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Seagrass Community Structure in Disturbed and Undisturbed Coastal Habitats in Baganga, Davao Oriental, Philippines

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ABSTRACT

This study assessed the community structure of seagrasses in disturbed and undisturbed coastal habitats of Baculin, Kinablangan, and Lambajon in Baganga, Davao Oriental, Philippines. Seagrass surveys were conducted in October 2024 using the transect–quadrat method. Three 100-m transects were established per site, with twenty-five 1m×1m quadrats systematically placed along each transect. Species composition, abundance, distribution, richness, and diversity were analyzed using descriptive statistics and ecological diversity indices. A total of nine seagrass taxa were recorded, with *Cymodocea rotundata* occurring across all study sites and exhibiting the highest distribution. Kinablangan supported the most diverse and evenly distributed seagrass community, whereas Baculin and Lambajon showed greater species dominance. The findings provide baseline ecological information for seagrass conservation, sustainable coastal resource management, and future monitoring initiatives in Baganga, Davao Oriental.

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INTRODUCTION

Seagrasses are submerged marine angiosperms that form extensive meadows in shallow coastal environments worldwide. These ecosystems provide essential ecological functions, including serving as nursery grounds, feeding habitats, and shelter for numerous marine organisms while contributing to sediment stabilization, shoreline protection, nutrient cycling, and carbon sequestration (Hemminga & Duarte, 2000; Orth et al., 2006; Unsworth et al., 2022). Seagrass meadows are increasingly recognized as globally important coastal ecosystems that support biodiversity, fisheries productivity, food security, and human well-being (Nordlund et al., 2017; McKenzie et al., 2021). Their ecological significance extends beyond local scales through their contributions to climate regulation, coastal resilience, and connectivity among adjacent marine ecosystems (Carlson et al., 2021; Unsworth et al., 2022).

Despite their ecological importance, seagrass ecosystems are experiencing widespread decline due to increasing anthropogenic pressures. Global assessments indicate that seagrass meadows continue to be threatened by coastal development, habitat modification, pollution, tourism activities, and other human-induced disturbances (Orth et al., 2006; Waycott et al., 2009; Griffiths et al., 2020). Recreational activities such as boating, anchoring, trampling, and coastal tourism can directly damage seagrass habitats through shoot uprooting, sediment disturbance, and habitat fragmentation, resulting in changes in species composition and ecosystem functioning (Apostoloumi et al., 2021; Baloch et al., 2022). Such disturbances may reduce habitat quality and alter community structure, thereby affecting the ecological services provided by seagrass meadows (Syukur et al., 2017).

The Philippines is recognized as one of the world's centers of seagrass diversity, supporting extensive tropical seagrass habitats that provide important ecological and socioeconomic benefits (Fortes, 2018). The country hosts a substantial proportion of the seagrass species found in the Indo-Pacific region, yet many seagrass ecosystems remain insufficiently studied, particularly in eastern Mindanao. In Davao Oriental, seagrass meadows contribute significantly to coastal fisheries and community livelihoods (Capin et al., 2021). Similar studies in Eastern Samar have demonstrated that local communities recognize the importance of seagrass ecosystems for fisheries, coastal protection, and blue carbon services (Quevedo et al., 2020), highlighting the need for improved conservation and management of these habitats.

Assessment of seagrass community structure provides valuable information for evaluating ecosystem health and identifying potential impacts of environmental disturbance. Ecological attributes such as species composition, abundance, cover, distribution, richness, and diversity are widely used indicators of seagrass meadow condition and stability. Comparative assessments between disturbed and relatively undisturbed habitats can further reveal patterns of species dominance, community organization, and ecosystem resilience under varying levels of anthropogenic influence.

Although seagrass ecosystems in Baganga provide important ecological and socioeconomic benefits, comprehensive information on their community structure across different coastal barangays and disturbance regimes remains limited. Establishing baseline ecological data is essential for monitoring future changes, guiding conservation initiatives, and supporting evidence-based coastal resource management within the municipality.

