



Introduction and Overview

The existence and ecosystem health of mangrove forests are vital to the long-term productivity and stability of coastal environments in the Philippines (Salmo et al. 2007). Mangroves contribute to fisheries production, which provide food and livelihood to millions of coastal residents. They also buffer the shoreline against natural disasters such as typhoons, storm surges, coastal erosion, and rising sea level. Their performance of ecological functions, however, depends on the extent and ecosystem health of the forest (Duke et al. 2007).

Mangroves in the Philippines have long been ‘ecologically disturbed’ by rampant cutting for timber products and massive conversion of forests into aquaculture ponds (Primavera 2000). Sea level rise (SLR) is another threat that will aggravate the situation by causing widespread tree mortalities due to drowning (Lovelock et al. 2015).

Aside from declaring mangrove conservation sites, the primary mode of mangrove management in the country is through planting programs (Walters 2004). An effectively designed and implemented mangrove restoration program helps increase mangrove forest cover and abate the impacts of SLR. However, evidence of success is lacking despite the widespread implementation of mangrove planting programs in the country since late 1980s. Most of these programs have selected unsuitable sites and used inappropriate species, thus, resulted to poor survival and stunted growth of mangroves, at best (Salmo et al. 2007).

Monitoring data and reports on the status of natural mangrove stands and the growth and survival rate of the planted mangrove stands have rarely been provided. Such information is critical in crafting science-based management strategies for conservation and restoration programs. In addition, sharing information on mangrove ecosystem status and best practices for mangrove management and planting can enhance current management efforts that will lead to more effective programs. Thus, the State of the Mangrove Summit aimed to gather and consolidate nationwide information on mangrove status and management. The first part of the series is the Northwestern Luzon Summit in October 2014. This second part covers selected areas in Southern Luzon.

The Need for a Mangrove Summit

The summit envisions institutionalizing a national State of the Mangroves biannual workshop that consolidates monitoring data (e.g. growth and biodiversity). The information, collated in an accessible online database, will

also be useful in estimating the carbon sequestration of mangroves and in assessing the vulnerability or resiliency of mangroves against sea level rise.

This summit covers three administrative regions (NCR, Regions 4A, and 4B), and eight provinces (Romblon, Marinduque, Palawan, Oriental Mindoro, Occidental Mindoro, Batangas, Cavite, and NCR). These areas boast a diversity of mangrove settings—from heavily disturbed (NCR and Cavite) to the most intact and largest extent of mangroves in the country (Palawan and Mindoro).

Although Southern Luzon has the most extensive mangrove areas in the country, it is highly vulnerable against anthropogenic impact and natural disasters. In all its provinces, mangrove planting is a regular activity. Planting sites are usually along the shoreline using species from the genus *Rhizophora* (Salmo & Duke 2010). The survival rate is low and usually attributed to wrong species-substrate matching, and the inappropriate location and timing of planting. Similar to most mangrove rehabilitation programs in the country, most mangrove planting activities in the region are more of ‘afforestation’ (which affects the existing nearby habitats like seagrass beds and mudflats) rather than reforestation of denuded mangrove areas. The planted stands are usually mono-specific (Walters 2004, Primavera & Esteban 2008, Salmo et al. 2013) with stunted growth and poor survival (Samson & Rollon 2008).

Summit Objectives

The 2nd State of the Mangroves Summit provided an opportunity for mangrove managers to discuss the status of mangrove forests in their regions. The summit also aimed to complement the State of the Coast Reports of the UP Marine Science Institute in providing a more comprehensive overview of the status of coastal ecosystems in the Philippines. The specific objectives of the summit were to:

- Provide a venue for provincial representatives to share and discuss the status of mangrove forests in the Philippines, especially in the light of climate change vulnerability;
- Involve experts in the field of mangrove ecology and management, climate change vulnerability, and carbon sequestration;
- Consolidate more accurate data from each province; and
- Come up with a plan of action to enhance mangrove management.

Content and Structure of the Proceedings

The first part of the Proceedings came from individual provincial reports. Prior to the summit, a survey form was sent to the eight provinces. This survey was implemented through the Philippine Higher Education Research Network (PHERNet) project funded by the Commission on Higher Education, entitled “Assessing the Success of Mangrove Rehabilitation Projects: Comparative Rates of Carbon Deposition in Natural versus Planted Mangrove Stands”.

