Productivity and Distribution of Seagrass Communities in Davao Gulf

HELEN W. NOEL[1], RUTH S. LUCERO[1], SATURNINO C. PARCASIO JR.[2], PETER Y. LABIS[2] AND MATIAS J. LUCERO[2]
[1]*Southern Philippines Agri-Business and Marine and Aquatic School of Technology, Malita, Davao del Sur 8012, Philippines*
Corresponding author, Email: helenwnoel@yahoo.com:FAX:(082) 553 8894
[2]*Lgu-Malita-Office of the Municipal Agriculture and Fisheries (OMAF), Malita, Davao del Sur 8012, Philippines*

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).

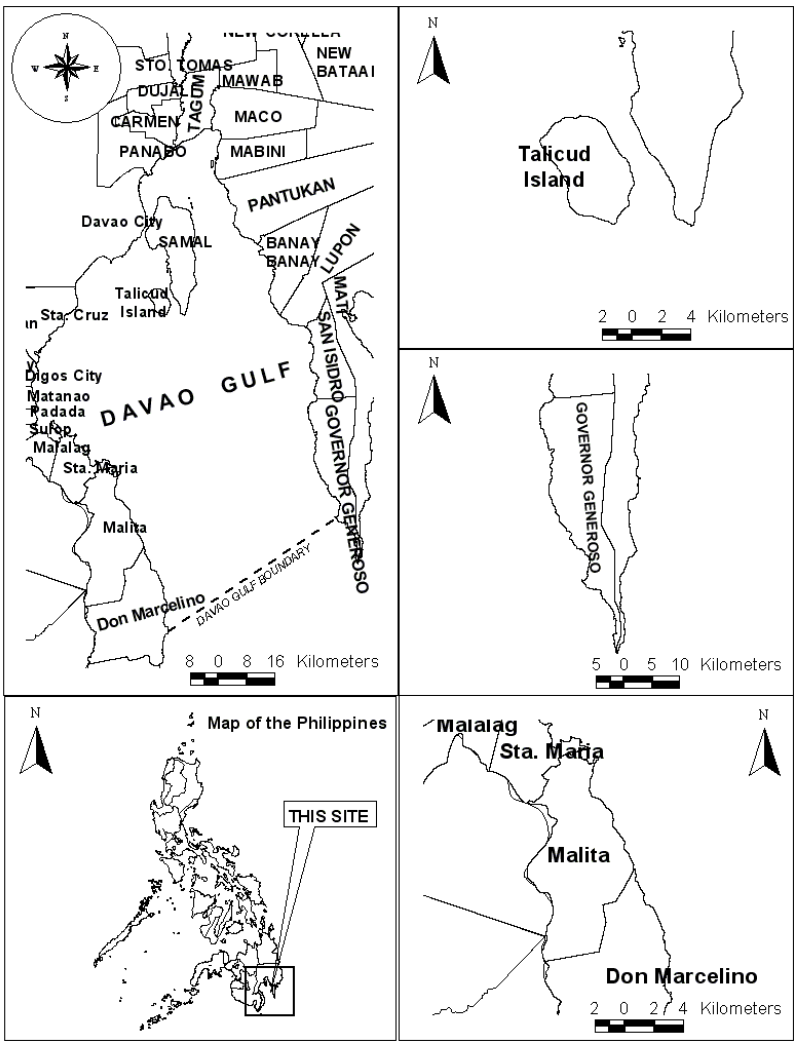

Figure 1. Map of Davao Gulf showing strategic locations of study areas

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

Species No.	Species	New Argao	Talicud	Governor Generoso
1	*Halodule pinifolia*	√	-	√
2	*Halodule uninervis*	√	√	√
3	*Cymodocea rotundata*	√	√	√
4	*Cymodocea serrulata*	√	-	√
5	*Syringodium filiforme*	-	√	-
6	*Syringodium isoetifolium*	√	√	√
7	*Enhalus acoroides*	√	√	-
8	*Thalassia hemprichii*	√	√	√
9	*Thalassia testudinum*	-	√	-
10	*Halophila decipiens*	√	-	-
11	*Halophila engelmannii*	√	√	-
12	*Halophila minor*	√	√	√
13	*Halophila ovalis*	√	√	√
14	*Halophila spinulosa*	√	√	-
Total		**12**	**11**	**8**

Occurrence of seagrass species within Davao Gulf is plotted in the map (Figure 2).

