

The Diversity of Fish in Seagrass Beds and Bare Sand channel In Tablolong Waters, Kupang Regency

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(Received 24 February, 2022; Accepted 3 April, 2022)

ABSTRACT

Seagrass ecosystems in Tablolong waters have important values related to the availability of fish resources. However, this seagrass meadow experiences a lot of fragmentation in the form of empty sand areas without vegetation (bare sand), both in the form of channels and tidal pools which provide many small living spaces (microhabitats) that are interesting for aquatic ecology studies. The aim of this research was to analyze the diversity and dominance of fish species in the seagrass beds and bare sand channels, as well as to determine the dominant species of seagrasses in the seagrass beds. The study was conducted through direct observation by catching fish specimens using gillnets (# 1.5 inches and #1.25 inches, @ length 20 m x height 1.5 m) and scoop nets three (3) times sampling with time intervals. 7-10 days in the time period of October-November 2021. The results showed that the seagrass beds in the Tablolong Waters are classified as heterospecific from at least 6 (six) seagrass species with an average density of all species reaching 219.2 stands/m² and an average cover of 40.0% (medium level of cover) where *Thalassia hemprichii* was the dominant seagrass species in terms of density value (more than 50% of total species) and cover value almost 40% of total species. The fish collection obtained as a whole consisted of 22 fish species from 17 families with 86 individuals where the fish community in the seagrass beds (9 species, 8 families, 17 individuals) was recorded to be lower than the fish community in the empty sand tunnel (13 species, 11 families, 49 individuals), each with a ratio of 41%:59% in species, a ratio of 47%:65% in families and a ratio of 43%:57% in the number of individuals. The status of the fish species that dominates was the occasional visitor fish of 90% (20 species) compared to seasonal visitor fish and whole life resident fish of 5% (1 species). The index value of fish species diversity in seagrass beds was moderate ($H' 2$) which was lower than the fish community in empty sand tunnels which was high ($H' 4$) and the total number of fish species on Tablolong beach was high ($H' > 4$). The fish species dominance index value showed that in both fish in seagrass beds ($D 0.28$), in empty sand tunnels ($D 0.11$), and the whole area ($D 0.25$) in Tablolong waters there were no dominant fish species. so that the structure of the fish community tends to be stable or the diversity of fish species tends to be high.

Key words : Fish Diversity, Seagrass Beds, Bare Sand channel, Tablolong Waters

Introduction

Tablolong waters in the western part of Timor Island, Nusa Tenggara Province have a variety of coastal ecosystem habitats such as seagrass beds which have important values related to the availability of fish resources. However, seagrass ecosys-

tems still receive less attention and appreciation and are often forgotten compared to mangrove and coral reef ecosystems (Merryanto, 2008; Zurba, 2018). Research on seagrass in Indonesia began in the 1970s. The abundance of fish in seagrass beds is thought to be determined by the overall density of seagrass and the morphology of the seagrass species that form it.

The abundance and structure of the fish community in the seagrass ecosystem vary with time, influenced by several environmental factors such as brightness, salinity, substrate and water current velocity; and the nature of the biota within the community itself (Kikuchi, 1974; Hutomo, 2014; Fortes, 1990; Dahuri *et al.*, 1996 in Merryanto, 2000).

Seagrass ecosystems in coastal areas are generally a relationship of dense seagrass beds with fragmented areas in the form of bare sand areas without vegetation, either in the form of channels or in the form of tidal pools, which appear as puddles of seawater trapped during low tide. This tidal microhabitat, especially the empty sand tunnel, is often used by fish for playing, looking for food, growth, development and reproduction wherein the end this tidal empty sand tunnel area can also be a key habitat for the diversity of coastal fish species. Although the fish community in this microhabitat is not an economical fish group and is generally small in size, it is ecologically important and has not been touched and understood by many researchers (Merryanto and Emola, 2019). The existence of diversity and density of the community of organisms, both animals and plants in the seagrass ecosystem, can be used as an ecological model related to the natural simplification of environmental complexity that affects the community of its inhabitants so that it can be a biological indicator of environmental quality and systems, for example, the impact of climate change (Merryanto and Emola, 2000). 2019, Fletcher, 2021). Based on these reasons, it is deemed necessary to conduct research on the diversity of fish species, to determine the predominant species of fish, and to determine the dominant species of seagrass in the seagrass beds and in the empty sand channels of Tablalong Waters.

