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Research Article

Sandfish (*Holuthuria scabra*) Fisheries in Saleh Bay: Stock Status Based on Fishermen's Perception and Catches

Perikanan Teripang Pesisir (*Holuthuria scabra*) Teluk Saleh: Status Stok berdasarkan Persepsi Nelayan dan Hasil Tangkapan

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Abstract

The exploitation of sandfish (*Holuthuria scabra*) in Saleh Bay is so far not well managed. Consequently, over-fishing and species extinction of sea cucumbers emerge. Currently, information related to the supply of sandfish (*H. scabra*) is very limited. The purpose of this research was to investigate the stock status of sandfish (*H. scabra*) based on the fishermen's perception and fish capture information. This research was carried out in the Saleh Bay coast, Sumbawa District, West Nusa Tenggara. The method used was a semi-closed interviews with the scope of fishermen's demography, methods, efforts and catches, and fishermen's perception of the stock condition, conducted by a total of 39 respondents. The result of this research showed that sea cucumber fishermen consisted of male and female with a ratio of 46 : 54, age ranged between 26-59 years old, all were married; education level between unschooled to senior high school; fishermen were from Bajo tribe (37%), Bugis (25%), Samawa (5%) and Mandar (33%). Sea cucumbers were caught by hands for 5-6 weeks (1-4 hours per day), CPUE ranges between 2 to 25 kg (wet weight). The main reason for capturing sea cucumber was because of the ease of method (97%). 84% of the fishermen stated that sea cucumber stock in Saleh Bay declined. The research cocluded the fishermen on Saleh Bay assumed that sandfish (*H. scabra*) had decreased in stock.

Abstrak

Eksploitasi teripang pasir (*Holuthuria scabra*) di perairan Teluk Saleh terus dilakukan tanpa adanya pengelolaan sehingga memacu terjadinya kelebihan tangkap dan bahkan bisa menyebabkan kepunahan spesies teripang pasir. Kurangnya ketersediaan informasi dan data terkait stok menyebabkan sulitnya pengelolaan teripang pasir (*H. scabra*) di perairan Teluk Saleh ke depannya. Tujuan dari penelitian ini adalah untuk mengetahui staus stok teripang pasir (*H. scabra*) berdasarkan persepsi nelayan dan gambaran hasil tangkapan. Lokasi penelitian yaitu di pesisir wilayah perairan Teluk Saleh, Kabupaten Sumbawa, Nusa Tenggara Barat. Metode yang digunakan ialah wawancara semi tertutup dengan menggunakan kuesioner. Aspek yang dikaji dalam wawancara terdiri dari : 1) demografis nelayan; 2) metode, upaya dan hasil tangkap serta 3) persepsi nelayan terhadap kondisi stok. Responden dalam penelitian ini ialah nelayan penangkap teripang yang berada di pesisir Teluk Saleh. Jumlah responden adalah 39 orang. Hasil penelitian menunjukkan bahwa penangkap teripang pasir terdiri dari laki-laki dan perempuan dengan rasio 46 : 54%, usia berkisar antara 26-59 tahun, nelayan berstatus telah menikah, tingkat pendidikan nelayan mulai dari tidak bersekolah hingga SMU, nelayan berasal dari suku Bajo (37%), Bugis (25%), Samawa (5%) dan Mandar (33%). Penangkapan teripang dilakukan menggunakan tangan, penangkapan dilakukan 5-6 minggu-1 (1–4 jam hari-1), CPUE ialah 2 hingga 25 kg (berat basah), alasan utama nelayan (97%) menangkap teripang pasir adalah kemudahan metode penangkapan, 84% nelayan menyatakan bahwa stok teripang pasir di Teluk Saleh mengalami penurunan. Kesimpulan dari penelitian ialah sebagian besar nelayan Teluk Saleh menganggap bahwa teripang pasir (*H. scabra*) telah mengalami penurunan stok.

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1. Introduction

Sea cucumber is one of the sea invertebrates that has been exploited in some waters in the world. The exploitation keeps increasing from year to year since the development of the use of sea cucumbers in many sectors, primarily in the medical sector. Chinese traditional medication relates to consuming sea cucumbers to joints, urinary problems and cancer healing (Purcell *et al*. 2014). The latest research shows that sea cucumbers have high protein and amino acid and some other bioactive compounds (Aydin *et al*., 2011; Roggatz *et al*., 2016, 2017; Sicuro *et al*., 2012), as a natural source of steroid, natural aphrodisiac, menopause and post-menopause medication substance (Riani *et al*., 2005), and play role to beautify and to increase fish production and shrimp masculinization (Riani 2010; Riani *et al*., 2006).

Sea cucumber utilization has made an impact on the increasing consumers of sea cucumbers in the world. Purcell *et al*. (2013) said that the number of sea cucumber consumers in Asia was more than one billion. The more increasing the number of consumers makes more demand for sea cucumbers and the price is getting more expensive from year to year. This has an impact on the high exploitation of sea cucumbers in nature (Berkes *et al*., 2006; Brewer *et al*., 2012; Cinner *et al*., 2013; Cinner and McClanahan, 2006). Bell *et al*., (2008) said that market demand always correlated with the decrease in fishery resources. Continuous exploitation without good management has caused sea cucumber supply in some waters in the world decreases. Purcell (2013) said that there were more than 70% of sea cucumbers in the world had decreased in stock and even some species had been used up. The global stock decline of sea cucumber is indicated from the import value of sea cucumber in Hongkong market form $347 million in 2012 to $273 in 2015 (Trade Consul Consulate General of the Republic of Indonesia for Hong Kong SAR People Republic of China, 2016).

