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Inventory of mangroves in Katunggan Coastal Eco-Park, Sultan Kudarat Province, the Philippines

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Abstract. *Mangaoang CC, Flores AB. 2019. Inventory of mangroves in Katunggan Coastal Eco-Park, Sultan Kudarat Province, the Philippines. Bonorowo Wetlands 9: 59-64.* The coastal wetlands of the Philippines are dominated by mangrove ecosystem and are experiencing different forms of threats particularly anthropogenic activities. The local government unit of Lebak in the Province of Sultan Kudarat and non-government organizations envision of rehabilitating and conserving mangrove forests, but no research has been done. Thus, this study was conducted to document different species of mangrove which will serve as a baseline in developing conservation and rehabilitation strategies. Purposive sampling was done and morphological characteristics of each species were examined for identification. A total of 29 mangrove species belonging to 14 families were identified. Three of which are threatened species including *Ceriops zippeliana*, *Avicennia rumphiana* and *Camptostemon philippinensis*. It was also noted that the local community is aware of the importance of mangroves but not all have concern on the conservation and protection policies being implemented by the government. Despite the decreasing status of Philippine mangroves, local exploitation and anthropogenic pressures, such as aquaculture, are still uncontrolled. Therefore, the presence of threatened species implies that the area needs to be prioritized in terms of conservation and rehabilitation activities with joint effort of both the government and local communities to save and protect this mangrove ecosystem.

Keywords: Baseline, conservation, identification, mangroves, restoration

INTRODUCTION

Rehabilitation and restoration of mangrove ecosystems are being promoted by governments, non-government organizations and aid agencies across different parts of Southeast Asia (Thorhaug 1990; Sukardjo and Yamada 1992; Saenger and Siddiqi 1993; Kaly and Jones 1998) with efforts that have met succession with necessary estimates of planted tree survival (e.g., Lewis 1990; Saenger and Siddiqi 1993; Calumpong 1994; Pomeroy et al. 1996; Primavera and Agbayani 1996; Erftemeijer and Lewis 1999). The degree to which mangrove planting actually facilitates the restoration of diverse and structurally complex forests similar to their natural precursors is little examined, although there is considerable literature on this "catalytic" effect in upland forest plantations (Parrotta and Turnbull 1997).

The Philippines as an archipelago has over 7,100 islands, which is bordered by 36,300 km of coastline along seagrass' beds, coral reefs and even mangrove forests (Benecario et al. 2016). The biodiversity of mangroves and mangroves as an ecosystem have been increasingly attracting greater interest because it is highly productive but also extremely sensitive and fragile environment (Donoso 2018). Mangroves which is comprised of only 65-69 species are well known for their floral diversity of vascular plants which have several specific adaptations to the vibrant coastal setting (Kathiresan and Bingham 2001). Spalding et al. (1997) and Spiers (1999) stated that less than half of the remaining mangrove ecosystems are now existing to date and continues to be in degraded conditions (UNEP 2004; MAP 2005). The continued decline of the mangrove forests is due to numerous anthropogenic disturbances like conversion to agriculture, aquaculture, tourism, urban development and overexploitation (Alongi 2002; Giri et al. 2008) and even natural disasters. According to studies, 35% of mangroves had been lost from 1980 to 2000 (MA 2005), and the mangrove forests have been declining at a faster rate compared to either coral reefs or tropical forests (Duke et al. 2007). The rapid rise of sea-level could also be the greatest threat to mangroves (Gilman et al. 2008). As a result, important ecosystem goods and services of mangrove ecosystems such as natural barrier of ocean wave, carbon sequestration and the biodiversity contained in mangrove forests will be diminished or lost (Duke et al. 2007) even in the Philippines.

Currently, according to the latest checklist of Philippine mangroves by Primavera (2006), there are at least 32 species known and found in the Philippine coastal areas. Consequently, a mangrove reforestation effort exists in the Province of Sultan Kudarat in Mindanao, Philippines. This is specifically located in the coastal Barangay Taguisa, municipality of Lebak, Sultan Kudarat. Barangay Taguisa in cooperation with the Department of Environment and Natural Resources (DENR) has developed mangrove restoration and conservation programs to protect the area. This mangrove forest covers at least 1000 hectares of

mangroves but no record of mangrove species had been published. Thus, this study was conducted. The data generated in this study will give a complete list of the species thriving in the area. It will also provide reliable baseline information for determining threatened species which could be used as basis to further strengthen the efforts being done in conservation and protection of this ecosystem.

MATERIALS AND METHODS

Study period and location

The study was conducted during summer between April-May, 2018 in Katunggan Coastal Eco Park in Sultan Kudarat. one of the provinces in the Philippines situated in the mainland Mindanao. During these months, most of the mangrove species in the area are in flower which helped the researchers in the identification process. Lebak, a municipality in the western Sultan Kudarat which faces the Celebes Sea, harbors both mountainous and coastal areas. Barangay Taguisa (A barangay is referred as the smallest administrative division in the Philippines and is native to the Filipino term village, district or ward), a coastal community of Lebak, is where an eco-park can be found which is part of the 1000-ha mangrove forest (Figure 1). The Katunggan Coastal Eco-park is being managed by the Local Government Unit in partnership with the Department of Environment and Natural Resources (DENR).

Sampling and inventory of mangrove species

The inventory of mangrove species was done through purposive sampling and walks on the park and in other parts of the mangrove forest in Barangay Taguisa, Lebak together with staff from the Municipal Environment and Natural Resources Office (MENRO) of the said municipality. Field notes were taken and preliminary identification of mangrove species was done in the area. Morphological characteristics of leaf, flowers, and propagules were noted and used in the identification of species. Key guides such as the Field guide to Philippine Mangroves by Primavera 2006 and other published work were used. Photographic documentation was also employed to further identify the species. Voucher specimens were also collected.

