

ECONOMIC POTENTIAL ANALYSIS RENGKAM ON BATAM ISLAND

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Abstract : *The marine and fisheries resources sector is one of the potentials that is widely utilized by coastal communities who mostly work as fishermen. The lives of fishermen who depend on natural conditions can be proven by the income of fishermen who increase during the fish season. The off-season causes the intensity of fishing to decrease, thus the amount of income received by fishermen is certainly drastically reduced. Collecting rengkam can be a solution for fishermen who have obstacles in catching fish. This profession switch provides benefits and improves welfare and makes coastal communities have choices to make a living. Rengkam has the potential to improve the welfare of coastal communities, especially during the season when fish are difficult to obtain, while it has consequences for ecosystem changes that cannot be ruled out. This study aims to scientifically examine the social and economic potential of rengkam exploration and review the environmental impacts of exploration activities and determine strategies that can be carried out to maximize social and economic potential and minimize the possibility of environmental impacts. This research uses a qualitative approach. Qualitative approach was conducted through in-depth interviews and field observations (primary data collection). This research was conducted at one location of the rengkam exploration center, Pecong Island, with the subjects involved in the research process being the community and SKPD at the research location. Measurements using survey instruments, interviews, observations and literature review. Qualitative data collected was analyzed using the Narrative Analysis method of important data not only related to context, but also time, place, specifications, experience, and suggestions for consideration.*

Keyword: Rengkam, Community Wellbeing, Fisherman.

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INTRODUCTION

Batam is one of the maritime areas in Riau Islands province with an area of 251,810.71 KM² (25,181,071 Ha). As one of the cities characterized by archipelago, Batam City has several large islands (Batam Island, Rempang Island, Galang Island, Galang Baru Island, Bintan Island, Natuna Island and Moon Island). Batam City, which has 172 km of coastline, is estimated to have 61,131.8 ha of mariculture development potential, consisting of 10,709.7 ha for coastal marine culture and 50,422.0 ha for offshore marine culture. Marine areas with potential for coastal marine culture development are spread across 4 sub-districts, namely Galang District, Bulang District, Belakang Padang District and Nongsa District.

Batam has contributed positively to the national economy as well as to the local economy of Batam and the Riau Islands province. The growth of investment in Batam City from year to year shows growth. In fact, the Indonesian economic crisis in mid-1997 did not have a negative impact on investment in Batam. The economic growth rate of 7.5% per year contributes to the national economy, as well as to Batam City itself. Batam's contribution to the national economy is about 14% of the value of national non-oil and gas exports and 11% of the total value of foreign investment (FDI) into Indonesia

(Qodriyatun, 2013).

The problem is that the rapid economic growth of Batam City is not followed by equal distribution of income for its residents. Infrastructure development and economic growth are enjoyed more by people living in urban areas than by people living in coastal areas (hinterland), so there tends to be a gap between people in urban areas and people in coastal areas. Research by Rosmawati Hilderiah Pandjaitan (2000) shows that the development of the Batam industrial area has resulted in marginalization of the local population.

The local people of Batam City are Malays, commonly called local people, who live in the coastal areas (hinterland) of Batam City. People in the coastal areas are generally fishermen who still live in poverty. They generally live by catching fish in the sea and collecting mangrove wood for charcoal. The empirical condition of the fishermen community is that until now there are still many who have not received the touch of development programs. As a result, fishermen who have been engaged in fisheries business are still faced with various backwardness and helplessness (Annual Report of Marine, Fisheries, Agriculture and Forestry Agency of Batam City, 2011).

Batam has considerable marine potential, there are several marine potentials such as marine resources and fisheries, shipping and trade transportation services, marine tourism, and sustainable energy. The marine resources and fisheries sector is one of the potentials that is widely utilized by coastal communities who are mostly fishermen. With the marine potential that is owned, it should be able to prosper the lives of fishermen who depend on the marine and fisheries potential. However, in reality, the fishing profession is often identified with poverty.

