University of Muhammadiyah Malang, Indonesia
e-ISSN 2622-4836, p-ISSN 2721-1657, Vol. 4 No.1, February 2021. pp. 41–49
IJOTA
Indonesian Journal of Tropical Aquatic
Journal homepage: http://ejournal.umm.ac.id/index.php/ijota

Analysis of catching of sea cucumber (*Stichopus variegatus*) in Kramian islands, Sumenep regency, East Java

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ARTICLE INFO

Keywords:
Kramian island
Productivity
Sea cucumber

ABSTRACT

Kramian Island is located in the north of the Masalembu Islands, East Java. This area has good sea cucumber resources, but the rules on the prohibition of overfishing of sea cucumbers have not been implemented by the government in the Kramian Islands, so that fishing activities carried out by fishermen, continuously regardless of the type and size of sea cucumbers, can cause sea cucumbers in the wild to run out and the impact of sea cucumbers will be extinct. The research was conducted with the aim of knowing the fishing location, fishing method, sea cucumber species, number of catches, and benefits of sea cucumber catch. This research was conducted in March-June 2020. The method used in the study was observed with fishermen. The results of the discovery of the location of sea cucumbers using GPS, there were 3 types of sea cucumbers, namely Tanduk (Stichopus variegatus), Kapuk (Stichopus variegatus), and Susu (Holothuria rigida). Sea cucumber catch in March (253.4 kg), April (261.1 kg), May (124.1 kg), June (733.6 kg). The highest sea cucumber catch data occurred in June, while the lowest catch occurred in May

How to cite:
Prasetyo, D., Hakim, R. R., & Andriyanto, A. (2021). Analysis of catching of sea cucumber (*Stichopus variegatus*) in Kramian islands, Sumenep regency, East Java. *IJOTA,* 4(1): 41–49.
DOI: https://doi.org/10.22219/ijota.v4i1.13327

1. Introduction

Sea cucumber (Holothuroidea) is one of the commodities, fisheries that have important economic value found in Indonesian. There are three genera of sea cucumbers consisting of 23 species, of which only five species have been exploited, including the genera Holothuria, Stichopodidae, and Thelenota. Important species include Sandfish (*Holothuria scabra*), Blackfish (*Actinopyga* Sp), Blanckteatfish (*Microthele nobilis*), and Holothuria (*Microthele Fusccogliva*) (Sulardiono & Boedi, 2014). In 2012 - 2015 the sea cucumber increased from 900 to 1200 tonnes.

Meanwhile, China remains the main customer. Currently, it is becoming increasingly difficult for sea cucumbers to find the size of the sea cucumbers in the smaller habitat because the high market demand for sea cucumber products has not been matched by cultivation activities (Ministry of Marine Affairs and Fisheries, 2015). Sea cucumbers are generally used as part of seafood or some types are used in the cosmetic industry. Sea cucumbers have a high protein content (Martoyo *et al.* 2006). In addition, sea cucumbers also have great potential to be used as medicinal raw materials (Oh *et al*. 2017) or high sources of antioxidants (Hawa *et al*. 1999).

Kramian Village is an area that has sea cucumber resources. Due to the high number of arrests carried out continuously by the fishing community of Kramian village, regardless of the type and size being caught, it can cause sea cucumbers in the wild to decline (Umardiono, 2011). Based on this, it is necessary to research the capture of sea cucumbers in the waters of Kramian Village, Masalembu District, Masalembu Regency, East Java.

This research is important in order to obtain data on the type and number of sea cucumbers caught, fishing areas, methods and economic value of sea cucumber catching business. The research objective was to determine of the catching area and catch productivity of sea cucumbers by the diver in Kramian Island, Masalembu District, Sumenep Regency, East Java Province. With the availability of this data and information, it can be used as a basis for determining further policies.

2. Material and methods

Survey data were obtained from 60 respondents in divers and captains on sea cucumber fishing vessels. Retrieval of data used in the study, namely, the method of interviewing sea cucumber fishers and participating in sea cucumber fishing activities carried out by fishermen (Kerr, 2006). Interview with sea cucumber divers using questionnaires. The research was conducted in May 2020, in the waters of Kramian Island, Masalembu District, Sumenep Regency, East Java. The location of this Kramian village is located between 5 ° 2'55.9 "S and 114 ° 36'32.4" E (Fig. 1).