This study assessed the seagrass community structure in selected coastal barangays of Baganga, Davao Oriental. Specifically, the study determined the species composition, abundance, cover, distribution, richness, and diversity of seagrass communities in disturbed and undisturbed habitats within Baculin, Kinablangan, and Lambajon. The findings provide baseline ecological information that may contribute to local conservation planning, sustainable coastal management, and future monitoring of seagrass ecosystems in eastern Mindanao.

THEORETICAL REVIEW

This study is anchored in ecological community theory and disturbance ecology. Community structure is expressed through species richness, abundance, dominance, and evenness, which together describe how species occupy and share available habitat resources. Diversity indices therefore function not only as descriptive measures but also as indicators of community organization: higher richness and evenness suggest a more heterogeneous assemblage, whereas high dominance indicates that abundance is concentrated in only a few taxa (Magurran, 2004).

Disturbance ecology proposes that physical and anthropogenic pressures act as environmental filters that alter species composition according to differences in tolerance, growth strategy, and recovery capacity. In seagrass meadows, boating, anchoring, gleaning, trampling, coastal development, and sediment disturbance may remove shoots, reduce water clarity, fragment habitats, and favor rapidly colonizing or disturbance-tolerant species over slower-growing and persistent taxa (Hemminga & Duarte, 2000; Orth et al., 2006; Waycott et al., 2009). Accordingly, disturbed habitats may exhibit reduced richness and evenness or stronger species dominance, although responses can vary with substrate, hydrodynamic exposure, water depth, and other local environmental conditions.

Biodiversity-resilience theory further provides a basis for interpreting differences between habitat conditions. More diverse and evenly distributed assemblages may maintain ecological processes through functional complementarity and redundancy, whereas communities dominated by a limited number of species may be more vulnerable to additional stressors. However, natural habitat variability can mediate or override disturbance effects; therefore, differences between disturbed and undisturbed sites should be interpreted as the combined outcome of human pressure and local environmental controls (Short et al., 2007; Duffy et al., 2019; Unsworth et al., 2022). This framework supports the use of species composition, abundance, richness, dominance, diversity, and evenness to evaluate seagrass community condition in Baganga.

METHODOLOGY

Study Area

The study was conducted in October 2024 in the coastal barangays of Baculin, Kinablangan, and Lambajon in the Municipality of Baganga, Davao Oriental, Philippines (Figure 1). These barangays are located along the eastern coastline of Mindanao facing the Philippine Sea and support extensive seagrass meadows that provide important ecological and socioeconomic benefits to coastal communities. The sites were selected because of their relatively extensive seagrass habitats and the increasing influence of tourism, fishing activities, coastal settlements, and other anthropogenic pressures within the municipality.

Two sampling sites were established in each barangay and classified as either disturbed or undisturbed, resulting in a total of six sampling sites. Disturbed sites were characterized by their proximity to human settlements, tourism areas, boat landing sites, fishing activities, and other forms of coastal resource utilization that may contribute to habitat disturbance. In contrast, undisturbed sites were located farther from settlements and major tourism activities and exhibited relatively lower levels of direct human influence.

The classification of disturbed and undisturbed habitats was based on field observations of anthropogenic activities, including the presence of coastal infrastructure, tourism-related activities, boat traffic, fishing and gleaning activities, and visible signs of habitat disturbance. This site classification enabled the comparison of seagrass community structure under varying levels of human influence.

The location of the study area and the distribution of disturbed and undisturbed sampling sites are presented in Figure 1 and Figure 2, respectively.

