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ABUNDANCE OF SEA CUCUMBER SPECIES IN THE COASTAL WATERS OF NUSI ISLAND, NABIRE REGENCY, CENTRAL PAPUA PROVINCE

KELIMPAHAN SPESIES TERIPANG DI PERAIRAN PESISIR PULAU NUSI, KABUPATEN NABIRE, PROVINSI PAPUA TENGAH

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ABSTRACT

The intertidal zone of Nusi Island, Nabire Regency, is a habitat for sea cucumbers. Nusi Island is part of a group of small islands administratively located in Makimi District and is privately managed by the Kipuw family, implementing the "sasi" customary system, which regulates resource utilization. This study aims to identify sea cucumber species and analyze their abundance on Nusi Island as baseline information for island owners and local government. The study was conducted from June to August 2023. A total of 13 sea cucumber species were identified, belonging to four genera: *Holothuria* (four species), *Bohadschia* (six species), *Pearsonothuria* (one species), and *Actinopyga* (two species). The abundance of sea cucumbers in the first, second, and third observations was 91 individuals/250 m² (0.36 individuals/m²), 49 individuals/250 m² (0.20 individuals/m²), and 37 individuals/250 m² (0.15 individuals/m²), respectively. The mean total abundance of sea cucumbers on Nusi Island was 177 individuals per 250 m² (0.71 individuals/m²). The highest relative abundance was found in the sand sea cucumber (*Holothuria scabra*), followed by the banded sea cucumber (*Actinopyga bannwarthi*), while the eyed sea cucumber (*Bohadschia ocelata*) showed the lowest relative abundance. The relatively even distribution of individuals among species suggests that the sea cucumber community structure is comparatively stable and well-balanced. Environmental parameters, including pH, salinity, and temperature, were within the appropriate range for sea cucumber survival. This study provides baseline data to support the designation of conservation or limited-use zones and to guide sustainable sea cucumber management within an integrated coastal management (ICM) framework.

Keywords: aquatic resources, Holothuroidea, intertidal, Nabire Regency, sea cucumber

ABSTRAK

Zona intertidal Pulau Nusi, Kabupaten Nabire, merupakan habitat bagi teripang. Pulau Nusi termasuk dalam gugusan pulau kecil yang secara administratif berada di Distrik Makimi dan dikelola secara privat oleh keluarga Kipuw dengan menerapkan sistem adat sasi, yang mengatur pemanfaatan sumber daya. Penelitian ini bertujuan untuk mengidentifikasi jenis teripang serta menganalisis kelimpahannya di Pulau Nusi sebagai informasi dasar bagi pemilik pulau dan pemerintah daerah. Penelitian dilaksanakan pada bulan Juni hingga Agustus 2023. Sebanyak 13 spesies teripang teridentifikasi di lokasi tersebut, yang tergolong ke dalam empat genus, yaitu *Holothuria* (empat spesies), *Bohadschia* (enam spesies), *Pearsonothuria* (satu spesies), dan *Actinopyga* (dua spesies). Kelimpahan teripang pada pengamatan pertama, kedua, dan ketiga berturut-turut sebesar 91 individu/250 m² (0,36 individu/m²), 49 individu/250 m² (0,20 individu/m²), dan 37 individu/250 m² (0,15 individu/m²). Rata-rata kelimpahan total teripang di Pulau Nusi adalah 177 individu/250 m² (0,71 individu/m²). Kelimpahan relatif tertinggi ditemukan pada teripang pasir (*Holothuria scabra*), diikuti oleh teripang sepatu (*Actinopyga bannwarthi*), sedangkan teripang jepang (*Bohadschia ocelata*) menunjukkan kelimpahan relatif terendah. Pola distribusi individu yang relatif merata antar spesies menunjukkan bahwa struktur komunitas teripang yang cenderung stabil dan seimbang. Parameter lingkungan, meliputi pH, salinitas, dan suhu, berada dalam kisaran yang sesuai bagi kelangsungan hidup teripang. Hasil penelitian ini dapat menjadi dasar ilmiah dalam penetapan kawasan konservasi atau kawasan dengan pemanfaatan terbatas serta dalam mendukung implementasi pengelolaan teripang berkelanjutan melalui pendekatan *Integrated Coastal Management* (ICM).