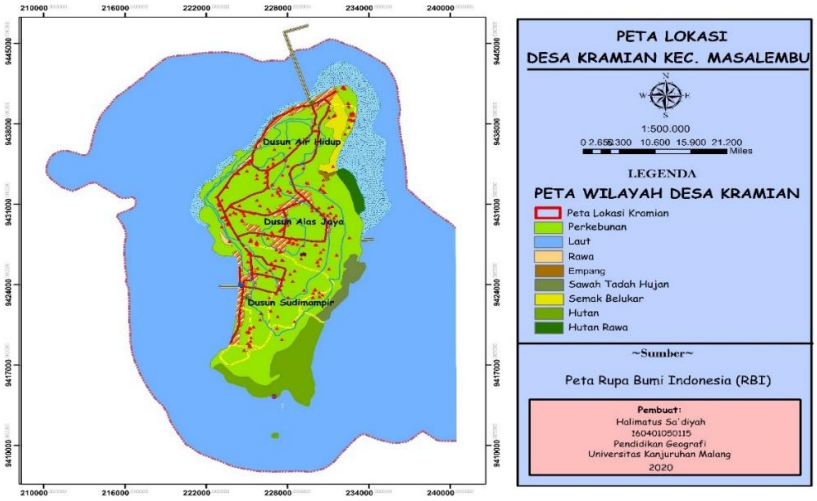

Figure 1. Catching area of sea cucumber

3. Results and Discussion

The results of interviews from each fishing boat on Kramian Island show that the number of crew members (divers) is around 5-7 people consisting of teenagers (15-20 years), adults (25-30

years), and some are even-aged (50 years). Catching sea cucumbers is carried out by diver with a period of 7-10 days in one sail. Fishermen/diver usually sail early in the morning. The types of data collected include fishing methods, fishing locations, observation of aspects of length, the weight of sea cucumbers, and the number of sea cucumber catches obtained by fishermen. This can be seen in Figure 2. (A) Taking sea cucumbers is done to distinguish large, small, and defective sea cucumbers, (B) Measuring the weight of sea cucumbers using spring scales, (C) Measuring sea cucumbers using a meter, and identifying types of sea cucumbers carried out in the field concerning (Sulardiono & Boedi, 2014).

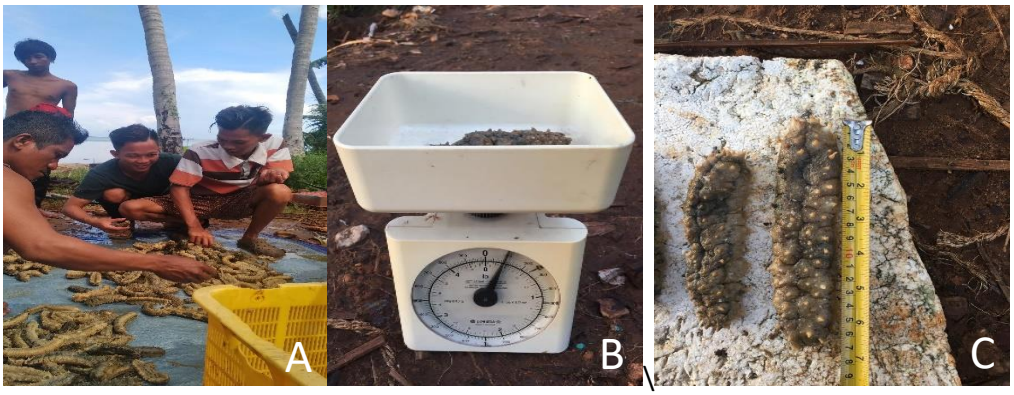

Figure 2. Weight sampling of *Stichopus variegatus.*

Fishermen operate sea cucumber fishing gear in boats, compressors, hoses, swimming areas, duck shoes, and waring as places for catching sea cucumbers. The catching area for sea cucumbers has the characteristics of a muddy sand substrate mixed with broken sand with coral, with a water depth of 10-30 meters. When catching sea cucumbers, divers operate the tools that have been prepared according to their respective functions. In the waters of Kramian Island, the growth of thorn sea cucumbers is quite good because the catch from itself is able to change or meet the costs of daily life (Sukmiwati *et al.* 2012).

Catchment area

A wooden boat that uses a machine is transportation for fishermen to arrive at the place where sea cucumbers are caught. Fishermen use GPS which functions to make it easier for fishermen to find sea cucumbers. Using this GPS, fishermen usually look for a place where the sea cucumbers are good to catch, then if they find the location of the catch directly in the program, one of the results is: 1. (S05°05.007`E114°34.922), 2. (S05°14.956`E114°30.391), 3. (S 05°13.856`E114°30.672. The fishing location is about 30-70 miles from the coastline on the island of Kramian, takes 7 - 10 days and the fishing location for sea cucumbers has characteristics of muddy sand, sand mixed with coral fragments and a water depth of about 10 - 35 meters. This is in accordance with the statement (Yanti, 2014). That fishermen will get abundant catches in the eastern season due to the very calm waters and sea cucumbers in the eastern season are actively looking for food.

