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SEAGRASSES BIODIVERSITY: ITS ECOLOGICAL ROLES AND SOCIO-ECONOMIC RELEVANCE

By Jeckson M. Yusop
Assistant Professor IV
Director, Office for Student Affairs
Mindanao State University-Sulu

I. INTRODUCTION

Seagrasses are aquatic plants less common to most of us and thereby received lesser appreciation and concern. Despite the increase in scientific publications on seagrasses, the level of public awareness, as reflected by the number of reports on seagrass ecosystems in the media, is far less than that for other coastal habitats. There seems to be a disconnection between available information on seagrasses and public awareness. Much of this disconnection undoubtedly stems from the invisibility of seagrasses as they grow underwater. Especially here in our locality, little did we know about the significant roles of sea grasses in aquatic ecosystem which may have a considerable relevance to socio-economic aspect of the community. Accordingly, along with algae, the ecological roles of sea grasses range from supplying oxygen and food to housing young aquatic organisms thereby making the aquatic ecosystem livable and productive. This fact alone should invite our concern and curiosity about this little thing. Sad to note little, or none at all, effort or programs (government or private) did we know initiated to protect and conserve sea grasses in our locality. Why we need to protect and conserve sea grasses? Considering its significant roles in the ecosystem and how they possibly affect socio-economic condition of the society really demands an urgent concern; and considering the fact that seagrasses are located in the intertidal zone just about 50 to 200 meters away from the seashore which is more prone to human disturbances (leisure and other activities) should really invite attention of everyone, especially those who have deeper concern with environment and biodiversity.

Assessing the biodiversity of the seagrasses in Sulu is essential in protecting and conserving this little precious plant. This paper aims to identify the different species of sea grasses in the province and determine its biodiversity index, its ecological role and its possible relevance to socio-economic development of the society.

In a preliminary study I conducted in 2013 at a highly disturbed study site, Maubuh Beach, Litayun, Patikul, Sulu so far reveals a significant result. The locale of the study was actually limited to one study site due to the accessibility, and threats of the outlaw elements in the province at that time. However, Maubuh Beach as the most accessible beach by the time of the conduct of study, and therefore a highly disturbed area, I believed it was the right place to study the biodiversity of the sea grasses in the province. The study site was divided into three stations, and data gathering was through ocular inspection of the seagrass species found in each station using random sampling method. In this paper however, due to limited local literature, ecological significance and socio-economic relevance of seagrasses were based primarily on published local and international studies

II. BIODIVERSITY OF SEAGRASSES IN SULU

Seagrasses are flowering plants that live in the coastal waters of most of the world's continents. They are the main diet of dugongs and green turtles and provide a habitat for many, smaller marine animals, some of which, like prawns and fish, are commercially important. They also absorb nutrients from coastal run-off and stabilize sediment, helping to keep the water clear.

There are about 60 (or some say 72) species of seagrasses worldwide. Philippines has the second highest seagrass diversity in the world, second only to Australia. It contributes about 19 species or about 55% of the number of species in East Asia. Seven (7) species, comprising 40% of the total recorded in the Philippines and in Southeast Asia and 18% of global record, are found in Ulugan Bay in Palawan (Fortes, 2004).

Fortes at present is a leading researcher in Philippine seagrasses, yet, he did not mention in his research any data about seagrasses in greater part of Mindanao, especially BASULTA.

Fortunately, in a research I conducted in 2013 at Maubuh Beach, Barangay Litayun, Patikul, Sulu revealed that in spite of seemingly highly disturbed area, there were five species of seagrasses found which include the *halodule pinifolia* (lusay), *cymodocea rotuntada* (manatee grass), *halophila ovalis* (paddle weed/spoon grass/dugong grass), *thalassia testudinum* (turtle grass) and *syringodium isoetifolia* (noodle seagrass). Of the five species identified, *cymodocea rotuntada* is the dominant species. Palawan, who has the highest biodiversity of seagrasses in the Philippines, is just two species ahead over Sulu with just one study site considered.

Manatee grass (*cymodocea rotuntada*) basically has smooth, herbaceous rhizome with a short erect lateral shoot at each node bearing two to seven linear, flat, strap-shaped, and bluntly rounded tip leaves. *Halodule pinifoia*, locally known as "lusay", has thin, herbaceous rhizome with numerous leaf scars, and a linear flat, rounded tip leaf blade. *Thalassia testudinum* (turtle grass) has thick rhizome with a long, ribbon-like leaves. *Halophila ovalis* has thin, smooth rhizome and an oval shape leaf blade. *Syringodium isoetifolia* (noodle seagrass) has thin, herbaceous rhizome and a narrow, cylindrical tapering leaves.

