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ABUNDANCE AND DIVERSITY OF MEGAGASTROPODA IN SEAGRASS BED ECOSYSTEM IN THE WATERS OF TIHI-TIHI VILLAGE, BONTANG CITY, EAST KALIMANTAN

Kelimpahan Dan Keanekaragaman Megagastropoda Pada Ekosistem Padang Lamun Di Perairan Desa Tihi–Tihi Kota Bontang Kalimantan Timur

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ABSTRACT

Seagrass beds provide habitat for the abundance and diversity of megagastropods that form the food chain in supporting the productivity of coastal waters. The purpose of this study was to determine the diversity and abundance of megagastropoda in the seagrass beds of Tihi-Tihi Village. This study was conducted in October 2024 - February 2025 using a purposive sampling method. Megagastropoda sampling using Van Veen Grab and seagrass stands using 50x50cm square frames. Data analysis included abundance, community structure index and morphometrics of individual megagastropoda, and seagrass stand density and Pearson Product Moment correlation analysis. The results of the study found 18 species of megagastropoda. Diversity in moderate criteria, moderate population uniformity and dominance in moderate criteria with an abundance of individuals reaching 567 individuals/m2. The seagrass found 4 species of seagrass, namely *E. acoroides*, *T. hemprichii*, *C. rotundata*, and *H. ovalis*. There is a positive and very close correlation between the abundance of megagastropoda and the characteristics of seagrass density.

Key words: Diversity, Megagastropoda, Seagrass, Tihi-Tihi Village.

ABSTRAK

Padang lamun menyediakan habitat bagi kelimpahan dan keanekaragaman megagastropoda yang membentuk rantai makanan dalam mendukung produktivitas perairan pesisir. Tujuan penelitian ini adalah untuk mengetahui keanekaragaman dan kelimpahan megagastropoda di padang lamun Desa Tihi–Tihi. Penelitian ini dilaksanakan pada bulan Oktober 2024 - Februari 2025 dengan menggunakan metode *purposive sampling*. Pengambilan sampel megagastropoda menggunakan Van Veen Grab dan tegakan lamun menggunakan bingkai kuadrat 50x50cm. Analisis data meliputi kelimpahan, indeks struktur komunitas maupun morfometrik individu megagastropoda, dan kerapatan tegakan lamun serta analisis korelasi *Pearson Product*

Moment. Hasil penelitian ditemukan 18 spesies megagastropoda. Keanekaragaman dalam kriteria sedang, keseragaman populasi sedang dan dominansi dalam kreteria sedang dengan kelimpahan individu mencapai 567 individu/m^2. Lamun yang ditemukan 4 spesies lamun yaitu *E. acoroides*, *T. hemprichii*, *C. rotundata*, dan *H. ovalis*. Adanya korelasi yang positif dan sangat erat antara kelimpahan megagastropoda dengan karakteristik kerapatan lamun.

Kata Kunci: Desa Tihi-Tihi, Keanekaragaman, Megagastropoda, Lamun,

INTRODUCTION

Seagrass ecosystems have high productivity and play an important role as spawning areas, nursery areas for various aquatic biota (Jayanti, 2020), maintaining the sustainability of marine organisms, the diversity of marine organisms, and the balance of ecosystems in waters (Gusriana *et al.,* 2020; Jalauddin *et al.,* 2020). Seagrass beds provide habitat for individual gastropods (Minarni *et al.,* 2011; Fajeri *et al.,* 2020; Faizal *et al.,* 2022; Gea & Hariono, 2022; Adam *et al.,* 2023). The characteristics of seagrass species that make up seagrass beds are closely related to the availability of habitat niches for aquatic biota, especially mega gastropods (Batuallo *et al.,* 2024).

The interaction of gastropod individuals with seagrass beds is an important component in the food chain as detritus eaters (Tomascik *et al.,* 1997) from leaf litter, able to filter suspended particles in water (Batuwael and Rumahlatu 2018; Fajeri *et al.,* 2020), and act as aquatic bioindicators (Rukmana and Purnomo, 2019). Gastropod individuals are a source of animal protein (Subhan, 2014) with a protein content ranging from 50.06-63.69% (Warsidah *et al.,* 2022).

