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Seagrass Diversity and Distribution in Maribojoc Bay, Bohol, Philippines

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ABSTRACT

Seagrasses are major parts of coastal and marine biodiversity. Unfortunately, these aquatic plants and their ecological values are virtually unknown to many Filipinos. This study assessed the seagrasses in Maribojoc Bay, particularly in the coastal areas of the three municipalities, namely Maribojoc, Dauis, Panglao, and the City of Tagbilaran. Ecological assessments were conducted to determine the species composition, abundance, distribution, percent cover, diversity, dominance, and evenness of seagrass species. Eight sampling sites were surveyed from October to December 2020. Seven seagrass species were identified, with *Thalassia hemprichii* as the most abundant (52.79%). There was a significant difference ($p>0.05$) in seagrass species relative abundance. The Shannon diversity index implies low diversity (H'=1.40) of seagrass species. High dominance (2.98) and low evenness (0.72) were attributed to the high abundance of *T. hemprichii* in the seagrass beds. The seagrass coverage was characterized by patchy and continuous meadows, with percentage cover ranging from 17.45% (poor) – 60% (good). Maribojoc Bay had a seagrass percentage cover of 38.65%, which can be classified under "fair" condition. Seagrass community structure implies sparse coverage and low diversity, probably due to the deterioration of once-continuous meadows. However, further studies concerning seagrass communities are recommended in order to implement rehabilitation program or improve current management in Maribojoc Bay.

INTRODUCTION

Seagrass meadows are among the most productive ecosystems (McRoy & McMillan, 1997; Duarte & Chiscano, 1999) and support a whole range of highly valuable ecosystem services that rival those well-known ecosystems such as coral reefs and mangrove forests (Phillips & Milchakova, 2003; Nordlund et al., 2016). About 72 species of seagrasses are found worldwide (Saenger et al., 2013). Western Australia has more than 30 seagrass species recorded. While the Philippines has 16 species of seagrasses widely distributed throughout the country (Meñez et al., 1983; Fortes, 1989; Calumpong & Meñez, 1997). Although unknown to many, seagrasses are beneficial in the province as the majority of Boholanos are directly dependent on the coastal resources for food and livelihood. Unfortunately, seagrass beds are faced with serious threats from construction and reclamation activities in some parts of Bohol (Green et al., 2002).

In Maribojoc Bay, human pressure on its coastal area increases as the coastline is fringing a fast-growing city and urbanized municipalities. As observed, the shallow coastal habitats colonized by most seagrass meadows are often either dug up or covered to allow coastal development. Multiple environmental stressors, often attributable to human activities have caused seagrass reductions such as water eutrophication, coastal salinity changes, water turbidity in relationship to sediment management, and alien species (Orth et al., 2006; Waycott et al., 2009). Land-based activities also put pressure such as wastewater pollution and run-off from deforestation, mining, and agriculture (Hemming & Duarte, 2000; Short et al., 2011). Likewise, climate change is a large-scale pressure that affects seagrass ecosystems. Hence, resources productivity might be affected in the coming future (McKenzie et al., 2007). If these problems are not addressed, seagrass ecosystems may be threatened by stresses causing the natural productivity and ecosystem values to be compromised and degraded. Besides, seagrass degradation will not only cause scarcity in resource availability but affecting as well the ecological integrity of Maribojoc Bay. This study assessed the composition, abundance, distribution, diversity, and percentage cover of seagrasses in Maribojoc Bay. The result of this study would help support seagrass conservation so that coastal biodiversity values and services will be optimized and sustained.

LITERATURE REVIEW

Seagrasses are angiosperms which grow in marine environments. Seagrasses are not true grasses. They are called "seagrass" because most species have long green, grass-like leaves. Like terrestrial plants, seagrasses have leaves, roots and veins, and produce flowers and seeds (McKenzie, 2008). Sea grasses are one of the groups of flowering plants capable of completing their life cycle in a marine environment (Kuo & McComb, 1989). Seagrass meadows have evolved important physiological, morphological and ecological adaptations to cope with the range of coastal marine environments they inhabit. The spatial distribution of seagrass meadows heavily influenced by environmental factors such as light, temperature, salinity, nutrient availability, and wave action (Orth et al., 2006; Hemming & Duarte, 2000). Being plants, they need light for photosynthesis. Light availability