Kata kunci: Holothuroidea, intertidal, Kabupaten Nabire, sumberdaya akuatik, teripang

INTRODUCTION

Sea cucumbers are benthic organisms widely distributed in tropical and subtropical waters, including those in Indonesia. Their main habitat is in the littoral to shallow sublittoral zone, at depths of 0–40 m, depending on the species (Purcell *et al.* 2012a). Ecologically, sea cucumbers are found in seagrass beds, coral reef areas, sandy and muddy bottoms, coastal areas, and shallow lagoons. Sea cucumbers play an important role in the aquatic environment as deposit and suspension feeders. These organisms digest large amounts of sediment, thereby oxygenating the upper layers of the sediment (Hamel and Mercier 2008). The sea cucumber's activity of stirring the waterbed in search of food helps fertilize the surrounding substrate. Ecologically, sea cucumbers function in the decomposition of organic matter in sediment and release nutrients into the food chain (Maruanaya and Tampubolon 2017). Furthermore, sea cucumbers play a crucial role in the food chain, supporting the lives of various other species by providing food in the form of eggs and larvae (Suryaningrum 2008; Siddiqi *et al.* 2017). In this regard, ecosystem health indicators can be assessed by the presence of sea cucumbers associated with aquatic ecosystems (Sasongko *et al.* 2020). Declines in sea cucumber populations often reflect a degradation of the seabed or a decline in the quality of coastal ecosystems (Purcell *et al.* 2012a).

One potential fishery resource in Nabire Regency that provides income for coastal communities is sea cucumbers. Coastal communities catch or collect sea cucumbers directly from the wild. The sea cucumbers are used as a food ingredient due to their high nutritional content. The management and utilization of Nusi Island is carried out by the Kipuw family of Ambonese descent as part of their customary territory and home. To preserve the surrounding marine resources, the community practices the "sasi" (conservation) tradition. The biota targeted by "sasi" are only fish. Other resources, such as sea cucumbers, are not yet part of the "sasi", resulting in uncontrolled sea cucumber collection by fishers from outside Nusi Island. The target sea cucumbers are those with high economic value, such as the sand sea cucumber (*Holothuria scabra*) (Hendri *et al.* 2009). According to Wiadnyana (2009), high export market demand and attractive selling prices have encouraged the community to carry out large-scale exploitation of sea cucumbers, which has resulted in increased sea cucumber production at the national level.

To date, there is no information on the species composition and abundance of sea cucumbers, so the Nusi Island owners have not yet designated them as a biota that requires "sasi". Ecological studies that provide information on sea cucumber management are needed to maintain wild sea cucumber stocks. The benefit of this research is that it provides fundamental data for managing sea cucumber resources on Nusi Island. Furthermore, this research provides support for the designation of Nusi Island's waters as a management area based on "sasi" for fish and sea cucumber.

METHODS

Research location and tools

The research was conducted in the waters of Nusi Island, Makimi District, Nabire Regency, Central Papua Province (Figure 1). Sea cucumber data collection was conducted three times: June, July, and August 2023. The equipment used in this study included nylon ropes and measuring tapes to establish transects and quantify sea cucumber abundance; a Global Positioning System (GPS) device and digital cameras for spatial positioning and field documentation, a pH meter to measure water pH, a refractometer to determine salinity, a thermometer to record water temperature, and a canoe was used as transportation to access the seagrass beds. The research was conducted using a survey method that included direct observation of the sea cucumber community and its habitat conditions.

Data collection techniques

Sea cucumber

The sampling technique used in the sea cucumber survey on Nusi Island involved six sampling segments. Sampling segments were determined using a stratified random sampling method, with a 100 m spacing between segments. Sea cucumber sampling began at the low water level and extended 50 m out to sea. Sea cucumbers are abundant in this zone. An illustration of the segments is shown in Figure 2.