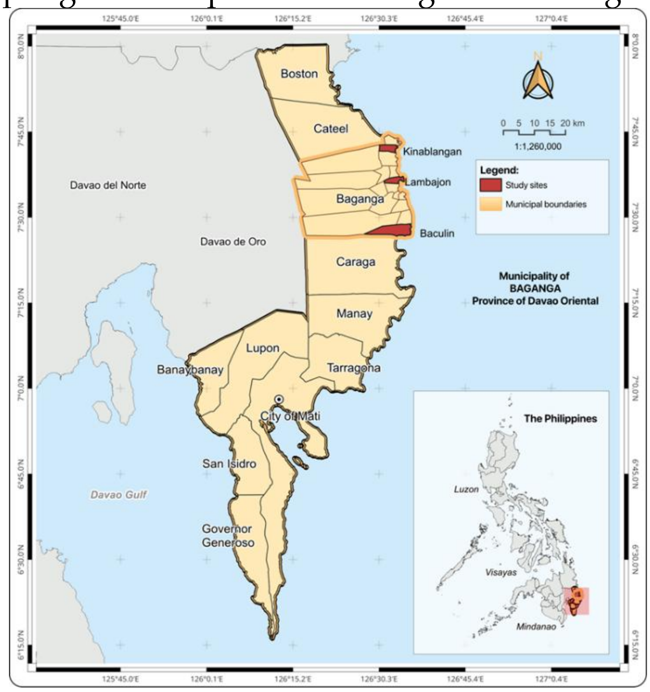

Figure 1. Location map of the study area showing the coastal barangays of Baculin, Kinablangan, and Lambajon in Baganga, Davao Oriental, Philippines.

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Research Design

The study employed a descriptive ecological assessment design to evaluate the community structure of seagrass meadows in selected coastal habitats. The assessment focused on determining species composition, abundance, relative abundance, distribution, richness, and diversity of seagrass communities in disturbed and undisturbed habitats.

Sampling Procedure

Seagrass assessment was conducted using the transect–quadrat method following established seagrass monitoring protocols. In each sampling site, three 100-m transect lines were laid perpendicular to the shoreline across the seagrass meadow during low tide conditions.

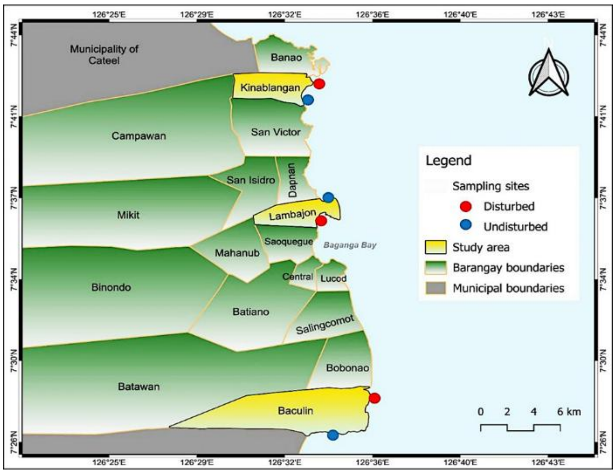

Figure 2. **Locations of disturbed and undisturbed sampling sites in the coastal barangays of Baculin, Kinablangan, and Lambajon, Baganga, Davao Oriental**

Along each transect, twenty-five (25) quadrats measuring 1 m × 1 m were systematically placed at regular intervals, resulting in a total of 75 quadrats per site. Within each quadrat, all seagrass species present were identified and recorded, and the abundance of each species was determined by counting the number of shoots occurring within the sampling unit.

Species identification was based on observable morphological characteristics using standard seagrass identification guides and taxonomic references. Geographic coordinates of all sampling sites were recorded using a Global Positioning System (GPS) receiver.

Data Collection

Data collected included species composition, abundance, occurrence, and percent cover of seagrass species. Species composition was determined through the identification of all seagrass taxa encountered within the quadrats. Abundance was measured as the total number of shoots recorded per species, while occurrence data were used to evaluate species distribution among sampling sites.

Percent cover was estimated within each quadrat to assess the extent of seagrass occupancy within the meadow. Relative abundance was calculated as the proportion of individuals of a species relative to the total abundance of all species recorded in a site.

Data Analysis

Species richness (S) was determined as the total number of seagrass species recorded within each sampling site. Species abundance was calculated as the total number of occurrences of each species across all quadrats, while relative abundance (%) was computed by dividing the abundance of a species by the total abundance of all species and multiplying the result by 100. Species frequency was determined as the percentage of quadrats in which a species occurred relative to the total number of quadrats sampled. Percent cover values were estimated from quadrat observations and summarized to describe the dominance and spatial distribution of seagrass species within each site.

To evaluate community diversity, several ecological indices were calculated. The Shannon–Wiener Diversity Index (H') was used to assess species diversity by incorporating both species richness and relative abundance. Simpson's Dominance Index (D) was computed to determine the degree to which one or a few species dominated the community, while Simpson's Diversity Index (1 − D) was used to estimate the probability that two randomly selected individuals belonged to different species. Pielou's Evenness Index (J) was calculated to determine how evenly individuals were distributed among species within each sampling site.