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is the most important factor determining seagrass growth and distribution (Hall et al., 1999; Bach et al., 1998; Dennison et al., 1993). Likewise, temperature and salinity affect the growth and distribution of seagrasses (Masini & Manning, 1997; Koch & Dawes, 1991; Bulthuis, 1987) while sheltered conditions (reduced wave action and current velocity) are also often necessary for seagrasses to become established (Van Katwijk & Hermus, 2000; Dan et al., 1998; Lee Long et al., 1993). Conversely, seagrass beds affect these physical parameters. They reduce current velocity (Koch & Gust, 1999; Gambi et al., 1990; Fonseca & Fisher, 1986; Fonseca et al., 1982), attenuate wave energy (Verduin & Backhaus, 2000; Koch, 1996; Fonseca & Cahalan, 1992), change the level of turbulence in the water (Koch & Gust, 1999; Worcester, 1995; Ackerman & Okubo, 1993; Gambi et al., 1990), and enhance light availability by promoting the deposition of suspended sediments (Kemp et al., 1984, Short & Short, 1984).

Seagrass are mainly found in clear shallow inshore areas between mean sea-level and 25 meters depth. The depth range of seagrass is most likely to be controlled at its deepest edge by the availability of light for photosynthesis (McKenzie, 2008). Seagrass abundance typically shows a parabolic pattern with increasing depth, with low abundance towards its shallow limit, increasing to maximal abundance at intermediate depths, and declining exponentially thereafter (Duarte, 1991). Seagrasses survive in the intertidal zone with most extensive meadows occurring on soft substrates like sand and mud. Exposure at low tide, wave action and associated turbidity and low salinity from fresh water inflow determine seagrass species survival at the shallow edge. Seagrass plants form small patches that develop into large continuous meadows. These meadows may consist of one or many species, sometimes up to 12 species present within one location (McKenzie, 2008).

Seagrasses evolved from terrestrial plants which migrated back into the ocean about 75 to 100 million years ago (Papenbrock, 2012; Orth et al., 2006). Seagrasses returned to the sea in a least three separate lineages or families (Les et al., 1997). Thus, seagrasses are not a taxonomically unified group but a biological or ecological group. The evolutionary adaptations required for survival in the marine environment have led to convergence in morphology (Olsen et al., 2016; McKenzie, 2008). Seagrasses are a polyphyletic assemblage of basal monocots belonging to four families in the *Alismatales* (Larkum et al., 2006; Les et al., 1997) namely *Zosteraceae, Hydrocharitaceae, Posidoniaceae and Cymodoceaceae* (Tomlinson & Vargo, 1966). Their common names, like eelgrass, turtle grass, tape grass, shoal grass, and spoon grass, reflect their many shapes and sizes and roles in marine ecosystems (McKenzie, 2008). Seagrasses represent a diverse and globally distributed group with up to 76 species occurring in boreal, temperate, and tropical waters (Green & Short, 2003). While most coastal regions are dominated by one or a few seagrass species, regions in the tropical waters of the Indian and western Pacific oceans have the highest seagrass diversity with as many as 14 species growing together. Antarctica is the only continent without seagrasses. Over 30 species can be found within Australian waters. The most diverse seagrass communities are in the waters of north-eastern Queensland (McKenzie, 2008). The global distribution of seagrass genera is remarkably consistent north and south of the equator. The northern and southern hemispheres share ten seagrass genera and only have one unique genus each. Some genera are much more speciose than others, with the genus *Halophila* having the most seagrass species. There are roughly the same number of temperate and tropical seagrass genera as well as species (Short et al., 2007).

MATERIALS AND METHODS

Sampling and Data Collection

Maribojoc Bay is situated in the southwestern part of the island province of Bohol covering the coastal areas of the four municipalities of Maribojoc, Cortes, Dauis, Panglao, and the City of Tagbilaran. It has a total of 73.4 kilometers of coastline and covers an area of 145 square kilometers. Four sampling stations were established in the three municipalities of Maribojoc, Dauis, Panglao, and the City of Tagbilaran (Figure 1). At each station, two sampling sites were established, for a total of eight sites surveyed. This study followed a standardized field sampling design consisting of three fixed, parallel, 50m transects (Short et al., 2006; McKenzie et al., 2008). At each sampling site, three transect lines were laid perpendicular to the shoreline, each separated from the other by a distance of 100 meters. For each transect line, a quadrat measuring 50cm x 50cm was laid at five-meter intervals along each transect. A total of 11 quadrats were sampled. Within each quadrat, biotic variables were measured such as species composition, abundance, distribution, diversity, and percentage cover (McKenzie et al., 2003; Short et al., 2006). Identification of seagrass species was based on the identification keys by McKenzie et al (2003) and the classification system used by Fortes (2013).