Considering the limited study site, and its condition, as I described as highly disturbed anthropogenically, yet the research yielded an astonishing result as far as seagrasses biodiversity in the country is concerned. What more if the research is extended far wide its study sites, which I am planning to do next.

The research further reveals that seagrass biodiversity in said study site is still rich with a Shannon-Weiner index of 1.34, Simpson's index of 0.68, and 0.833 species evenness in spite of disturbances made by human in the area.

Figure 1. Biodiversity indices of Seagrass species of Mauboh Beach, Patikul, Sulu.

Seagrass species	Number of Individual	Shanon-Weiner index	Simpson's Index	Margalef's Index	Species Evennes s
Halodule pinifolia	2,400	1.34	0.68	5	0.833
Cymodocea rotuntada	4,675				
Halophila ovalis	1,325				
Thalassia testudinum	755				
Syringodium isoetifolia	625				

Figure 2. Pictures of Seagrasses samples collected from the study site.

Thalassia testudinum

Halophila ovalis

Syringodium isoetifolium

Cymodocea rotuntada

Halodule pinifolia

Result of this study provides additional inputs and explanation why Sulu sea is a home of a great biodiversity of fishes and other aquatic organisms.

In another study on seagrasses conducted by biology students of MSU-Sulu, as their thesis, in other area in Sulu also revealed almost similar result ranging from four to five seagrasses species found.

III. ECOLOGICAL ROLES OF SEAGRASSES

Just like mangrove and coral reefs, seagrasses also form ecosystem of complex structures and functions.

A multitude of plants and animals inhabit seagrass ecosystems forming complex food webs linking a variety of species together. The major function of seagrasses is supporting both aquatic and terrestrial species to include food production, nutrientre cycling, and refuge from predation. (*Japp & Hallock, 1990*).

Seagrass habitat is used as nursery area by juveniles of larger species. Smaller species use the cover as protection from predation *(Altsman, et.al, SEAGRASS HABITAT IN THE GULF OF MEXICO: Degradation, Conservation and Restoration of a Valuable Resource)*.

Seagrasses stabilize coastal sediments, and trap and recycle nutrients. They also provide food and shelter for many organisms and are a nursery ground for commercially important prawn and fish species (*CRC Reef Research Centre Ltd 2004, Queensland, Australia)*.

Finfish and shellfish use the beds as habitat for rearing juveniles and feeding as adults. Seagrass beds improve water quality by adding oxygen to the water column. They baffle sediments, reducing adverse effects from waves and currents. Seagrasses provide sediment stabilization, reduce coastal erosion, and filter nutrients and contaminants from the water (*Florida Department of Environmental Protection. Seagrass and the Economy 200; http://www.dep.state.fl.us/coastal/seagrass/facts/economy.htm.)*

A study conducted in South Sulawesi, Indonesia listed a total of 49 fish species were collected in seagrass beds (*Paul LA. Erftemeijer* and Gerald R. Allent, 1993)*.

And in another study conducted by CRC Reef Research Centre Ltd in 2004, at Queensland, Australia identified 134 fish species and twenty prawn species found in the seagrass meadows.

Other studies conducted across the globe revealed parallel findings as far as ecological role of seagrasses is concerned. A study conducted in the Gulf of Mexico by Altsman, et. al., reveals a multitude of aquatic animals living and grazing on seagrass bed. This includes species of mammals and turtle such as manatees (*trichecus manatus*), green sea turtles (*chelonia mydas*), and bottlenose dolphins (*tursiop struncatus*). Fish species utilizing seagrass habitat include drums (sciaenidae), sea bass (serranidae), porgies (sparidae), grunts (haemulidae), snappers (lutjanidae) and mojarras (gerreidae), and species of shellfish like the spiny lobster (*panuliru sargus*), queen conch (s*trombus gigas*), West Indian sea star (o*reaster reticulata*), pink shrimp (*farfante penaeus*), and bayscallops (*argopecten irradians*). *(Altsman, et. al., Seagrass Habitat in the Gulf of Mexico: Degradation, Conservation and Restoration of a Valuable Resource)*.

