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June Ian C Dedel
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Cresencio C Cabuga JR
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Maria Anita Ayaton
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Ivan Cris B Delabahan
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Eve F Gamalinda
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Laurence B Calagui
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Correspondence
June Ian C Dedel
Biology Department, Caraga State University, Ampayon, Butuan City, Philippines

Seagrass species distribution and coverage in the intertidal zones of Bucas Grande island, Surigao Del Norte, Philippines

June Ian C Dedel, Cresencio C Cabuga JR, Maria Anita Ayaton, Ivan Cris B Delabahan, Eve F Gamalinda and Laurence B Calagui

Abstract
The study was carried out as a preliminary assessment of seagrass resources in the intertidal communities of Bucas Grande Island (Barangays Taruc, Santa Cruz, and Pamosaingan), relying on low tide in determining the species distribution and coverage of seagrass. A total of 150 sampling plots were laid using quadrats; with the ten quadrats arranged in an alternate manner and placed perpendicular to the shore. A total of three species of seagrasses were observed; these include *Cymodocea rotundata*, *Thalassia hemprichii*, and *Enhalus acoroides*. The species of seagrass identified by the study belongs to the family *Hydrocharitaceae* and *Potamogetonaceae*. Different areas have different abundance for each species, with Barangay Taruc obtaining the highest at 74.6% coverage, followed by Barangay Santa Cruz at 49.84%, and then Barangay Pamosaingan at 33.56%. This could be the basic information for the management of seagrass ecosystem in Bucas Grande Island.

Keywords: Preliminary assessment, seagrass resources, species distribution, coverage, bucas Grande Island

1. Introduction
Seagrass is considered as an important resources in different coastal areas. Seagrass ecosystems contribute nutrients for coastal water productivity due to its high biodiversity. There are about 58 known species of seagrass worldwide [1]. Numerous marine species are being provided habitat and food by seagrass, it also helps in the stabilization of the ocean bottom, quality water maintenance, as well as supporting local economies [2]. According to studies, seagrass beds can produce leaves of approximately 10,000 per acre. [3].
Seagrass conditions in some parts of Bucas Grande Island are under serious threat from human activities which include ports, aquaculture, and tourism. Seagrass beds are undergoing deprivation due to natural and human disturbances [2]. In fact, seagrass ecosystems found in the different parts of the world, with an estimate of 58%, has decreased extents [4].
Like many tropical regions, the Island of Bucas Grande has a well-developed seagrass community. This is true especially in areas with intertidal zones. However, human activities influence seagrass distribution, abundance, and condition, specifically the area of forest cover. Especially in an area like Bucas Grande Island, where continued industry and coastal development is observed.
With this in mind, it is important that conservation and management procedures be taken in order to continue the benefits derivation from this particular resource. This study tries to gather some initial information on the species distribution and coverage of seagrass in three barangays of Bucas Grande with intertidal zones, including Taruc, Santa Cruz, and Pamosaingan. Its primary objective is to determine the extent of seagrass coverage and species composition in Bucas Grande Island, Philippines.

2. Materials and Methods
2.1 The Study Area
The study was carried out at Bucas Grande Island, located at northern Mindanao (Figure 1). Three sites were selected (Barangays Taruc, Sta. Cruz, and Pamosaingan), at each location consisting of fifty (50) quadrats. These barangays are intertidal communities. The sites represent the general area.

Fig 1: Map showing the study area. (A)-Location of study area from the map of the Philippines (B)-relative locations of the three sites in Bucas Grande Island

2.2 Inventory of Seagrass

The study was carried out in the three sampling sites. The identified species of seagrasses were listed and included as part of species inventory. The seagrass was identified with the help of resources from the internet, especially information coming from www.seagrasswatch. org, using the Manual for Mapping and Monitoring Seagrass Resources by Community Volunteers 2nd Edition [5]. Intertidal areas were the focus of the sampling efforts.