The belt transect method can cover a large area, thus allowing for representative counts of individual numbers and abundance of sea cucumbers (Hill and Wilkinson 2004). The positions of the transect points at the research site are shown in Figure 1. A total of six transects were placed perpendicular to the

shoreline. Each transect was 50 m in length and 5 m in width, with left and right sides each 2.5 m in width. The total area scanned for each transect was 250 m^2 or 1,500 m^2 for all transects. The distance between transects was 100 m, so the total research area was 2,000 m^2.

Sea cucumber surveys were conducted during three sampling periods (June, July, and August 2023). The same six transects were used in each sampling period to ensure consistency and comparability of abundance data among the first, second, and third observations. All sampling procedures and measurement protocols were applied consistently during each survey period.

Water quality

Water temperature, salinity, and pH characteristics were measured along three coastal transect zones: the inner (Zone 1), middle (Zone 2), and outer (Zone 3) sections of the study area. The instrument used to measure the respective parameter was calibrated before use by rinsing it with distilled water to ensure measurement accuracy. These measurements aimed to determine the suitability of the environmental parameter for sea cucumber life in each zone.

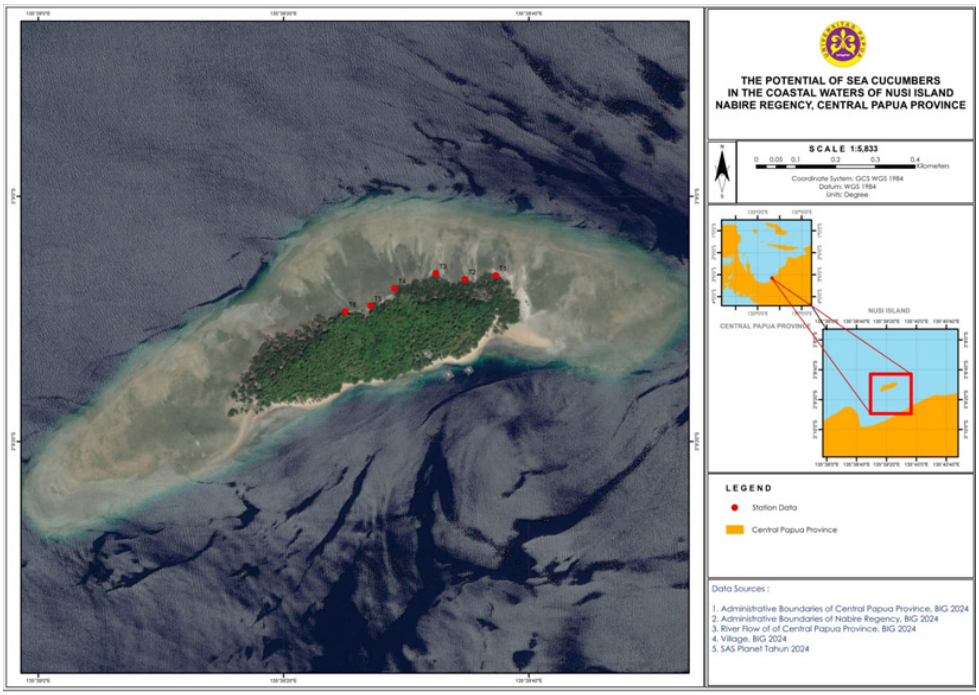

Figure 1. Sampling location (marked) with a red dot at Nusi Island, Makimi, Central Papua.

