This paper was peer-reviewed for scientific content.
Pages 426-428 In: D.E. Stott, R.H. Mohtar and G.C. Steinhardt (eds). 2001. Sustaining the Global Farm. Selected papers from the 10th International Soil Conservation Organization Meeting held May 24-29, 1999 at Purdue University and the USDA-ARS National Soil Erosion Research Laboratory.

Mangrove Structure on the Eastern Coast of Samar Island, Philippines

*Antonio B. Mendoza and Danilo P. Alura**

ABSTRACT

The mangrove forest in the Eastern Coast of Samar Island plays an important role in the protection of the coastline with the coconut plantation. No information is available that will guide land managers and policy makers on the status of this coastal resource. In 1997 an assessment was conducted to determine the tree density, canopy height, basal area, and density of seedlings and saplings and to find out its relationship to soil conservation in coastal areas. Five sampling sites were established based on its economic and ecological importance. A 10 x 10-meter plot was used for detailed study. This was laid at 100 meter intervals from the shoreline to the last mangrove stand in the seaward zone. A 5 x 5-meter plot was laid inside the mainplot for the saplings and seedlings study. There were 22 mangrove species identified belonging to 9 families. Highest density of mangrove trees is in Borongan with 3,300±656 trees per hectare. Mangrove canopy height ranges from 3.19±0.6 m. to 5.39±0.5 m. Highest is in Gamay Bay while the lowest is in Guiuan. The number of saplings ranges from 2,533±1,139 to 19,600±8,461 per hectare while the seedlings range from 32,000±11,087 to 84,000±31,000 ha^{-1}. Mangrove forest protects coastal erosion especially in areas directly exposed to the Pacific Ocean. Land managers and policy makers were provided necessary information on the ecological uses of mangrove in the protection of the agricultural crops along the coastline.

INTRODUCTION

The Eastern Coast of Samar Island, Philippines is directly exposed to the strong wave action of the Pacific Ocean and strong winds during times when typhoon enters the Philippine area of responsibility in the southern portion of the country. Mangrove forests line almost the entire coastline in this part of Samar Island except for sandy beaches and cliffs. This serves as buffer zone against typhoon and tidal waves. They prevent soil erosion, stabilize shoreline and minimize water pollution (Cabahug, 1991). Although statistics showed that mangrove forests has been significantly denuded at an average of 4,572 ha annually from 1920 – 1988 (Cabahug, 1991) and conversion into brackish water fish ponds is considered the principal factor behind the loss of Philippine mangrove forest (Zamora, 1990), the mangrove forest remains intact with only negligible area converted to fish ponds. The only threat to their destruction is cutting down trees for firewood, charcoal making, and construction materials.

Realizing the ecological importance of mangroves, Local Government Units have passed laws for their protection against destruction. However, no detailed studies have been conducted that will give a general picture of the mangrove structure in the Pacific Coast of Samar Island to guide land managers and policy makers in implementing conservation initiatives. This study aimed to determine the tree density, canopy height, basal area, density of seedlings and saplings and to find out its relationship to soil conservation in coastal areas.

MATERIALS AND METHODS

A 10 x 10-meter plot was used for the study. This was laid at 100-meter intervals from the shoreline to the last mangrove stand in the seaward zone. A 5 x 5-meter plot was laid inside the mainplot for saplings and seedlings study. Collection of samples was undertaken for identification of species that were not sampled in the plot. There were 5 samplings sites representing the most productive coastal area (*Guiuan, Matarinao Bay, Borongan, Dolores* and *Gamay Bay*). Observations were made on the threat to mangrove forests and its importance in protecting coastal erosion in the coastal waters directly facing the Pacific Ocean.

RESULTS AND DISCUSSION

There were 22 mangrove tree species identified belonging to 9 families (Table 1). In the coastal area directly exposed to the Pacific Ocean with sandy and limestone substrate, *Sonneratia casiolaris* and *Avecinnia marina* dominate. These two species prefer to thrive in areas directly facing the sea (Sneadaker & Sneadaker, 1984). It occupies the seaward part of the mangrove forest, preferring rocky to sandy-muddy soil (Calumpong & Meñez, 1997). In a narrow strip of mangrove in the coastline, no distinct zonation was observed. Species found at the sea face are also present in the landward mangrove edge. However in vast mangrove areas in Gamay and Matarinao Bays, distinct zonation was noted with *A. marina* and *S. casiolaris* dominating the seaward area with *Brugeria, Rhizophora* and *Xylocarpus* species in the landward zone. *Lumnitzera racemosa* is reported by Tomlinson (1986) to be resistant to saline condition, but it occupied the landward zone with brackishwater in Borongan and Dolores in association with *Nypa pruticans*.

