

Historical review of seagrass research in the Philippines

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Abstract—This historical account of seagrass research in the Philippines includes an advancement in the effort of more than four decades of scientific research in the country. The studies started with the taxonomy, distribution, and structural accounts of selected species, and continuing at present, with ecology, physiology, metabolism, and responses to environmental and climate change impacts. Advocacy on the importance of seagrass to local economy and the environment was initiated by the publications, which pointed to the Indo-West Pacific affinities of Philippine seagrasses, its status as a habitat under stress in East Asia, and its environmental and management perspectives in the region. With the works published primarily from projects funded by the European Union, which dealt with basic scientific data useful as guides to sound coastal developmental activities, a shift in direction of seagrass research towards addressing environmental issues commenced. The shifting needs of the times, aggravated principally by an alarming reduction and loss in resources resulting from a decline in coastal water quality and degradation of the environment, dictated a corresponding shift in seagrass research focus from basic to its applications, from purely scientific initiatives to those that now require support and collaboration from social and behavioral sciences.

Key words: seagrass, Philippines, action plan, JSPS, conservation

Introduction

Seagrass bed is a discrete community dominated by flowering plants with roots and rhizomes (underground stems), thriving in slightly reducing sediments and normally exhibiting maximum biomass under conditions of complete submergence (Fortes 1995). Their unique ecological function provides an immeasurable amount of benefits to coastal dwellers. Unknown to these communities, the contribution of seagrass meadows to the high biodiversity in these areas plus their ability to supply a great deal of revenues from the resources account for much of their daily incomes and benefits. Seagrasses are home to many economically important marine organisms, including shrimps, sea urchins, clams, various fish species, and endangered animals like sea turtles and the enigmatic dugong, some 95% of whose diet is seagrasses. All these make the conservation, rehabilitation, and persistent scientific research on seagrass habitats a high priority in the coastal action agenda of governments in Southeast Asia.

For decades, the main interests of marine scientists of Southeast Asia focused almost solely on the corals, seaweeds, animals, or fish that either live in coastal habitats or are associated with them (Fortes 1989). On the other hand, the traditional orientation of the region's marine science has been to view the ocean as a deep-water mass, neglecting the shallow coastal fringes where seagrasses abound. Investigators with the interest on seagrass research are few and priori-

ties for research and developmental activities are usually directed towards other resources with immediate economic impacts. Ironically, in Southeast Asia where the second highest seagrass diversity in the world is found, seagrass ecosystem has been a focus of scientific inquiry only in the last 15 years and, as an object of natural resource management, only in the last 8 years!

This report embodies a historical account of the research effort on seagrass in the Philippines. It includes advancement in the effort of more than four decades of seagrass scientific research in the country. The studies started with the taxonomy, distribution, and structural accounts of selected species, and continuing at present, with ecology, physiology, metabolism, and responses to environmental and climate change impacts. Many of these later studies include monitoring, assessment, rehabilitation and management of the already dwindling seagrass habitats and were participated in by diverse, far-reaching organizational involvements. There were successes in protecting seagrass and demonstrating their importance to local economy and ecology, like that in Ulugan Bay, the local ordinance, *Bantay Isay* (literally “Seagrass Watch” in the Philippine vernacular), in Puerto Galera, and the Bolinao Seagrass Demonstration Site and the Seagrass Reserve in the same municipality. These were achieved through the functional collaboration between local and international experts, the local government and the community.

The beginnings of seagrass research in the Philippines: 1830–1981

The earliest accounts on seagrasses in the Philippines include reports of *Vallisneria sphaerocarpa* (= *Enhalus acoroides*) from Zambales (Blanco 1837, 1845, 1879). Merrill (1918) made another report of *Vallisneria sphaerocarpa* from Palawan. Ostefeld (1909) recorded *Halophila ovata* (= *Halophila minor*) from the Philippines, based on Loher's specimen from Luzon and later, Merrill's collection from Manila Bay.

