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DISTRIBUTION AND ABUNDANCE OF SEAGRASS IN BONGAO, TAWI-TAWI

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ABSTRACT

Seagrass is one of the coastal ecosystems that is crucial to ecological and economical contribution in Bongao, Tawi-Tawi. This study aimed to document the seagrass species diversity and abundance through its distribution and percent cover in three selected sites or barangay, namely Barangay Pahut, Barangay Simandagit, and Barangay Pasiagan. Fixed transect design by Mckenzie was used. Results showed that seven (7) seagrass species were found, lower than what FISH project in 2005 had recorded. Within the three sites the diversity index of 1.653 indicates unstable community, although in terms of total percentage cover it is in" good" condition because of dominating presence of *Thalassia hemprichii*. *Thalassia hemprichii* was the most abundant species (56.59%). This suggests that *T. hemprichii* is preventing growth of other species. The most extensive seagrass bed was found in Pasiagan where *Thalassia hemprichii* wasn't found. Species on that area were evenly distributed, and Pasiagan has the most species diversity (61.32%) indicating that seagrass biodiversity found in that area is still healthy.

KEYWORDS: Abundance, distribution, percentage cover, diversity index, fixed transect design.

INTRODUCTION

Seagrasses are submerged vascular plants that can form condensed vegetative communities in shallow water estuaries. They are highly productive, faunally rich, and ecologically important habitat within the coastal areas and estuaries of Bongao, Tawi-Tawi. It forms vast, and extensive seagrass beds that sheltered and provide source of food to thousands of flora and faunal species. Seagrasses thus, constitute a major link of food chain. The combination of food availability and shelter results in seagrass beds being the richest nursery grounds of many juvenile fishes and other small and large invertebrates like shrimp, crabs and sea urchins. Sea grass habitats also serve as the feeding ground for those endangered or highly valuable species like marine turtles and for some instances, endangered dugong too (Fortes and Santos, 2004). Seagrass beds also provide the transitional pathway or buffer necessary for coral reefs to protect coasts and mangroves from strong waves and streams and for mangroves to protect reefs from erosion and sedimentation (Fortes, 1995). The most significant and high level statement about seagrass vis-à-vis climate change was made: "when healthy, mangrove forests, saltwater marshlands and seagrass meadows are extremely effective at storing atmospheric carbon, thereby mitigating climate change" (UNEP/IUCN 2009).

From surveys in 96 sites throughout the Philippines, 978 km^2 of seagrass beds have been identified in the country, mostly in northwestern, western, and southern areas, with outlying islands having sizable beds. Eighteen (18) seagrass species from three families of Cymodoceaceae, Hydrocharitaceae and Ruppiaceae (Sensu, Hartog & Kuo 2007) have been found from the 529 sites visited, according to Fortes (2008 and 2012). However, about half of the seagrass beds have either been lost or severely degraded over the past 50 years and the rate of degradation is increasing (DA-BFAR, 2004). These losses and degradations resulted from coastal development like construction of ports, waste disposal, sedimentation, destructive fishing, eutrophication and aquaculture (Fortes, 1995).

In Tawi-Tawi, Coastal areas except in Simandagit and Tubig-Tanah, seagrass beds occur in narrow (<50m) alongside the coastline. High frequency of commercially important fauna such as Siganus guttatus, Caranx sp, and Scylla Serrata are found (Alino et al, 2005). Some insights from the fisheries survey that the general status of fisheries resources in the area is much better than most areas of the country but there are clear indications that the status of fisheries resources are in slow decline, one of indicator of it is the decreasing abundance of seagrass. Indiscriminate human settlement and human activities such as sand and coral quarrying, cyanide and dynamite fishing, fish corralling, mangrove cutting and neglectful waste disposal have caused considerable damage to the natural resources of the area. Worse as it can be, environmental depletion is not receiving the serious attention it deserves, both from the province's leadership figures as well as the community itself (Arsad, 2008).

The purpose of this study aimed to document the abundance and distribution of seagrass species along the selected coastlines of Bongao, Tawi-Tawi as of year 2018.

The result of this study will serve as an update report regarding the abundance and diversity of seagrass in Bongao, Tawi-Tawi. Seagrass serves as an indicator of stable community.