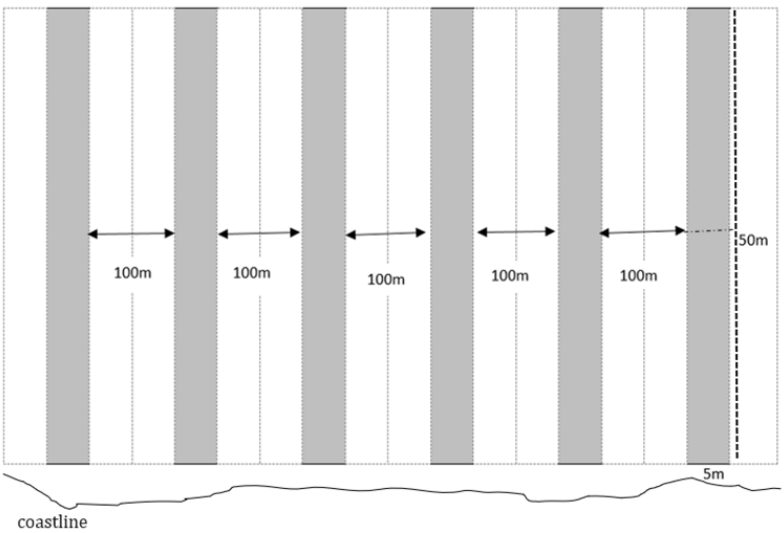

Figure 2. Segmentation division for sea cucumber sampling at Nusi Island.

Data analysis

Identification of sea cucumber types

Identification of sea cucumber species was carried out using available books, such as the General Guidelines for Identification and Monitoring of Sea Cucumber Populations compiled by Sadili *et al*. (2015), the Easy Guidebook for Sea Cucumber Cultivation (Nurwidodo *et al*. 2018), Indonesian Sea Cucumber (Setyastuti and Purwati 2015), and other books on sea cucumbers by Elfidasari *et al*. (2012) and Hisam *et al*. (2022).

Species abundance

Species abundance is an important parameter in ecological studies, used to determine the number of individuals of a species within a given area and their relative role within a community. Abundance calculations refer to Odum (1993) using the following formula:

$$Abudance\ (ind./m^2) = \frac{Number\ of\ individuals\ of\ the\ i\text{-}th\ species\ found}{Area\ (m^2)\ where\ the\ sample\ was\ taken}$$

$$Relative\ abudance\ (\%) = \frac{Number\ of\ individuals\ of\ species\ i}{The\ total\ number\ of\ individuals\ of\ all\ species\ in\ a\ community} \times 100\%$$

RESULTS AND DISCUSSION

Description of Nusi Island

Nusi Island, with a total area of approximately 11.78 hectares, is one of the smaller islands in the Haarlem Archipelago. The coastal typology of Nusi Island showed that the supratidal zone, located at the top of the island, is generally limited and bordered by coastal vegetation. The western part of the island has a large intertidal zone, where changes between high and low tide occur quickly. Meanwhile, in the eastern part of the island, the intertidal zone is relatively narrow and immediately transitions to deeper waters. The intertidal zone in the western part of the island is dominated by sandy substrates and sturdy coral reefs. The sandy substrate habitat supports a seagrass community at a low density. The subtidal zone grows a well-developed seagrass community at a high density, bordering an extensive coral reef ecosystem.

The habitat typology of Nusi Island's area included sandy beaches that dominate the western coast, while the eastern coast is dominated by rocky outcrops. Mangrove communities, particularly *Sonneratia alba*, grow at low densities on the north and south sides of Nusi Island, while coral communities are more dominant and in excellent condition in the subtidal areas. Vegetation on Nusi Island is dominated by coconut, casuarina, and tropical almond ("ketapang") trees, as well as several shrubs commonly found in coastal areas.