Indonesia becomes one of the countries which experience stock declining of sea cucumbers. Based on the data of exported dried sea cucumber, it is known that Indonesia exported 871 tons of sea cucumbers in 1981. Then it increased by 4,600 tons per year from 1987 to 1990 (Bruckner *et al*., 2003). However, the volume of sea cucumbers decreased by 80.32% into 905.23 tons (BPS RI., 2012). An indication of a decline in stock was seen from the export value of sea cucumbers that declined by 2.4% in 2014 to 2015 (UN Comptred, 2016). Sea cucumber export condition that kept declining indicated that there were a decline and a threat to the population and stock of sea cucumber in nature. Conand *et al*., (2014) said that there were 16 species of sea cucumber classified as "susceptible" and "threatened" on IUCN (*International Union for Conservation of Nature*) list.

Based on information released by IUCN, one of the species of sea cucumber that is classified as "susceptible" is *H. scabra* or sandfish. Stock declining of sandfish is alleged because of its higher price than other kinds of sea cucumber. Purcell *et al*., (2014) said that the highest price of dried sea cucumber in the Hongkong market was US$ 1.668 kg^{-1}. The high price of sandfish in the global market and its ease in catching sandfish have caused overexploitation of this species so that it made its stock declining in nature.

Stock declining of *H. scabra* in the water has become a problem that will influence ecological, social and economic aspects. Losing one species will ecologically eliminate the function of the species in the ecosystem. Sea cucumbers, including *H. scabra*, have some important role in water ecosystem, including as deposit and filter feeder, affecting nutrient cycle, improving sediment quality, play an important role in food chain cycle, increasing the species numbers, stimulating the growth of microalgae and play a role in sediment mixing in underwater layer (Purcell *et al*., 2016 ; MacTavish *et al*., 2012). Based on the ecological function, it can be predicted some effects that may occur if the population of sea cucumber in nature significantly is declining or have used up. Based on the social and economic aspect, stock declining of sea cucumber *H. scabra* made an effect on the fishermen's income that becomes lower, collectors and parties involved in sea cucumber fishery business. Based on the importance value of *H. scabra* in nature, both ecologic and social-economic, sea cucumber management needs to be done seriously, primarily at the places where *H. scabra* exploited, such as in Saleh Bay in Sumbawa District.

Saleh Bay is one of the waters in Indonesia that has been used to catch sea cucumbers. Located in Sumbawa Island, the water has been the center of sandfish (*H. scabra*) fishing. Although sandfish have been exploited for a long time on the coast of Saleh Bay, information and data of researches related to sandfish are still limited. It is caused by a little number of researches in Saleh Bay. Related information of sandfish was taken from the research by Yusron (2003). He stated that sandfish density in Saleh Bay water was ranged between 1.26 – 1.32 individuals m^2. Lack of information and data has become one of the problems in sea cucumber fishery