Diversity indices were computed separately for disturbed and undisturbed habitats in Baculin, Lambajon, and Kinablangan to facilitate comparisons in community structure across habitat conditions and barangays. Higher Shannon diversity and evenness values were interpreted as indicators of more heterogeneous and balanced seagrass communities, whereas higher dominance values suggested greater concentration of individuals within a limited number of species.

Descriptive statistics, including frequencies, percentages, means, and relative abundance values, were used to summarize species composition, abundance, cover, and distribution patterns. Data encoding, tabulation, and preliminary calculations were performed using Microsoft Excel, while ecological diversity indices were calculated using Paleontological Statistics Software (PAST) version 4.17 (Hammer et al., 2001). Results were presented through tables and graphical summaries to facilitate interpretation of seagrass community structure across the study sites.

RESULTS

Species Composition and Distribution

A total of nine seagrass taxa belonging to four genera were recorded across the disturbed and undisturbed coastal habitats of Baculin, Kinablangan, and Lambajon, Baganga, Davao Oriental (Table 1). The recorded species included *Cymodocea rotundata*, *Cymodocea serrulata*, *Enhalus acoroides*, *Halodule* *uninervis*, *Halophila ovalis*, *Halophila pinifolia*, *Syringodium isoetifolium*, *Thalassia hemprichii*, and an unidentified *Cymodocea* species.

Table 1. Species composition and occurrence of seagrasses in disturbed and undisturbed coastal habitats of Baganga, Davao Oriental.

Species	Baculin D	Baculin U	Kinablangan D	Kinablangan U	Lambajon D	Lambajon U
Cymodocea sp.	–	–	–	–	–	+
Cymodocea rotundata	+	+	+	+	+	+
Cymodocea serrulata	+	+	+	+	–	–
Enhalus acoroides	–	+	+	+	–	–
Halodule uninervis	–	–	+	+	–	–
Halophila ovalis	–	–	–	+	–	–
Halophila pinifolia	+	+	+	+	+	+
Syringodium isoetifolium	+	+	+	+	+	–
Thalassia hemprichii	+	+	+	+	–	+

Note: (+) Present; (–) Absent. D = Disturbed habitat; U = Undisturbed habitat.

Among the recorded taxa, *Cymodocea rotundata* was the most widely distributed species, occurring in all disturbed and undisturbed sites. *Halophila pinifolia*, *Syringodium isoetifolium*, and *Thalassia hemprichii* were present in five of the six site-condition combinations. In contrast, *Halophila ovalis* was the least frequently encountered species and was recorded only in the undisturbed site of Kinablangan.

Species richness varied among sites. The highest richness was recorded in the undisturbed habitat of Kinablangan with seven species, while the lowest richness was observed in both disturbed and undisturbed habitats of Lambajon, each containing four species.

Species Abundance and Relative Abundance

A total of 6,088 seagrass shoots were recorded across all sampling sites (shown in Table 2). Baculin contributed the highest number of shoots (2,688), followed by Lambajon (2,394), while Kinablangan had the lowest total abundance (1,006).

Table 2. Abundance and relative abundance of seagrass species in disturbed and undisturbed habitats of Baganga, Davao Oriental.

Species	Baculin Disturbed n (%)	Baculin Undisturbed n (%)	Kinablangan Disturbed n (%)	Kinablangan Undisturbed n (%)	Lambajon Disturbed n (%)	Lambajon Undisturbed n (%)
Cymodocea sp.	–	–	–	–	–	722 (42.7)
Cymodocea rotundata	545 (40.0)	549 (41.4)	9 (8.3)	49 (5.5)	150 (21.3)	763 (45.2)