The area of seagrass beds as a habitat for gastropods in the coastal waters of Bontang City reaches 3,865.55 ha (Bontang City DLH, 2018) and seagrass beds in Tihi-Tihi Village are residential areas and places to find shellfish (Fadilah *et al.,* 2022). The vast seagrass ecosystem in this area provides ecological and economic benefits to the local community (Paskalia *et al.,* 2023). The utilization of individual gastropods is not only as a source of animal protein but also megagastropoda shells as a traded commodity. Megagastropoda are shellfish with shell sizes larger than 10 mm (Laili & Parson, 1993 in Arbi & Sihaloho, 2017). Understanding the importance of the role of seagrass beds and megagastropoda in supporting the productivity of coastal waters, it is necessary to conduct research to understand the diversity and abundance of megagastropoda in seagrass ecosystems, especially the Tihi - Tihi Village Waters area, Bontang City which has seagrass characteristics.

RESEARCH METHODS

Place and Time of Research

This research was conducted in the Seagrass Field of Tihi - Tihi Village, Bontang City, East Kalimantan from October 2024 to February 2025. Sampling was carried out at 4 stations, namely North Station, East Station, South Station, and West Station (Figure 1).

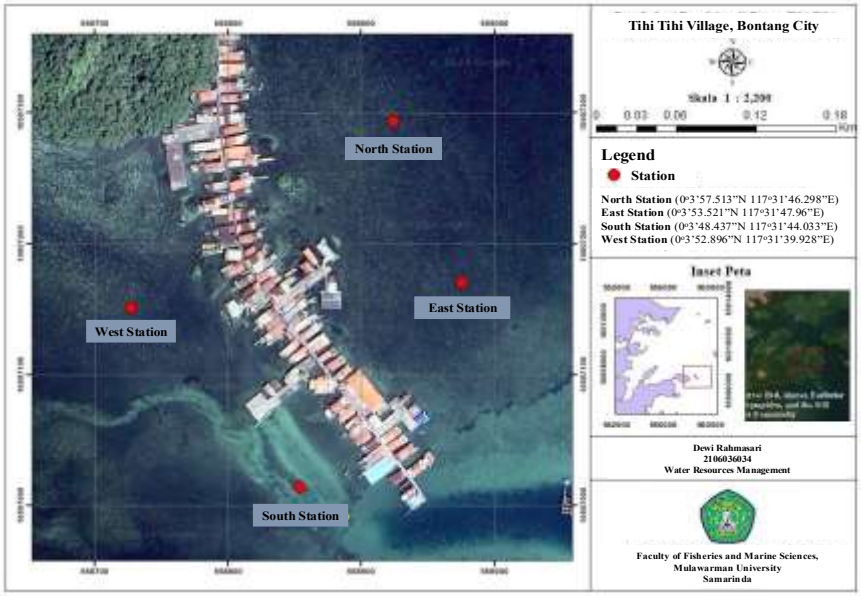

Figure 1. Research Location

Materials and Tools

The tools used in this study are as follows (Table 1).

Table 1. Tools used

Alat			
1. *Water checker*		5. Plastik klip	10. Van Veen Grab
2. Bingkai kuadrat (50x50cm)		6. GPS	11. *Secchi disk*
3. Roll meter		7. Saringan bentos	12. Alat tulis
4. Kamera		9. *Sediment Corer*	13. Jangka sorong
Material			
1. Megagastropoda	2. Lamun	3. Aquades	1. Formalin

Determination of Research Stations

The determination of research stations used the purposive sampling method which was divided into 4 stations, namely: North Station, East Station, South Station and West Station.

Water Quality and Basic Substrate Sampling Techniques

Parameter measurements were carried out 3 times with a time interval of 15 days at each station. Measurements were carried out in situ, namely: temperature, salinity, pH, DO, depth, brightness, and current speed, while water parameters such as turbidity, nitrate, and phosphate were measured ex situ. Substrate sampling at each station used sediment cores.

Seagrass Sampling Techniques

Seagrass sampling follows the transect line, namely each station consists of 3 transect lines with 3 plots with 3 repetitions with an interval of 15 days. The length of the transect line reaches 50-100m (Rumana & Purnomo, 2019) and the distance between plots is 25-50m. Seagrass sampling uses a 50x50 cm square frame (English et al., 1994). Identification of seagrass species based on Fortes (1993); Tomascik *et al.,* (1997).