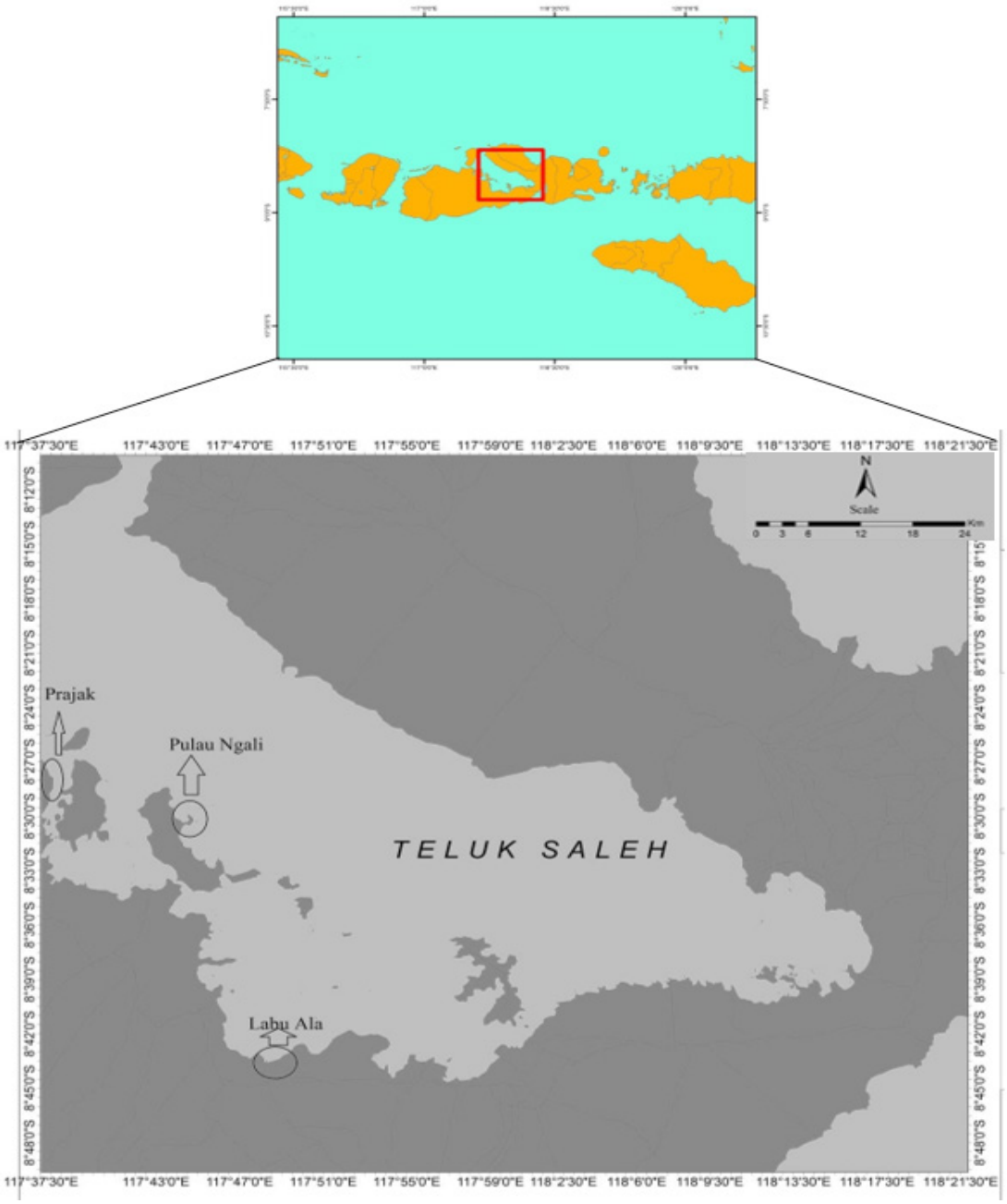

Figure1. Research Location on the Coast of Saleh Bay; they are Ngali Island (Labu Kuris Village), the coast of Prajak Water (Batu Bangka Village) and Labu Ala (Brang Kolong Village.

management. Bannet and Basurto (2018) said that sea cucumber fishery in tropical countries has experienced mismanagement. It is caused by the availability of data related to the stock status and the social-economic status of the fishermen.

Data or information about stock status, fishing method and social-economic of sandfish (*H. scabra*) in Saleh Bay are still limited so that it makes sandfish management more difficult in the future. Size and the number of catches, also fishermen's perception of the stock can be used as a basis for describing the situation or stock status in water. Stock status of sandfish in general has been studied based on the export data (Anderson *et al*., 2011; Conand, 1990), through an underwater sea cucumber survey by diving (Berkes *et al*., 2006 ; Cariglia *et al*., 2013 ; Conand 1989 ; Dissanayake and Stefansson 2010 ; Eriksson *et al*., 2015; Friedman *et al*., 2011; Purcell *et al*., 2009; Shepherd *et al*., 2004 ; Skewes *et al*., 2010). Some researches also studied sea cucumbers from the fishermen's knowledge (Conand and Muthiga 2007; Eriksson, de la Torre-Castro and Olsson 2012 ; Ochiewo *et al*., 2010). However, there has been no related research about stock status description based on the catches and fishermen's perception primarily on sand-

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fish (*H. scabra*) until now. Therefore, as the first step in sandfish management in Saleh Bay, this research is conducted to know the general description of sandfish stock based on the fishermen's perception and catch size.

2. Material and Method

2.1 Location and Time of Research

This research is located on the coast of Saleh Bay, Sumbawa District, West Nusa Tenggara. The three villages on the coast of Saleh Bay that became the research location are Ngali Island (Labu Kuris Village), Prajak coastal water (Batu Bangka Village), and Labu Ala (Brang Kolong Village) (Figure 1). The research was done in Juli to September 2018.

2.2 Survey Method and Data Retrieval

Data retrieval was done by interviewing and using a semi-closed questionnaire. The respondents of this research were fishermen who caught sea cucumbers as their main occupation or as their side occupation. Respondents were chosen by using the snowball method (Cinner 2005; Henry 1990). Snowball is an approach to find key informants who have a lot of information.

In this research, data from the questionnaires and interviews included some aspects; they were 1) respondents' demographic information, such as sex, education level, marital status, and race; 2) Information about sandfish catching system, such as type of catch, fishing location, numbers of catch, time needed to do one catching attempt and some other information related to sandfish fishing; 3) the reasons of catching and the fishermen's perception on sandfish stock.

Respondents were from three villages on the coast of Saleh Bay; they were the coast of Labu Ala (Brang Kolong Village), the coast of Ngali Island (Labuhan Kuris Village), Prajak (Batu Bangka Village). Those three locations are places where most of the sandfish (*H. scabra*) fishermen live in the Saleh Bay area. 39 respondents were taken from those locations. The respondents were people who catch sandfish or ever caught sandfish years before. Every respondent was interviewed for about 40 to 60 minutes using Indonesian and local language (Sumbawa language). The purpose of using the local language was that the fishermen could understand the questions.