---

*Antonio B. Mendoza and Danilo P. Alura, Eastern Samar State College, Borongan, Eastern Samar, Philippines. *Corresponding author: renn_tp@yahoo.com. This research was funded by the USAID-funded project "Preparation of a Comprehensive Coastal Resource Management Plan for Eastern Visayas (Philippines) 1997-2007".

Table 1. List of mangove species in the Eastern Coast of Samar Island

Family	Species
Avicenniaceae	*Avicenna marina*
	Avicenia lanata
	Avicennia officinales
Sonneratiaceae	*Sonneratia alba*
	Sonneratia caseolaris
Rhizophoraceae	*Ceriops decandra*
	Ceriops tagal
	Rhizophora apiculata
	Rhizophora stylosa
	Rhizophora mucronata
	Bruguiera cylindrica
	Bruguiera gymnorrhiza
	Bruguiera parviflora
	Bruguiera sexangule
Myrtaceae	*Osbornia octodonta*
Lythraceae	*Pemphis acidula*
Myrsinaceae	*Aegiceras corniculatum*
	Aegiceras horidum
Combretaceae	*Lumnitzera racemosa*
	Lumnitzera littorea
Sterculiaceae	*Heritiera littoralis*
Meliaceae	*Sylocarpus granatum*

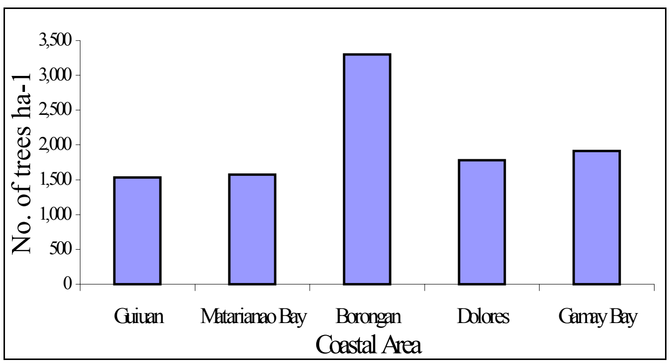

Figure 1. Density of mangrove in eastern coast of Samar Island.

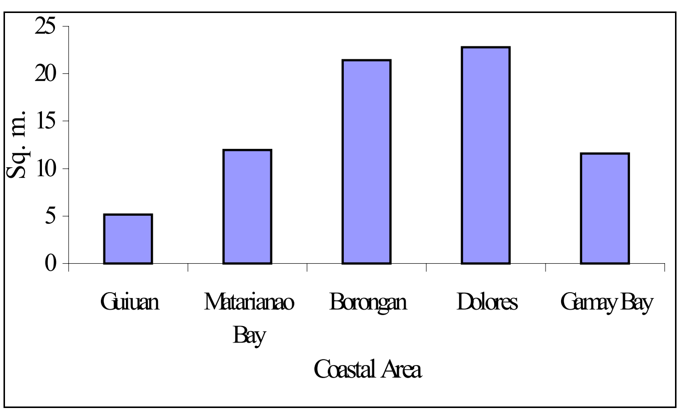

Figure 2. Basal area of mangrove in eastern coast of Samar Island.

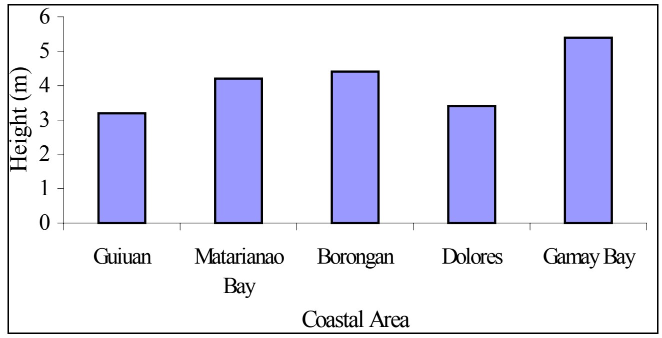

Figure 3. Average canopy height of mangrove trees in eastern coast of Samar island

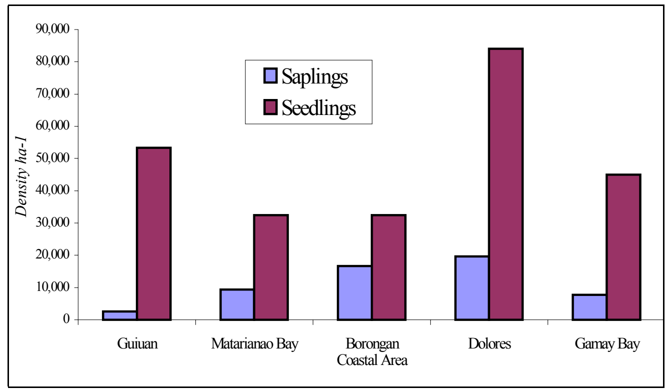

Figure 4. Number of saplings and seedlings of mangrove areas in different coastal areas Samar Island

The coastal agricultural area is predominantly planted with coconut where mangroves play an important role in protecting against coastal erosion. It was noted that in areas without mangroves, the coconut trees were uprooted due to wave action during stormy weather. This did not occur in coastal area where a strip of mangrove protected the coconut trees. Likewise, riverbanks without mangroves were easily eroded compared to those with mangrove trees. In coastal areas directly exposed to the strong wave action of the Pacific Ocean, coastal erosion was reduced either by mangrove trees or by cliffs.