Ecological Assessments

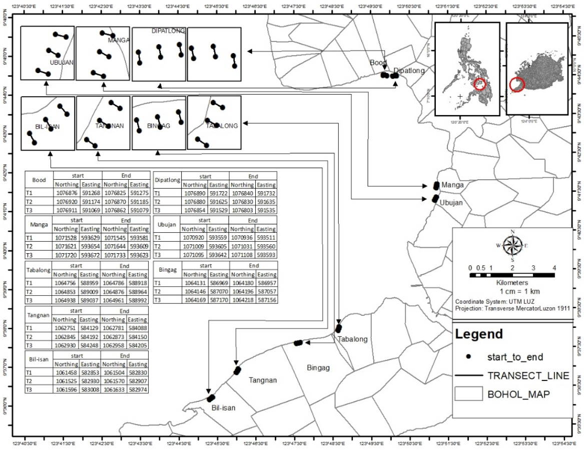

Figure 1. Location map of transect lines in eight study sites of Maribojoc Bay, Bohol.

Calculation of Diversity Index

Relative abundance was calculated to determine the species abundance and its distribution.

Relative Abundance = (n/N)*100

Where n = individual species count N=total species count

Shannon Diversity Index and Simpson Index Dominance were computed to determine the diversity index, dominance, and evenness of seagrass species among sampling stations.

Whittaker plot or rank-abundance curve was created

$H' = -\Sigma\, p_i \ln p_i \qquad D = \sum_{i=1}^{S}(pi)^2 = \sum_{i=1}^{S}(ni/N)^2 \qquad E = H'/H_{max}$

using Tinn-R version 6.01 and R for windows version 4.0.1.

Calculation of Seagrass Coverage

Estimation of the percent cover for each seagrass species found in each quadrat was done through ocular estimates based on the seagrass percentage cover photo guide (McKenzie et al., 2007). Calculations for the cover (C) of each species in each 50cm x 50cm quadrat are as follows (English et al. 1997):

The seagrass coverage for each transect was determined

$$C = \frac{\Sigma\,(M_i \times f_i)}{\Sigma f}$$

by dividing the sum of the average cover for each quadrat by the number of quadrats utilized. The corresponding percent cover per sampling site was determined by getting the total percent cover of transects divided by the number of transects used for each sampling site. The percentage of seagrass cover of each sampling site was then categorized using the categories used by Jackson and Nemeth (2007), where poor = 0-25%, fair =26-50%, good = 51-75%, and excellent = 76-100%.

Data Analysis

One-way analysis of variance (ANOVA) was used to test for significant differences at the alpha (α=0.05) level of confidence. The post-hoc test was used in defining the subsets of variance that contribute to differences among sampling stations and between sampling sites. The data was analyzed using SPSS.

RESULTS AND DISCUSSION

Species Composition, Abundance, and Distribution

Seven species of seagrass were identified in Maribojoc Bay, namely *Cymodocea rotundata, Enhalus acoroides, Halodule pinifolia, Halodule uninervis, Halophila ovalis, Syringodium isoetifolium,* and *Thalassia hemprichii* (Table 1). Compared to the 16 species that are present in the Philippines (Meñez et al., 1983; Fortes, 1989; Calumpong & Meñez, 1997), the seagrass in Maribojoc Bay is about 44% of the total seagrass found in the country. In Region 7, about 78% of the total seagrass species were found in 8 surveyed sites that included four municipalities (Calape, Getafe, Mabini, and Talibon) in Bohol (Alcaria et al., 1999). The seagrass species composition in Maribojoc Bay is comparable to other seagrass beds surveyed in Palawan (Terrados et al., 1998), Pangasinan (Vermaat et al., 1995), Guimaras Island (Babaran & Ingles, 1996), Davao del Sur (Jumawan et al., 2015), and Tawi-Tawi (Abubakar et al., 2018). There were more seagrass species compared to some surveyed areas in Mindanao (Orbita & Gumban, 2013; Redondo et al., 2017) and even southwestern Thailand and South Sulawesi, Indonesia (Terrados, et al., 1998; Vonk et al., 2008).