Substrate types were distributed homogeneously but showed specific patterns along the six observation transects. Observations showed that the substrate consisted of sand, coral rubble, and seagrass, with different distributions according to the upper, middle, and lower zones. According to Nurwidodo *et al*. (2018), sea cucumbers are highly dependent on the conditions of the surrounding substrate due to their slow movement and lack of active locomotion, such as fins or paddles. In the upper zone, the dominant substrate is sand with seagrass growth in the middle zone, coral rubble dominates with little sand and seagrass growth, while in the lower zone, the dominant substrate is sand with little coral rubble and seagrass growth. Transects 4, 5, and 6 show the dominance of extensive coral reef areas in the upper to middle zones, with several narrow open areas and sandy substrates with seagrass growth. The dominant seagrass species is *Thalassia hemprichii*. According to Manuputty and Noya (2019), the substrate plays an important role as a living medium for sea cucumbers. The distribution of sea cucumbers is highly dependent on the type of substrate available. According to Purcell *et al*. (2012b), some sea cucumber species tend to inhabit harder habitats, such as coral reefs or coral flats, while others are more likely to be found on softer substrates, such as muddy sand. Some sea cucumber species are also found associated with seagrass beds or both (seagrass beds and coral), as these substrates often collect food such as plankton, organic material, and detritus within or on their surfaces.

Water quality of Nusi Island

The pH parameters in the six transects at the research site ranged from 7 to 7.5 (Table 1). Compared with the seawater quality standards for marine biota stipulated in the Decree of the Minister of State for the Environment Number 51 of 2004, which range from 7 to 8.5, the pH in the waters of Nusi Beach is within the normal range, suitable for sea cucumber survival. The ideal pH range to support sea cucumber growth is 6.50 to 7.50 for productive waters and 7.50

to 8.50 for highly productive waters (Padang *et al*. 2017).

Based on seawater quality standards for marine biota stipulated in the Decree of the Minister of State for the Environment Number 51 of 2004, salinity in marine waters ranged from 33 to 34 PSU. Salinity in the waters of Nusi Beach was measured as lower than standard, between 20 and 25 PSU. However, the changes in salinity did not indicate an effect on sea cucumber survival at the research site. The low salinity may be caused by rainwater input from the river in Nifasi Village into the waters of Nusi Island during the research period. Experiments conducted by Tuwo *et al*. (2020) provided information on the survival rate of larvae and juveniles of sand sea cucumbers (*Holothuria scabra*), which could survive up to 20 PSU on the eighth day, despite a sudden change in the salinity level in the tank. However, the sea cucumbers quickly died on the second day when the salinity was changed to 15 PSU. The conditions were different when the tank water was slowly lowered by replacing 7.5% of the fresh water every 12 hours until it reached 15 PSU. The survival rate of sea cucumbers was still 91.7±14.4% on day 7 (156 hours). The survival rate dropped drastically to 0% when the salinity reached 14.6 PSU on day 8. Thus, 15 PSU is the low salinity tolerance limit for sea cucumbers to survive.

Water temperature plays a crucial role in regulating the metabolism of aquatic biota (Effendi 2003). Temperature increases can increase oxygen consumption but, conversely, can reduce oxygen solubility in water. In terms of average temperature, the upper zone exhibits the highest average temperature, at around 20.17 °C, higher than the average temperature in the middle zone of around 19.83 °C and the lower zone of around 18.67 °C. Zones adjacent to land have even higher temperatures. Temperatures across the six research transects ranged between 18 and 21 °C. Based on Decree of the Minister of State for the Environment Number 51 of 2004, the water temperature standard for marine biota is 28–30 °C. The water temperature on Nusi Island was recorded as being lower than this standard.

The effect of temperature on sea cucumber growth has been reported by Gunay *et al*. (2015). Juvenile *Holothuria tubulosa* were placed in 4 temperature groups: 15 °C, 20 °C, 25 °C, and 30 °C. The best specific growth rate (SGR) was recorded at 0.288 ± 0.02 % day^{-1} in the 25 °C temperature group. The lowest SGR was recorded at 0.085 ± 0.005 % day^{-1} in the 30 °C temperature group, while a negative specific growth rate (–0.03 ± 0.02 % day^{-1}) was recorded in the 15 °C temperature group. Aestivation observed in the 30 °C temperature group and hibernation in the 15 °C group are suspected to be the cause of the decrease in the specific growth rate. However, the survival rate for all groups reached 100%. Thus, the temperature of 18 °C in Nusi waters is still within the range that supports the survival and growth of sea cucumbers.