Borongan had the highest mangrove density with 3,000±656 trees ha^{-1} (Figure 1). Since the area is the center of population, large mangrove trees were cut as construction materials and firewood for bakeries during the last decade that resulted in denser trees of smaller size (BA = 21.49±11.5 m^2). Dolores had lesser density (1,780±349 trees ha^{-1}) with larger basal area (22.78±7.9 m^2) This is due to less utilization of large mangrove trees since the economic activities in this area was charcoal making, which utilizes the smaller size of mangrove trees. The smallest tree size in Guiuan with only 5.17±3.3 m^2 basal area in 1,533±674 trees ha^{-1} due to excessive harvesting since this has the smallest mangrove area compared to other important coastal areas studied (Figure 2). In *Matarinao Bay*, mangrove plays an important role in trapping the sediments from mountainous agricultural land. The mangrove density (1,575±269 trees ha^{-1}) is higher than in Guiuan and larger (11.94±3.4 m^2) in size. This mangrove structure is better than in *Liloan*, Cebu located at the central part of the Philippines, which has 6,033 trees ha^{-1} with only 0.73 m^2 basal area (Dacles et al. 1995).

The highest average canopy height was in Gamay Bay while the lowest was in Guiuan (Figure 3). This can be attributed to less pressure to utilize the trees due to vast mangrove area and smaller human population compared to the Guiuan area. Although Dolores has the highest basal area, it was noted that the average height was only 3.41±0.5 m. This was due to cutting branches of large trees for charcoal making rather than cutting down the tree. In general the lowest canopy height in all the mangrove area studied were at the seaward portion since this area serves as frontline breaker for strong waves and wind.

In all the sites, the number of saplings and seedlings ranges from 2,533±1,139 to 19,600±8,461 and 32,500±15,000 to 84,000±31,000 ha^{-1} respectively (Figure 4). The highest number of seedlings and saplings in Dolores can be attributed to lower canopy height of the mangrove trees. In partially sheltered coves, the seedlings started to invade the tidal flat expanding the mangrove area seaward. The seedlings in all coastal areas can supply mangrove reforestation projects in other parts of Samar with degraded mangrove forests due to excessive cutting.

The common threats of mangrove forests are the conversion of the land of human settlements, gathering the trees for charcoal making and as construction materials. The most notable destruction is the mangrove forest is in Gamay Bay caused by an oil spill by a fishing boat that run aground on the nearly coral reef in 1993. Until recently, 40 hectare were still denuded and only two mollusk species were found in the area as compared to undisturbed mangrove with diverse species mollusk and other invertebrates species.

It is recommended that the mangrove forests in this area be preserved due to its function in the protection against coastal erosion and other ecological economic uses. Conversion of mangroves to aquaculture and other related projects should be discouraged. Mangrove reforestation is not necessary since the number of saplings and seedlings are enough for the maintenance of the mangrove stand and the natural reforestation in some tidal areas.

LITERATURE CITED

Cabahug, D.M. 1991. Mangrove resource regeneration, rehabilitation and management. PCARRD. Improved reforestation technologies in the Philippines. Los Baños, Laguna: 93 – 111 pp.

Calumpong, H.P. & H. Meñez, 1997. Field guide to the common mangroves, seagrasses and algae in the Philippines Bookmark, Makati City 197 p.

Dacles, T. U., F.F. Freire, H. de Dios, H. Martin, F.B. Sotto and J.G. Young. 1995. Mangrove community structure in Silut Bay, Liloan, Cebu. Sotto et al. (eds). The Philippines Scientist special issue. In Proc: 3rd Nat. Symp. Mar. Sci. 152 – 162 pp.

Snedaker, S.C. & J.G. Snedaker, 1984. The mangrove ecosystem: research methods. UNESCO. Bungay, U.K. 250 p.

Tomlinson, M.S. 1986. The botany of mangroves. Section B.: Key. Cambridge studies on tropical ecology. Cambridge Publishing Co. 383 p.

Zamora, P.N. 1990. Report on mangrove forest component of the master plan for forestry development. DENR, Quezon City.