A local study conducted at Puerto Galera, Oriental Mindoro by team of Filipino researchers lead by Miguel D. Fortes says that "grazing evidence is almost always present in all the quadrats for all sampling months during the year. Invertebrate grazers particularly the sea urchins are abundant the entire year. Also found were schools of juvenile fishes, small crabs, brittle stars, starfishes and sea cucumbers (Fortes, et. al., Seagrass Net *Monitoring in the Western Pacific: Philippine Component,* Final Technical Report: January 2003-December 2004*.)*

These bunch of data revealed by the different research studies, locally and internationally, clearly pointed out how important are seagrasses in the ecosystem of aquatic environment. How vital and essential they are in shaping and rearing a complex and productive marine biodiversity. They play the roles of as shelter that provides a safe haven for juvenile aquatic organisms, nutrients recycler, oxygen replenisher together with algae, substrate stabilizer, and food supplier which serve as basic component of food web in aquatic ecosystem.

IV. SOCIO-ECONOMIC RELEVANCE OF SEAGRASSES

Unlike algae, mangroves, corals, and other aquatic organisms which have an obvious market value, seagrasses socio-economic relevance is subtle, and beyond the glimpse of appreciation.

However, while there is no single estimate of the value of seagrasses, there are several attributes that demonstrate the importance of the habitat to both the aquatic ecosystem and to the local economy.

In a study made by the Florida Department of Environmental Protection in 2001 states that "While there is no single estimate of the value of seagrasses, there are several attributes that demonstrate the importance of the habitat to both the aquatic ecosystem and to the local economy. Economically, recreational fishing for finfish and shellfish supported by seagrass habitat increase tourism, which benefits the local economy. It is estimated that between 70 percent to 90 percent of commercial fish spend some part of their life in seagrass habitat. (*Florida Department of Environmental Protection. Seagrass and the Economy 2001; http://www.dep.state.fl.us/ coastal/seagrass/facts/economy.htm)*

Seagrass meadows produce a variety of goods (finfish and shellfish, sediment) and provide ecological services (maintenance of biodiversity, water-quality control, shore-line protection) that are directly used or beneficial to humans. The presence and abundance of seagrasses can be considered, therefore**,** as indicator of the overall environmental quality of the coastal zone. Hence, their long-term maintenance could be a surrogate target of coastal management strategies aiming at preserving or improving the environmental quality of the coastal zone. In addition to fisheries, urban development, tourism and other recreational activities are significant parts of the economy of countries with access to the sea, and these activities are highly dependent on the quality of the coastal water and the stability of the coastline condition which is strongly supported by healthy, well-developed seagrass meadows. Seagrasses are, therefore, a valuable resource amenable to economic quantification and their conservation should be given high priority in coastal management *(Jorge Terrados and Jens Borum, European seagrasses: an introduction to monitoring and management 2004)*.

Anchoring on these findings would clearly show how relevant are seagrasses to socio-economic development of the community through supporting fishery and tourism industry by performing its ecological functions.

V. CONCLUSION

Among the many precious treasure of Sulu province is the Sulu Sea, and that includes the seagrasses. Though it may seem unknown or somewhat neglected resources, protecting and maintaining its biodiversity is a worthwhile endeavor every Tausug should consider. Understanding the seagrasses biodiversity, and its ecological value and socio-economic relevance is a journey worthy of investment.

Seagrasses in Sulu is diverse having an initial finding of five species namely the *halodule pinifolia* (lusay)*, cymodocea rotuntada* (manatee grass), *halophila ovalis* (paddle weed/spoon grass/dugong grass), *thalassia testudinum* (turtle grass) and *syringodium isoetifolia* (noodle seagrass). Ecological status of these species of seagrass is still “rich” with respect to abundance and biodiversity as indicated in the calculated Shannon-Weiner index of 1.34, Simpson’s index of 0.68, and a 0.833 species evenness.

Ecological potential of seagrasses is highly significant to aquatic ecosystem as they play a multi-character: as shelter that provides a safe haven for juvenile aquatic organisms, nutrients recycler, oxygen replenisher along with algae, substrate stabilizer, and food supplier which serves as basic component of food web in aquatic ecosystem.

Subtle as may seem, yet, the socio-economic relevance of seagrasses is an established fact as long as social activities and livelihood engagement are connected with quality of the coastal water. These include fisheries, tourism (beach resorts) and other recreational activities. These are significant parts of the economy. And these are highly dependent on the quality of the coastal water and the stability of the coastline condition. Seagrasses are, therefore, a valuable resource amenable to economic quantification.

Conservation of seagrasses biodiversity should be given high priority in coastal management if we wish to maintain good quality marine environment which is a pride of Sulu archipelago.

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