MATERIAL AND METHOD

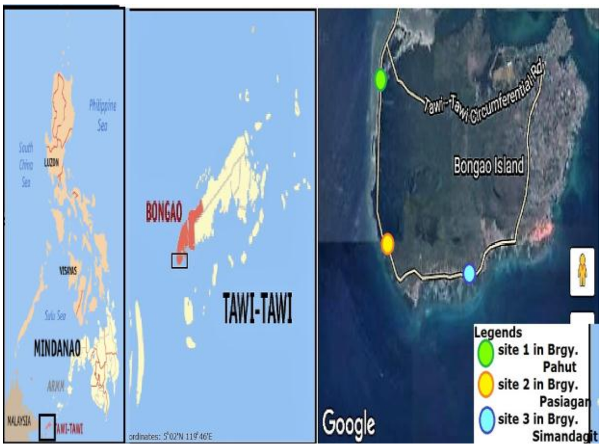

Figure 1: Map of the study sites in Bongao, Tawi-Tawi.

50 m	50		50		50
	45		45		45
	40		40		40
	35		35		35
	30		30		30
	25		25		25
	20		20		20
	15		15		15
	10		10		10
	5		5		5
	0		0		0
		25 m		25 m	

Figure 2: Fixed transect design by McKenzie (2003).

Description of the study sites. This study was conducted at Bongao, Tawi-Tawi. Along the 20 kilometers coastline of Bongao, three coastal barangays were purposively selected based on the observed rampant construction of resorts and quarrying in the area. The barangays were Brgy. Pahut, Brgy. Pasiagan, and Brgy. Simandagit. The three sites have an interval of 5 km away from each other.

Field Sampling Design. The study followed a modified field sampling design based from the intertidal fixed transect sites of McKenzie et al (2003). In Figure 2, three transect lines per study site was laid, each transect was separated from each other by a distance of 25 m within the 50 m by 50 m site. For each transect, 11 sampling stations were created at five meter intervals along each transect. Total transect utilized were 9 transects.

Field Sampling of Seagrasses Identification of the seagrass species was based on the identification keys compiled by McKenzie et al (2003) and a key to the Philippine seagrasses by Meñez (1983) and Fortes (2004) to identify the seagrass species within each replicate quadrat. Estimation of the percent cover for each seagrass species found in each quadrat was done through ocular estimation of quadrat. Ocular estimates were computed using cover class. In this study, Daubenmire (1959) cover class method was used (Figure 3). Table 1 shows the equivalent midpoint % of each cover class. Each species in the quadrat was assigned with cover class and the equivalent midpoint percentage.

Table 1: Daubenmire Cover Class Method.

Cover Class	% substratum covered	midpoint % (M)
1	Trace – 5%	2.5%
2	6 – 25%	15%
3	26 – 50%	37.5%
4	51 – 75%	62.5%
5	76 – 95%	85%
6	96 – 100%	97.5%

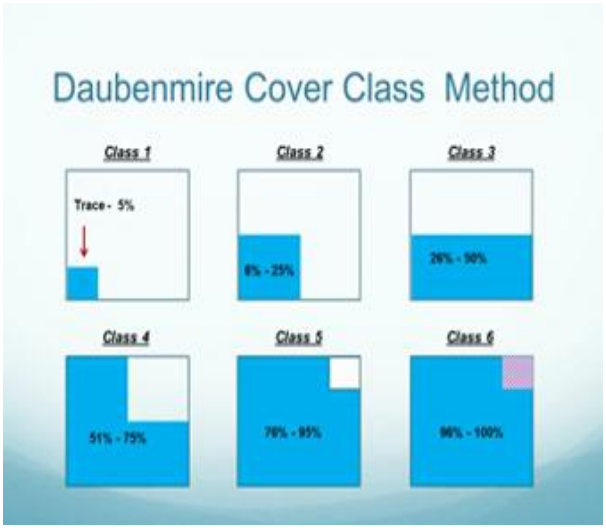

Figure 3: Daubenmire Cover Percentage

Data Analysis. Calculations for the cover (C) of each species in each 0.5 m x 0.5 m quadrat followed the equation by English et al (1997). $C = \frac{\Sigma(M_i \times f_i)}{\Sigma f}$ where Mi= midpoint percentage of class I, f= frequency (number of sectors with the same class of dominance (i). The cover for each transect was determined by dividing the sum of the average covers for each sampling station by the number of sampling stations utilized. The corresponding seagrass percent cover per study site was determined by getting the total percent cover of the transects divided by the number of transects used for each study site.

***Diversity*.** Shannon-Weiner diversity index will be computed to determine the seagrass diversity for the evaluation of the status of condition of seagrass areas. $H' = -\sum pi \ln pi$, where pi is the proportion of individuals found in species i and computed as: pi=ni/N, where ni is the percent cover per species i and N is percent cover of seagrasses per study site. Seagrass similarity $E = \frac{H'}{\ln S}$ was calculated with the formula as follows: where E= similarity index, H' = diversity index, S= number of species.