The lives of fishermen who depend on natural conditions can be proven by the income of fishermen who increase during the fish season. The low fishing season causes the intensity of fishing to decrease, thus the amount of income received by fishermen is certainly drastically reduced. Seasonal changes cause fishermen's income to be unpredictable, the impact is that the amount of income earned is not sufficient to meet the needs of fishermen both in the fishing season and the off-season. To anticipate this, many fishermen in the coastal areas of Batam city do other work, namely searching and collecting weeds or commonly called rengkam that drifted due to strong currents and waves.

Rengkam is a type of seaweed belonging to the sargassum family that grows in the waters of the Riau Islands. Rengkam was initially underestimated because it is a marine plant that is considered garbage and disturbs the nets and trawls of fishermen when looking for fish. Collecting rengkam can be a solution for fishermen who have problems catching fish. Rengkam is an aquatic plant that has a brown color, relatively large in size, grows and develops on strong bottom substrates. The top of the rengkam resembles a bush that is bilaterally or radially symmetrical and is equipped with side growth (Yende, 2016). Rengkam was once only an underwater plant that was not known to have selling value and was underestimated by fishermen because it was considered as marine litter. Apparently, rengkam has economic value that can help boost the economy of coastal communities, especially fishermen whose income is unstable.

Rengkam or seaweed is a product that has more value. Rengkam has potential that can be developed and can help to improve the economy and welfare of fishermen. By becoming a rengkam collector, fishermen who previously had difficulty finding fish due to natural factors, weather, supporting tools and did not get a certain income, became certain income because rengkam was very easy to find and the growth of rengkam was

quite fast, namely three months had grown back. Rengkam also does not recognize the season, so it is always available at any time.

Fishermen who initially depended on their economy by fishing at sea began to switch to collecting rengkam. Collecting rengkam is a job that is not too difficult and can be done by anyone. In one family, husbands, wives and children can also collect rengkam because rengkam is easy to find and there are certainly collectors who will accept it. This change in profession provides benefits and improves the welfare of coastal communities who used to work as fishermen. With this change in profession, coastal communities have choices to make a living. When the fish season arrives, the fishermen will go to the sea to look for fish and the wife and children can look for rengkam. Likewise, during the rainy season, or bad weather that makes fishermen unable to go to sea, they can look for rengkam around the coastline so that they do not lose their source of income.

Finding rengkam is not as difficult as finding fish. When fishing, fishermen have to go to the middle of the sea to get a big catch, have to spend the night on the boat, not to mention the challenge of bad weather. Meanwhile, the job of looking for rengkam is fairly light. There is no need to spend capital to look for rengkam because it is widely available in the sea, just go down at low tide and you can get a lot of rengkam. In addition to getting income, the search for rengkam is also very helpful because the nets or trawls that are stocked are no longer disturbed by rengkam because they slowly begin to clean because they are taken by rengkam seekers.

Rengkam that can be sold is rengkam that has been aged for 3 months. After harvesting, the rengkam will grow by itself again so there is no cultivation. The rengkam that has been collected is then dried in the sun for 2 to 3 days. After drying, then the rengkam is collected to collectors up to 500 kg to 1 ton in a dry state and the rengkam is sold for Rp. 1,700 per kg. Not only for resale, rengkam also has the potential to be developed, namely processing rengkam into seaweed flour. With the help of the government, facilities can be built to process rengkam from raw materials into finished products. With the rengkam management facility, labor will be needed and taken from coastal communities who work as fishermen, housewives, so as to improve the welfare and economy of coastal communities.

This brown seaweed produces alginate. Alginate is one type of hydrocolloid, which is a colloidal system by organic polymers in water (Hoefler, 2004). Alginate can be extracted from brown seaweed such as *Sargassum* sp. and *Turbinaria* sp. (Figure 1) whose potential in Indonesia is quite large, but has not been optimally utilized. Alginate has long been utilized, both in the food and non-food fields. In the food sector, alginate is widely used as an emulsion stabilizer in ice cream, suspension in chocolate milk, viscosity regulator in yoghurt, and others. In the non-food field, alginate is widely used as a thickener in textile printing, a regulator of uniformity and smoothness of paper surfaces, a controller of penetration and stability of glue made from starch or latex, and a regulator of slow release of chemicals in fertilizers and medicines (Mc. Hugh, 2008).