Megagastropoda Sampling Techniques

Sampling of gastropods follows the transect line (Minarni *et al.,* 2016), namely each station consists of 3 transect lines with 3 plots with 3 times (Heryanto *et al.,* 2006) repetitions with a time interval of 15 days at low tide. The length of the transect line reaches 50-100 m (Rumana & Purnomo, 2019) and the distance between plots is 25-50m. Sampling using Van Veen Grab. The megagastropoda samples that have been obtained are put into plastic bags that have been labeled according to the station (Faizal *et al.,* 2022). Identification of megagastropoda species based on De Bruyne (2004); Dharma (1992).

Data Analysis

Physical and Chemical Parameters of Waters and Basic Substrates

The physical and chemical parameters of the waters and the bottom substrate are presented in tabular form. The physical and chemical parameters of the waters measured are compared with the quality standards of the Government Regulation of the Republic of Indonesia No. 22 of 2021 concerning seawater quality standards. The bottom substrate describes the characteristics of the seagrass habitat and megagastropoda individuals.

Seagrass Density

Calculation of seagrass density levels can be formulated as follows (Fachrul, 2007):

$$K = \frac{\sum Di}{\sum ni \; x \; A}$$

Description: K = Individual density (stand/m2); ∑Di = Number of individuals or stands of each species; ∑ni = Number of quadrants; A = Quadrant area (m^2).

Abundance and Biological Ranking of Megagastropoda

The abundance of megagastropoda is calculated based on the number of individuals per unit area (individuals/m^2) using the formula (Fachrul, 2007):

$$K = \frac{Ni}{A}$$

Description: K=Abundance of megagastropoda (individuals/m^2); Ni=Number of individuals of a species; A=Area (m^2).

The Biological Index is calculated based on the number of individuals of the 10 species with the highest abundance. The species with the first highest abundance is given a value of 10, then the second highest abundance is given a value of 9 until the 10th highest abundance is given a value of 1. The values for each species are added up to obtain a total value (Romimohtarto & Juwana, 1999).

Megagastropoda Shell Morphometrics

Each individual species of megagastropoda had their shell height and width measured (Heryanto et al., 2006)

Diversity Index

Species diversity index, the Shannon-Wiener index formula is used (Krebs, 1985) as follows:

$$H' = -\sum_{i=1}^{s} pi \ln pi$$

Description: H′ = Species diversity index; s = Number of all species; pi = ni/N; ni = Number of individuals of the i-th species; N = Total individuals.

The species diversity index is grouped according to the following criteria: H′<1= indicates low diversity; 1≤H ≤ 3 = indicates moderate diversity; H′ > 3 = indicates high diversity.

Uniformity Index

The evenness index is the number of individuals between species in a community (Odum, 1993), namely:

$$E = \frac{H'}{H\ maks}$$

Description: E = Uniformity index; H' = Diversity index; H max = Number of species. Uniformity Index criteria are as follows: E<0.4 = Small population uniformity; 0.4<E<0.6 = Medium population uniformity, E>0.6 = High population uniformity.

Dominance Index

The dominant index uses the Dominance of Simpson formula (Odum, 1993), namely:

$$C = \sum \left[\frac{ni}{N}\right]^2$$

Description: C = Dominance index; ni = Number of individuals of each species; N = Total number of individuals. Categories in dominance index: 0<C<0.3 = low dominance, 0.3≤C≤0.6 = medium dominance; 0.6 < C ≤ 1.0 = high dominance.

Relationship between Megagastropoda Abundance and Seagrass Density

The relationship between megagastropoda abundance and seagrass density using Pearson Product Moment Correlation analysis (Abdullah and Susanto, 2015).

$$r\ xy = \frac{n(\sum xy) - (\sum x)\ (\sum y)}{\sqrt{\left[n\ (\sum x^2) - \ (\sum x)^2\right]\ \left[n\ (\sum y^2) - \ (\sum y)^2\right]}}$$

Description: r = Correlation coefficient value; x = Seagrass variable value; y = Megagastropoda variable value; n = Number of sampling/plot. The relationship criteria are as follows (Nazir, 2009): r = - 1 (very strong relationship and is not unidirectional); r = 0 (no correlation); r = 0 – 0.5 (weak correlation); r = 0.5 – 0.8 (moderate correlation); r = 0.8 – 1 (strong or close correlation); r = 1 (perfect correlation and unidirectional)

RESULT

Water Quality Parameters and Basic Substrate

The physical and chemical parameters of the waters and the basic substrate are listed in Table 2.