Statistical Analysis. One-way ANOVA was used to determine if there is a significant difference between the means of density in the study site at alpha (α=0.05) level of confidence.

RESULT AND DISCUSSION

Within the three study sites (Pahut, Pasiagan, Simandagit), seven seagrass species of two families were found (Table 2). There are four species of family Cymodoceaceae: *Cymodocea rotundata, Syringodium isoetifolium, Halodule pinifolia, and Halodule uninervis.* And three species are of family Hydrocharitaceae: *Enhalus acoroides, and Halophila ovalis, and Thalassia Hemprichii.*

Among the three sites, Pasiagan has the highest number of species found, only *Thalassia hemprichii* wasn't present within the 50 by 50 m transect within the site. According to Meñez (1983), *Thalassia hemprichii* was commonly found on mud-coral-sand or coarse coral-sand substrates, in sheltered habitats. Moreover, it was also revealed by the same study (Meñez, 1983) that at several sites in Negros, *T. hemprichii* appeared to be mowed down in large patches and fish grazing on the leaves of the plant can be observed. *Syringodium isoetifolium* and *Halodule uninervis* weren't found in Pahut within its transect, while *Halophila ovalis* and *Halodule pinifolia* were absent in Simandagit with respect to its transect. The findings were lower compared to the Initial Feedback Independent Baseline Assessment of Fisheries Improved for Sustainable Harvest project in 2005. They had identified ten (10) species throughout the coastal areas of Bongao, while in the present study is only seven (7). FISH project (2005) pointed to the deteriorating condition of seagrass species richness in Bongao, Tawi-Tawi. The difference in the number of species identified is one factor for the deterioration of seagrasses species. This can be associated with the disturbances on the areas like construction of recreational facilities and human settlements, and the like.

Cover Percentage. Pasiagan has the highest total mean cover among the three study sites (64.32%). Pasiagan has a shallow water environment of sand-mud or sand substrates that are favorable to the growth of several seagrass species. Six species were identified, and the prevalent among them is the *Cymodocea rotundata* (18.71%). However, in terms of total cover in all sites, *Thalassia hemprichii* is the most abundant (56.59%). The result is consistent with the report of FISH project in 2005 that shows good condition rate for *T. hemprichii*, although in Pasiagan the species was not observed according to the data. It is most observed in Pahut, where it can be found at 20 m plot. The result hints on the dominating capability of *Thalassia hemprichii* that it prevents the growth of other species. And the species with least cover *is Halodule pinifolia* with only 9.70%. In relation to Meñez's study (1983), the rarity of *H. pinifolia* indicates that it is less tolerant of prevailing hydrographic parameters compared to other seagrasses. The species has only been collected from two sites along the coast of Negros and Samar islands.

Table 2: Seagrass composition of the study sites.

Sites	 *Thalassia hemprichii*	 *Cymodocea rotundata*	 *Syringodium isoetifolium*	 *Halophila ovalis*	 *Halodule pinifolia*	 *Enhalus acoroides*	 *Halodule uninervis*
Pahut	✓	✓		✓	✓	✓	
Pasiagan		✓	✓	✓	✓	✓	✓
Simandagit	✓	✓	✓			✓	✓

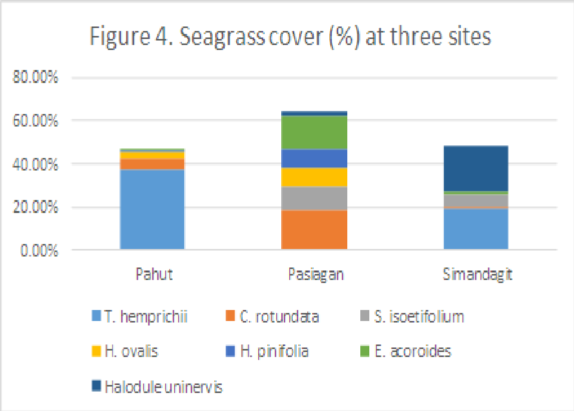

Figure 4. Seagrass cover (%) at three sites

Table 3: Seagrass condition criterion based on percent cover (Amran, 2010).

Coverage	Assigned Condition
> 75.4%	Very good
50.5 - 75.4%	Good
25.5 - 50.4%	Fair
5.5 - 25.4%	Poor
< 5.5%	very poor

Based on the cover percentage of seagrass species in three sites, it was found out to be in good condition (Table 3), with a total mean cover percentage of 53.03%.