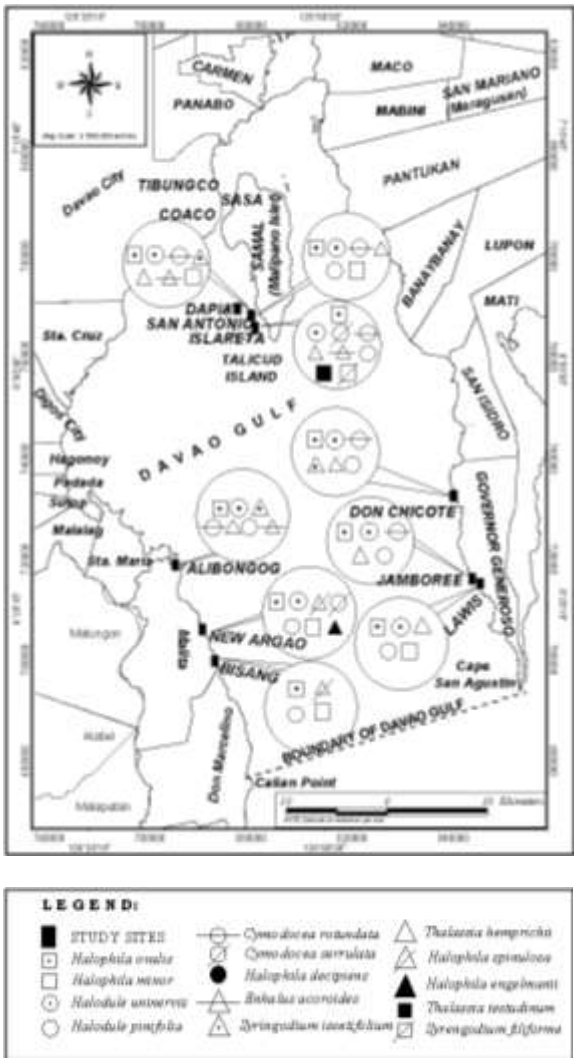

Figure 2. Map of Davao Gulf showing the occurrence and distribution of seagrass species

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%.

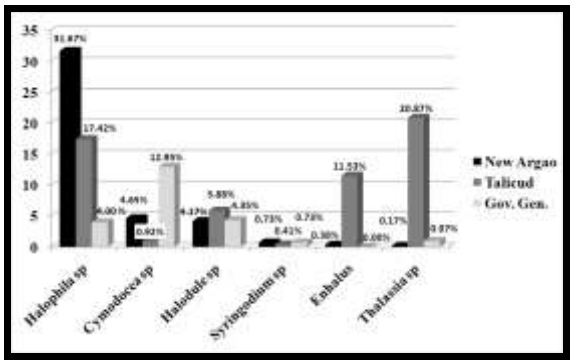

Figure 3. Graph of the seagrass percent cover in each study area

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, S*iganus 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 macro-invertebrates found in these areas were grouped into two categories namely: mollusca (gastropods and bivalves) and echinodermata (starfish and sea cucumber). Among the groups, the echinoderms

were found to have the most number of species. *Echinothrix diadema*, *Echinothrix calamares* 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 advertive 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). *H. ovalis* was found in pure strands or mixed with *Thalassia hemprichii*, *Halodule uninervis*, *Halodule pinifolia*, *Cymodocea rotundata*, and *Enhalus acoroides* (Meñez et al, 1983).

Halophila decipiens coexisted with *Halophila ovalis* and could be found as small patchy beds in deep coastal environments and mixed in with larger species of seagrasss in extensive meadows in the Pacific and Indian Ocean (Lardizabal, 2006). In contrast, *Halophila engelmannii* could be found in the sheltered area from low spring tide to 90 m deep in sandy and muddy substrates (Meñez et al, 1983). It may also occur in a shell hash substrate.

Percent Cover

The abundance and dominance of *Halophila ovalis* might be due to its characteristics as the most eurythermic of all the seagrasses, occurring from the tropics to the warm temperate areas. It extends from intertidal level to 10 – 12m deep and grows on coarse coral rubble to soft mud and in sand where it was occasionally almost completely buried (Meñez et al, 1983).

Most of the extensive seagreass 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 seagrass.

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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