Pascasio and Santos (1930) published a critical morphological study of *Thalassia hemprichii*. Domantay (1962) listed eight species of seagrasses in his study of the marine vegetation of the Hundred Islands in Pangasinan. Merrill (1912, 1915, 1918, 1925) and Mendoza and del Rosario (1967) included seagrasses in vascular plant floras. In his most comprehensive account of the seagrasses of the world, den Hartog (1970) reported 11 species for the Philippines. Calumpang (1979) reported three seagrasses from Central Visayas region. Cordero (1981) illustrated and described the morphology and distribution of three species of seagrasses. The most comprehensive ecological account of seagrasses from the Philippines was made by Fortes (1986).

Advocacy on the importance of seagrass to local economy and the environment was initiated by the publications, which pointed to the Indo-West Pacific affinities of Philippine seagrasses (Fortes 1988a), its status as a habitat under stress in East Asia (Fortes 1988b), and its environmental and management perspectives in the region (Fortes 1995). With the works published from the projects funded by the European Union (1996–2000), which dealt with basic scientific data useful as guides to sound coastal developmental activities, a shift in direction of seagrass research towards addressing environmental issues commenced.

Current and future research trends

It took more than 5 decades after the morphological account of Pascasio and Santos (1930) to follow up the works on taxonomy and distribution and initiate an ecological research on seagrasses in the Philippines. It was the visit in the country in 1983 of the late Dr. Ronald Philips, one of the world's foremost seagrass scientists, which started the ecological impetus on this 'obscure' group of marine plants. With a small research project awarded by the precursor of the present Philippine Council for Aquatic and Marine Research and Development (PCAMRD) of the Department of Science and Technology (DOST), this writer initiated what many consider as the pioneer in seagrass ecological and conservation research in the country.

The shifting needs of the times, aggravated principally by an alarming reduction and loss in resources resulting from a decline in coastal water quality and degradation of the environment, dictated a corresponding shift in seagrass research focus from basic to its applications, from purely scientific initiatives to those that now require support and collaboration from social and behavioral sciences. This is shown in Fig. 1 which depicts the relative distribution of the published materials on the seagrass ecosystem among the 6 major research concerns in the Philippines from 1830 to 2010. From the figure, the last five decades have brought a mixture of researches aimed at presenting various methods of conservation, rehabilitation and management of the seagrass habitats in the country, together with the organisms associated with them. A good chunk of the general literature on coastal science dealt with coral reefs, which is undoubtedly the most studied of all the tropical marine habitats, with the seagrasses, enjoying 'a mere mention' as the latter is often a major component of the reef flats. The emerging impetus on the studies on interconnectivity among coral reefs, seagrass

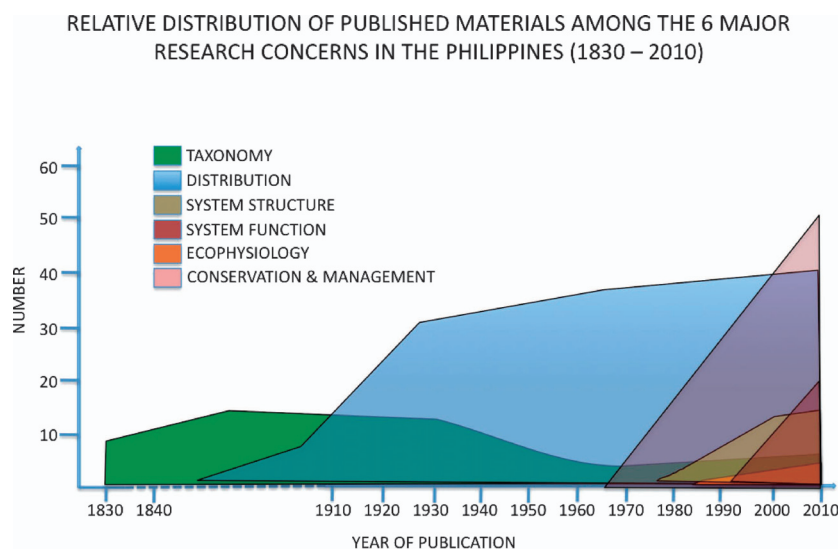


Fig. 1. The relative distribution of published materials on seagrass among the 6 major research concerns in the Philippines (1830–2010).