Diversity Index. Pasiagan shows highest diversity index compared to the other two sites. The site has the highest species richness and species are evenly distributed within the 50 by 50 transect design. There were highly dominating species, like *Thalassia hemprichii* found in Pahut and *Halodule uninervis* in Simandagit. *Thalassia hemprichii* had a wide distribution in the areas of Pahut; it can be easily spotted at 20 m from the shoreline though the area has limestone to sandy substrate. In Simandagit, *Halodule uninervis* was spotted at 5 m from the shoreline together with different species of algae. The area is highly rich in algae even at the very shoreline. According to Hemminga and Duarte (2000), seagrass which had extensive distribution had a high adaptability so that it could grow well in different types of habitat with various environmental conditions. But then again, the presence of these dominating species means that the community is less diversed. As a whole and with only 1.653 Shannon-Wiener index indicates low stability community, which means that the condition of the coasts was under threats, both from natural factors and human activities. Quarrying is rampant in those areas.

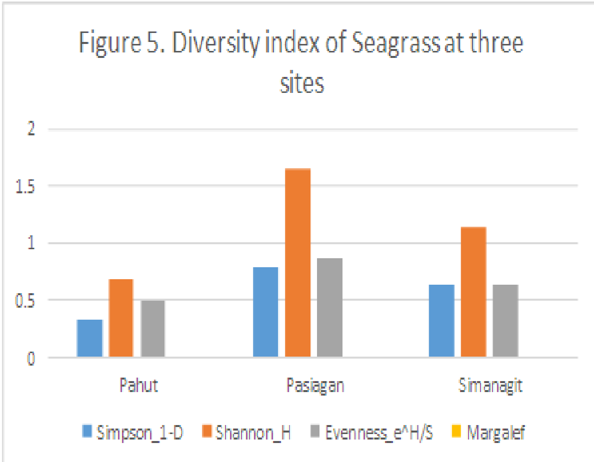

Figure 5. Diversity index of Seagrass at three sites

Table 4: Biodiversity Index Category (Odum 1983).

Biodiversity	Category
H'< 2.0	Low
2.0 < H' < 3.0	Moderate
H' ≥ 3.0	High

Statistical Analysis. ANOVA as shown in Table 5 revealed that there was no significant difference (α=0.05) as to the cover percentage of the seagrass species among the three sites (0.2214).

Table 5: One-Way ANOVA of cover percentage of the 3 sites.

Source of Variation	Sum of sqrs	df	Mean square	F	Sig.
Between groups:	0.083645	6	0.013941	1.726	0.2214
Within groups:	0.072679	9	0.008075	Permutation p (n=99999)	
Total:	0.156324	15	0.2149		

Similarity Index. Results of the cluster analysis (Figure 6) showed that the groups with the highest percentage of seagrass cover were Pasiagan and Pahut as the first group, Simandagit as the second group.

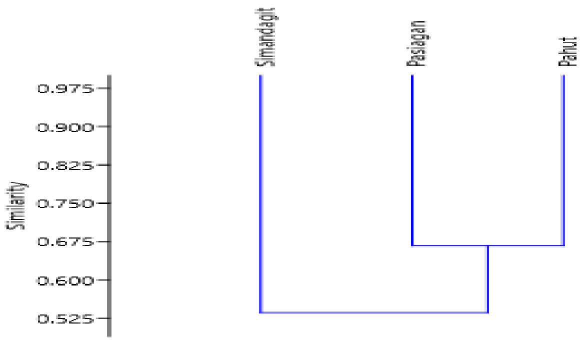

Figure 6: Cluster Analysis of three sites based on cover percentage of seagrass.

CONCLUSION

Seven species of seagrasses were observed in three selected coastlines of Bongao, Tawi-Tawi. FISH project in 2005 had recorded 10 species, while this study had only 7, this denotes less diversity. On the other hand, seagrass beds in Bongao still indicates good condition in terms of total percentage cover, but it is believed to decrease because of rampant disturbance such as construction of infrastructures for recreational purposes, quarrying activities, and human settlements, and the biodiversity index indicates low stability due to dominancy of some species like *Thalassia hemprichii*. The most extensive seagrass bed was found in Pasiagan where *Thalassia hemprichii* wasn't found. Species on that area were evenly distributed. This suggests that *T. hemprichii* is preventing growth of other species. Admittedly, this study has its shortcomings in terms of limitation in the study sites and the transect area, so it is highly recommended to broaden the scope into whole Tawi-Tawi province so that more authentic and precise data will be gathered.

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