Data on the size of catch and numbers of catch were obtained from the interviews and direct measurement. Fishermen's catches that just landed were then measured the number of individuals, length, weight and the total weight of the catch. The data was then analyzed descriptively.

3. Result and Discussion

3.1 Fishery Type and Sandfish Fishermen Demographics

The research results show that sea cucumber fishery in Saleh Bay is classified as small-scale fisheries involving small fishermen and or coastal communities. Bennett and Basurto (2018) said that invertebrate fisheries, including sea cucumber, were classified as small-scale fisheries. Purcell and Pomeroy (2015) stated that small-scale fisheries were located in developing countries including Indonesia. Small-scale fisheries dominated as much as 90% of the world fisheries and contributed half of the world catches (FAO, 2014). Previous research by Tuwo (2004) said that sea cucumber fisheries in Sulawesi were done by small fishermen. It is showed that sea cucumber fisheries have been in the same category since a few years ago, that was small-scale fisheries.

In this research, some descriptions related to the demographic aspects of sandfish fishermen (*H. scabra*) in Saleh Bay is shown in Figure 2. Based on the sex aspect, the sandfish fishermen in Saleh Bay consist of men and women with a ratio of 46%:54%. The ratio shows that there is 8% more female than male fishermen. In some research results said that women often took parts in invertebrate fisheries including sea cucumbers (Crawford *et al*., 2010; Harper *et al*., 2013; Lambeth *et al*., 2014; Mecki *et al*., 2010). The difference between male and female fishermen in catching sea cucumbers included the number of catch and catching area (Frocklin *et al*., 2014; Lambeth *et al*., 2014). The result of this research was different from the other research which showed that sea cucumber fisheries in the Indian Ocean and Southeast Asia were generally dominated by a male (Choo 2008 ; Eriksson *et al*., 2015 ; Ochiewo *et al*., 2010 ; Muthiga and Conand, 2014). Purcell *et al*., (2013) stated that in global fishery activities, the number of women involved in fishery activities was more than 15%. In Kiribati, there were only a few women involved in sea cucumber fisheries (Purcell *et al*., 2016). History about how women involved in sea cucumber fisheries years before was still unknown for sure. It is because researches related to the issue have not been conducted. However, it was known from the interview that women had been involved since the beginning of sea cucumber fishery activities.

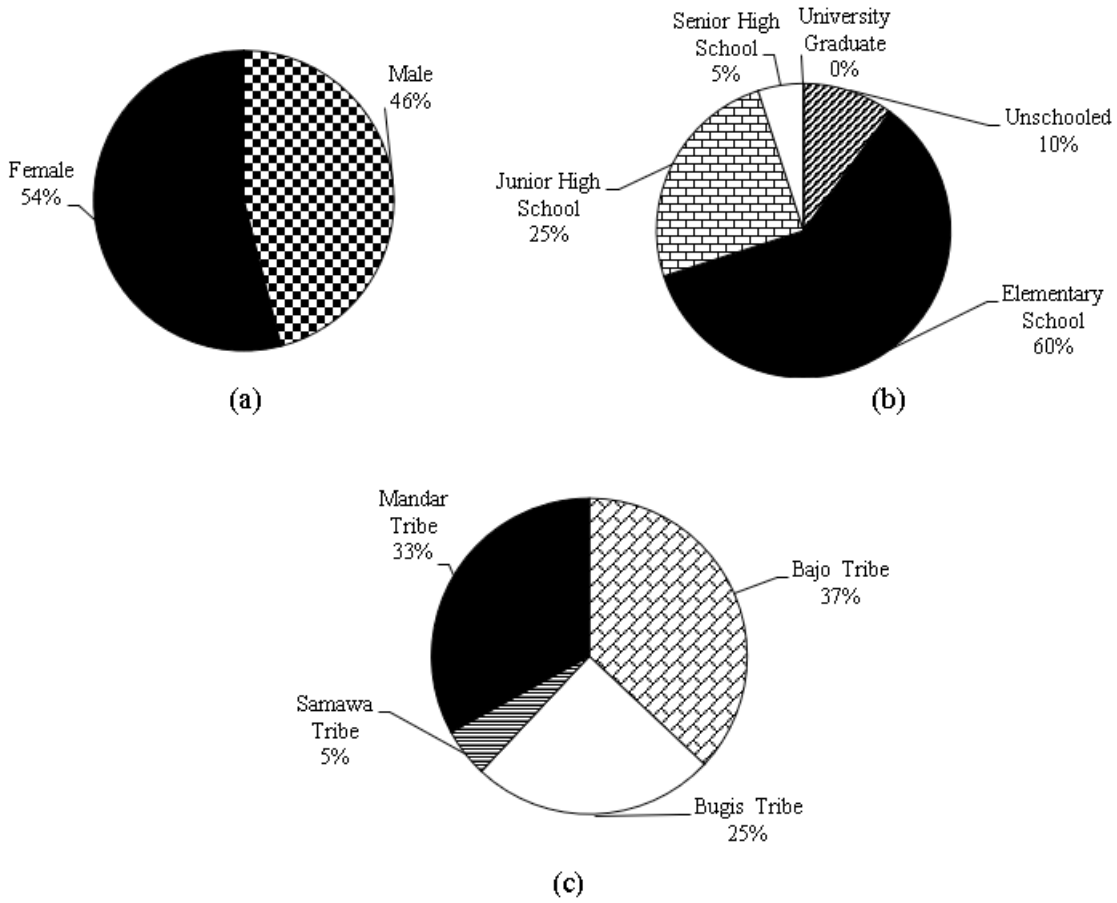

Figure 2. Sandfish (*H. scabra*) Fishermen Demographics on the Coast of Saleh Bay. (a) sex; (b) education level; (c) tribe