Table 2. Physical and chemical parameters of the waters and the basic substrate

No	Water quality	Unit	Station				Average	Quality standards
			North	East	South	West		
1.	Temperature	ºC	29,7	28,9	28,5	29,1	29,1	28-30
2.	Salinity	‰	34,5	31,5	31,5	31,9	32,4	33
3.	pH	-	8,1	8	8	7,5	7,9	7-8,5
4.	DO	mg/L	6,6	6,4	6,5	6,2	6,4	>5
5.	Brightness	m	0,8	0,8	0,7	0,7	0,75	>3
6.	Turbidity	NTU	1,47	2	1,38	1,62	1,61	5
7.	Current speed	m/s	0,09	0,11	0,11	0.11	0,11	-
8.	Depth	m	0,8	0,8	0,7	0,7	0,75	-
9.	Nitrate	mg/L	0,06	0,05	0,02	0,11	0,06	0,06
10.	Phosphate	mg/L	0,006	0,004	0,003	0,004	0,004	0,015
	Bottom Substrate							
1.	Very coarse sand	%	12,59	13,14	11,26	13,61	12,59	
2.	Coarse sand	%	23,88	22,75	22,02	21,1	23,88	
3.	Medium sand	%	24,71	23,89	17,71	21,07	24,71	
4.	Fine sand	%	23,82	21,40	19,17	20,73	23,82	
5.	Very fine sand	%	8,36	10,10	10,31	9,95	8,36	
6.	Total sand	%	93,36	90,92	80,47	86,46	93,36	
7.	Dust	%	5,24	5,91	12,72	9,67	5,24	
8.	Clay	%	1,40	3,17	6,81	3,87	1,40	
9.	Texture	-	S	S	SL	LS	S	

Keterangan: LS = *Loamy Sand*; SL = *Sandy Loam*; S = *Sand*

Sea grass

Seagrass species consist of *Enhalus acoroides, Thalassia hemprichii, Halophila ovalis, and* Cymodocea *rotundata* with a density range of 484-694 stands/m2 (Table 3).

Table 3. Seagrass composition and density.

Species	North Station	East Station	South Station	West Station
	Density (stands / m^2)			
Enhalus acoroides	17 ±4	23 ±21	20 ±15	36 ±28
Thalassa hemprichii	240 ±6	252 ±45	341 ±14	339 ±18
Halophila ovalis	49 ±5	89 ±26	122 ±7	72 ±57
Cymodocea rotundata	178 ±9	290 ±26	212 ±15	165 ±35
Amount	484	654	694	611

Megagastropoda

Megagastropoda found 14 families, 17 genera and 18 species with abundance ranging from 157-246 individuals/m2 (Table 4). The length and width of the megagastropoda shell (Table 5). The value of the diversity, uniformity and dominance index (Table 6).

Table 4. Abundance of megagastropoda based on station

Family	Genus	Species	North Station	East Station	South Station	West Station
			Abundance (individual /m2) (±SD)			
Angariidae	Angaria	*Angaria delphinus*	0	0	1 ±2.6	0
Astralium	Astralium	*Astralium calcar*	3 ±2.6	0	0	0
Bullidae	Bull	*Bulla quoyii*	3 ±2.6	0	3 ±5.1	0
Conidae	Cone	*Conus ferrugineus*	3 ±5.1	1 ±2.6	0	0
Volutidae	Cymbiola	*Cymbiola innexa*	3 ±2.6	15 ±5.1	9 ±7.7	6 ±6.8
Cypraeidae	Cypria	*Cypria* sp.	0	0	0	1 ±2.6
		Cypria tiger	0	3 ±2.6	7 ±2.6	0
Muricidae	Chicory	*Chicorys capucinus*	0	1 ±2.6	0	13
	Hexaplex	*Hexaplex cichoreum*	1 ±2.6	1 ±2.6	4 ±4.4	6 ±6.8
Nassariidae	Nassarid	*Nassarid Dorsat*	1 ±2.6	7 ±9.3	1 ±2.6	7 ±9.3
family naticidae	Natica	*Natica vitellus*	4 ±4.4	3 ±2.6	1 ±2.6	0
	Polinices	*Pollinaceae*	7 ±9.3	0	10 ±5.1	3 ±2.6
Cerithiidae	Pseudovertagus	*Pseudovertagus aluco*	12 ±5.1	76 ±7.7	34 ±6.8	81 ±5.1
	Rhinoclavis	*Rhinoclavis vertagus*	0	1 ±2.6	6 ±6.8	0
Strombidae	Strombus	*Strombus urceus*	98 ±0	89 ±4.4	104 ±5.1	84 ±4.4
Potamididae	Telescope	*Telescope telescope*	4 ±0	0	0	1 ±2.6
Potamididae	Terebralia	*Terebralia sulcata*	4 ±2.6	0	0	4 ±4.4
Trochidae	Trochus	*Maculatus trochus*	15 ±2.6	47 ±5.1	24 ±2.6	34 ±9.3
Amount			157	246	206	231