The survey yielded information on:

1. Province/area geographic and socioeconomic profile (e.g. population in coastal areas, barangays, and threats);
2. Mangrove assessment status (including areas of old-growth and planted stands, presence of a mangrove protected area, importance of mangroves to the community, mangrove products utilized, mangrove managers, causes of decline, effects of decline, steps taken to address decline, and presence of mangrove protection/planting/rehabilitation efforts); and
3. Provincial mangrove projects/programs (specifying the type of project, objectives, funding groups, implementing groups, partners, budget, area replanted/rehabilitated, growth and survival rate, presence of monitoring programs, community engagement, and community benefits).

Information gathered from the survey was organized into a matrix and formatted into a comprehensive, accessible online database to supplement existing mangrove information. An outline was prescribed for both oral and written reports. Each partner institution was then requested to submit an oral presentation and written report. Oral presentations were delivered during the Mangrove Summit while the written reports were submitted and completed in June 2016. The Secretariat reviewed the submitted documents for formatting and copyediting to achieve consistency (while retaining the original contents and context) throughout the Proceedings. In cases where the reporters did not provide data, the Secretariat labeled it as “no data provided.” Although some reports were submitted in November 2015, there were some provinces that were not able to submit. In this case, the Secretariat prepared for the report and used the PowerPoint and survey files as bases for the report. These individual reports constitute the bulk of the Proceedings, which is available at <http://mangroveecology.com>.

The second part is composed of six technical reports covering topics on:

(1) **Status of Mangroves and Mangrove Management in the Philippines (Dr. Villamor, DENR-ERDB)**. The document discusses the status of mangroves along with the historical trend in changes in mangrove forest cover. The national government agencies that were tasked to manage mangroves, their respective mandates and

policies from 1970s to current period were discussed. This includes the priority government programs on mangrove rehabilitation and post-Yolanda rehabilitation programs. There was also a recognition of the constraints and “failures” of previous mangrove planting practices. While there are various programs on mangrove conservation and management, the report emphasizes the need to harmonize all programs, and it can start more particularly on government-sponsored programs.

(2) **Mangrove Forest Extent Mapping in Southwestern Luzon Using 2015 Landsat Imagery (Al Jayson Songcuan, Department of Geodetic Engineering and Marine Science Institute, UP Diliman)**. This report presents the spatial distribution and estimate of coverage of mangrove forests in Southwestern Luzon (including the province of Quezon). The data on mangrove extent and cover, similar to the Northern Luzon Summit, is quite different from the provincial reports as well as with the data of Long and Giri (2013). Nonetheless, the study documented some areas with a decreasing forest cover while some areas had a significant increase. The increase in mangrove areas is attributed to the enhanced methods in areal estimation (through remote sensing and GIS) and likely with the conservation and restoration programs as well.

(3) **Resiliency and Vulnerability of the Coastal Zone Against Sea Level Rise (Dr. Samuel S. Mamauag, Marine Environment and Resources Foundation, Inc./Marine Science Institute, UP Diliman)**. The document discusses the analyses on the vulnerability and/or resiliency of mangroves against SLR.

(4) **Integrating Mangrove Ecosystems Approaches to Integrated Coastal Management (Dr. Porfirio M. Aliño, Marine Science Institute, UP Diliman)**. The document discusses frameworks and strategies that incorporate mangrove ecosystem in Integrated Coastal Management.

(5) **Blue Carbon (Ms. Ma. Josella Pangilinan, Conservation International-Philippines)**. The document presents the initiatives and activities of Blue Carbon International Working Group, as well as early attempts to establish Blue Carbon Philippines. The Philippines is one of the original members of the International Technical Working Group. However, there has not been much development in the country since its inception. This Blue Carbon Initiative offers a great opportunity to provide value-adding services (through Carbon Accounting and Payment for Ecosystem Services, among others) that would contribute in enhancing mangrove conservation and management.

(6) **Status of Mangroves and Mangrove Research in the Philippines (Dr. Miguel D. Fortes, Marine Science Institute, UP Diliman and Dr. Severino G. Salmo III, Department of Environmental Science, Ateneo de Manila University)**. The document provides a comprehensive review of studies done on Philippine mangroves since the 1600s. This include historical accounts of research

according to timeline, theme (ecology, conservation, biodiversity, etc.), geographic regions (comparing number of publications), and management. The study emphasized that research priorities differed across time and that most of the research works were in response to environmental issues at the time.

