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<td>Author(s)</td>
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Productivity and Distribution of
Seagrass Communities in Davao Gulf

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ABSTRACT
The status of seagrass communities in Davao Gulf in terms of composition, seagrass cover and
distribution were assessed. Maps of the distribution of seagrass species were generated. Species
composition and seagrass cover as a measure of abundance were determined using the line transect
quadrat method. Fourteen species of seagrasses were found. Among them, the most dominant species
were Halophila, Thalassia, and Cymodocea. In general, higher mean percentage cover of Halophila
species (31.67%) along New Argao, Thalassia species (20.87%) along Talicud Island and Cymodocea
species (12.95%) in Governor Generoso were observed.

Thirteen species of fish belonging to five families and twenty species of macroinvertebrates
were identified along the seagrass beds in the sampling areas. The family with the most number of
species caught was Pomacentridae (6 species), followed by Tetraodontidae (3 species), Lutjanidae (2
species) and Siganidae and Labridae both with one species identified. A total of twenty seagrass
associated macroinvertebrate species were identified in Davao Gulf.

Keywords: seagrass communities, productivity, seagrass distribution, Davao Gulf

INTRODUCTION
Seagrasses are highly specialized marine angiosperms that have adapted to a totally
submerged life and having few species globally (< 70 species). They are among the most productive
areas of marine ecosystems and are widely valued to be important in providing food resource as well
as nursery and feeding grounds for invertebrates and juvenile fishes (Orth et al.1996) and
consumed by many animals including the green turtles and the endangered dugongs (Klump et
al.1989). Seagrasses filter nutrients, contaminants and sediments and are closely related to other
communities such as coral reefs and mangrove systems of estuarine and coastal waters (Nybakken,
2001). Moreover, the large, thick assemblages formed along intertidal and subtidal zones of the
tropical areas perform well in stabilizing and protecting the coastlines because of the physical
character of the leaves and intensive root and rhizome system (Fortes, 1990).

Considering the ecological, biological and economic importance of these rich marine natural
resources as against the socio-economic pressures, such as the demands of the population for food,
transportation, living space, recreation area and waste disposal (Fortes, 1991), there must be an intensive
measure for their management in order to conserve the biodiversity and maintain ecological balance in
seagrass meadows particularly in Davao Gulf. Along this context, generating baseline
information on the productivity and distribution of seagrass communities to track the changes is
imperative before any significant perturbation occurs. However, at present, studies on seagrasses
conducted in some parts of Davao Gulf are fragmented. Some baseline information such as
mapping, species composition, abundance in terms of density, biomass and percent cover, threats and
seagrass associated fauna (e.g. fish, macro invertebrates) needed for the management and
conservation efforts are lacking. It is then the intent of this study to provide more comprehensive
information in terms of seagrass mapping in Davao Gulf, species composition and cover as a measure
of abundance, and seagrass associated fauna (e.g. macro invertebrates, fish) in support to the
dugong conservation.

MATERIALS AND METHODS
The study was conducted within Davao Gulf in three strategic stations: Malita in Davao del Sur,
IGaCOS in Davao del Norte and Governor Generoso in Davao Oriental (Figure 1).
Seagrass species composition, distribution and cover as a measure of abundance were determined employing the line transect quadrat method. The distribution of seagrass was marked by establishing coordinates with the use of GPS and was plotted in GIS Maps.

RESULTS
Species Composition and Distribution
There were 14 seagrass species identified around Davao Gulf occupying more or less 305.35 hectares. These were the Halophila ovalis, Halodule uninervis, Cymodocea rotundata, Thalassia hemprichii, Syringodium isoetifolium, Halodule pinifolia, Halodule minor, Cymodocea serrulata, Enhalus acoroides, Halophila decipiens, Halophila spinulosa, Halophila engelmannii, Thalassia testudinum, and Syringodium filiforme (Table 1).

Table 1. Seagrass species composition and distribution in the three study areas in Davao Gulf

<table>
<thead>
<tr>
<th>Species No.</th>
<th>Species</th>
<th>New Argao</th>
<th>Talicon</th>
<th>Governor Generoso</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Halodule pinifolia</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>2</td>
<td>Halodule uninervis</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td>Cymodocea rotundata</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>4</td>
<td>Cymodocea serrulata</td>
<td>√</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>5</td>
<td>Syringodium filiforme</td>
<td>-</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Syringodium isoetifolium</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>7</td>
<td>Enhalus acoroides</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Thalassia hemprichii</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>9</td>
<td>Thalassia testudinum</td>
<td>-</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Halophila decipiens</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Halophila engelmannii</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Halophila minor</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>13</td>
<td>Halophila ovatis</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>14</td>
<td>Halophila spinulosa</td>
<td>√</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12</td>
<td>11</td>
<td>8</td>
</tr>
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</table>

Occurrence of seagrass species within Davao Gulf is plotted in the map (Figure 2).
New Argao has the highest species richness of 12, dominated by *Halophila* species, followed closely by Talicud with 11 species dominated by *Thalassia* species. Eight species were found in Governor Generoso dominated by *Cymodocea* species.

