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Abundance and Diversity of Sea Cucumber (*Holothuroidea*) in Hajoran Beach, Central Tapanuli, North Sumatra

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ABSTRACT

Hajoran is a beach located on the coast of Pandan District, Tapanuli Tengah Regency, North Sumatra. This beach is one of the popular tourist destinations. It boasts high marine biodiversity, including a diverse array of marine organisms, which are part of the invertebrate animal group. This study was conducted in December 2024 along the Hajoran coast. The objective of this study was to determine the species, abundance, and diversity of sea cucumbers. The study also utilized supporting data, including water quality parameters that characterize the habitat conditions of sea cucumber species, such as temperature, salinity, depth, dissolved oxygen (DO), and total suspended solids (TSS). The study employed a survey method with sample collection using the quadrant transect method at three stations. Based on the study's results, four species were identified at the study site: *Holothuria atra, H. scabra*, *Stichopus ananas*, and *S. chlorosomatus*. The average abundance at all stations ranged from 9.600 to 14.000 ind/ha; the highest abundance was recorded at station III. The relative abundance values for each sea cucumber species ranged from 8 to 100%. The lowest relative diversity value was shown by the species *S. chloronotus*, with a value of 8% at station III. Conversely, the species *H. atra* exhibited the highest relative diversity value. The diversity index (H') of sea cucumbers at the research site was classified as moderate. Overall, the relatively stable and standardized water quality conditions at Hajoran Beach support the abundance and diversity of sea cucumber species.

Keywords: Abundance, Diversity, Sea Cucumber, Hajoran beach

1. INTRODUCTION

In Indonesia, sea cucumbers currently have no protected status; however, they could be included in the CITES Appendix list. Thus, it is necessary to strengthen data related to the condition of the sea cucumber population. In the world, it is recorded that there are more than 1,400 species of sea cucumbers, and around 66 of these species are included in commodities. Meanwhile, in Indonesia, there are 350 species of sea cucumbers, with 54 species included in the group of traded sea cucumbers. However, of the 54 species, only 33 have been taxonomically validated (Sadili et al., 2015).

In Indonesia, 10% of the 650 sea cucumbers are sea cucumbers worldwide. Of that number, the following are four types that are classified as having high selling value, namely blood sea cucumbers (*Holothuria atra*), sand sea cucumbers (*H. scabra*), spiny sea cucumbers (*S. chloronotus*), and pineapple sea cucumbers (*S. ananas*). Sea cucumbers (*Holothuroidea*) are characterized by their soft, fleshy bodies and elongated cylindrical shapes like cucumbers. Their bodies have spines, which are skeletons made of lime. Their colours range from black, grey, brownish, reddish, and yellowish to white, and their movements are such that they spend almost their entire lives diving (Romadhoni, 2013).

Sea cucumbers (*Holothuroidea*) are one of the primary commodities in the Ministry of Maritime Affairs and Fisheries' development program. Sea cucumbers have a vital economic and ecological role (Handayani et al., 2017). The body of sea cucumbers contains a high nutritional content, comprising 82% protein, 1.7% fat, 8.9% water, 8.6% ash, and 4.8% carbohydrates. With this high dietary content, coastal communities usually use sea cucumbers as food ingredients (Husny & Fadhilah, 2018).

2. RESEARCH METHOD

Time and Place

This research was conducted in December 2024. Data collection was located in the coastal waters of Hajoran Beach, Central Tapanuli Regency, North Sumatra Province (Figure 1)

and continued with sample analysis at the Marine Biology Laboratory of STPK Matauli Central Tapanuli Fisheries and the Marine Biology Laboratory of the Department of Marine Sciences, Faculty of Fisheries and Marine Sciences, Universitas Riau.