Materials and Methods

The research was carried out through direct observation using gill nets that were spread over seagrass beds at depths as high as gill nets. While the sampling of fish in shallow empty sand channels in the seagrass ecosystem area was carried out purposively. Meanwhile, seagrass measurements were carried out using quadrants on two (2) transect lines which were determined purposively based on the presence of seagrass beds and empty sand channels located parallel to a distance of up to 150 m from the shoreline, with a transect line of 50 m length and a

seagrass plot interval of 10 m. The interval between transect lines was 50 m. This field research was carried out in October-November 2021.

Fish Sampling in each seagrass bed and empty sand channels was carried out three times separately with an interval of 1-2 weeks, while seagrass sampling was only done once at the end of the study.

- Fish Sampling was carried out during low tide or low tide until before high tide
 - o All fish were collected using gill nets directly on seagrass beds and/or by hand scooping in empty sand channels for approximately three (3) hours of the fishing operation, then sample fish were transferred to holding buckets and specimen jars.
 - o Each individual fish was grouped according to the species and location of the catch, then the number (individuals) was counted and the total length (cm) and weight (grams) were measured. Fish sample specimens were then identified and the data recorded.
 - o For situations where fish in empty sand channels are impossible to catch entirely, the calculation and identification of the species will be carried out by means of a visual census for a maximum of 30 minutes of observation.
 - o Fish sample collections that have been identified were then grouped into three occupancy statuses, namely permanent resident fish, seasonal resident fish, and occasional visitor fish according to Peristiwady (1994) in Merryanto (2000).
- Identification of fish was carried out based on a number of appropriate reference books (Munro, 1967; Sawada, 1980; Allen and Steene, 1994; Atmadja *et al.*, 1996; Allen, 2000) and using the help of online media such as FishBase (www.fishbase.org) and WORMS (www.marinespecies.org)
- The collection of seagrass samples (species, percent cover and density) was carried out by calculating them using a quadrat and taking and identifying the species using appropriate identification methods and books (English *et al.*, 1994; Hutomo and Nontji, 2014) and using online tools such as GCE (www.live-plants.com).

Fish and seagrass data were processed using Excel and SPSS (www.ibm.com) where the results were displayed in tabulations and graphs and analyzed descriptively quantitatively. Analysis of fish community data was based on the value of its

ecological index including species diversity and dominance (Fachrul, 2007; Jorgensen *et al.*, 2010); while, analysis of seagrass data includes composition, percent cover, and density of species (English *et al.*, 1994; Hutomo and Nontji, 2014).

Results and Discussion

The study was carried out during the transitional period between the dry season and the rainy season with relatively hot and dry air temperatures (27-33 °C) and light rain, low wind speed (0.2-5.4 m/s, equivalent to a Beaufort scale of 1-4 where the air is light to moderately light) causing small calm currents with small waves not overflowing to small sea

waves with broken waves. Based on the water quality standards for marine biota in seagrass ecosystems according to Appendix 3 of KEPMENEG-LH No.51 of 2004, it is known that the range and average of all oceanographic and environmental physics parameters in the seagrass beds of Tablolong were in Table 3, they were water temperature 28.5-30 °C, 29.0 °C), salinity 33-34‰/oo, 33.3 ‰/oo), brightness 100% at a depth of 20-170 cm was considered optimal for the survival of various aquatic biota at the study site.

Tablolong waters have a fairly wide expanse of seagrass beds with a general condition of moderate cover (40% average cover) which grows at a

Table 1. Fish communities in seagrass beds and empty sand channels in Tablolong Waters

No.	Family	Fish		Size		Amount (ind.)	Attend Freq.	Occupancy Status ¹⁾
		No.	Scientific name	Length (cm)	Weight (g)			
A. Seagrass Beds								
1	Bothidae	1	<i>Bothus pantherinus</i>	10.0	8.9	1	1	OV
2	Clupeidae	2	<i>Dussumieria elopsoides</i>	5.4-6.7	1.3-2.7	17	1	OV
3	Gobiidae	3	<i>Bathygobius</i> sp.	14.0	30.1	1	1	OV
4	Labridae	4	<i>Cheilio inermis</i>	30.5	106.5	1	1	OV
5	Lethrinidae	5	<i>Lethrinus harak</i>	12.5-14.5	27.4-32.2	4	2	SV
		6	<i>Lethrinus variegatus</i>	14.0	29.4	1	1	OV
6	Lutjanidae	7	<i>Lutjanus carponotatus</i>	12.0	18.2	1	1	OV
7	Monachantidae	8	<i>Acreichthys tomentosus</i>	8.0-10.0	11.1-18.0	10	3	WR
8	Ophichthidae	9	<i>Yirrkala lumbricoides</i>	28.5	14.6	1	1	OV
						Total (A)	37	
						H'	2,22	
						D	0,28	
B. Empty sand channels								
1	Apogonidae	1	<i>Cheilodipterus quinquelineatus</i>	1.7	0.1	5	1	OV
		2	<i>Apogon</i> sp.			3	1	OV
2	Callyonimidae	3	<i>Callyonymus</i> sp.	5.0	0.6	3	1	OV
3	Congridae	4	<i>Heteroconger</i> sp.			2	1	OV
4	Engraulidae	5	<i>Stoleptorus indicus</i>	6.5	1.5	5	1	OV
5	Gobiidae	6	<i>Istigobius</i> sp.			3	1	OV
6	Labridae	7	<i>Pseudojuloides elongatus</i>	2.0		3	1	OV
7	Mugilidae	8	<i>Mugil</i> sp.	6.1-6.3	2.3-3.0	5	1	OV
8	Pomacentridae	9	<i>Abudefduf</i> sp.			5	1	OV
9	Scaridae	10	<i>Scarus</i> sp.	3.0		3	1	OV
		11	<i>Siganus</i> sp.1			5	1	OV
10	Siganidae	12	<i>Siganus</i> sp.2			2	1	OV
		13	<i>Terapon</i> sp.			5	1	OV
						Total (B)	49	
						H'	3,63	
						D	0,11	
						Total (A + B)	86	
						H'	4,23	
						D	0,25	