Figure 3. Catching *S. variegatus* by diving technique

From the results of interviews with fishermen, it was found that the traditional fishing gear used by fishermen is a compressor (oxygen storage tube) which functions to help divers breathe as for how to operate it. The compressor is connected to a 150 m long hose. Then the air has flowed from the compressor to the diver who is below sea level with the supply of air from above in this way. The diver is free to catch sea cucumbers (Yanti, 2020). In addition to carrying fishing gear to look for sea cucumbers as the main target, fishermen also bring other fishing gear to catch fish as a side target, namely in the form of fishing rods to look for fish in the sea so that the fishing rods can be used as a meal.

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Figure 4. Oxygen compressor, and divers

The catch of fishermen on Kramian Island contained 3 types of sea cucumbers, namely Duri (*Stichopus varigatus*), kapok sea cucumbers (*Holothuria cinerascens*), and Susu (*Holothuria rigida*). Duri (*Stichopus varigatus*) were the most dominant.

Figure 5. (A) dorsal (left) and ventral (right) of *Stichopus variegatus*

Morphological observations of sea cucumber (*Stichopus variegatus*), the body of the sea cucumber is generally soft, the skin is smooth, speckled, smooth, fleshy and its shape is elongated cylindrical. The sea cucumber body consists of the front (anterior), back (posterior), lower part (ventral), and upper (dorsal). In the anterior part there is a tentacles mouth which functions to pick up and suck in food or solution particles, while in the posterior part it functions to remove food and water waste. On the lower ventral side of the sea cucumber, there are tube feet that are tight and irregular in arrangement which function as a driving device (Sulardiono & Boedi, 2014). Sea cucumbers can grow to a size of 40cm, weighing 1.5 kg, the first maturity of female gonads occurs at an average size of 220 mm, which produces a large number of eggs up to about 1.9 million eggs. While male sea cucumbers are only able to produce half, the life cycle of this biota begins with a fertilized egg that will hatch in about 2 days. The respiratory system in sea cucumbers can be done in two ways, namely breathing in the form of a channel that branches like a respiratory tree which has a thick body wall. This branching channel functions to absorb oxygen and distribute it to the blood and tube feet, while sea cucumbers, which have thin body walls, breathe through absorption with their entire body (Odum, 1971).

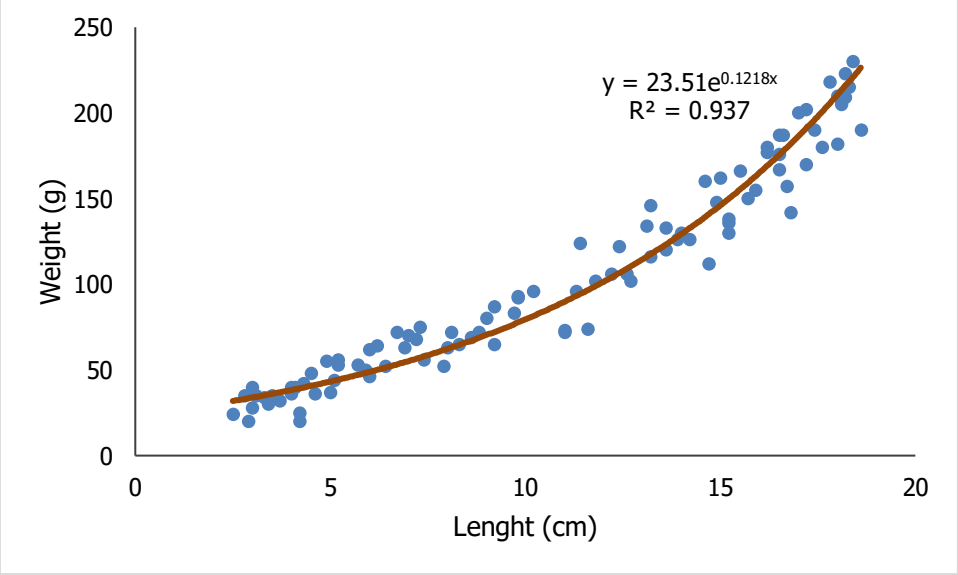

Figure 6. The wieght-length relationship of *Stichopus variegatus*

The sea cucumbers have daily eating activities that follow a grouping, namely actively eating throughout the day, and digging holes at the bottom of the substrate, hiding undersea plants or rocks stirring sand or mud. Sea cucumbers are nocturnal animals, which begin to forage at night actively. During the day, they will immerse themselves in the sand more often or protect themselves

from predators (Sukmiwati *et al.* 2012). The behavior of the sea cucumbers will be greatly influenced by the conditions of the substrate or seabed. Sea cucumbers are more commonly found in waters with a sand substrate (Yusron, 2018).