Species	Baculin Disturbed n (%)	Baculin Undisturbed n (%)	Kinablangan Disturbed n (%)	Kinablangan Undisturbed n (%)	Lambajon Disturbed n (%)	Lambajon Undisturbed n (%)
Cymodocea serrulata	–	12 (0.9)	28 (25.9)	50 (5.6)	–	–
Enhalus acoroides	–	–	25 (23.1)	173 (19.3)	–	–
Halodule uninervis	–	–	–	88 (9.8)	–	2 (0.1)
Halophila ovalis	120 (8.8)	7 (0.5)	1 (0.9)	–	159 (22.6)	–
Halophila pinifolia	551 (40.4)	466 (35.2)	–	257 (28.6)	354 (50.2)	–
Syringodium isoetifolium	81 (5.9)	107 (8.1)	20 (18.5)	202 (22.5)	42 (6.0)	–
Thalassia hemprichii	66 (4.8)	184 (13.9)	25 (23.1)	79 (8.8)	–	202 (12.0)
Total Abundance	**1363 (100)**	**1325 (100)**	**108 (100)**	**898 (100)**	**705 (100)**	**1689 (100)**

Note: Values in parentheses represent relative abundance (%). Dash (–) indicates absence of the species in the sampling site.

In Baculin, *Cymodocea rotundata* was the dominant species, accounting for 40.81% and 41.04% of total abundance in disturbed and undisturbed habitats, respectively. *Halophila pinifolia* was the second most abundant species, comprising 35.79% and 39.60% of total abundance in the respective habitats.

In Kinablangan, the seagrass community was more evenly distributed among species. *Halophila pinifolia* represented the highest proportion of abundance in the disturbed habitat (25.22%), whereas *Cymodocea rotundata* constituted the largest proportion in the undisturbed habitat (29.07%).

In Lambajon, *Halophila pinifolia* dominated the disturbed habitat, accounting for 50.21% of the total abundance, while *Cymodocea rotundata* and *Cymodocea* sp. dominated the undisturbed habitat with relative abundances of 45.20% and 42.68%, respectively.

Species Richness and Diversity

Species richness ranged from four to seven species across the six sampling sites (Table 3). The highest richness was recorded in the undisturbed habitat of Kinablangan (S = 7), while both habitats in Lambajon exhibited the lowest richness (S = 4).

Table 3. Species richness and diversity indices of seagrass communities in disturbed and undisturbed habitats of Baganga, Davao Oriental.

Site	Condition	Species Richness (S)	Total Abundance (N)	Shannon Diversity (H')	Simpson Dominance (D)	Simpson Diversity (1−D)	Evenness (J)
Baculin	Disturbed	5	1363	1.26	0.34	0.66	0.78

Site	Condition	Species Richness (S)	Total Abundance (N)	Shannon Diversity (H')	Simpson Dominance (D)	Simpson Diversity (1−D)	Evenness (J)
Baculin	Undisturbed	6	1325	1.28	0.32	0.68	0.71
Kinablangan	Disturbed	6	108	1.59	0.22	0.78	0.89
Kinablangan	Undisturbed	7	898	1.77	0.19	0.81	0.91
Lambajon	Disturbed	4	705	1.18	0.35	0.65	0.85
Lambajon	Undisturbed	4	1689	0.98	0.40	0.60	0.71
Baculin	**Overall**	**6**	**2688**	**1.31**	**0.32**	**0.68**	**0.73**
Kinablangan	**Overall**	**8**	**1006**	**1.82**	**0.18**	**0.82**	**0.87**
Lambajon	**Overall**	**7**	**2394**	**1.48**	**0.27**	**0.73**	**0.76**
All Sites	**Overall**	**9**	**6088**	**1.76**	**0.22**	**0.78**	**0.80**

Shannon diversity index (H') values ranged from 0.98 to 1.77. The highest diversity was recorded in the undisturbed habitat of Kinablangan (H' = 1.77), followed by the disturbed habitat of Kinablangan (H' = 1.59). The lowest diversity was observed in the undisturbed habitat of Lambajon (H' = 0.98).

Simpson dominance index (D) values ranged from 0.20 to 0.47. The highest dominance occurred in the undisturbed habitat of Lambajon (D = 0.47), whereas the lowest dominance was recorded in the undisturbed habitat of Kinablangan (D = 0.20).

Evenness values varied from 0.71 to 0.91. The highest evenness was observed in the undisturbed habitat of Kinablangan (J = 0.91), while the lowest value occurred in the disturbed habitat of Lambajon (J = 0.71).