¹⁾WR= whole life resident), SR = seasonal resident), OV = occasional visitor

distance of about 50 m to 300 m from the mean sea level. There were 6 (six) species of seagrass that make up the composition of the seagrass beds in this research location, namely *Halodule pinifolia* (Hp), *Cymodocea rotundata* (Cr), *Syringodium isoetifolium* (Si), *Enhalus acoroides* (Ea), *Thalassia hemprichii* (Th) and *Halophila ovalis* (Ho). *Thalassia hemprichii* was the predominant species compared to other seagrass species, both in the density value of 1,568 stands/m² (more than 50% of the total species) and the coverage value reaching 95% (almost 40% of the total species) or categorized as very dense. Meanwhile, the lowest value belonged to the seagrass *Halophila ovalis* with a density value of 97 stands/m² (less than 4% of the total species) and a cover value of 15% (less than 7% of the total species).

The fish community in Tablolong waters as a whole was composed of 22 fish species from 17 families with 86 individuals (Table 1).

Table 1 showed that the fish communities in the seagrass beds had fewer species and numbers of fish (9 species from 8 families with 37 individuals) compared to fish in the empty sand channels (13 species from 11 families with 49 individuals), i.e. with each ratio 41%:59% for species, 47%:65% for families and 43%:57% for individuals.

There were no fish species that significantly dominated other fish species, either in the seagrass beds or in the empty sand channels, only *Acreichthys tomentosus* (family Monacanthidae) could be considered as the predominant fish species in the seagrass beds based on the frequency of its presence (3 times present) and there were no dominant fish species in the empty sand channels of Tablolong Waters. Furthermore, there were three (3) families of fish whose species were present more than once, they were Lethrinidae (2 species), Apogonidae (2 species), and Siganidae (2 species). Based on their occupancy status, in general, the species of fish present in this ecosystem were dominated by occasional visitor fish of 90% (20 species) compared to seasonal visitor fish and whole life resident fish, which each 5% each (1 species).

The ecological index value was based on the diversity index value (H') of the fish community in the seagrass beds showing $H' \approx 2$ which means that the fish community has moderate diversity or moderate stability of the fish community, while in the empty sand channels and overall, in Tablolong waters it shows $H' \approx 4$ and $H' > 4$, which means that the fish community has high diversity or the stability of the

prime fish community (stable) and/or the stability of the fish community was high. While, the dominance index value (D) of fish communities in seagrass beds, in empty sand channels, and the overall fish community in Tablolong waters, respectively showed the value of $D = 0.28, 0.11,$ and 0.25 or the overall value of $D \approx 0$ which means that there were no fish species that dominate other fish species or the fish community structure was stable, or the diversity of fish species tends to be high.

Conclusion

1. The diversity of fish species in the seagrass beds was moderate and lower than the diversity of fish species in the empty sand channels of Tablolong waters, which were classified as prime. However, in terms of abundance, it was inversely,
2. There were no dominant fish species in the seagrass beds, in the empty sand channels of the Tablolong Waters, or as a whole. Only *filefish* (family Monacanthidae) can be called the predominant fish species based on the frequency of their presence in seagrass beds,
3. The seagrass ecosystem in Tablolong waters was classified as multispecies with at least 6 (six) types of seagrass as its constituent, whereas *Thalassia hemprichii* was the dominant type of seagrass both in density value and percent cover.

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