Introduction and Overview

Mangroves contribute to fisheries production which supports millions of coastal residents as source of food and livelihood. They also protect the shoreline against natural disasters such as typhoons, storm surges, coastal erosion, and sea level rise (SLR). Their performance of ecological functions, however, depend on the coverage and ecosystem health of the forest (Duke et al. 2007). The existence and ecosystem health status of mangrove forests will be vital in the long-term productivity and stability of coastal environment in the Philippines (Salmo III et al. 2007; Salmo III et al. 2018).

Mangroves in the Philippines have long been 'ecologically disturbed' primarily because of rampant cutting for timber products and massive conversion to aquaculture ponds (Primavera 2000). The loss of mangroves will reduce its capacity to effectively perform its ecological functions (Duke et al. 2007). The occurrence of catastrophic typhoons and the threats of SLR will aggravate the demise of mangroves (Lovelock et al. 2017). Some mangrove species will be able to retreat landward, but only if they will have spaces to colonize. Unfortunately, these "colonization spaces" are constrained with coastal infrastructures or are occupied by settlers in most parts of the country. Hence, when coastal squeeze happens, mangroves will be drowned, resulting in severe tree mortalities (Lovelock et al. 2015).

Aside from declaring mangrove forests as a conservation site, the primary mode of mangrove management in the country is through planting programs (Walters 2004). An effectively designed and implemented mangrove restoration program will help contribute in increasing the mangrove forest cover and in abating the impacts of SLR. However, despite the massive mangrove planting programs in the country (since late 1980s), there have been lacking evidence of success. Most of these programs are located in unsuitable sites and used inappropriate species—leading to poor survival and stunted growth (Salmo III et al. 2007). Monitoring data and reports are rarely provided, both on the status of natural mangrove stands and the growth and survival rate of the planted mangrove stands. These information are needed to come up with a science-based decision in designing management for conservation and restoration programs, and recently in integrating the importance of "blue carbon" ecosystem service (Donato et al. 2011). The State of the Mangrove Summit series aims to gather and consolidate nationwide information on mangrove status and management. This is the third part of the series that previously covered selected areas in Southern Luzon (October 2015) and Northwestern Luzon (October 2014).

The Need for a Mangrove Summit

The summit envisions institutionalizing a national State of the Mangrove biannual workshop that consolidates monitoring data (e.g., growth and biodiversity). These information, collated in an accessible online database, will also be useful in estimating the carbon sequestration and in assessing the vulnerability (or resiliency) of mangroves against SLR.

This year's summit covered Central and Eastern Visayas. These two administrative regions are parts of two marine biogeographic regions (Visayan Sea and South Philippine Sea). This proceedings only features reports from the provinces of Cebu and Bohol (from Central Visayas); Leyte, Southern Leyte, Samar, Eastern Samar, and Northern Samar (from Eastern Visayas); and the municipality/city of Palompon and Ormoc (from Leyte). These areas have high species diversity, particularly Bohol with 26 to 33 species. Several mangrove protected areas were declared as early as 1980s. However, there are still some challenges in some areas. For example, some local government units (LGUs) lack technical personnel who have expertise or knowledge on mangrove assessment. Moreover, some provinces lack basic mangrove information (e.g., species, area) and, in fact, even have confusions on who has mandate on doing mangrove management.

Similar with other coastal provinces in the country, there were massive mangrove rehabilitation projects implemented in the provinces listed above. Most of them got funding from the national government, while some were from local and international non-government organizations (NGOs). Objectives vary from increasing fisheries production to improving resiliency against natural disasters to providing employment through contract labor.