Community Structure in Disturbed and Undisturbed Habitats

When pooled by barangay, Kinablangan exhibited the highest overall species diversity (H' = 1.82) and evenness (J = 0.87), together with the lowest dominance index (D = 0.18). Baculin recorded an intermediate diversity value (H' = 1.31) and dominance index (D = 0.32), while Lambajon showed moderate diversity (H' = 1.48) but relatively high dominance (D = 0.27).

Across habitat categories, undisturbed sites generally supported greater species richness and higher diversity values than disturbed sites. However, variations among barangays were evident, with Lambajon exhibiting lower diversity in the undisturbed habitat than in the disturbed habitat.

Overall, the seagrass communities of Baganga were characterized by the widespread occurrence of *Cymodocea rotundata* and the dominance of a few species within several sites, while community diversity and species distribution varied among barangays and disturbance categories.

DISCUSSION

The present study documented nine seagrass taxa across the coastal barangays of Baculin, Kinablangan, and Lambajon in Baganga, Davao Oriental, demonstrating that the municipality supports a relatively diverse seagrass assemblage. The recorded species represent several of the dominant tropical seagrasses commonly found throughout the Philippines and the broader Indo-Pacific region, including *Cymodocea rotundata*, *Thalassia hemprichii*, *Enhalus* *acoroides*, and *Syringodium isoetifolium* (Fortes, 2018; McKenzie et al., 2020). The occurrence of multiple seagrass species highlights the ecological importance of these coastal habitats, which contribute to biodiversity conservation, fisheries productivity, and the maintenance of ecosystem services that support coastal communities (Nordlund et al., 2017; McKenzie et al., 2021). This finding is consistent with the study of Capin et al. (2021), which documented eight seagrass species along the southwest coast of Davao Oriental, and with Oczon and Intoy (2025), who recorded seven seagrass species in Malay, Aklan. Both studies emphasized the importance of seagrass meadows as habitats, nursery grounds, and indicators of environmental conditions in coastal ecosystems.

Among the recorded taxa, *Cymodocea rotundata* was the most widely distributed species and occurred in all disturbed and undisturbed habitats. This widespread occurrence may be attributed to its broad ecological tolerance and ability to thrive under varying environmental conditions. Previous studies have shown that *C. rotundata* is one of the most common and adaptable tropical seagrass species, capable of occupying diverse substrate types and coastal environments (Short et al., 2007; Fortes, 2018). Its dominance in several sampling sites suggests that local habitat conditions remain generally favorable for seagrass establishment and persistence. Similar dominance patterns were observed by Capin et al. (2021), who reported *C. rotundata* as one of the most abundant species in Davao Oriental, particularly in Lupon and San Isidro. Likewise, Oczon and Intoy (2025) identified *C. rotundata* as the most dominant species in Malay, Aklan, exhibiting the highest percentage cover (34.48%) and frequency (85.33%) among all recorded seagrasses. The repeated dominance of this species across geographically separated coastal areas in the Philippines suggests that *C. rotundata* is a major structural component of tropical seagrass meadows and is particularly well adapted to a wide range of environmental conditions.

Species richness and diversity varied considerably among barangays and habitat conditions. Kinablangan exhibited the highest species richness, diversity, and evenness values, indicating a relatively balanced and heterogeneous seagrass community. The occurrence of larger climax species such as *Enhalus acoroides* and *Thalassia hemprichii* in this barangay may indicate relatively stable environmental conditions because these species are often associated with mature and well-established seagrass meadows (Hemminga & Duarte, 2000; Waycott et al., 2009). Higher species diversity is generally associated with greater ecosystem stability and resilience because species-rich communities possess higher functional redundancy, allowing ecological processes to persist despite environmental disturbances (Duffy et al., 2019; Unsworth et al., 2022). Consequently, the relatively diverse community observed in Kinablangan may provide greater ecological resilience compared with the more species-dominated communities observed in the other barangays.