Table 5. Shell length and width of megagastropoda species

Species	North Station		East Station		South Station		West Station	
	Length (±SD)	Width (±SD)	Long (±SD)	Wide (±SD)	Long (±SD)	Width (±SD)	Length (±SD)	Width (±SD)
A. delphinus	0	0	0	0	0	0	3.5 ±0.0	2.6 ±0.0
A. calcar	1.6 ±0.6	1.3 ±0.5	0	0	0	0	0	0
B. quoyii	3.1 ±0.7	2.0 ±0.2	0	0	0	0	3.0 ±0.0	1.8 ±0.0
C. capucinus	0	0	5.3 ±0.0	2.5 ±0.0	7.3 ±0.0	2.8 ±0.0	0	0
C. ferrugineus	4.4 ±0.0	2.0 ±0.0	0	0	6.1 ±0.0	4.7 ±0.0	0	0
C. innexa	3.6 ±0.1	1.7 ±0.0	6.7 ±0.5	2.9 ±0.2	5.2 ±0.1	2.4 ±0.1	5.4 ±0.9	2.5 ±0.4
***Cypria* sp .**	0	0	3.6 ±0.0	1.9 ±0.0	0	0	0	0
C. tiger	0	0	0	0	7.4 ±0.1	5.3 ±0.1	6.4 ±0.7	4.6 ±0.4
H. cichoreum	5.2 ±0.0	3.1 ±0.0	4.8 ±1.3	2.5 ±0.5	5.6 ±0.0	2.4 ±0.0	4.4 ±0.1	2.7 ±0.4
N. dorsum	2.9 ±0.0	1.5 ±0.0	2.6 ±0.2	1.5 ±0.0	2.6 ±0.1	1.5 ±0.0	2.9 ±0.0	1.6 ±0.0
N. vitellus	1.7 ±0.0	1.3 ±0.1	0	0	2.2 ±0.1	1.7 ±0.0	1.8 ±0.0	1.5 ±0.0

P. tumidus	2.3 ±0.3	1.6 ±0.1	2.3 ±0.3	1.7 ±0.2	0	0	2.1 ±0.4	1.6 ±0.3
P . aluco	4.4 ±0.1	1.7 ±0.1	4.6 ±0.2	1.6 ±0.0	4.4 ±0.1	1.5 ±0.1	4.6 ±0.2	1.7 ±0.1
R. vertagus	0	0	0	0	4.1 ±0.0	1.4 ±0.0	4.1 ±0.1	1.3 ±0.0
S. urceus	3.5 ±0.1	2.0 ±0.7	3.7 ±0.1	1.6 ±0.0	3.6 ±0.1	1.6 ±0.0	3.3 ±0.1	1.5 ±0.0
T. telescopium	8.0 ±1.4	3.3 ±0.6	0	0	0	0	0	0
T. sulcata	4.4 ±0.0	1.9 ±0.0	4.6 ±0.0	1.6 ±0.1	0	0	0	0
T. maculatus	1.4 ±0.1	1.3 ±0.2	1.6 ±0.2	1.3 ±0.1	1.4 ±0.0	1.6 ±0.6	1.5 ±0.0	1.3 ±0.0

Table 6. Biological Index

Rank 1: *S. urceus*	**Rank 5: *P. tumidus***	**Rank 9: *N. vitellus***
Rank 2: *P. aluco*	Rank 6: *T. sulcata*	Rank 10: *A. calcar*
Rank 3: *T. maculatus*	Rank 7: *T. telescopium*	
Rank 4: *C. innexa*	Rank 8: *B. quoyii*	

Table 7. Index values diversity , uniformity and dominance.