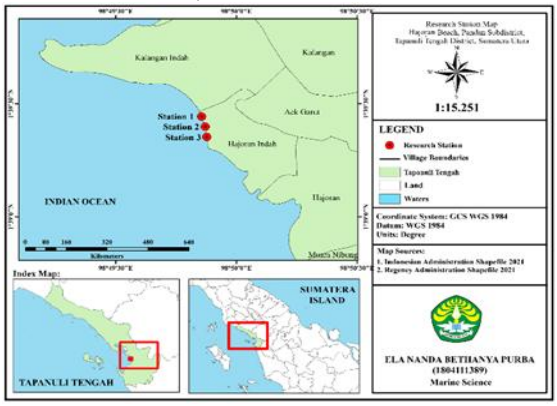

Figure 1. Research location

Method

This study employs a survey method, collecting primary data through direct observations in the field. Meanwhile, secondary data can be obtained from books, journals, literature reviews, papers, documents, and reports from institutions relevant to the topic. The samples obtained were analyzed at the Marine Biology Laboratory of STPK Matauli Tapanuli Tengah Fisheries and the Marine Biology Laboratory of the Department of Marine Sciences, Faculty of Fisheries and Marine Sciences, Universitas Riau. The parameters to be measured include the type of sea cucumber, abundance, diversity, and water quality parameters. The data obtained were analyzed descriptively.

Procedures

Sampling and Identification of Sea Cucumber Type

Sea cucumber sampling was conducted using the selected quadrant transect method, which is designed to represent the abundance of sea cucumbers. The location of the selected station was recorded using a GPS (Global Positioning System). Each station has three transects, with a distance of 50 m between transects. Each transect consists of three plots, each with a quadrant plot size of 5 x 5 m^2. The samples obtained were photographed using a digital camera as documentation material. Samples obtained in each plot were identified based on their morphological characteristics (Sadili et al., 2015).

Abundance of Sea Cucumber (*Holothuroidea*)

Abundance refers to the total number of species within a specific area unit. According to Brower et al. (1984), the formula of abundance is as follows:

$$D = ni/A$$

Description:
D = Simpson Dominance Index (ind/m^2)
ni = Total number of Species (ind)
A = Area of Transect plot (m^2)

Diversity of Sea Cucumber (*Holothuroidea*)

The index of diversity is determined by the formula Shannon-Wiener index (Kasry et al., 2012), with the following formula:

$$H` = ni/N$$

Description:
H' = Index of diversity
ni = Important value for each species
N = Individual total

Data Analysis

The data obtained from the calculations were analysed, presented in tables and graphs, and then discussed descriptively. Meanwhile, to see the differences in the abundance of sea cucumbers between stations in the waters of Hajoran Beach using a statistical method, namely the one-way ANOVA test using SPSS v.25 software.

3. RESULT AND DISCUSSION

Water Quality

Central Tapanuli Regency is located on the West Coast of Sumatra Island, with coordinates between 1º11'00 "and 2º22'00" LU and 98º07 'and 98º12' BT. The location of Hajoran Beach is hidden because it is situated behind a residential area and is administratively part of the Central Tapanuli Regency government area. This beach is directly adjacent to the Sibolga Navigation District office and the Sibolga Nusantara Fisheries Port (Sihombing, 2019). Hajoran Beach offers a range of interesting tourist attractions, featuring beautiful stretches of white sand. Access to this beach is about 7 km from Pandan City, Central Tapanuli Regency, and 10 km from the center of Sibolga City, passing through hills and uphill roads. Hajoran Beach also features two main ecosystems: the mangrove and seagrass ecosystems, with a vast expanse of seagrass. In addition, this beach has three types of substrates:

sandy, muddy, and rocky, which support biodiversity in the area. Water quality parameters were measured at each station by taking one in situ observation at each station point. The parameters measured include temperature, brightness, salinity, depth, DO, and TSS (Table 1).