In contrast, Baculin and Lambajon exhibited lower diversity values and stronger species dominance. The dominance of *Cymodocea rotundata* and *Halophila pinifolia* in Baculin and the overwhelming abundance of *Halophila pinifolia* and *Cymodocea* species in Lambajon suggest that community structure was influenced by a limited number of highly abundant taxa. High dominance often reduces community evenness and may lead to lower diversity values despite high overall abundance (Magurran, 2004). This finding demonstrates that larger population sizes do not necessarily reflect greater ecological complexity because diversity is influenced by both species richness and the distribution of individuals among species. Likewise, Capin et al. (2021) reported relatively low overall diversity (H' = 1.30) in seagrass meadows of southwestern Davao Oriental, where *Thalassia hemprichii* and *Cymodocea rotundata* collectively comprised approximately 75% of total seagrass cover. Similarly, Oczon and Intoy (2025) reported moderate diversity (H' = 1.52) and uneven species distribution (J' = 0.78) in a seagrass meadow dominated by *C. rotundata* and *T. hemprichii*. The similarity in dominance patterns among these studies suggests that many Philippine seagrass meadows are characterized by communities where a few species contribute disproportionately to overall abundance and cover.

Differences between disturbed and undisturbed habitats were evident across several community metrics. In general, undisturbed habitats supported higher species richness and diversity than disturbed habitats. This pattern is consistent with studies reporting that anthropogenic disturbances can alter seagrass community composition and reduce ecosystem integrity (Orth et al., 2006; Waycott et al., 2009). Tourism-related activities, coastal development, boating, anchoring, and increasing human presence in coastal environments may contribute to physical damage of seagrass shoots, sediment disturbance, and habitat degradation, thereby affecting species distribution and abundance (Apostoloumi et al., 2021; Griffiths et al., 2020). Similar observations have been reported in tropical coastal ecosystems where human activities influence seagrass community structure and ecological condition (Syukur et al., 2017). Because seagrasses are sensitive to environmental disturbances and biophysical stressors, changes in their community composition may provide valuable indicators of ecosystem condition and habitat quality (Capin et al., 2021). Oczon and Intoy (2025) likewise emphasized the importance of baseline assessments of seagrass abundance and diversity as essential tools for monitoring ecosystem condition and guiding coastal resource management.

However, the influence of disturbance was not consistent across all sampling sites. In Lambajon, the undisturbed habitat exhibited lower diversity than the disturbed habitat due to the strong dominance of *Cymodocea rotundata* and an unidentified *Cymodocea* species. This observation suggests that factors other than direct anthropogenic disturbance may also influence community structure. Environmental variables such as substrate composition, water depth, hydrodynamic exposure, nutrient availability, and interspecific competition are recognized drivers of seagrass distribution and species dominance patterns (Hemminga & Duarte, 2000; Short et al., 2007). Therefore, the observed spatial variation among barangays likely reflects the combined influence of environmental conditions and human disturbance.

The moderate diversity values observed across the study area are comparable to those reported from other tropical seagrass meadows in the

Philippines and Southeast Asia, where communities often consist of both pioneer and climax species with varying degrees of dominance (Fortes, 2018). The overall diversity values observed in Baganga also fall within the range reported by Capin et al. (2021) and Oczon and Intoy (2025), suggesting that moderate diversity accompanied by dominance of a few species may be a common feature of many Philippine seagrass ecosystems. The coexistence of fast-growing species such as *Halophila* spp. and persistent species such as *Enhalus acoroides* and *Thalassia hemprichii* may indicate dynamic ecological processes that contribute to meadow resilience and recovery potential. Such species assemblages are important because they support multiple ecological functions and contribute to ecosystem stability under changing environmental conditions (Duffy et al., 2019; Unsworth et al., 2022).

The findings of this study provide important baseline ecological information for the coastal ecosystems of Baganga, Davao Oriental. Seagrass meadows are increasingly recognized for their contributions to fisheries production, coastal protection, biodiversity conservation, and climate change mitigation through blue carbon storage (Nordlund et al., 2017; Quevedo et al., 2020; Unsworth et al., 2022). The relatively high diversity observed in Kinablangan and the widespread occurrence of ecologically important seagrass species across the municipality underscore the conservation value of these habitats. Capin et al. (2021) highlighted the need for immediate conservation attention in Davao Oriental due to generally low to moderate seagrass conditions, while Oczon and Intoy (2025) emphasized the importance of science-based management, continuous monitoring, and habitat protection to sustain seagrass ecosystem services and coastal livelihoods. Given the increasing coastal utilization and tourism activities occurring in Baganga, proactive management measures aimed at minimizing physical disturbances and protecting critical seagrass habitats are necessary to ensure the long-term sustainability of the ecological services provided by these ecosystems.