**CONCEPTUAL FRAMEWORK OF THE PHILIPPINE SEAGRASS CONSERVATION STRATEGY & ACTION PLAN
SHOWING THE NICHE OF THE SEAGRASS COMPONENT OF THE JSPS CMS PROJECT**

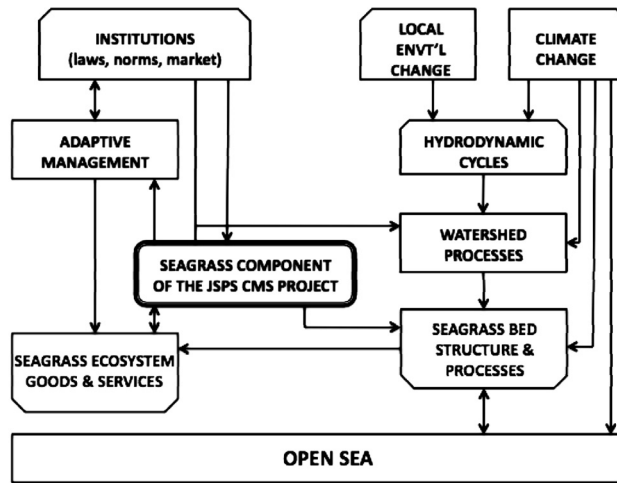


Fig. 2. The conceptual framework of the Philippine Seagrass Conservation Strategy and Action Plan, emphasizing the niche of the Seagrass Component of the JSPS/CMS Project.

beds and mangroves makes the study of seagrass meadows equally important. Partly in these studies, the meadows' distinct role in providing a stable foundation for all marine ecosystems emerged. More recently, its unique role came at the forefront in global environmental awareness due largely to their effectiveness in mitigating the impacts of climate change.

From then on, this new research thrust on seagrasses was and is being pursued, sustained by numerous funding agencies and institutions. Among these are the Philippine Government through PCAMRD (1983–1990), the European Union (1996–2002), the Australian International Development Assistance Bureau (1986–1996), Association of Southeast Asian Nations (1998–2000), United Nations Educational, Scientific and Cultural Organization (2003–2006), United Nations Environment Programme/Global Environment Facility (2002–2008), and Japan International Cooperation Agency-Japan Science and Technology Agency (2010–2015).

The Philippine National Seagrass Conservation Strategy and Action Plan

Under the aegis of the UNEP/GEF South China Sea Project, entitled, “Reversing Environmental Degradation Trend in the South China Sea and the Gulf of Thailand (2002–2008)”, the Philippine National Seagrass Committee (PNSC) was established. It was tasked to oversee and support all activities that relate to seagrass in the country. This task was translated into the Philippine National Seagrass Conservation Strategy and Action Plan (PNSCSAP). The action program is the Philippines' collective response to the UNEP/GEF South China Sea Project's goal of restoring 80% of the region's seagrass cover to the 1995 level. The concep-

tual framework of its research component is given in Fig. 2, emphasizing the niche of the Seagrass Component of the JSPS CMS (Coastal Marine Science) Project. In the plan, each of the programme components (blocks) has a defined course of action, objectives, outputs, a timeframe and specific line up of collaborators in each area of implementation. This framework defines the course of management and project implementation for the seagrasses of the Philippines from 2002–2012. The interactive nature and interdependence among the various components of the plan is also emphasized. These interactions are guided by the following key questions, which only research could answer:

- Q1: How do long-term and short-term human impacts interact to alter seagrass ecosystem structure and function?
- Q2: How can the biological characteristics of the ecosystem be both the causes and consequences of fluxes of energy and matter?
- Q3: How do changes in seagrass ecosystem dynamics affect ecosystem services?
- Q4: How do changes in seagrass ecosystem services feed back to alter human behavior?
- Q5: Which human actions influence the frequency, magnitude, and form of human impacts across the ecosystem, and what determines these human actions?

The answers to these fundamental questions provide the basis of an integrated decision support system arrived at after thorough and timely consultation with the stakeholders. The end point or ultimate product is policy, which should be institutionalized, i.e., legislated, incorporated in management decisions, and infused into the social norm.

The PNCSAP has set the stage for the research and development agenda for seagrasses in the country. Past efforts

of the scientific community, and the lessons learned from previous coastal resource management initiatives should serve as a jump off point for future achievements in seagrass research. In the Philippines, it must be overly emphasized that the continuous support and transparency between all sectors are vital to the success of seagrass conservation and management (Montaño 2007).

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