Composition of sea cucumber species

Thirteen species of sea cucumbers were found at the research site. This number is quite high for a small island like Nusi Island, compared to the more than 50 species of sea cucumbers distributed throughout Indonesia (Setiawan *et al*. 2018). The distribution of sea cucumber species in Nusi Island waters, along with their common names, is shown in Table 2 and Figure 3. The composition of sea cucumber species found in Nusi Island waters consists of four main genera. The genus *Holothuria* has four species, the genus *Bohadschia* has six species, the genus *Pearsonothuria* has only one species, and the genus *Actinopyga* has two species. The diversity of sea cucumber species at the research site tends to be dominated by the genus *Bohadschia*, followed by the genus *Holothuria*, while the genus *Actinopyga* and *Pearsonothuria* have only a few species. These findings are consistent with the research of Yanti *et al*. (2014) in Bali waters, which showed that the genus *Bohadschia* is quite common, especially *Bohadschia marmorata* and *Bohadschia argus*. Meanwhile, the research of Setiawan *et al*. (2018) found that the genus *Holothuria* is most commonly found in various waters in Indonesia. Interestingly, this study did not find the genus *Stichopus* in the study site, although this genus is generally found in the waters of Papua and West Papua, with around 5–6 species identified in the region (Arafat *et al*. 2024). Overall, around 10 species of the genus *Stichopus* have been identified in Indonesia (Setiawan *et al*. 2018), while globally there are an estimated 20 known species, mainly found in coral reefs and shallow waters (Liu *et al*. 2023).

Abundance of sea cucumbers

The number of sea cucumbers observed indicates that some groups are more abundant than others. The presence of many individuals indicates that they thrive on suitable substrates in the waters of Nusi Island. These substrate

conditions play a significant role in determining the abundance of sea cucumber populations. The number of sea cucumbers per transect at three observation times is shown in Table 3.

According to Table 3, the abundance of sea cucumbers in observations I, II, and III was 548 individuals/1,500 m^2 (0.36 individuals/m^2), 292 individuals/1,500 m^2 (0.20 individuals/m^2), and 220 individuals/1,500 m^2 (0.15 individuals/m^2), respectively. Therefore, the average abundance of sea cucumbers on Nusi Island was 353 individuals/1,500 m^2 (0.71 individuals/m^2). This value indicates a relatively low abundance compared to West Nusa Tenggara, which recorded a sea cucumber density of around 1.2 individuals/m^2, and Bali waters, which recorded a density of around 1.3 individuals/m^2 (Yanti *et al.* 2014). However, when compared to the abundance in Wailiti Maumere waters (East Nusa Tenggara), which was only 0.04 individuals/m^2, it is still higher (Riniatsih and Munasik 2017).

Table 1. Results of water quality parameter measurements in the upper (1), middle (2), and lower (3) zones in six transects of Nusi Beach.

Parameters	Observations	Transect I	Transect II	Transect III	Transect IV	Transect V	Transect VI
pH	1	7.5	7	7	7.5	7.5	7.5
	2	7	7	7	7.5	7.5	7
	3	7	7	7.5	7	7	7.5
Salinity (PSU)	1	25	25	22	20	25	24
	2	25	25	22	20	25	24
	3	25	24	24	20	24	25
Temperature (°C)	1	20	20	20	21	20	20
	2	20	19	20	20	20	20
	3	18	18	20	20	18	18

Table 2. Number of species and abundance of sea cucumbers on Nusi Island during three observation periods.