Table 1. Result of water quality

No	Water Quality Parameter	Unit	Station Observation		
			I	II	III
1.	Temperature	°c	31	31,4	31,8
2.	Brightness	%	100	100	100
3.	Salinity	ppt	31	33	33
4.	Depth	m	0,86	1,2	1,3
5.	DO	mg/L	6,45	6,42	6,50
6.	TSS	mg/L	0,11	0,11	0,12
7.	Geography Location	-	1°39'2.42"N 98°50'5.99"E	1°39'7.18" N 98°50'3.62"E	1°39'7.61"N 98°50'2.32"T

Table 2. Species of sea cucumber in the research location

Class	Ordo	Genus	Species
Holothuroidea	Aspidochirotida	*Holothuria*	*Holothuria atra* *Holothuria scabra*
	Synallactida	*Stichopus*	*Stichopus chloronotus* *Stichopus ananas*

Table 3. Abundance of sea cucumber

Station	Species	Abundance (ind/ha) ± Standard Deviation
I	*H. atra*	12.800
	Amount	12.800 ± 3.100
II	*H. atra*	7.200
	S. chloronotus	2.400
	Amount	9.600 ± 3.500
III	*H. atra*	4.000
	H. scabra	4.800
	S. chloronotus	1.200
	S. ananas	1.400
	Amount	14.000 ± 6.100

Species of Sea Cucumber

Based on the research results, four sea cucumbers were obtained, namely, *H. atra, H. scabra, S. chloronotus,* and *S. ananas*. The most common species found in Hajoran Beach is the Holothuria atra species (Table 2).

In stations I and II, more species of H. atra were found, indicating that this species has a wide distribution in these waters. In addition, *H. scabra* was also found at station III. In the order Synallactida, the species *S. chlorous*, initially recorded at station II, was verified to refer to *S. chlorous*, which was also found at station III, along with *S. ananas*.

Abundance of Sea Cucumber

Based on the calculation results, the abundance of sea cucumbers at each station can be seen in Table 3.

Based on the research results conducted at three research stations, the abundance of sea cucumbers varied at each location. At the station, the species *H. atra* was recorded with an abundance of 12,800 ind/ha. At station II, the abundance of sea cucumbers consisted of *H. atra* with 7,200 ind/ha and *S.chloronotus* with 2,400 ind/ha, resulting in a total abundance of 9,600 ind/ha. Meanwhile, at station III, several species were found, namely *H. atra* (4000 ind/ha), *H. scabra* (4,800 ind/ha), *S. chlorous* (1,200 ind/ha), and *S. ananas* (1,400 ind/ha), with a total abundance of 1,400 ind/ha. These results indicate that the abundance of sea cucumbers varies between stations, with station III having

the highest total abundance and variations in the types of sea cucumbers identified at each station.

The high abundance of *H. atra* on Hajoran Beach cannot be separated from the characteristics of the water environment in this area, which is very supportive of sea cucumber life. Hajoran Beach is a coastal area with a relatively natural ecosystem, such as seagrass beds, coral reefs, and sandy-clay substrates rich in organic matter. These conditions are ideal for sea cucumber species that depend on detritus particles as their food source. *H. atra* can adapt to stable environmental conditions, especially in waters with good light penetration and low suspended particle content. At station I, *H. atra* dominates with a relative abundance of almost 100%. This is due to the maximum brightness (100%) and low TSS (0.11 mg/L), which allows optimal light penetration and the availability of abundant organic particles as the primary food source. These stable environmental conditions allow *H. atra* to grow and reproduce optimally (Budiarto & Setiawan, 2022).

Relative Abundance of Sea Cucumber

The research results conducted at Hajoran Beach show that *H. atra* mostly dominates the relative abundance of sea cucumbers at each station. To see the relative abundance value of each station, see Figure 2.

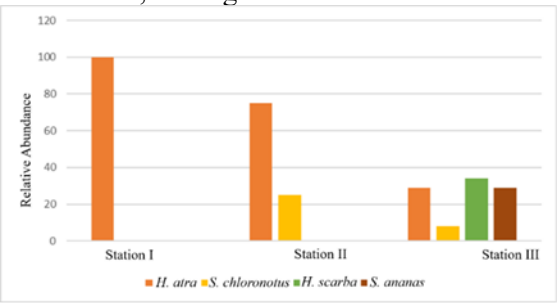

Figure 2. Relative abundance of each station observation

The results showed that *H. atra* dominated at Station I with a relative abundance of 100%, while no other species were found. At Station II, H. atra still dominated at 75%, followed by *S. chloronotus* at 25%. The relative abundance at Station III was more diverse, with *H. atra* decreasing to 29%, *S. chlorous* to 8%, and *H. scabra* and *S. ananas* reaching 34% and 29%, respectively. These results indicate that *H. atra* is the most dominant species; however, species diversity increased at Station III, resulting in a more even distribution.