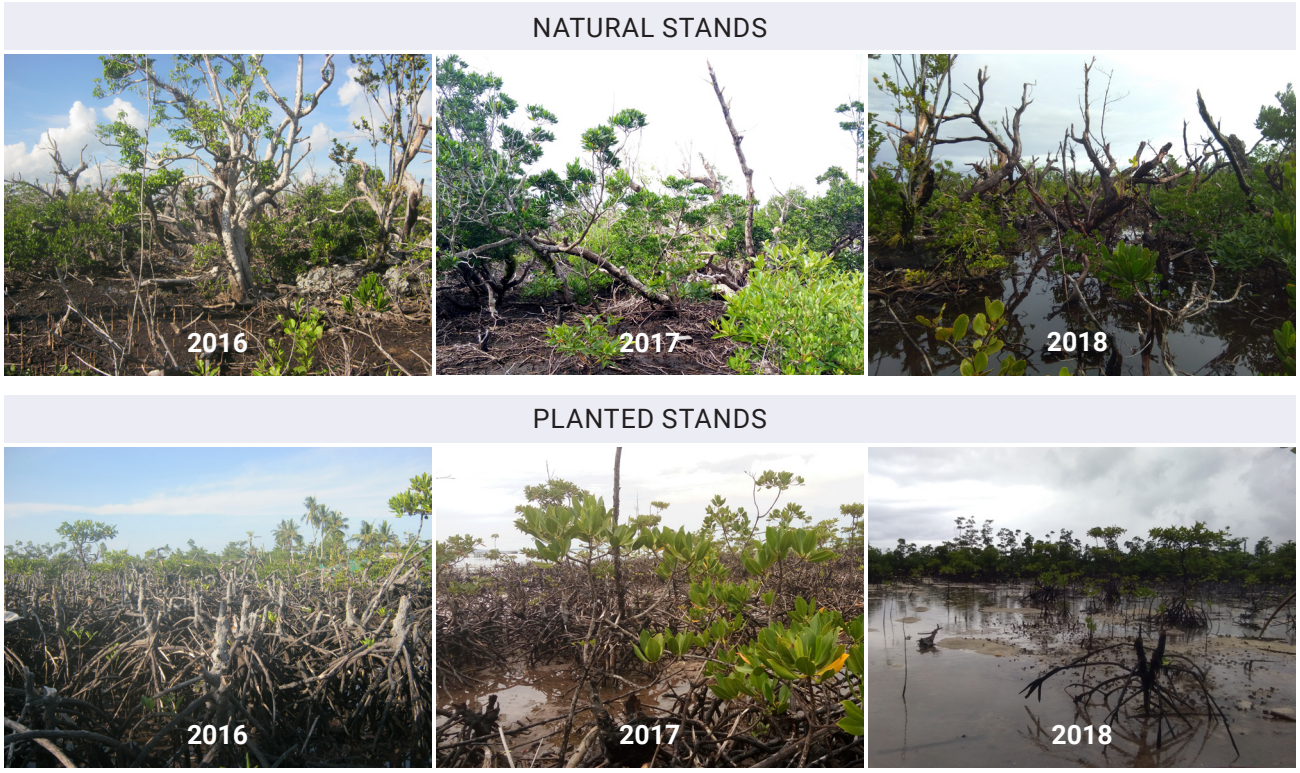

Figure 1. Contrasting typhoon damage and post-typhoon recovery patterns between natural (top) and planted (bottom) mangrove stands. Refoliation and seedling recruitment are evident in the natural stands.

The Eastern and Central Visayas were the most devastated areas damaged by Super Typhoon Yolanda (international name: Haiyan) in November 2013. Some municipalities in Samar claim that mangroves protected them from the typhoon. Mangroves were also affected but showed contrasting patterns between natural and planted stands in terms of extent of damage and recovery (**Fig. 1**). Most natural mangrove stands showed recovery through refoliation and coppicing. In fact, the municipality of Palompon claimed 100 % recovery four years after the typhoon. Those that recovered were from the *Avicennia* and *Sonneratia* spp. Unfortunately, most plantations composed of monospecific *Rhizophora* spp. were severely damaged and have not recovered. These lessons have been learned and documented in other places in the country since 1990s, yet are still being practiced. Mangroves may either be vulnerable or adaptive to natural disasters; therefore, managers must recognize the importance of species-substrate matching to make them adaptive or resilient to typhoons.

The damages on mangroves were so severe that several large-scale reforestation programs were implemented by the government. Fortunately, some LGUs (i.e., Cebu, Ormoc, and Palompon) already learned and were adamant on the practice of *Rhizophora*-planting program. Some LGUs did not accept mangrove planting program anymore despite the available funding. Those LGUs that implemented post-Yolanda monospecific planting reported high seedling mortality. The province of Bohol, however, reported survival rate as high as 85 % and even reached 100 % in some of its municipalities.[1]

[1]Disclaimer: The editors do not have the means to verify this report. But, it is possible that the monitoring was conducted when seedlings were still young (e.g., less than 5 years); hence, does not reflect yet the long-term survival.

Summit Objectives

The **3rd State of the Mangrove Summit** aimed to complement the State of the Coast Reports of the University of the Philippines – Marine Science Institute (UP-MSI) in providing a more comprehensive overview of the status of coastal ecosystems in the Philippines. The summit provided an opportunity for mangrove managers to discuss the status of mangrove forests in the region.

Specifically, the summit was able to accomplish the following objectives:

- Provide a venue for provinces to share and discuss the status of mangrove forests in the Philippines, especially in the light of climate change vulnerability;
- Invite experts in the field of mangrove ecology and management, climate change vulnerability, and carbon sequestration to share state-of-the-art knowledge to enrich the workshop and action planning;
- 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/municipal reports. Prior to the summit, a survey form was sent to the participating LGUs.