Among the surveyed stations, Dauis had all seven seagrass species. The higher number of seagrass species in the area can be due to its landscape, which is a cliff-rocky shore. Thus, seagrasses are sheltered from direct impact from sediment burial and human disturbances like the construction of tourism facilities, pollution, and human settlements. Other stations recorded six or five of the species, and the lowest was in Tagbilaran, with only four species found. Tagbilaran is located in a high-use bayside that serves as a docking port, tourism, fishing area, and human settlements. The difference in the number of species identified in the four stations could be one factor in the deterioration of the seagrass ecosystem in Maribojoc Bay.

The occurrence of seagrass species ranged from *Thalassia* – *Enhalus* bed to a maximum of seven species in mixed

Table 1: Species composition and distribution of seagrass species among four sampling stations in Maribojoc Bay, Bohol.

Species	Maribojoc	Tagbilaran	Dauis	Panglao
Cymodocea rotundata	+	+	+	+
Enhalus acoroides	+	+	+	+
Halodule pinifolia	+	-	+	-
Halodule uninervis	+	-	+	+
Halophila ovalis	+	+	+	+
Syringodium isoetifolium	-	-	+	+
Thalassia hemprichii	+	+	+	+
Total species	6	4	7	6

+presence, - absence

communities. In the Philippines, seagrass bed is often a mixed of *T. hemprichii, E. acoroides, C. rotundata, H. pinifolia, H. uninervis,* and *H. ovalis* (Meñez et al., 1983). Notably, this study shows that some species are site restricted, for example, *S. isoetifolium* is restricted in Panglao Island. Of the seven seagrass species, *T. hemprichii* was observed to be the most ubiquitous. In similar studies, *T. hemprichii* was also found to be the most proliferate in Negros (Meñez, et al., 1983), Bolinao (Vermaat et al., 1995), Guimaras (Babaran & Ingles, 1996), Pto Galera (Terrados et al., 1998), Calape, Bohol (Alcaria et al., 1999), Tawi-Tawi (Abubakar et al., 2018) and some surveyed areas in Mindanao (Orbita & Gumban, 2014; Redondo et al., 2017). The ubiquitous presence of *T. hemprichii* is probably an indication of their morphological advantage in thriving without significant interference from the other seagrass species (Genito et al., 2010).

In terms of relative abundance, *Thalassia hemprichii* had the highest across sampling stations (Figure 2; Table 2). More than half of the overall relative abundance was obtained by *T. hemprichii* (52.79%) when all stations were combined. The remaining seagrass relative abundance were *Enhalus acoroides* (18.85%), *Cymodocea rotundata* (9.55%), *Halodule uninervis* (7.48%), *Halophila ovalis* (7.20%), *Syringodium isoetifolium* (3.96%) and *Halodule pinifolia* (0.18%) respectively. ANOVA analysis showed a significant difference ($p>0.05$) in seagrass species relative abundance ($F (6, 21) = 19.77$, $p= 0.00$). The highest relative abundance of T. hemprichii was recorded in the municipality of Dauis (59.36%), followed by Maribojoc (56.73%), Panglao (53.85%), and Tagbilaran City (41.22%) respectively. One-way ANOVA analysis showed no significant difference ($p>0.05$) in *T. hemprichii* relative abundance among sampling stations ($F (3, 20) = 1.56$, $p= 0.23$). The result suggests that *T. hemprichii* is highly tolerant of various environmental conditions. Considered a climax species (den Hartog, 1970; Lacap et al., 2002; Short et al., 2010), *T. hemprichii* usually dominates over the other seagrass species (Meñez et al., 1983). It can occupy more space permanently, and accumulate and retain resources for longer periods of time (Vermaat et al., 1995). *T. hemprichii* thrives on mud-coral-sand or coarse coral-sand substrates in sheltered habitats (Meñez et al., 1983). Also, a study found that *T. hemprichii* can grow even under algal blooms and develop optimally, so it can successfully colonize seagrass beds with other species. One factor for its resilience is its root system and its adaptability to the low concentration of light during algal blooms (Liu et al., 2005; Jiang et al., 2010).