Index	North Station	East Station	South Station	West Station	Average
Diversity	1.49	1.55	1.49	1.65	1.54
Uniformity	0.52	0.53	0.52	0.57	0.53
Dominance	0.41	0.28	0.27	0.30	0.32

Relationship between Abundance of Megagastropoda and Density of Seagrass Species

The relationship between megagastropoda abundance and seagrass density is shown in Table 8.

Table 8. Relationship between megagastropoda abundance and seagrass species.

	Correlation Value				
	E. acoroides	*T. hemprichii*	*H. ovalis*	*C. rotundata*	Total Density
Abundance of megastropods	r = (+)0.616	r = (+)0.331	r = (+)0.454	r = (+)0.552	r = (+)0.746

DISCUSSION

Characteristics of physical and chemical parameters of water and bottom substrate

The physical parameters of the waters include temperature, salinity, pH, DO, brightness and turbidity and nitrate content ranging from 0.02-0.11 mg/l with an average of 0.06 mg/l indicating within the natural range and in accordance with the seawater quality standards of the Republic of Indonesia Government Regulation No. 22 of 2021 concerning seawater quality standards. In contrast, the phosphate content ranges from 0.003-0.006 mg/l with an average of 0.004 mg/l lower than the seawater quality standard which reaches 0.015 mg/l (Table 2). The physical and chemical characteristics of these waters are similar to the physical and chemical conditions of the waters in the seagrass beds of Kedindingan Island (Widyawati et al., 2022) and Badak Badak Island, Bontang City (Batuallo et al., 2024).

The bottom substrate at the North and East Stations tends to be sand, while the South

Station tends to be sandy loam or sandy clay with the highest percentage of dust reaching 12.72% and clay 6.81% and the West Station tends to be loamy sand or clayey sand. The existence of 3 groups of bottom substrate textures is a good habitat for the diversity of seagrass species (Table 3) and megagastropoda (Table 4). This can be compared with the characteristics of the bottom substrate texture on Miang Besar Island, East Kutai Regency, which tends to be sand (Faizal et al., 2022) and on Badak Badak Island, Bontang City, which tends to be sand clay, is a monospecific seagrass habitat *(Enhalus acoroides*) and 4 species of megagastropoda (Batuallo et al., 2024).

Composition and Density of Seagrass Meadows

The composition of seagrass species E. acoroides reached 3.9%, *T. hemprichii* reached 47.9%, *H. ovalis* reached 13.5%, and *C. rotundata* reached 34.6% (Table 3) with dominant species namely; *T. hemprichii* and *C. rotundata*, while the composition of seagrass species in the northern part of Bontang City waters contained 5 species, namely: *C. rotundata, H. pinifolia, E. acoroides, T. hemprichii*, and *H. minor* with the highest importance index values being *C. rotundata and E. acoroides* (Irawan et al., 2018). This shows that *C. rotundata* is a key species that makes up seagrass beds in Bontang City waters, such conditions can be seen in the seagrass beds of Melahing Island which are dominated by *C. rotundata* with a density ranging from 73-101 stands/m2 (Irawan et al., 2024). The dominance of *T. hemprichii* tends to be found in seagrass beds with higher salinity (Irawan et al., 2018) and *E. acoroides* tends to be found increasing in seagrass beds near river estuaries with turbidity above seawater quality standards (8.1-8.6 NTU) (Batuallo et al., 2024).

Seagrass density ranges from 484-694 stands/m2 with an average of 611 stands/m2 (Table 3). Based on the range and average in very dense conditions (density ≥176 stands/m2) (Gosari & Haris, 2012), while in the seagrass beds of Badak Badak Island, Bontang City, which tend to be monospecific with a density ranging from 42-54 stands/m2 in sparse conditions (Batuallo et al., 2024). The highest seagrass density was at the South Station, then the East Station, West Station and North Station (Table 3). The high density of seagrass at the South Station tends to be related to the characteristics of the base substrate with a sandy clay texture, and the opposite can be seen from the decreasing density of seagrass species in line with the decreasing percentage of clay and dust at the other three stations (Table 2), such substrate conditions were also found in the northern seagrass beds of Bontang City waters with a clay percentage ranging from 5.56-9.30% and dust ranging from 7.76-23.04% (Irawan et al., 2018) and in the seagrass beds of Melahing Island with a clay percentage ranging from 13.3-15.6% and dust ranging from 4.2-6.2% (Irawan et al., 2024).