Rengkam has the potential to improve the welfare of coastal communities, especially during hard-to-find fish seasons, while having consequences for ecosystem changes that cannot be ruled out. Furthermore, at present, exploration is still limited to the traditional collection and processing of rengkam. Therefore, a scientific study is needed regarding the social and economic potential of rengkam exploration and reviewing the environmental impacts of these exploration activities and determining strategies that can be carried out to maximize social and economic potential and minimize the possibility of environmental impacts.

LITERATURE REVIEW

Marine Potential of Batam City

Most of Indonesia's territory consists of oceans and has considerable marine potential. Batam is one of the maritime areas in Riau Islands province with an area of 251,810.71 KM² (25,181,071 Ha). Meanwhile, based on the outer boundary of the regency/city as far as 4 nautical miles, the area of Batam City is 390,900 Ha.⁵ As one of the cities with archipelagic characteristics, Batam City has several large islands (Batam Island, Rempang Island, Galang Island, Galang Baru Island, Bintan Island, Natuna Island and Moon Island). Batam City, which has 172 km of coastline, is estimated to have 61,131.8 ha of mariculture development potential, consisting of 10,709.7 ha for coastal marine culture and 50,422.0 ha for offshore marine culture. Marine areas with potential for coastal marine culture development are spread across 4 sub-districts, namely Galang District, Bulang District, Belakang Padang District and Nongsa District.

Batam has considerable marine potential, there are several marine potentials such as marine resources and fisheries, shipping and trade transportation services, marine tourism, and sustainable energy. The marine resources and fisheries sector is one of the potentials that is widely utilized by coastal communities who mostly work as fishermen. With the marine potential that is owned, it should be able to prosper the lives of fishermen who depend on the marine and fisheries potential. However, in reality, the fishing profession is often identified with poverty.

Geographically, Batam City is a strategic area, because it borders directly with Singapore and Malaysia, while on the other side it borders with several other regions, namely Riau, South Sumatra, Jambi and West Kalimantan. One of the areas of Batam that has great marine potential is Bulang Subdistrict, an area surrounded by ocean, making the people in Bulang Subdistrict almost all people work as fishermen or reach 90% of the population or cultivators of marine products (seen in the picture below), but a small part of the population in Bulang Subdistrict work as farmers, among the types of crops include: food crops, vegetables, fruits.

Rengkam

Some types of seaweed in Indonesia that have economic value include: *Eucheuma sp.*, *Gracilaria sp.*, *Gelidium sp.*, and *Hypnea*. Class *Rhodophyceae* and *Sargassum sp.* from class *Phaeophyceae*. Cultivation and processing of red algae are well developed, but some species are not cultivated specifically from the brown algae group (*brown algae*) optimally (Basmal, et al., 2013). It is the largest group of brown algae *Sargassum* (*Phaeophyta*) in tropical seas. *Sargassum* is a family of brown algae that consists of approximately 350 species in the world. There are about 12 species of *Sargassum* known in Indonesia including: *Sargassum Echinocarpum*, *S. Gracilimun*, *S. Obtusifolium*, *S. Bindi*, *S. polisi*, *st. Crassifolium*, *S. Mikrofilum*, *S. Aquofilum*, *S. Vulgare*, *S. duplicatum*, *S. Histrix* and *S. polyceratium* (Rachmat 1999).

This group of algae is scattered and very abundant in the marine areas of Indonesia from several species, especially the alginate-producing seaweed group (Atmadja, et al., 1996). However, this alginate-producing *brown alga* has not been optimally cultivated. So far, its utilization is still very low. (Basmar et al., 2013). Alginate is an organic linear polymer consisting of *Polysaccharides*, *Monomers* - *L guluronic acid (G)* and *-D mannuronic acid (M)*, or *Combination of two monomers*. Alginate is available derived from: Brown algae of the *genus Ascophyllum, Ecklonia and Durvillaea Laminaria*,

Lessonia, *Macrocystis*, as well as species of *Sargassum*, and *Turbinaria*. The main component of algae is carbohydrates while other components are protein, fat, ash (sodium and potassium) and 80-90% water. (<https://www.psychologymania.com/2013>).

