. This geographical condition means that Indonesia has vast marine fisheries resources and the opportunity to develop its fisheries.

As a maritime nation, Indonesia promotes sustainable fishing as sustainable use of fishery resources adopted by the Fisheries Law (Revised by Law No. 31 of 2004 and Law No. 45 of 2009) that manages fishing activities. Fishing activities must be regulated. Not only by the Fisheries Law but also by international regulations adopted worldwide, such as the Code of Conduct for Responsible Fisheries (CCRF) (Ariadno, 2011).

Sustainable fishing requires a stable and viable population in the wild. The level of the sustainable fishery depends on the productivity of the people, which is a function of growth rate, reproductive rate, and natural mortality

rate. These are also climate-affected population factors, so the scope of sustainable fishing can change due to climate change (Brander, 2007; Pinsky et al., 2013).

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