The role of male and female fishermen in sandfish (*H. scabra*) fisheries caused sandfish exploitation higher than the other kinds of sea cucumbers, such as curry fish (family: Sticopodidae) that only be caught by men by diving at the certain depth. Woman involvement in sandfish fishing in Saleh Bay was caused by some factors, including sandfish habitat that was easily accessible and located in the tidal area (deep diving until seabed was unnecessary), they could be caught by hand and became a social activity with a lot of fun. Age of sandfish (*H. scabra*) fishermen in Saleh Bay ranged between 26 to 59 years old with an average of 36 years old, which was categorized into an adult and productive. Purcell *et al*., (2016) said that sea cucumber fishing was an activity that involved adults and some of them were children and teenagers. Purcell *et al*., (2016) said that the age of fishermen did not affect the catches. Further interviews with the fishermen showed that fishermen at the age of 26-36 years old did the sea cucumber fishing more often than the ones at the age of ≥ 59 years old. This research had similar results to the research in the Philippines, which stated that younger fishermen caught sea cucumbers more often (Muallil *et al*., 2013).

One of the reasons for the high number of young fishermen (± 36 years old) in sea cucumber fishing in Saleh Bay was that people at that age had enough energy to do the fishing activity in quite a long time duration with wide range area. Besides their energy, fishermen at this age had good sight so that it was easy for them to recognize sandfish in the night.

Based on the education level, sandfish fishermen's education was on the level of unschooled, Elementary School until High School, with the highest composition, was on Elementary School level. The low level of education of respondents caused a lack of opportunity to get the other job that required a higher education levels. It made the fishermen use (exploited) resources around them, including sea cucumbers, to improve their prosperity. Apart from that, sea cucumber fishing does not need special skills, therefore it can be done by people from any education level or even people who have no education (unschooled). In this research, sea cucumber fishermen with bachelor degrees were not found.

Based on the marital status, most of the sea cucumber fishermen respondents are married men or women. Among 37 respondents, there was only one re-

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spondent who has not married. Further interview with the married respondents showed that sea cucumber fishing was done to increase family income. Based on the indigenous tribe of fishermen, sandfish fishermen were from the Bajo tribe (37%), Bugis (25%). Samawa (5%) and Mandar (33%). The results showed that the sandfish fishermen native tribe in Saleh Bay were dominated by Bajo and Mandar tribe. Artanto (2017) said that the community of Bajo and Banjar tribe lived in some waters in Indonesia, primarily in the east of Indonesia including the coast of Saleh Bay. Bajo tribe also lived in Johor and the Philippines.

3.2 Method, Attempts and Catches of Sandfish in Saleh Bay

The research results showed that fishing methods used by all respondents were all the same; namely sandfish fishing in shallow waters and took them by hands. From the interview, the respondents told that fishing by hand had been done for a long time ago. On the coast of Saleh Bay, sandfish fishing in the shallow waters was called "bekelili". This method was also used in other waters. Purcell *et al*., (2013) and Toral-Granda *et al*., (2008) stated that the sandfish fishing method had been used in some world waters generally by hands. Some researches in other places also showed that sandfish were collected by hands (Choo 2008 ; Eriksson *et al*., 2010 ; Raboanaijoana 2013) .

Sandfish were taken when the seawater tide was going out until it was coming in. From a further interviews with the fishermen, sandfish fishing was rarely or even never carried out by diving. The diving method was only used on the other kinds of sea cucumber, such as curry fish (Sticopus) which lived in the coral reef ecosystem. While sandfish (*H. scabra*) was one of the commercial species lived in the shallow waters (Pitago *et al*., 2018; Wolkenhaur *et al*., 2010). Purcell *et al*., (2016) said that fishing method used to collect sea cucumbers were catching in the shallow waters and some other kinds were done by diving.

Fishing activity was done when the water tide was going out until it was coming in and it was in the evening until midnight (at about 18.00-22.00 Central Indonesia Time). Fishing was done at that time because it was easier to find sea sand than in the afternoon. According to the fishermen, sandfish usually buried themselves in the sand in the afternoon and went out for food at night. This information showed that the fishermen had known sandfish behavior in nature well. To make the fishing activities easier, fishermen usually had flashlights, boots, and buckets with them. The flashlight was used as lighting equipment during the activity, while buckets were used to put the catches.

Interview result with 39 respondents on how to get to the fishing location showed that there were two ways to get to the location, walking and using a boat. The percentage of walking and going by boat was 75%:25% (Figure 3). A higher percentage on walking showed that the sandfish fishing location was not far from the respondents' houses. The interview result also showed that the time needed to get to the sea cucumber fishing location was about 15-30 minutes on foot, with the average time of 25 minutes.

