Abundance and Diversity of Echinoderms in Seagrass and Coral Reefs Ecosystems

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Abstract

This study aims to determine the abundance and diversity of Echinoderms in seagrass and coral reef ecosystems in the waters of Tomini Gulf, Lamu Village, Batudaa Pantai, Gorontalo Regency. This research was conducted for 3 months, from July to September 2017. The method used was the quadrant transect method in seagrass ecosystems and in coral reef ecosystems using the Line Intercept Transect (LIT) method. Observations were made at 3 stations based on the presence of seagrasses and coral reefs. The results showed that the highest abundance in the seagrass ecosystem is *Ophiolepis superba* with a value of 36.48%, in the coral reef ecosystem was the type of Diadema sp with a value of 52.73%. The highest echinoderms diversity in seagrass ecosystem was obtained at Station 1 with a value of 0.7433 which was included in the medium category and the highest coral reef ecosystem at Station 3 with a value of 0.6624 and included in the medium category.

Keywords: echinoderms; sea grass; coral reefs; abundance; diversity.

Introduction

Echinoderms are inhabitants of shallow waters, commonly found on coral reefs and seagrass beds. This animal has the ability to autotomy and regenerate parts of the body that are lost, broken or damaged (Jasin in Budiman et al., 2014). Echinoderms are very important animals in the marine ecosystem and are useful as a component in the food chain, organic waste eaters and other small animals. According to Dahuri in Katili (2011) that the types of Echinoderms can be seston-eaters or detritus-eaters, so that its role in an ecosystem is to overhaul the remnants of organic material that are not used by other species but can be utilized by several types of Echinoderms. In addition Echinoderms contain chemical elements that have high value in the fields of food, medicine and are often used as beautiful decorative collection items.

Tomini Gulf is one of the marine areas that has a coral reef ecosystem and seagrass ecosystem as a place of life for echinoderms. The existence of Echinoderms in the waters of Tomini Gulf is not yet known for their abundance and diversity. The purpose of this study was to determine the abundance and diversity of Echinoderms in seagrass and coral reef ecosystems in the waters of Tomini Gulf, Lamu Village, Batudaa Pantai, Gorontalo Regency.

Research Methodology

The study was conducted in July-September 2017 in Lamu Village, Batudaa Pantai, Gorontalo Regency.

The sampling method in seagrass ecosystems uses the Purposive Sampling method, which is sampling based on the representation of seagrass ecosystems and coral reefs. Measurement of water quality parameters is carried out in conjunction with echinoderms observations. The procedure in observing Echinoderms carried out in seagrass ecosystems by referring to Jumanto et al. (2013), laying plots at each observation station by setting plots from land to sea with a size of 25 x 4 meters and the distance of each plot is 20 meters. For data collection on coral reefs using the Line Intercept Transect (LIT) method along 50 meters with 2.5 meters observation to the left and right so as to form a 5 x 50 meter transect (Anwar, 2006).

Data obtained during the subsequent studies were analysed to determine its abundance and diversity. The abundance of Echinoderms was calculated using the Odum formula in Purwadatama et al. (2014). This diversity index is calculated by the Simpson formula (Understand, 2003).

The data obtained were tabulated and analysed descriptively to see the difference between the three station locations. If the diversity index value (D') ≤ 0.50, then diversity falls into the low category, diversity index (D')> 0.50 (D') ≤ 0.75, then diversity falls into the medium category, and diversity index (D')> 0.75, then diversity falls into the high category.

Results and Discussions

Species of Echinoderms

Echinoderms found in the Seagrass Ecosystem in the waters of Tomini Gulf, Lamu Village can be seen in Table 1.

Table 1 Echinoderms in sea grass ecosystem

No	Kelas	Spesies	Stasiun I	Stasiun 2	Stasiun 3
1	Echinoidea	*Tripneustes gratilla*	6	1	0
		Echinometra mathaei	14	9	24
		Deadema sp	0	3	0
2	Asteroidea	*Protoreaster nodosus*	0	1	0
3	Holothuroidea	*Holothuria edulis*	2	0	0
		Holothuria atra	17	6	5
4	Ophiuroidea	*Ophiocoma superba*	13	23	13
Jumlah total			**52**	**43**	**42**

Source: primary data

There are only 5 species of echinoderms found in coral reef ecosystems from 2 different classes. More can be seen in Table 2.