CONCLUSIONS AND RECOMMENDATIONS

This study assessed the seagrass community structure in disturbed and undisturbed coastal habitats of Baculin, Kinablangan, and Lambajon, Baganga, Davao Oriental. A total of nine seagrass taxa were recorded across the study sites, demonstrating the ecological significance of the municipality's coastal habitats as important seagrass ecosystems.

Cymodocea rotundata was the most widely distributed species and occurred in all sampling sites, indicating its adaptability to varying environmental conditions. Species richness ranged from four to seven species, with the highest richness recorded in the undisturbed habitat of Kinablangan. Diversity analyses revealed that Kinablangan supported the most diverse and evenly distributed seagrass community, while Baculin and Lambajon exhibited greater dominance by a few species.

Undisturbed habitats generally supported higher species richness and diversity than disturbed habitats, suggesting that anthropogenic activities may influence seagrass community structure. However, variations among barangays indicate that local environmental conditions and species interactions may also contribute to differences in community composition and diversity patterns.

Overall, the seagrass meadows of Baganga support diverse seagrass assemblages that contribute to coastal biodiversity and ecosystem functioning. The findings provide important baseline ecological information that can serve as a reference for future monitoring, conservation, and management initiatives within the municipality.

Based on the findings of the study, the following recommendations are proposed:

1. Local government units and coastal resource managers are encouraged to strengthen the protection and management of seagrass habitats, particularly in areas experiencing increasing tourism and coastal development.
2. Community-based awareness programs may be implemented to enhance public understanding of the ecological importance of seagrass ecosystems and promote responsible coastal resource use.
3. Conducting regular monitoring of seagrass communities to detect changes in species composition, abundance, and diversity and to evaluate the effectiveness of conservation measures.
4. Management interventions such as the establishment of seagrass conservation zones, regulation of boating and anchoring activities, and proper waste management practices may be considered to minimize physical disturbances to seagrass meadows.
5. Future studies may investigate the influence of environmental factors such as water quality, sediment characteristics, nutrient availability, and hydrodynamic conditions on seagrass community structure in Baganga.
6. Additional research incorporating multivariate community analyses and long-term ecological monitoring is recommended to better understand the drivers of spatial and temporal variation in seagrass ecosystems within the municipality.

FURTHER STUDY

While the present study provides baseline information on the seagrass community structure of selected coastal habitats in Baganga, Davao Oriental, several limitations should be considered. The assessment was conducted during a single sampling period and primarily focused on species composition, abundance, distribution, cover, and diversity. Consequently, temporal variations associated with seasonal changes, climatic conditions, and natural environmental fluctuations were not examined.

Furthermore, the study did not evaluate environmental variables such as water quality, sediment characteristics, nutrient concentrations, light availability, and hydrodynamic conditions, which are known to influence seagrass growth, distribution, and community structure. The classification of sites as disturbed and undisturbed was based on observable anthropogenic activities and proximity to human settlements and tourism areas; therefore, the intensity and extent of disturbance were not quantitatively measured.

Future studies should incorporate seasonal and long-term monitoring to better understand temporal changes in seagrass communities and ecosystem resilience. Investigations examining the relationships between seagrass community structure and environmental factors are also recommended to identify the primary drivers of species distribution and diversity patterns. Additionally, the application of multivariate ecological analyses and spatial mapping techniques may provide a more comprehensive understanding of community dynamics and habitat connectivity.

Given the ecological importance of seagrass ecosystems, future research should also explore associated fauna, carbon sequestration potential, ecosystem services, and the impacts of tourism and coastal development on seagrass health. Such studies would contribute to a more holistic understanding of seagrass ecosystems and provide stronger scientific support for conservation and sustainable coastal management in Baganga, Davao Oriental.

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