2.3 Establishment of Sampling Stations

Three sites were surveyed along the intertidal areas. Five 50-meter transects for each sampling station were established. Between transects, there was a distance of 50 meters. 10 quadrats were laid at 5 meter interval in each transect. Seagrass species were identified and percent cover was estimated for each species within each quadrat [6].

2.4 Data Analysis

The average for percentage cover was computed for each transect by getting the total for each transect and dividing each by the quadrat number. The averages from each transect were added and divided by the totals of the averages of each component by the number of transects in the survey. While species composition was calculated using the cover data using the formula: % composition Spp A = $\left(\frac{\%\ cover\ of\ Spp\ A}{Sum\ of\ cover\ for\ all\ species}\right) X\ 100$. The condition of the seagrass beds was determined using the criteria set by Fortes (1989) as stated below:

Condition	Criteria
Excellent	76-100% coverage
Good	51-75% coverage
Fair	26-50% coverage
Poor	0-25% coverage

3 Results and Discussion

3.1 Distribution and percentage coverage of seagrass beds in Bucas Grande Island

Among the three sampling areas, barangay Taruc obtained the highest overall percentage coverage of 74.6% (Table 1), comprising of two species namely *C. rotundata* and *T. hemprichii*. Based on the criteria set for habitat assessment [7], this can still be considered a good coverage. This is presumably due to the suitable substrate in the form of sand and rubble in the waters of barangay Taruc [8]. Despite a good coverage, on-going establishment of resorts may contribute to pollution, leading to habitat destruction over time, within this area. Second highest coverage was observed in Barangay Santa Cruz at 49.84%, comprising of three species namely: *C. rotundata*, *T. hemprichii*, and *E. acoroides*. This coverage is considered to be in fair condition. One reason for the lower coverage in this area is the existence of coastal community which result to it being a drainage area for some nearby residents causing a negative impact to it [9]. The lowest coverage was observed in barangay pamosaingan at 33.56%, comprising of still three species namely: *C. rotundata*, *T. hemprichii*, and *E. acoroides*. This lowest coverage could be due to the rocky substrate in the waters of Pamosaingan [10], although it is still considered to be in fair condition. Unfortunately, the existence of a port nearby and the multiple uses of the intertidal zones as a docking area for fishing boats could also be the reason behind this lowest coverage.

Table 1: Seagrass average percent cover in the three area of study

Area of Study	T_1	T_2	T_3	T_4	T_5	Average Percent Cover
Brgy. Taruc	72	73.5	83	73.5	71	74.6%
Brgy. Pamosaingan	65.5	50.2	5.8	19.8	26.5	33.56%
Brgy. Sta. Cruz	46	44	51.7	55	52.5	49.84%

3.2 Percentage cover per species

In terms of percentage cover per species, *T. hemprichii* found in barangay Taruc has the highest coverage (48.56%), followed by *C. rotundata* found in barangay Sta. Cruz (27.2%), and *C. rotundata* in barangay Taruc (25.74%) (Figure 2). Highest coverage of *T. hemprichii* thriving in barangay Taruc is due to the suitable substrate of the water in the form of sand and rubbles [8]. While the low coverage of *C. rotundata* in both Sta. Cruz and Taruc is due to its preference of a muddy substrate [10].