No	Common Name	Scientific Name	Individual Number			Total Number	Average per observation
			1	2	3		
1.	Golden sand sea cucumber	*Holothuria lessoni*	31	16	25	72	24
2.	Brown sand sea cucumber	*Bohadschia marmorata*	32	15	19	66	22
3.	Black spotted sea cucumber	*Pearsonothuria graeffei*	37	21	16	74	25
4.	Brown sea cucumber	*Bohadschia vitiensis*	29	15	15	59	20
5.	Black sea cucumber	*Holothuria atra*	33	18	17	68	23
6.	Eyed sea cucumber	*Bohadschia ocelatta*	23	0	0	23	8
7.	Leopard sea cucumber	*Bohadschia argus*	30	29	21	80	27
8.	Banded sea cucumber	*Actinopyga bannwarthi*	50	42	22	114	38
9.	Sand sea cucumber	*Holothuria scabra*	98	55	35	188	63
10.	Yellow sea cucumber	*Bohadschia* sp.	50	8	11	69	23
11.	White sand sea cucumber	*Holothuria* sp.	35	22	14	71	24
12.	"Snake-skin" sea cucumber	*Bohadschia subrubra*	60	27	6	93	31
13.	Hairy blackfish sea cucumber	*Actinopyga miliaris*	40	24	19	83	28
Total abundance of each species of sea cucumber (inds./1.500 m^2)			**548**	**292**	**220**	**1,060**	**353**

Figure 3. Types of sea cucumbers found on Nusi Island: (a) Golden sand sea cucumber (*Holothuria lesson*), (b) Brown sand sea cucumber (*Bohadschia vitiensis*), (c) Black spotted sea cucumber (*Pearsonothuria graeffei*), (d) Brown sea cucumber (*Bohadschia vitiensis*), (e) Black sea cucumber (*Holothuria atra*), (f) Eyed sea cucumber (*Bohadschia ocelatta*), (g) Leopard sea cucumber (*Bohadschia argus*), (h) Banded sea cucumber (*Actinopyga bannwarthi*), (i) Sand sea cucumber (*Holothuria scabra*), (j) Yellow sea cucumber (*Bohadschia vitiensis*), (k) white sand sea cucumber (*Holothuria* sp.), (l) "snake-skin" sea cucumber (*Bohadschia subrubra*), (m) Hairy blackfish sea cucumber (*Holothuria leucospilota*).

Table 3. Abundance of sea cucumber communities based on transects and observation time at Nusi Island.

Observations	Transects						Individuals Number 1,500 m²	Individuals Average 250 m²	Individuals Average 1 m²
	1	2	3	4	5	6			
I	190	133	125	79	21	-	548	91	0.36
II	106	74	44	36	27	5	292	49	0.20
III	91	62	41	15	11	-	220	37	0.15
Total	**387**	**269**	**210**	**130**	**59**	**5**	**1,060**	**177**	**0.71**

The results also showed that the dominant sea cucumber found on Nusi Island was *Holothuria scabra* (sand sea cucumber) (Table 2). The total number of individuals of this species during the three observations was 188, with an average of 63 individuals per observation. This species is very expensive, reaching a selling price of IDR 912,500/kg from fishers (Arafat *et al.* 2024). The second most abundant sea cucumber species was *Actinopyga bannwarthi* (banded sea cucumber), with a total of 114 individuals during the three observations, and an average of 38 individuals per observation. The sea cucumber with the lowest abundance in this study was *Bohadschia ocelatta* (eyed sea cucumber), with only 23 individuals found during the study and an average of 8 individuals per observation. Figure 3 presents visual documentation of sea cucumbers that supports morphological species identification.

Relative abundance

The results of the study show the proportion or relative contribution of each type of sea cucumber to the total number of individuals of all species at the study site (Figure 4). The sand sea cucumber (*Holothuria scabra*) showed the highest relative abundance of 18%, followed by the banded sea cucumber (*Actinopyga bannwarthi*) with a contribution of 11%. The majority of other sea cucumber species had a relative abundance of around 6–7%, such as the golden sand sea cucumber, brown sand sea cucumber, black spotted sea cucumber, brown sea cucumber, black sea cucumber, yellow sea cucumber, and white sand sea cucumber. Figure 4 also shows that the Japanese sea cucumber had the lowest relative abundance value in the sea cucumber community at the study site.