Sargassum has various nutrients that are beneficial to both humans and animals. The efficacious components of *sargassum* include: protein (14.8%), carbohydrates (25%), lipids (7.6%), dietary fiber (21.3%), and various *tannins*, *flavonoids*, *terpenoids*, *glycosides*, *fucoindans*, *steroids*, and *phenols*. This content makes this potential algae has a myriad of benefits for human and animal health. Possible uses of *sargassum* are, as fish and shrimp feed, food for humans, potential as anti-obesity, anti-bacterial, anti-cancer and anti-virus.

Profile of Rengkam Exploration in Batam Island

World demand for seaweed in the form of processed products continues to increase, including agar-agar in 2018 the total world demand was valued at 275,188,000 US \$, an increase of 4.9 percent from the previous year, while carrageenan had a total world demand of 1,131,820,000 US \$, an increase of 8.4 percent from the previous year (ITC, 2019). The high demand and value of processed seaweed products is an opportunity for Indonesia as the world's main seaweed producer.

Seaweed traded in the world market consists of raw materials and processed products. Raw material products can be divided into fit for human seaweed (for human consumption) with HS code 121221 and unfit for human (not for human consumption) with HS code 121229. Processed seaweed products include agar HS 130231 and carrageenan HS 130239. World demand for seaweed in the form of processed products continues to increase, including agar-agar in 2018 the total world demand was valued at 275,188,000 US\$, an increase of 4.9 percent from the previous year, while carrageenan had a total world demand of 1,131,820,000 US\$, an increase of 8.4 percent from the previous year (ITC, 2019). The high demand and value of processed seaweed products is an opportunity for Indonesia as the world's main seaweed producer.

The amount of Indonesian raw material seaweed exports in 2018 reached 176,481 tons with a value of 190,671,000 US\$. Indonesian seaweed exports when compared to processed seaweed exports are still very low. Indonesia's total exports of raw and processed seaweed commodities in 2018 reached 366,516,000 US \$, consisting of unprocessed products of 76.71 percent, exports of processed products in the form of agar 3.87 percent, and carrageenan 19.43 percent. According to (KKP, 2019), Indonesian seaweed exports are dominated by dry raw materials, which account for 80 percent of total national exports. Indonesia's potential to produce seaweed has an impact on its export trade. According to (Rajagukguk and Majus, 2009), seaweed exports in the form of *raw materials* have competitiveness in Hong Kong, Philippines, Spain, Denmark, USA, South Korea and China. While in Japan, France and the United Kingdom do not have competitiveness at all, this happens because the quality and quality of the product is still low. Research by Quilloy and Monis (2009).

Indonesian seaweed exports have lower competitiveness compared to Philippine seaweed. According to research by Van Den Berg et al (2016), seaweed marketing that is successfully carried out and increases the value obtained is in processed form. Research by Maximo, Pedro and Virgilia (2008) states that currently the utilization of increasingly diverse *cara-ginan* has expanded the seaweed and *keragenan* market. Therefore, it is necessary to increase the export of processed seaweed to increase profits in the Indonesian seaweed trade.

RESEARCH METHODS

This research uses a qualitative *descriptive research* design, which obtains data through exposure to several questions including who, what, when, where and how or through observation of a particular phenomenon (Cooper & Schindler, 2019). The author used this method to discover the potential of rengkam exploration in Batam Island. This research was conducted on Pecong Island which is located in Batam Island, Riau Islands Province. The subjects in this research include the community and SKPD in the research area, namely Pecong Island. This research categorizes informants into two groups: primary and secondary informants. Primary informants consisted of SKPD who already understood the activities of the island community. Secondary informants, namely island communities, are supporting informants as confirmation of the information obtained by the author from primary informants.

The results of interviews with primary and secondary informants will be used as keywords to find the exploration potential of rengkam in Batam Island. The information processed from the interview data will be analyzed and used as a reference in finding the exploration potential of rengkam in Batam Island. Data collection method is the main and important step in the research. In this research, the author will use primary data as a reference to process complete research data. The data collection methods that will be used by the author are *semi-structured* interviews and observation. The author will conduct semi-structured interviews. Semi-structured interview is an interview process that uses an interview guide derived from developing topics and asking questions and the use of more flexible than interviews. The author will also conduct observations on Panjang Island to be able to directly observe how behavior, business activities, and operational processes.