Diversity of Sea Cucumber

The results of the analysis of the diversity index values (H') in Hajoran Coastal Waters can be seen in Table 4.

Table 4. The value of diversity (H`)

Station	Transect	Index Diversity (H`)	Mean of Diversity (H`)
I	1	0	0 (Low)
	2	0	
	3	0	
II	1	0	0 (Low)
	2	0	
	3	0	
III	1	0,64	0,81 (Low)
	2	0,69	
	3	1,09	

Table 5 shows that the diversity index value (H') of sea cucumbers (Holothuroidhea) has different average values at each research station, namely in the range of average diversity index values ranging from 0 to 0.81.

4. CONCLUSION

The types of sea cucumbers found on Hajoran Beach consist of four species: *H. atra, H. scabra, S. chloronotus*, and *S. ananas*. The most common species found is *H. atra* from the genus Holothuria. The average abundance at all stations ranged from 9.600 to 14.000 ind/ha; the highest abundance was recorded at station III. The relative abundance value in each sea cucumber species ranged from 8 to 100%. The lowest relative abundance value was shown in the *S. chloronotus* species, with a value of 8% at station III. In contrast, the highest relative abundance value was shown in the *H. atra* species. The diversity index value (H') of sea cucumbers at the research location was moderate. Overall, the relatively stable and standardized water quality conditions of Hajoran Beach support the abundance and diversity of sea cucumber species.

REFERENCES

Brower, J.E., Zar, J.H., & Von Ende, C.N. (1998). *Field and Laboratory Methods for General Ecology*

(Vol. 4, pp. 25-51). Boston: WCB McGraw-Hill.

Budiarto, R., & Setiawan, H. (2022). Analisis Parameter Kualitas Perairan dalam Mendukung Ekosistem Biota Laut. *Jurnal Ilmu Kelautan*, 19(1): 34-49.

Handayani, T., Sabariyah, V., & Hambuako, R.R. (2017). Komposisi Spesies Teripang (*Holothuroidea*) di Perairan Kampung Kapisawar Distrik Meos Manswar Kabupaten Raja Ampat. *Jurnal Perikanan Universitas Gadjah Mada,* 19(1): 45-51.

Husny, T.H., & Fadhilah, A. (2018). Identifikasi Jenis Gastropoda di Ekosistem Lamun Pantai Pandaratan Kabupaten Tapanuli Tengah Provinsi Sumatera Utara. *Journal of Aquacoastmarine,* 6: 99-108.

Kasry, A., Fajri, N.E., & Agustina R. (2012). *Pedoman Praktikum Ekologi Akuatik*. Fakultas Perikanan dan Kelautan, Universitas Riau. Pekanbaru.

Sihombing, R. (2019). Analisis Kondisi Lingkungan Perairan di Pantai Hajoran, Kabupaten Tapanuli Tengah. *Jurnal Ilmu Kelautan*, 12(2): 45-56.

Romadhoni M.F. (2013). *Keanekaragaman Jenis Echinodermata di Pantai Kondangan Merak Kecamatan Donomulyo Kabupaten Malang.* Fakultas Sains dan Teknologi. Universitas Islam Maulana Malik Ibrahim. Malang. 73 p.

Sadili, D. (2015). *Pedoman Umum Identifikasi dan Monitoring Populasi Teripang*. Direktorat Konservasi dan Keanekaragaman Hayati Laut. Direktorat Jenderal Pengelolaan Ruang Laut. Kementerian Kelautan dan Perikanan.