The relative abundance of sea cucumber species found on Nusi Island is lower and more uniform compared to other regions in Indonesia. In North Sulawesi waters, *Holothuria atra* and *Stichopus hermanni* have relative abundances of approximately 35% and 20%, respectively (Budiman *et al.* 2014). In the Maluku Islands, the study of Sari *et al.* (2024) found that *Holothuria fuscogilva* and *Thelenota anax* had relative abundances of approximately 32% and 18%, respectively. In Depapre Bay (Jayapura), research conducted by Sujarta and Hadisusanto (2017) found that *Actinopyga echinites* and *Thelenota ananas* were the most dominant sea cucumber species, with relative abundances of approximately 25% and 20%, respectively. A combination of environmental factors, fishing pressure, and habitat degradation usually leads to a low relative abundance of sea cucumbers. These conditions limit the growth, reproduction, and survival of various sea cucumber species in a region. The almost uniform relative abundance of sea cucumbers indicates that environmental conditions in the region are homogeneous and ecological pressures are evenly distributed, so that no single species dominates (Hamamoto *et al.* 2022).

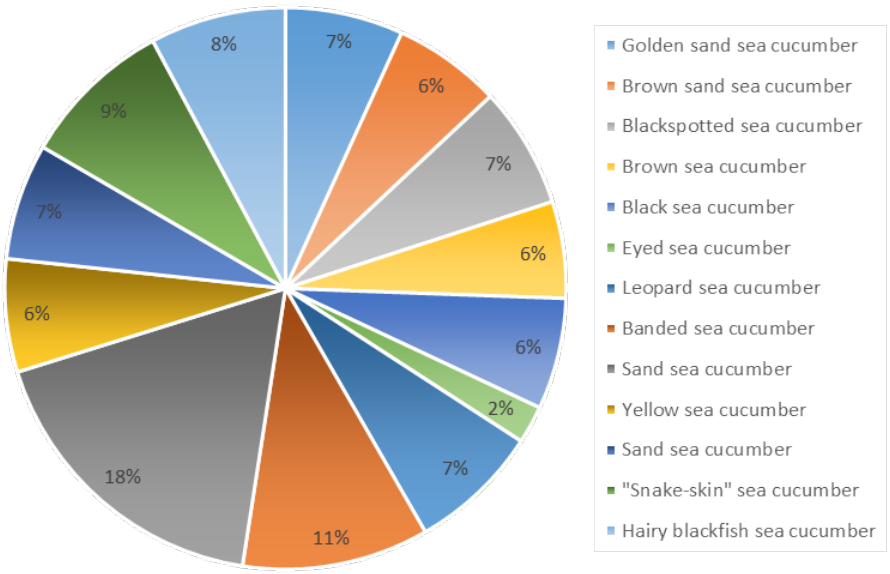

Figure 4. Relative abundance of each sea cucumber species on Nusi Island (%).

The relatively moderate density of economically important species such as *Holothuria scabra* indicates the need for spatial management measures. Areas with higher densities, particularly in transects 1–3, may function as potential spawning or nursery grounds and therefore should be prioritized for conservation or limited harvesting. The integration of sea cucumbers into the local "sasi" system could strengthen community-based resource management and contribute to the implementation of integrated coastal management (ICM) in Nabire Regency.

CONCLUSION

Thirteen species of four genera of sea cucumbers can be found in the coastal waters of Nusi Island. The average abundance of sea cucumbers is moderate. *Holothuria scabra* is the dominant species, contributing 18% of the total number of individuals. The salinity and temperature of the waters off Nusi Island are lower than the quality standards, but still support the survival of sea cucumbers. This study indicates that sea cucumber resources in the coastal waters of Nusi Island require regulated and spatially based management to prevent overexploitation. Areas with relatively higher densities, particularly in transects 1–3, should be considered as priority zones for habitat protection or limited harvesting to maintain spawning stocks of economically important species such as *Holothuria scabra*. Furthermore, integrating sea cucumbers into the local "sasi" management system could strengthen community-based conservation practices. These findings provide scientific support for zoning arrangements and the implementation of integrated coastal management (ICM) strategies in Nabire Regency.

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