RESULTS AND DISCUSSION

The research objects used in this study are the SKPD, the Community and, Fishermen and Rengkam Collectors who live on Pecong Island. From the island, the number of respondents was 15 fishermen and Rengkam collectors. This research uses a Skinative approach. Qualitative methods are conducted through in-depth interviews and field observations (primary data collection).

Exploration

Exploration was conducted to capture the wishes of the informants. Semi-structured interviews were conducted to explore the desires of the general public and fishermen to find out the shadow of respondents' answers to the exploration of this rengkam based on the interview guide used. After the data collection process is complete, the next step is:

1. Identifying important sentences conveyed by informants based on the questions asked about the rengkam exploration activities carried out and the effects felt by the community through the respondents which are then poured into narrative form by following the interview guidelines. Then from the important sentences, the keywords were searched and recorded based on the results.
2. Exploration Results History of Rengkam Exploration, Raw Material Availability, Economic Value of Rengkam, Rengkam Sales, Opportunities and Challenges of Rengkam Exploration, Government Support.

Based on the data collection process of informants about the history of rengkam exploration, the results obtained are:

- a) Based on the results of interviews conducted with informants, rengkam exploration on the island has been carried out by the general public and fishermen since one and a half years ago: "About a year past sir, a year and a half just started on the island of pecong in a crowd and there has not been ulu who collected rengkam before a year and a half".
- b) Economic factors encourage the general public and fishermen on Pecong Island to explore rengkam to find additional income for daily living costs, as expressed by informants: "Economic factors too sir, rengkam is easy to get sir, the term seller is also easy."
- c) Rengkam collected by the general public and fishermen is sold to collectors, as revealed by the informant: "The term, like here (pecong island) there are 3 collectors, so, it is up to the community itself to sell the collected rengkam to which collectors."
- d) On the island of Pecong there are many rengkam plants so that many general public and fishermen are interested in collecting them. Rengkam plants are usually found in the shallow sea, deep sea, in fish cages, coral reefs, coastal areas, as revealed by informants: "There are many rengkam plants on Pecong Island, sir. The general public and fishermen usually look for rengkam in coral reefs, fish cages, and coastal areas."
- e) The rengkam collected by the general public and fishermen are dried in the sun for a maximum of three days. If it is hot, in just one day the rengkam is dry and can be sold. However, on rainy days, the collected rengkam is immediately sold because if it is exposed to rainwater the rengkam cannot be sold anymore, as conveyed by the informant: "After being picked up using a canoe or boat, it is immediately lifted to the top, immediately dried in the sun sir. That's when it's hot, if it's the rainy season, it's not dried sir, it's just left alone, if it's dried it's destroyed sir. If the heat is good, one day the rengkam is dry and can be sold to collectors."
- f) Rengkam that is collected or explored will grow back within 1 month, so the general public and fishermen can return to collect it for resale, as conveyed by the informant: "Growing sir, growing. Within a month the grip will grow back and can be taken back to sell, sir. "
- g) Rengkam collected by the general public and fishermen are only sold to collectors. There are no activities such as cultivating rengkam or processing the rengkam into products with high economic value, as stated by the informant: "No sir, no. The problem is that we, as the general public, do not know how to cultivate or process this rengkam, sir, because no one has provided any socialization. So, most of it, generally just sold sir to collectors."
- h) The price of rengkam sold to collectors is not known for certain by the general public or fishermen because the selling price is determined by collectors and agents who buy the rengkam and 1 family that collects rengkam on the island can sell 400-500kg of rengkam and there are more than 100 families who collect the rengkam, as conveyed by the informant: "He's like this sir (selling price), sometimes it goes down, sometimes it goes up, so we can't predict a stable price. Because what determines the selling price is the collectors and agents sir. The selling price range that is usually bought by the collectors is around Rp. 1,200 - Rp. 2,000 per kg sir. At least 1 family sells 400-500kg to collectors, and the number of families who are rengkam collectors is hundreds of families."
- i) People who collect rengkam can help their economy because the income generated from selling the rengkam is not bad so that it can improve the welfare of the general public and fishermen, as conveyed by informants: "The opportunities and benefits are

like what I said earlier, initially the fish added to the economy of the community here sir. "