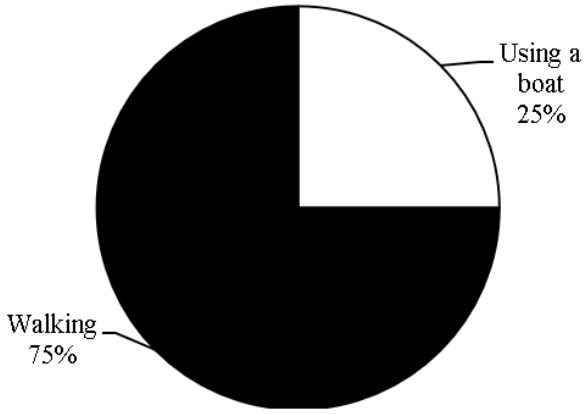

Figure 3. Composition of how fishermen of Saleh Bay get to the sandfish fishing location

Respondents did the fishing for an average of 5 to 6 days per week with 1 to 4 hours of the intensive time of fishing per day with an average of 3.5 hours a day. Most of the fishermen did not do the fishing on Fridays. This became a hereditary tradition in this area. The weekly fishing frequency in the coast of Saleh Bay was higher than other sea cucumber fishermen such as in the Philipines (3.4 – 4.6 days a week) (Muallil *et al*., 2013), Solomon Island (Ramofafia *et al*., 2005), Papua New Guinea (Kaly *et al*., 2005) and Kenya (Ochiewo *et al*., 2010). According to Purcell (2016), sea cucumber fishing and other commodity were much affected by some factors; that was fishermen's other jobs. Fishermen who had other jobs, such as farmers or builders, had a lower frequency of fishing than the ones who did not have other jobs. Most of the fishermen from the coast of Saleh Bay, primarily in Ngali Island, made sandfish fishing as their main job. While in the other two locations, sandfish fishing did not become their main job (only side job).

The time needed to do the sandfish fishing in a day in Saleh Bay was generally the same as other tropical

Figure 8. Distinctive Size of Sandfish (*H. scabra*) Caught in Saleh Bay Water

Table 1. Total Number, Size and Price of Sandfish (*H. scabra*) in the Coast of Saleh Bay

Location	Catch Overview			
	CPUE (kg.h^{-1} person)	Average length ind (cm)	Average weight ind (g)	Price kg^{-1} dried
Ngali Island	25	23.70	455	200,000 – 350,000
Prajak	1.5	12.00	120	200,000 – 350,000
Labu Ala	5	17.20	230	200,000 – 350,000

fishing locations in Indo-Pacific (Eriksson *et al*., 2010; Kaly *et al*., 2005 ; Ochiewo *et al*., 2010). However, fishing activity in Saleh Bay tends to get lower than the fishing in Tonga (average: 5.9 hours per day) (Purcell *et al*., 2016).

In one catch at a time, the number of catches between locations was far different. The number of catch on the coast of Labu Ala (Brang Kolong Village), Prajak and Labu Kuris village was lower than in Ngali Island. The average fishermen catch in Ngali Island was 25 kg (wet weight), while in the other three locations the fishermen could only catch 2 to 5 kg (wet weight).

The length and weight of the caught sandfish became one of the ways to assess the health of stock in water (Purcell *et al*., 2016). The research result showed that the sandfish length range in the coast of Saleh Bay was about 12 to 37.70 cm. The sandfish length in Saleh Bay was longer than the sandfish length in Un Bay, Southeast Maluku, but shorter than the sandfish in Morella waters, Central Maluku. According to the research result of Natan *et al*., (2015), the sandfish (*H. scabra*) length range in Un Bay was 9.50 to 223.00 cm. However, research by Ongkers *et al*., (2018) showed that sandfish length in Morella water, Central Maluku was about 9.5 to 28 cm. In Mahout Bay (Oman), the sandfish length ranged between 13 to 30 cm; in Lampung Bay ranged between 7 to 27 cm (Riani 2011) ; along Dar es, Salam ranged between 12-17 cm. Riani (2011) said that productive sandfish were 18-30 cm in size. According to the size, sandfish caught in Saleh Bay were categorized as unproductive and productive, so it was worrying for the sandfish population in the future. The average weight of sandfish caught in Ngali Island was 200-500 grams, in Labu Ala was 100-300 grams, and while in Prajak it was about 70-75 grams. The weight of sandfish caught in Un Bay was about 80-150 grams, while in Morella water was about 26-201 grams. Catch per Unit Effort in Saleh Bay was about 1.5 to 25 kg per person per day (Table 1). The number of catches in Saleh Bay was different from the other waters. Hunter *et al*., (2002) showed that CPUE of black sea cucumber was about 12 kg – 14 kg per day. In the Rasa Island wildlife reserve in the Philippines, CPUE was 1.79 kg per person per day (Dolorosa *et al*., 2017).