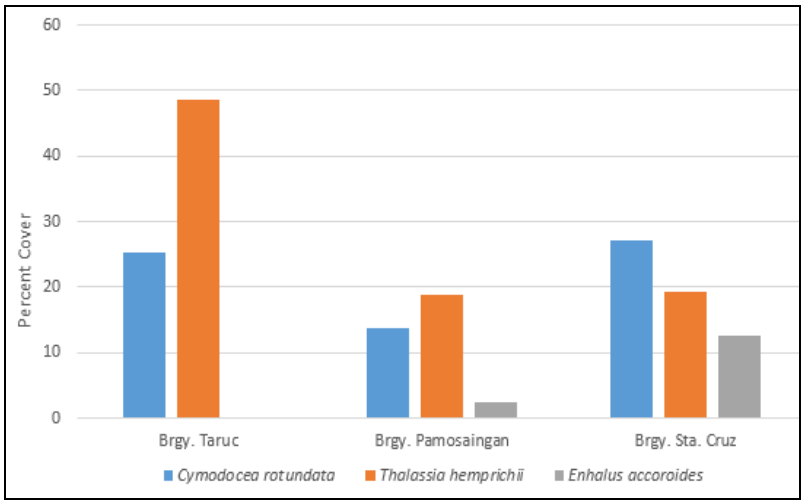

Fig 2: Seagrass coverage in Bucas Grande Island for each identified species

3.3 Species composition

Results of the study show that three dominant species are found thriving in Bucas Grande Island seagrass beds, namely: *C. rotundata*, *T. hemprichii*, and *E. acoroides* (Figure 3). In barangay Taruc, species composition is 34.65% and 63.35% for *C. rotundata* and *T. hemprichii* respectively. In barangay Pamosaingan, species composition is 39.42%, 53.57% and 7.11% for *C. rotundata*, *T. hemprichii*, and *E. acoroides* respectively. While for barangay Sta. Cruz, species composition is 46.15%, 32.64%, and 21.2% for *C. rotundata*, *T. hemprichii*, and *E. acoroides* respectively (Table 2).

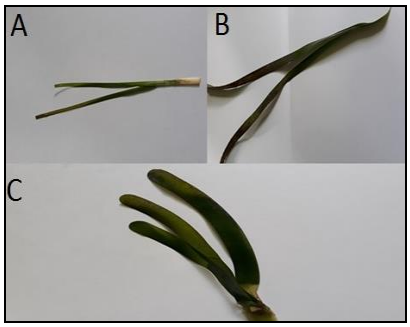

Fig 3: Seagrass species in Bucas Grande Island (A)-*C. rotundata* (B)-*E. acoroides* (C)-*T. hemprichii*

Table 2: Species composition of seagrass in Bucas Grande Island

Family	Species	Taruc	Pamosaingan	Sta.Cruz
Potamogetonaceae	*C. rotundata*	34.65%	39.42%	46.15%
Hydrocharitaceae	*T. hemprichii*	63.35%	53.57%	32.64%
	E. acoroides		7.11%	21.2%

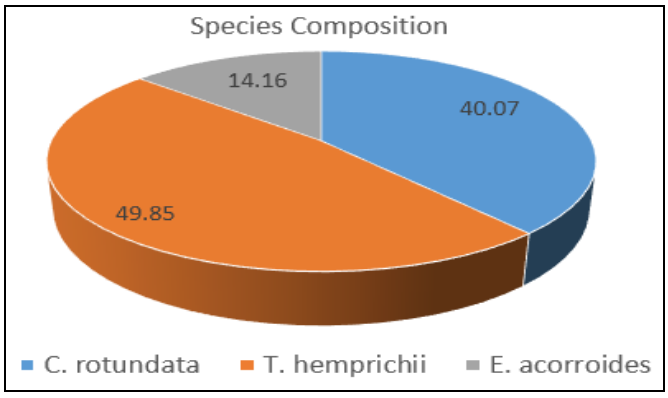

Fig 4: Species composition of seagrass in Bucas Grande Island, Surigao del Norte, Philippines

4. Conclusion

Seagrass plays a very important role in the entire coastal environment. When it comes to coastal resource management, a good tool or indicator species are seagrass beds. Seagrass beds status can reflect the changes in its surrounding environment which may be due to natural causes and other anthropogenic activities. In the case of Bucas Grande, although seagrass bed cover is still in good and fair conditions, possible threats leading to its decline are still existing. It is concluded that seagrass covers and species composition in Bucas Grande can still be improved up to excellent condition with intensified education campaign and application of management resources to ease pressures on this habitat. The researcher suggests that a detailed assessment of the biodiversity of seagrass in the three sites, as well as the corresponding physicochemical condition, water salinity, and sedimentation, be conducted. Establishment of sanctuaries and protected areas could also be a good management measure to implement in the future.

5. Acknowledgement

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