- j) Communities on the island support entrepreneurs who invest in the island to create a rengkam processing plant so that it can provide jobs for people on Pecong Island, as conveyed by informants: "The wish is, sir, that there is a company here to develop, produce, what, that rengkam, so we can sell it directly, it can absorb a lot of labor, maybe there is a factory here, for that process (processing rengkam into finished products)."
- k) The quality of the seawater around Pecong Island can be utilized for rengkam cultivation, as stated by the informant: "Very well sir, the sea water here is still very good."
- l) The challenges or obstacles commonly faced by the general public and fishermen who collect rengkam are unstable prices and the rainy season, as conveyed by informants: "First of all, sir, if the price is unstable, then, during the time of searching for rengkam, sir, the rainy season, sir. During the rainy season it is difficult for the community to work."
- m) The local government had visited Pecong Island and was aware of rengkam exploration activities, but until the time of this research there had been no assistance in any form provided by the government, as conveyed by the informant: "There is sir, but just looking at it sir. The one who came was the fisheries department, they have been here before. But there has been no support from the government for the people on this island who collect rengkam sir. "
- n) The informant's hope is that the community and fishermen who collect rengkam are noticed so that the rengkam collection activities carried out can potentially increase the income of the community who collect rengkam on Pecong Island, as conveyed by the informant: "Our hope for the future is that the government will pay more attention to community activities, especially for those who are not, such as the general public and fishermen who are looking for rengkam for the better in the future."

After exploring from informants through interviews, it can be concluded that, the factor that encourages the general public and fishermen on Pecong Island to collect rengkam is the economic factor. Economic limitations or income that cannot fulfill daily life make people collect rengkam. Collecting rengkam can be done by anyone such as fishermen, housewives, small children, because finding rengkam is very easy and rengkam will grow back within 1 month after being taken. The rengkam that has been collected is then sold to collectors, depending on the community who wants to sell to the existing collectors. The selling price of rengkam is unstable and uncertain because it is the collectors and agents who determine the price. One family that collects rengkam can sell as much as 400-500 kg of rengkam to collectors or agents, which is usually valued at around Rp. 1,200- Rp. 2,000/kg of rengkam. By collecting rengkam, the economy of the Pecong Island community can be helped so that it can improve welfare.

The skpd on pecong island hopes that investment will enter pecong island to improve the welfare of the people on the island by cultivating rengkam and opening a factory to process rengkam into finished products with high economic value. At the time of this research, rengkam was only sold as raw material, so the selling price was very low. With incoming investment such as the opening of a rengkam processing factory, it can absorb labor on the island so that welfare increases, the rengkam processed into finished products will also be of higher value. In addition to hoping for investment in pecong island, informants also hope for assistance from the government for rengkam seekers by

providing adequate equipment and providing assistance for canoes or boats to fishermen whose livelihoods are fishermen and rengkam seekers.

CONCLUSIONS

Based on the data analysis that has been done, it can be concluded that the exploration of rengkam is carried out by the general public and fishermen on the island due to economic factors that make the island community do the job of searching for rengkam to be able to increase income and can improve the welfare of community life. Not only people who work as fishermen who collect rengkam, but people such as housewives, their children, because collecting rengkam is very easy and the rengkam that is taken can grow quickly within a period of 1 month. Based on the data analysis that has been carried out, the researcher can make suggestions, namely:

1. The role of the government and the private sector is needed to be able to open access to entrepreneurs who are willing to invest or provide capital to communities on the island to create production houses and cultivate the rengkam collected and process it themselves.
2. The role of the government is needed to be able to provide socialization activities to the general public so that people have knowledge about rengkam which actually has high economic value.

The limitation that occurred in this study was that during the data collection process through interviews, the informants' answers seemed to be as they were and had to be directed first to be able to provide answers in accordance with the questions. However, overall, the informants were cooperative and eager when the researchers conducted the data collection process.

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