This species *Enhalus acoroides* was next to *T. hemprichii* in terms of its abundance (Table 3). E. acoroides abounds on the shore of Tagbilaran. Likewise, its relative abundance was highest in *Tagbilaran* (41.47%), it was slightly higher than *T. hemprichii.* One-way ANOVA analysis showed a significant difference ($p<0.05$) in *E. acoroides* relative abundance among sampling stations ($F (3, 20) = 3.89$, $p= 0.02$). A Tukey post hoc test revealed a significant difference between Tagbilaran and Panglao ($p = 0.02$). The abundance of E. acoroides in Tagbilaran sites could be due to the effect of muddy-sandy substrate (Calumpong & Meñez, 1997; Fortes, 2013). The large, slow-growing E. acoroides is also a climax species (Duarte, 1991) that has been demonstrated to be resilient to light reduction and enhanced sedimentation (Vermaat et al., 1995).

Table 2. Analysis of variance (ANOVA) to test seagrass relative abundance between seagrass species ($p<0.05$).

		Sum of Squares	Df	Mean Square	F	P-value
Relative Abundance	Between Groups	7712.362	6	1285.394	19.76762	0.00
	Within Groups	1365.529	21	65.02521		
	Total	9077.891	27			

The relative abundance of *C. rotundata* was higher in Dauis (12.82%), while *H. uninervis* was higher in Panglao (15.03%). One-way ANOVA analysis showed a significant difference ($p>0.05$) in H. uninervis relative abundance among sampling stations ($F (3, 20) = 3.17$, $p= 0.05$). A Tukey post hoc test revealed a significant difference between Tagbilaran and Panglao ($p = 0.05$). Pioneering seagrass species such as *C. rotundata* and *H. uninervis* were observed to be abundant in the sandy-rocky substrate. Pioneering seagrass species are best equipped to colonize new areas through rhizome expansion or to wander from gap to gap within established beds. These are best-adapted nearshore, as a result of their lower elongation rates (Vermaat et al., 1995). Relative abundance of *H. ovalis* was higher in Panglao (9.78%). This pioneering species is produced throughout the year in tropical waters and are known to be primary colonizers, being the first to enter areas of bare sand or disturbed seagrass beds (Waycott et al., 2002). On the other hand, *S. isoetifolium* was only encountered in Panglao Island: Panglao (9.84%) and Dauis (6.01%). According to Green and Short (2003), *S. isoetifolium* can be found in clear waters and prefers sandy substrates. Of the surveyed sites, Panglao Island had the highest horizontal visibility, and the substrate type is generally a combination of both sand and rock. Sufficient light and suitable substratum are therefore important physical factors determining seagrass presence and distribution (McKenzie, 2008). The species that occurs least frequently was *H. pinifolia,* with the lowest relative abundance found in Dauis (0.58%) and Maribojoc (0.13%). The rarity of *H. pinifolia* indicates that it is less tolerant of prevailing hydrographic parameters compared to other seagrass species (Meñez et al., 1983). Seagrass species such as *H. pinifolia*, H. ovalis, and S. isoetifolium are able to inhabit relatively deeper waters by having low light requirements, and faster and continuous rhizome growth (Vermaat et al., 1995). Meanwhile, *T. hemprichii* and *E. acoroides* are indiscriminate species in relation to depth (Genito et al., 2010). Certainly, the growth and distribution of seagrasses are controlled by the physical, chemical, and biological properties of the environment they live in (Greve & Binzer, 2004; Borum et al., 2006).

Diversity Index

The diversity of seagrass species was higher in Panglao (H'=1.33), followed by Dauis (H'=1.31), Maribojoc (H'=1.21), and Tagbilaran (H'=1.15) respectively (Figure 3). Dominance was also higher in Panglao (D=2.9), followed by Tagbilaran (D=2.8), Maribojoc (D=2.59), and Dauis (2.55). Meanwhile, evenness was higher in Tagbilaran (E=0.83), followed by Panglao (E=0.74),