The survey yielded information on:

1. Province/area geographic and socio-economic profile (e.g., population in coastal areas, barangays, and threats);
2. Mangrove assessment status (including areas of old-growth and planted stands, presence of mangrove protected areas, importance of mangroves to the community, mangrove products utilized, managers, causes of decline, effects of decline, steps taken to address decline, and presence of mangrove protection/planting rehabilitation reports); 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).

The information gathered from the survey was organized into a matrix and formatted into a comprehensive and accessible online database to supplement existing mangrove information. Each partner institution was then requested to submit an oral presentation and written report, following the prescribed outline. Oral presentations were delivered during the Mangrove Summit, while the written reports were submitted and completed in June 2018. The Secretariat reviewed the submitted documents for formatting and copy-editing 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." While some reports were submitted in May 2018, there were other provinces that were not able to submit. In this case, the Secretariat prepared for the report using their PowerPoint presentation and survey files as bases. These individual reports constitute the bulk of the proceedings, which are also available at *https://mangroveecology.com*.

The second part is composed of three technical reports covering topics on: assessment of relationship of mangrove ecosystem health with carbon sequestration and vulnerability/adaptability to SLR; mangrove extent and simulation of effects of SLR on mangroves; and mangrove assessment in Samar. The first report is the result of the OML Center-funded project which compared the carbon sequestration capacity and surface elevation change in mangroves that are natural, planted, and recolonized fishponds. The second report is a result of spatial analyses on mangrove extent in the region as well as simulation of the impacts of SLR on long-term distribution and extent of mangroves. Data from the OML Center-funded project was used in the simulation. The last report is the result of the mangrove assessment done by a people's organization (PO). This is the first time (in the Mangrove Summit series) that a technical report from a PO was incorporated.

The third part is the summary of the workshop-planning outputs drawn from three groups (Group 1: Leyte, Southern Leyte, Ormoc City, and Municipality of Palompon; Group 2: Eastern Samar, Northern Samar, Samar, Southeast Samar PO Consortium, and Guiuan Development Foundation, Inc.; and Group 3: Bohol and Cebu). The workshop was designed for the participants to realize the importance of having a regional mangrove network which they can use as an avenue for sharing their best practices and organizing a database (which they can regularly update). A set of guide questions was given to each group. They were tasked to identify challenges involved in updating the mangrove status in their jurisdictions, enhancing regional collaboration, and defining their common goals.

The last part is a synthesis of the 3rd State of the Mangrove Summit. Information from all reports, technical presentations, and workshop outputs were consolidated. Statistics on mangrove forest cover for the Central and Eastern Visayas in terms of species composition, distribution, and extent of old and planted stands were reported. Technical information (e.g., how to survey and monitor mangroves) and management gaps (e.g., issues on jurisdiction) were identified. Current and emerging issues that pose threats on the existence of mangroves (e.g., coastal poverty, habitat conversion, and SLR) were discussed. Varying management approaches across sites were summarized to identify common strategies that will help improve mangrove management in the region.

In this final section, we incorporated our insights and perspectives based on the identified data gaps and the needed research to complement the current management strategies. The editors documented some highlights that are unique from this summit. Repeated failures on monospecific mangrove planting and the need to make mangroves more adaptive or resilient against natural disasters made some LGUs develop more strategic interventions. Cebu, for example, uses geographic information system (GIS) and drone in determining mangrove extent and distribution. Palompon and Bohol capitalized on natural mangrove stands as an ecotourism program. Palompon and Ormoc collaborated with academic institutions in doing mangrove assessment and monitoring. More importantly, the mangrove managers from Central and Eastern Visayas strongly recommended the inclusion of mangroves in the management of marine protected areas (MPAs). In the past, MPAs are mainly made up of coral reefs. Cebu already initiated the inclusion of mangroves in their MPAs. To address the lack of or conflicting information, Cebu and Northern Samar suggested consolidation of mangrove information where the provincial government will serve as data repository. A provincial and regional mangrove network was proposed.

Summary and Challenges

Around 33 participants from the academe, NGOs, non-government agencies (NGAs), and LGUs attended the 3rd State of the Mangrove Summit. There was a total of nine case study presentations from mangrove managers from seven provinces and three technical presentations. The sharing sessions on mangrove statistics, the perceived threats and management responses, as well as the difficulties and lessons learned on mangrove management were valuable. The concerns mentioned in the workshop and planning session will serve as inputs in crafting the national mangrove management plan. This document will also be available online for public access.

Similar with the first two summits, this summit has accomplished its objectives, paving the way for future mangrove summits both at the regional and national levels. Organizing a summit, however, is not without its challenges, namely, matters on funding, coordination, participation, and publication of proceedings, among others. As we attempt to complete the Philippines' mangrove status report, we invite and encourage all concerned mangrove stakeholders to participate and help improve mangrove management in the country.

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