**Percent Cover**

Seagrass percent cover are illustrated in Figure 3.

In New Argao, the highest percent cover was obtained by *Halophila* species (31.67%) followed by *Cymodocea* species (4.65%) and *Halodule* species (4.17%). The species that obtained low percent cover were *Syringodium* (0.73%), *Enhalus* (0.38%) and *Thalassia* (0.17%). In totality the percent cover of seagrass species in New Argao is 41.77%.

In Talicud, the seagrass percent cover is 57.03%. *Thalassia* species obtained the highest percent cover of 20.87% followed by *Halophila* species (17.42%), *Enhalus* (11.53%) and *Halodule* species (5.88%). *Cymodocea* and *Syringodium* species obtained the least percent cover of .92% and .41%, respectively.

On the other hand, seagrass percent cover of 23% in Governor Generoso was observed to be low compared to other study sites. *Cymodocea* species obtained the highest percent cover of 12.95% followed by *Halodule* species (4.35%) and *Halophila* species (4.0%). *Thalassia* and *Syringodium* species obtained low percent cover of 0.97% and 0.73%, respectively.

The mean difference in seagrass percent cover among stations varied significantly (F= 5.208; p<.05). Seagrass percent cover was higher in Talicud Island and New Argao compared to Governor Generoso.

Relatively, seagrass biomass production is highest in Talicud Island which is estimated at 2.4 tons/ha. Biomass production in New Argao is approximately 1.6 tons/ha; while that in Governor Generoso is approximately 1 ton/ha.

**Seagrass Associated Fauna**

Thirteen species of fish under five families were documented. The family with the most number of species caught was Pomacentridae (6), followed by Tetraodontidae (3), Lutjanidae (2), Siganidae (1) and Labridae (1). Comparing the percentage (%) frequency of occurrence among the thirteen species of fish, *Siganus sp.* (100%) has the highest frequency of occurrence. This was followed by *Lutjanus decussatus* (71%) and *Lutjanus sebae* (43%).

**Macroinvertebrates**

Twenty macroinvertebrate species was observed in the three sites in Davao Gulf. The macroinvertebrates found in these areas were grouped into two categories namely: mollusca (gastropods and bivalves) and echinodermata (starfish and sea cucumber). Among the groups, the echinodermats
were found to have the most number of species. *Echinothrix diadema*, *Echinothrix calamaris* and *Linckia laevigata* were observed to dominate the area. Similarly, *Conus musicus* and *Strombus labiatus* dominated the mollusk family in the same area.

**DISCUSSION**

**Species Composition and Abundance of Seagrass in Davao Gulf**

The dominance of *Halophila* species in New Argao is favorable for the dugongs which are constantly seen in the area. However, high sediment disturbance on the various sampling sites in Talicud was likely to influence the percent frequency and distribution of seagrasses (Prathep, 2003). *Enhalus acoroides* abound the shores of Talicud. The presence of coastal residents, factories and other establishments in the vicinity could be considered as one of the built-up areas in Davao del Norte. *Enhalus* is a large seagrass and once it has established it will mask off the other young smaller forms of seagrass.

Among the co-occurring seagrass species, *Halophila decipiens* is present in the port area. *Halophila decipiens* seemed to thrive mostly in deep coastal environments and in small patchy beds mixed with larger species of seagrass in extensive meadows. *Halophila decipiens* species appears to be euryhaline or subtropical and considered as alien or adventive into other areas since they are transported thru the canal or fishing nets that were then cleared in harbors. Being the only truly pantropical seagrass species, the distributive abilities of *Halophila decipiens* is through the ships that make them exist around ports and harbors alone without any companion species (den Hartog, 1970). The occurrence of *Halophila ovalis*, however, was common in all sampling sites. The common occurrence of *Halophila ovalis* could be explained to its characteristics as a pioneering species. *Halophila ovalis* is the most eurythermic species occurring from the tropics to the warm temperate areas (den Hartog, 1970). It extends from intertidal level to 10 – 12m deep and grows on coarse coral rubble to soft mud, and in sand where it is occasionally almost completely buried (Meñez et al, 1983).

Most of the extensive seagrass beds in slightly sheltered reefs and bays are characterized by the discrete associations of *Thalassia hemprichii* and *Enhalus acoroides*. Den Hartog (1977) considered these species as representing the terminal stage in seagrass succession. Extending from about 5 to more than 500 meters in width, they form the bulk of the meadow. *Halophila ovalis* and *Halodule uninervis* compose the more extensive, of about 5-10 meters in width zone. It forms the upper fringe of the main seagrass bed. Similar studies conducted by Prathep (2003) on the percent cover and distribution of two common seagrass *Thalassia hemprichii* and *Cymodocea rotundata* showed that *Thalassia hemprichii* was significantly influenced by interactions between seasons, shore levels and degrees of wave exposure. High sediments disturbance was likely to influence the percent cover and distribution of other seagrasses.

In a study conducted by Ingles (2000) in Davao Gulf, seagrass species with high percentage cover include *Enhalus, Thalassia, Cymodocea, Halophila and Halodule*. Except for *Enhalus*, similar results were obtained.

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Smithsonian Contributions to Marine Science