Composition and Abundance of Megagastropoda

The composition of megagastropoda consists of 14 families, 17 genera and 18 species with an abundance ranging from 157-246 individuals/m2 with an average of 210 individuals/m2 (Table 4). Based on Table 4, the species composition at North Station has 13 species with an abundance of 157 individuals/m2, East Station has 11 species with an abundance of 246 individuals/m2, South Station has 12 species with an abundance of 206 individuals/m2, and West Station has 11 species with an abundance of 231 individuals/m2.

Based on the composition, it shows that the composition in the seagrass meadows of Tihi-Tihi Village tends to be higher than the composition of megagastropoda in the seagrass meadows of Badak Badak Island consisting of 3 families (Strombidae, Cypraeidae, and Cerithiidae) with 4 species, as well as the abundance tends to be lower (Batuallo et al., 2024), likewise on Miang Besar Island, East Kutai Regency, there are 9 species of megagastropoda (Faizal et al., 2022). The tendency for differences in species composition and abundance is

related to the characteristics of the seagrass species that make up the seagrass meadows, namely the seagrass meadows of Badak Badak Island, Bontang City, composed of Enhalus acoroides (Batuallo et al., 2024) and the seagrass meadows on Miang Besar Island, East Kutai Regency, which contain 4 species of seagrass, namely: Cymodocea serrulata, E. acoroides, Halodul pinifolia and T. hemprichii (Faizal et al., 2022).

The length of the megagastropoda shell ranges from 1.4-8.0 cm with an average of 3.9 cm and the width ranges from 1.3-5.3 cm with an average of 2.1 cm (Table 5). Based on Table 5, it shows that the largest shell height and width are found at the South Station (height: 1.4-7.4 cm with an average of 4.5 cm and width: 1.4-5.3 cm with an average of 2.4 cm), then the East Station (height: 1.6-6.7 cm with an average of 4.0 cm and width: 1.3-2.9 cm with an average of 1.9 cm), the West Station (height: 1.5-6.4 cm with an average of 3.6 and width: 1.3-4.6 cm with an average of 2.1 cm), while the North Station (height: 1.4-8.0 cm with an average of 3.6 cm and width: 1.3-3.3 cm with an average of 1.9 cm).

Based on species, it shows that Telescopium telescopium has the largest size, then Cypraea tigris, Chicoreus capucinus, Cymbiola innexa, and Hexaplex cichoreum (Table 5). Based on the biological index, it shows that rank 1 is Strombus urceus, rank 2 is Pseudovertagus aluco, rank 3 is Trochus maculatus, rank 4 is Cymbiola innexa and rank 5 is Polinices tumidus. This shows that the five species are key species in making up the megagastropoda community in the seagrass beds of Tihi-Tihi Village (Table 6).

The diversity index value ranges from 1.49-1.65 with an average of 1.54 (Table 7), the range and average are in the moderate diversity criteria. The evenness index value ranges from 0.52-0.57 with an average of 0.53 (Table 7), the range and average are in the moderate population evenness criteria. The dominance index value ranges from 0.27-0.41 with an average of 0.32, the range and average are within the moderate dominance criteria.

Relationship between Megagastropoda Abundance and Seagrass Density

Based on Table 8, it shows that the relationship between the abundance of megagastropoda and the density of seagrass species is negatively correlated from weak to moderate and the correlation between the abundance of megagastropoda and the total abundance of seagrass species with a correlation value (r = (+) 0.746) and a correlation coefficient of 55.65%. This shows that the characteristics of the seagrass species that make up the seagrass meadow contribute to increasing the abundance of megagastropoda by 55.65%.

CONCLUSION

1. The composition of seagrass species T. hemprichii reached 47.9%, C. rotundata reached 34.6%, H. ovalis reached 13.5%, and E. acoroides reached 3.9% with the characteristics of the basic substrate texture of sand, clayey sand, and sandy clay.
2. The composition of megagastropoda consists of 14 families, 17 genera and 18 species with an abundance ranging from 157-246 individuals/m2 with an average of 210 individuals/m2.
3. The value of the diversity index in the moderate diversity criteria, the uniformity index in the moderate population uniformity criteria, and the index in the moderate dominance criteria
4. The characteristics of seagrass species that make up seagrass beds contribute to increasing the abundance of megagastropoda.

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