The sea cucumbers caught by divers in the Kramian waters have various sizes. Divers usually divide into three groups, namely large size, with a fresh weight of 100-250 grams, and small sizes weighing 20-100 grams per head. There are also sea cucumbers that are not normal, namely sea cucumbers that have physical disabilities, damaged skin and others. Arriving at the auction place, the sea cucumbers are sorted into these 3 types, because large sizes have a higher value. The growth pattern of sea cucumbers is directly proportional to the weight and length, by fulfilling the equation y=23.51e0.1218x (Figure 6) with an R2 value of 0.937 which is very close to 1. The average weight of sea cucumbers caught in the Keramian waters is not different from the average wet weight of sea cucumbers caught in Kenya's southern sea is 173 grams per individual (Ochiewo et al. (2010).

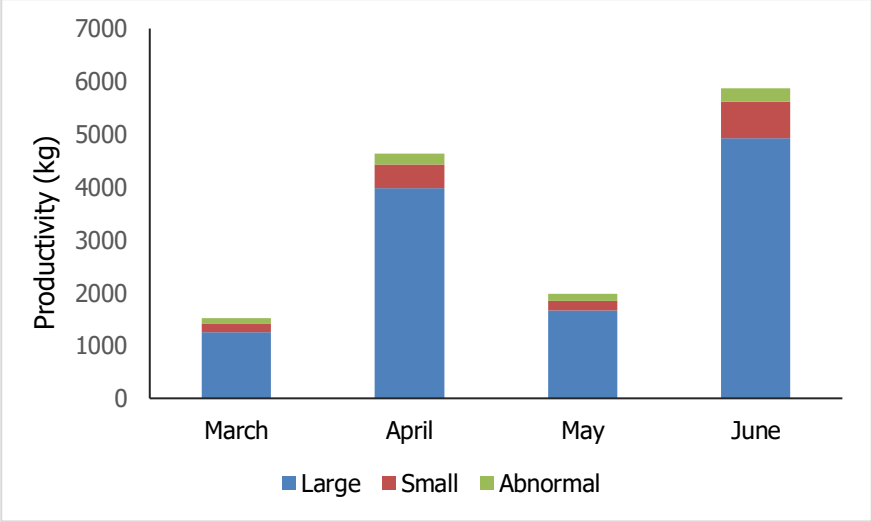

Figure 6. Productivity in size *of Stichopus variegatus in March-June 2020*

Oedjoe & Eoh (2015) stated that sea cucumbers are usually found in areas with an abundance of algae. The abundance of algae in the sea will be influenced by current patterns and weather conditions in the waters, especially around Kramian Island. Productivity of sea cucumbers on the island of Kramian in March as much as 1,520 kg (figure 6). In April the number of sea cucumbers caught increased by about 300 % to 4,600 kg. This increase indicates an increase in the number of sea cucumbers in natural reproduction. According to Elfidasari et al. (2012) the catch can also be influenced by the number of trips made in that month. In May, the total production decreased to 2 tons again and then increased again in June with a total production of 5.9 tons. The amount of natural production is thought to be influenced by the available sea cucumber stock. sea cucumbers need time to reproduce and increase the number of stocks in nature. In the west season there is no sea cucumber fishing activity due to high sea waves and strong winds. This season occurs in September–November, according to (Umardiono, 2011). However, this season fisher start sailing on their respective fields to survive for a while until this western season is over. According to Dolorosa et al (2017) the growth of sea cucumbers in nature is strongly influenced by climatic conditions in a waters. Various kinds of currents created in a waters will greatly affect water quality such as temperature, pH, hardness, organic and inorganic matter and the abundance of phytoplankton. This will be closely related to the growth process and the reproduction cycle of sea cucumbers.

In April and June the catch is higher than in March and May. The fluctuation pattern is thought to be related to the reproduction pattern of sea cucumbers in nature. According to Chao et al. (1995)

the reproduction cycle of sea cucumbers lasts throughout the year with a reaturation period of 2 months in summer and 4 months in winter. The waters in Kramian include tropical areas that have warm conditions throughout the year with conditions approaching summer. The time needed by sea cucumbers to reproduce can last 1 to 2 months.

4. Conclusion

The catch of sea cucumbers on the island of Kramian from March to June, the highest in June 733.6 Kg. The growth of sea cucumbers is good enough so that fishermen can meet their daily needs. Catching sea cucumbers continuously regardless of size and type can reduce sea cucumber stocks in the wild and have not been matched by cultivation activities. Therefore, the government needs to pay attention to the potential of sea cucumbers on the island of Kramian by prohibiting the overfishing of sea cucumbers.

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