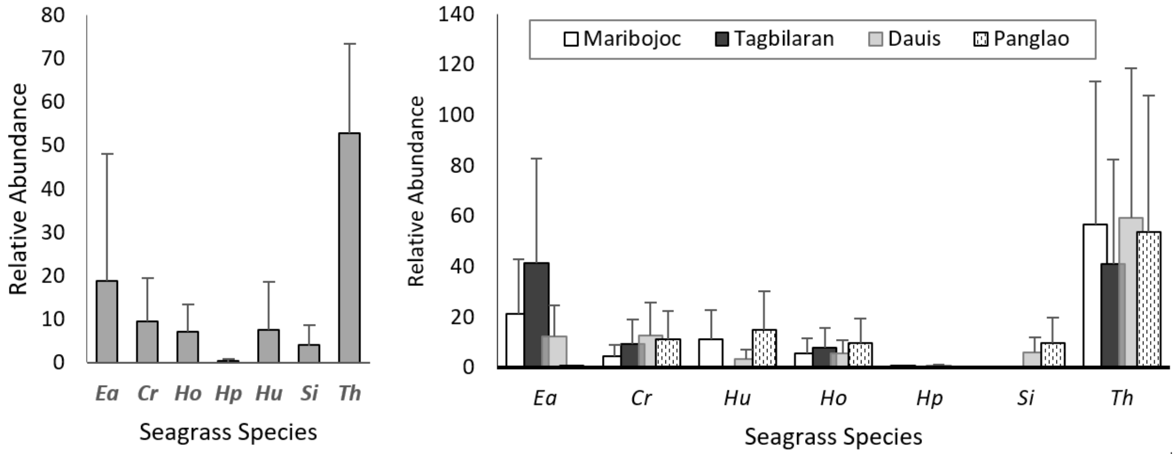

Figure 2. Relative abundance of seagrass species in four sampling stations (error bars are standard deviation).

Table 3. One-way ANOVA analysis showing difference on seagrass relative abundance among four sampling stations and Tukey post hoc test showing a significant difference between sampling stations (p<0.05).

		One-way ANOVA Test			Tukey's Multiple Comparisons					
Seagrass sp.	N	Sum of squares	F	P-value	1-2	1-3	1-4	2-3	2-4	3-4
E. acoroides	24	19550.01	3.89	0.02*	0.40	0.90	0.34	0.14	0.02*	0.73
C. rotundata	24	2256.49	0.62	0.61	0.87	0.60	0.70	0.96	0.99	1.00
H. ovalis	24	867.13	0.48	0.70	0.99	0.99	0.84	0.92	0.95	0.66
H. pinifolia	24	4.27	2.75	0.07	0.95	0.25	0.95	0.10	1.00	0.10
H.uninervis	24	2509.38	3.17	0.05*	0.21	0.49	0.90	0.93	0.05*	0.18
S. isoetifolium	24	587.90	12.81	0.00*	1.00	0.02*	0.00*	0.02*	0.00*	0.27
T. hemprichii	24	9912.87	1.56	0.23	0.45	0.97	1.00	0.24	0.34	1.00

Sites: 1-Maribojoc, 2-Tagbilaran, 3-Dauis, 4-Panglao
* The mean difference is significant at the 0.05 level.

Maribojoc (E=0.68), and Dauis (E=0.67). The overall biodiversity index values of the seagrass ecosystem in Maribojoc bay were diversity (H'=1.40), dominance (2.98), and evenness (0.72). The Shannon diversity index implies low diversity as the value is less than 2 (H'<2.0) based on the biodiversity index category by Odum (1983). Higher dominance and lower evenness were attributed to the extensive distribution of *Thalassia hemprichii*. The presence of dominating species means that the community is less diverse and indicates low stability. Hence, the seagrass ecosystem in Maribojoc Bay is under threat from losses and degradation. Coastal development, sedimentation, eutrophication, destructive fishing, and waste disposal are some of the anthropogenic activities that pose the greatest threats to seagrass ecosystems in the Philippines (Fortes 1995, 2013; Fortes & Santos, 2004).

The Whittaker plot, or Rank-abundance Curves (Figure 3), showed the patterns of species diversity among sampling stations. It shows *Thalassia hemprichii* as the most abundant species, and the slope indicates low evenness as *T. hemprichii* has a much higher abundance, thus a steeper gradient than the other species. The species richness showed the following order: Dauis > Panglao = Maribojoc > Tagbilaran. In terms of species evenness, a steep gradient indicates low evenness in Dauis, followed by Maribojoc and Panglao. In contrast, high evenness was observed in Tagbilaran, which could be due to the ubiquitous co-occurrence of Thalassia hemprichii and Enhalus acoroides. Moreover, abundance was higher in Maribojoc, followed by Panglao, Dauis, and Tagbilaran, respectively.