Table 2 Echinoderms in the coral reef ecosystem

No	Kelas	Spesies	Stasiun I	Stasiun 2	Stasiun 3
1	Echinoidea	*Diadema sp*	12	7	10
		Echinotrix calamaris	0	2	10
		Echinometrra mathae	9	0	3
2	Asteroidea	*Linckia laevigata*	1	2	1
		Nardoa pauciforis	0	0	1
Jumlah total			**22**	**11**	**25**

Source: primary data

Abundance of Echinoderms

The abundance of a species is determined based on the number of dominant individual species found. A species is declared abundant if the individuals found in very large numbers compared to other individual species (Nento, 2013). The results of the calculation of the relative abundance of Echinoderms in the waters of Lamu Village in the seagrass ecosystem and the Coral Reef Ecosystem can be seen in Table 3.

Table 3. Relative species abundance (%) Echinoderms

No.	Kelas	Spesies	KR rata-rata (%)
1	Echinoidea	*Tripneustes gratilla*	4,62
		Echinometra mathaei	35,00
		Diadema sp	2,33
2	Holothuroidea	*Holothuria edulis*	1,28
		Holothuria atra	19,52
3	Asteroidea	*Protoreaster nodosus*	0,78
4	Ophiuroidea	*Ophiolepis superba*	36,48

Source: primary data

The high value of the abundance of *Ophiolepis superba* organisms found at all stations in the seagrass ecosystem is due to the type of substrate and the availability of food suitable for its growth and is not disturbed by active community activities. As stated by Stöhr et al., (2012) in Nugroho et al (2014) snaking stars are mobile biota which, when disturbed, will seek safer places. In addition, according to Torani (2004) in Putra, et al, (2012) the low abundance of Echinoderms is thought to be caused by the lack of competitiveness in occupying habitats, also because many Echinoderms have been taken and utilized by local communities.

The results of the calculation of the value of the abundance of Echinoderms in the waters of Tomini Gulf, Lamu Village, Batudaa Subdistrict on the coast of the coral reef ecosystem can be seen in Table 4.

Table 4. Relative abundance (%) of Echinoderms in coral reef ecosystem

No	Kelas	Spesies	KR rata-rata (%)
1	Echinoidea	*Diadema sp*	52,73
		Echinometra mathaei	17,64
		Echinothrix calamaris	19,39
2	Asteroidea	*Nardoa pauciforis*	1,33
		Linckia laevigata	8,91

Source: primary data

The high value of abundance for the species of Diadema sp in the waters of Lamu Village in the coral reef ecosystem is due to the presence of the Diadema sp species population which is important for coral reefs as a counterweight. According to Suryanti (2014) that the balance of the Diadema population will maintain the balance of algal and coral populations, the results of the Diadema sp species are the most dominant because this type is one of the types of sea urchins that live in coral and seagrass ecosystems.

Diversity of Echinoderms

Species diversity is a combination of species richness and species balance or equality (Mahmudah, 2013).

The results of the analysis of the diversity index of Echinoderms in the waters of Lamu Village on seagrass and coral reef ecosystems can be seen in Table 5.

Table 5. Diversity index of Echinoderms in sea grass and coral reef ecosystems

	Lamun		Terumbu Karang	
	D	D'	D	D'
Stasiun 1	0,2567	0,7433	0,4669	0,5331
Stasiun 2	0,3553	0,6447	0,4711	0,5289
Stasiun 3	0,4365	0,5635	0,3376	0,6624
rata-rata	0,3495	0,6505	0,4252	0,5748

Source: primary data
Remarks: D = Dominance
D' = Diversity index

The high value of diversity index at Station 3 is because the area has good coral reefs and there is no influence of human activities. According to Barus in Hutauruk (2009) that a community is said to have high species diversity if there are many species with a relatively even number of individuals of each species. Table 5 above also shows that the average diversity index of all stations in the waters of Lamu Village in the coral reef ecosystem is included in the moderate category with a value of 0.5748.

The diversity value of Echinoderms found in each ecosystem in the waters of Tomini Gulf Lamu Village varies due to the number of species found at each station is uneven. This is also caused by an environment that is not suitable for growth of Echinoderms as a whole. According to Arbi in Wadja (2016) that the high and low values of the species diversity index can be caused by various factors, such as the number of species or individuals obtained, the presence of several species found in more abundant quantities than other types, conditions of substrate hemogeneity and physical chemical oceanographic factors and the condition and third of the aquatic / coastal ecosystem as a habitat for aquatic fauna. Meanwhile, according to Aslam in Wadja (2016) that the influence of human activities (excessive use of natural resources) can result in reduced biodiversity or even the occurrence of these types of extinctions.

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