3.3 The Reason Fishermen Catch Sandfish (H. scabra)

Sea cucumber exploitation by fishermen was caused by some reasons including its high price and increased demand (Purcell *et al*., 2014). In this research,

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the fishermen were faced with four reasons why they catch sandfish; 1) high sandfish price; 2) easy fishing method; 3) they weighed heavier than the other kinds of sea cucumber; 4) collective traders preferred them; 5) other reasons. Research results showed that 97% of respondents said that they preferred catching sandfish better than the other kinds of sea cucumber because sandfish were easier to catch. According to the respondents, sandfish fishing did not need big efforts and much cost compared to the other kinds of sea cucumber. This was different from the research by Purcell *et al*., (2014) which stated that sandfish (*H. scabra*) fishing in the world was more because of its high price, high demand, and its wide deployment. This factor was said as the main cause of species distinction. Some studies showed that sandfish fishing in some locations was caused by its high price compared to the other kinds of sea cucumber (Purcell *et al*., 2018). Different from the other researches, this research showed that sandfish price was far lower than the other kinds of sea cucumber, therefore selling price was not the main reason for sandfish fishing. The price of dried sandfish at the collectors was around Rp 200,000 – 300,000 per kilograms, while the price of other kinds of dried sea cucumber, like curry fish, was around Rp 500,000-750,000 per kilograms. The low price of sandfish in the coast of Saleh Bay was because of the small size of sandfish caught the fishermen, so that it produces small dried sandfish with a 3-4 cm in size. Purcell *et al*., (2018) said that the size and type of sea cucumber affected the price in the global market. *H. scabra* was a kind of sea cucumber with the highest price, but its price was affected by the size of sandfish. Sandfish with a size of ≤ 4 cm priced at less than US$100, while the ones with a size of ≥ 12 cm priced at ± US$1000 (Purcell *et al*., 2018). Further interviews with the fishermen showed that 3% of the respondents had other reasons to catch sandfish. What was meant by "other reasons" was the joy they felt when doing sandfish fishing because they did it together with other people.

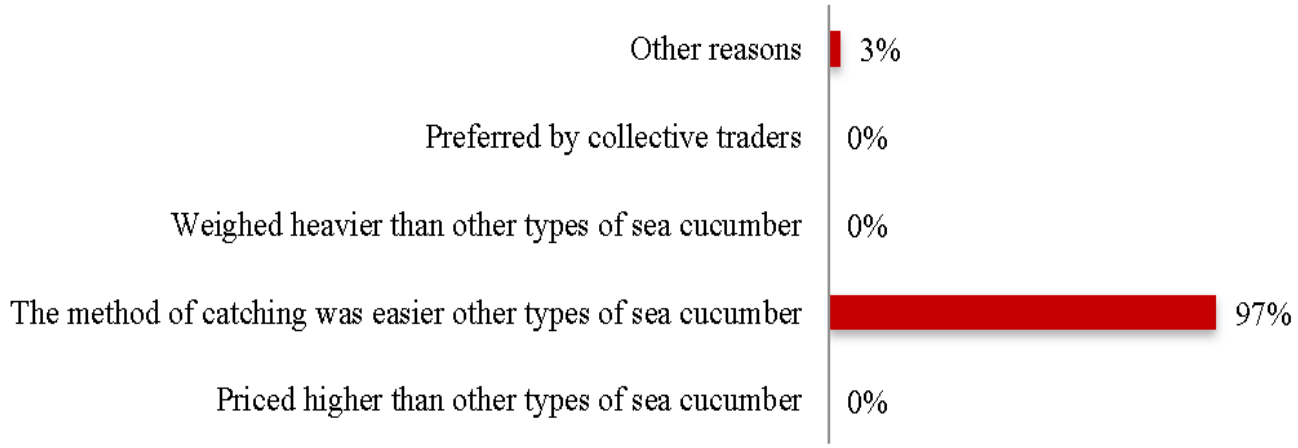

Figure 9. The Reasons Fishermen Prefers Sandfish Fishing

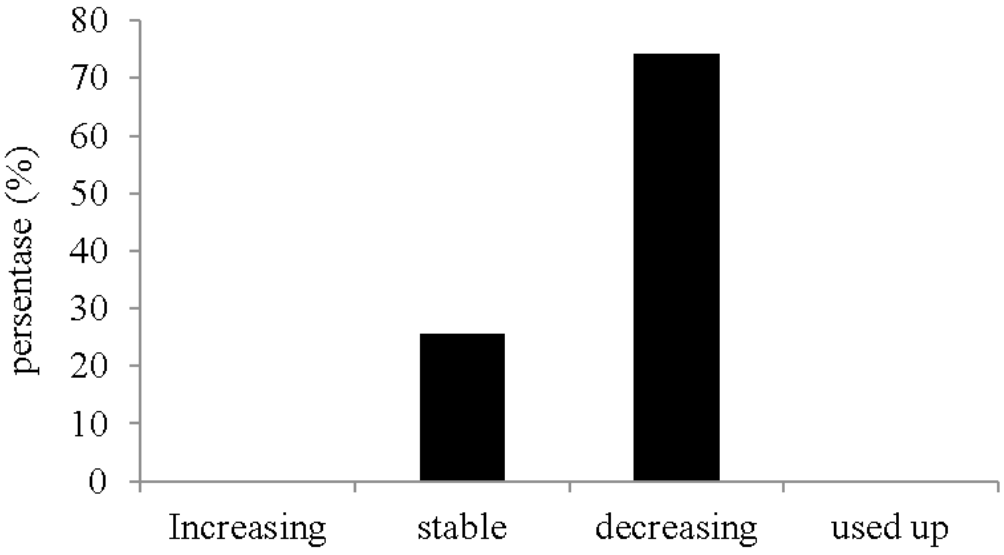

Figure 10. Fishermen's Perception of Stock Condition of Sandfish in Saleh Bay

This reason has never come up in previous researches. Other research said that sandfish fishing was carried out because of its high price, its location near the fishermen's settlement and because it was easy to find in shallow waters (Purcell *et al*., 2014).