Cover percentage

The seagrass coverage in Maribojoc Bay was characterized by both patchy and continuous meadows, with a percentage

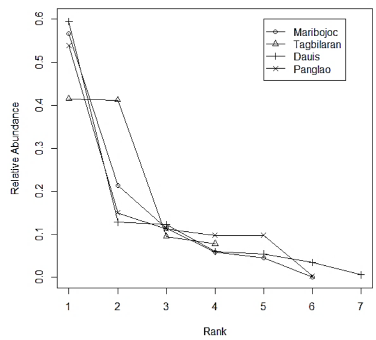

Figure 3. Whittaker plot on seagrass species among four sampling stations in Maribojoc Bay, Bohol.

cover ranging from 17.45% (poor) – 60% (good). Among sampling stations, the seagrass percentage (Figure 4) revealed Maribojoc (45.53%), Panglao (43.93%), and Dauis (40.53%) with "fair" seagrass conditions, while Tagbilaran (24.61%) revealed a seagrass percentage cover with "poor" condition. ANOVA analysis showed no significant difference ($p>0.05$) in seagrass percentage cover among sampling stations ($F (3, 20) = 1.45, p= 0.26$). The overall seagrass percentage cover for the entire bay area is 38.65%, which can be classified as "fair" seagrass conditions. The result indicates sparse coverage and habitat fragmentation, probably due to the deterioration of a once-continuous meadow. Possible causes are anthropogenic activities such as improper shoreline development, increased human settlements in coastal areas, and the use of destructive fishing gear. The use of the digging tool "sud-sud" by gleaners was observed in the area. In Tagbilaran, it is highly likely a result of relatively high sedimentation and siltation brought about by inputs from the Abatan River directly to the seagrass beds. Also, the introduction of waterborne pollutants as well as nutrient loading along the shores from domestic, agricultural, and industrial wastes. As observed, nutrient indicator algae, *Padina* sp. proliferates in Tagbilaran. High algal cover denotes high nutrients caused by pollution that contributes to the increase in sea nutrient level (Fortes, et al., 2004). The seagrass condition in Maribojoc Bay is similar to that in Guimaras Island (Babaran and Ingles, 1996), Lubang Island (Genito et al., 2010), and the coastal areas of Iligan City (Orbita & Gumban, 2013). In the Philippines, data from 26 sites reported seagrass cover to be generally low, usually not exceeding 20%, indicating that most of the seagrass beds in these areas have sparse coverage (BINU, 2005).

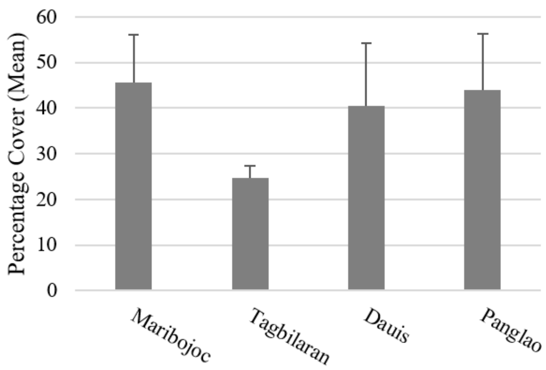

Figure 4. Percentage cover of seagrass species among sampling stations in Maribojoc Bay, Bohol (error bars are standard deviation).

CONCLUSIONS

Seven species of seagrass were identified in Maribojoc Bay, Bohol. The most abundant seagrass species was *Thalassia hemprichii,* which obtained the highest relative abundance. Species richness showed the following order: Dauis > Panglao = Maribojoc > Tagbilaran. Seagrass relative abundance and percentage cover were higher in Maribojoc, followed by Panglao, Dauis, and Tagbilaran respectively. The overall seagrass percentage cover revealed "fair" seagrass conditions, and the community structure revealed sparse distribution and low diversity. The seagrass ecosystem, as one of the most important coastal ecosystems, requires greater attention for its monitoring, management, and conservation. Thus, further studies concerning seagrass communities are recommended in order to implement rehabilitation programs or improve current management in Maribojoc Bay.

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