The third part is the summary of workshop-planning outputs drawn from the summit. There were three groups formed to do the workshop. Each group was asked to come up with a Problem Tree Analysis to identify data gaps and prioritize issues and problems. The activities to address the identified problems were elaborated.

The last part is a synthesis of the 2nd State of the Mangrove Summit. Information from all reports, technical presentations, and workshop outputs were consolidated. Statistics on mangrove forest cover for the Southern Luzon in terms of species composition, distribution, and extent of old and planted stands were reported. Current and emerging issues that pose threats to the existence of mangroves (e.g. coastal poverty, habitat conversion, and sea level rise) were discussed. Management approaches across sites were summarized to identify common strategies that will help improve mangrove management in the region. In this section, we incorporated our insights and perspectives based on the identified data gaps and the needed research to complement the current management strategies.

Summary and Challenges

Around 41 participants from academic institutions, NGOs, NGAs, and local government units attended the 2nd State of the Mangrove Summit. There were eight case study presentations from mangrove managers and five technical presentations from resource persons. The sharing sessions were valuable and covered mangrove statistics, perceived threats, management responses, as well as the difficulties and lessons learned in mangrove management. The concerns mentioned in the workshop and planning sessions will serve as inputs in crafting national mangrove management plan. This document will be available online for public access.

Like the first summit, the second summit has accomplished its objectives and paved the way for future mangrove summits at the regional and national levels. Organizing this summit was rife with challenges. Matters of funding, coordination, participation, and publication of proceedings were nonetheless overcome. For our success at each stage, we are grateful to all the participants and resource persons, as well as the members of the Secretariat, the Department of Environmental Science and the administrators of the Ateneo de Manila University, and the sponsors (Foundation for the Philippine Environment, Conservation International-

Philippines, USAID Protect Wildlife Project, and CHED). As we present this collection of status reports and knowing the formidable challenges ahead, we enjoin all mangrove stakeholders to participate in the continuing efforts and contribute to the improvement of mangrove management in the country.

References

- Donato DC, Kauffman JB, Murdiyarso D, Kurnianto S, Stidham M, Kanninen M. 2011. Mangroves among the most carbon-rich forests in the tropics. *Nature Geoscience* 4: 293–297.
- Duke NC, Meynecke J-O, Dittman S, Ellison AM, Anger K, Berger U, Cannicci S, Diele K, Ewel KC, Field CD, Koedam N, Lee SY, Marchand C, Nordhaus I, Dahdouh-Guebas F. 2007. A world without mangroves? *Science Letter* 317: 41–42.
- Fortes M, Salmo SG III. 2015 (in press). Mangroves in the Philippines: responding to change. National Book Development Board.
- Long JB, Napton D, Giri C, Graesser J. 2014. A mapping and monitoring assessment of the Philippines' mangrove forests from 1990 to 2010. *Journal of Coastal Research* 30(2): 260–271.
- Long JB, Giri C. 2011. Mapping the Philippines' mangrove forests using Landsat imagery. *Sensors* 11: 2972–2981.
- Lovelock CE, Cahoon DR, Friess DA, Guntenspergen GR, Krauss KW, Reef R, Rogers K, Saunders ML, Sidik F, Swales A, Saintilan N, Thuyen LX, Triet T. 2015. The vulnerability of Indo-Pacific mangrove forests to sea-level rise. *Nature* 526: 559–563.
- Primavera JH. 2000. Development and conservation of Philippine mangroves: institutional issues. *Ecological Economics* 35: 91–106.
- Primavera JH, Esteban JMA. 2008. A review of mangrove rehabilitation in the Philippines: successes, failures and future prospects. *Wetlands Ecology and Management* 16(5): 345–358.
- Salmo SG III, Lovelock CE, Duke NC. 2013. Vegetation and soil characteristics as indicators of restoration trajectories in restored mangroves. *Hydrobiologia* 720(1): 1–18.
- Salmo SG III, Duke NC. 2010. Establishing mollusk colonization and assemblage patterns in planted mangrove stands of different ages in Lingayen Gulf, Philippines. *Wetlands Ecology and Management* 18(6): 745–754.
- Samson MS, Rollon RN. 2008. Growth performance of planted mangroves in the Philippines: revisiting forest management strategies. *Ambio* 37(4): 234–240.
- Walters BB. 2004. Local management of mangrove forests in the Philippines: successful conservation or efficient resource exploitation? *Human Ecology* 32(2): 177–195.