3.4 Fishermen's Perception of Sandfish Stock in the Saleh Bay Water

Fishermen's perception related to stock status or population in water became very important to know primarily for resources that were not yet available or had a little availability in stock data of previous years. Information from the fishermen became an effort to get a stock overview in the past and present in water. Fishermen's majority perception said that the stock has decreased or has been used up. It became an indicator of overfishing (Friedman *et al*., 2008). Stock declining has been shown through fishermen and traders' perceptions in Zanzibar (Eriksson *et al*., 2010).

According to the questions about fishermen's perceptions of the change in sea cucumber abundance, 29 of 39 respondents said that sea cucumber abundance in Saleh Bay water was declining, while the other 10 respondents said that the abundance of sea cucumber in Saleh Bay was still stable. (Figure 10)

Interview results showed that sandfish (*H. scabra*) was a kind of sea cucumber that has decreased drastically compared to the other kinds of sea cucumber. The decrease in abundance of sandfish (*H. scabra*) was known from the fishermen's catch history from the 1990's until now. The interview result stated that in the 1990's, respondents could catch an average of 10 kg (dry weight) of sandfish at once, but in the last three years (2015-2018), fishermen could only get an average of 1-3 kg (dry weight) of sandfish during 6 days of fishing.

Fishermen's perception on the stock status of sandfish (*H. scabra*) in Saleh bay water showed that 84% of fishermen said that the stock was decreasing from the previous year, while the other 16% of the fishermen said that the stock of sandfish was still stable. The high percentage which stated that the stock has been decreasing became the indicator that high exploitation has happened. Friedman *et al*., (2008) stated that the trust of most of the fishermen in the declining of stock or even the stock has been used up became the strong indicator that over-exploitation has happened. A study related to stock status based on the fishermen's perception was conducted by Purcell *et al*., (2018) in three countries (Fiji, Kiribati, Tonga, and New Caledonia). It stated that stock status in the three countries has been declining or has been used up. The stock in Saleh Bay is better than the three countries. From a further interviews about when the decline stock of sandfish started to occurred, obtained information that some fishermen started to feel a decline in stock in 2010 while other fishermen said that it started in the 2000's.

Results of the in-depth analysis showed that there was a different perception in the year of stock decline influenced by differences of fishermen locations. Most of the fishermen from Brang Kalong Village, Prajak (Batu Bangka) and Labu Terata (Labu Kuris village) said that the decline started in 2001, while fishermen in Ngali Island (Labu Kuris Village) said that the decline started in 2010. Locations that have experienced a decline in stock since 2001 were the locations that have carried out sandfish fishing for a long time. The easy access for collective traders (sandfish buyers) and the fishermen have affected in increasing the exploitation of sandfish. Different from that location, Ngali Island has experienced the sandfish decline in 2010. It was because the location was far from society. To get to the location, the journey took 2 hours by boat. The location was far from the city center and the transportation to the location was difficult. That condition made the place rarely exploited by fishermen on the coast of Saleh Bay. The number of the family lived on the island was only 7 families. That became one of the factors of the slow exploitation of sandfish in this location. O'Regan (2015) stated that perception of the stock decline or stability of a stock depended on the fishing location. According to the fishermen, the cause of sandfish decline nowadays was because of the high exploitation of sandfish in the previous years. The high exploitation of sandfish years before due to the low price of sandfish, therefore people tend to get more sandfish to get more income. Apart from that, the high exploitation of sandfish was caused by too many fishermen in the previous years. The result of this study was similar to the studies by Purcell *et al*., (2016) that stated the decreased number of sandfish was caused by the high number of fishermen thereby increasing the exploitation. According to Bell *et al*., (2018), sandfish exploitation in the past had made the number of sandfish was declined or low. Bell *et al*., (2018) also said that stock decline interfered reproduction process, increased natural death which then increased the potential of species distinction.

4. Conclusion

Sandfish (*H. scabra*) fisheries in Saleh Bay water is still carried out using conventional method (straightly taken by hands) and was done by the fishermen (small-scale fishermen). The low price of sandfish compared to the other kinds of sea cucumber and the ease of fishing become the causative factors in the increase of sand-

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fish exploitation in Saleh Bay. Sandfish exploitation has been carried out since the 1990s and 84% of the respondents said that the number of sandfish in nature was decreasing. Therefore, further studies related to the sandfish management strategy in Saleh Bay.

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Authors' Contributions

All authors discussed the results and contributed to from the start to final manuscript; Ner: collected data, wrote the paper, conceived and disegned the research, Etty: conceived and disegned the research, wrote the paper, performed the analysis of result and discussion, Djam: conceived and disegned the research, performed the analysis of result and discussion, Sig:conceived and disegned the research, performed the analysis of result and discussion, wrote the paper

Conflict of Interest

The authors declare that they have no competing interests

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