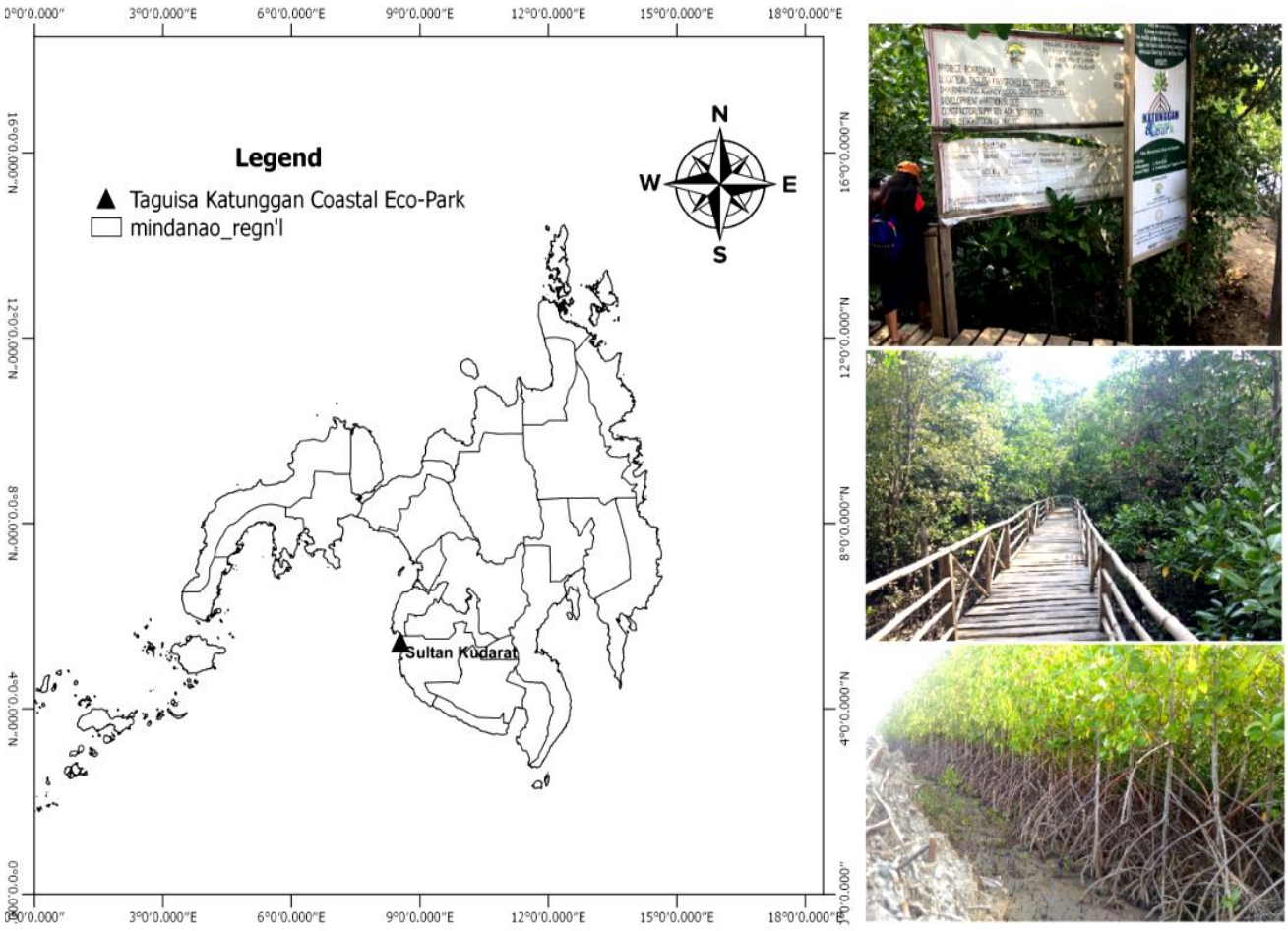

Figure 1. Map of the study site in Taguisa, Lebak Sultan Kudarat, Mindanao, Philippines

Table 1. List of mangrove species recorded during the survey in Taguisa, Coastal Eco-Park, Lebak, Sultan Kudarat, Philippines

Family	Species	Common name	Distribution	Ecological status
Fern				
Pteridaceae	*Acrosthicum aureum* L	Lagiwliw, ragoyhoy	Found in tropical and sub-tropical areas around the world	LC
	Acrostichum speciosum Willd.	Lagolo, palaypay	American Samoa; Australia; and Southeast Asia	LC
Vascular plants				
Acanthaceae	*Acanthus ebracteatus* Vahl	Lagiwliw, ragoyhoy	Widespread across Southeast Asia including the Philippines	LC
	Acanthus volubilis Wall.	Lagiwliw, ragoyhoy	Widespread across Southeast Asia including the Philippines and China and Taiwan	LC
Arecaceae	*Nypa fruticans* Wurmb	Nipa, sasa	Throughout the Philippines	LC
Avicenniaceae	*Avicennia alba* Blume	Bungalon, apiapi, miapi	South East Asia, including the Philippines, Australia and the Pacific islands	LC
	Avicennia marina (Forsk.) Vierh	Bungalon, apiapi, miapi	Southeast Asia, including the Philippines Australia, New Zealand, East Africa, India, Pacific Islands	LC
	Avicennia officinalis L	Bungalon, apiapi, miapi	Southeast Asia, including the Philippines, New Guinea and southern Australia	LC
	Avicennia rumphiana Hallier	Bungalon, apiapi, miapi	Southeast Asia including the Philippines and Papua New Guinea	Vul
Bignoniaceae	*Dolichodrone spathacea* (L. fil.) K. Schum	Mangrove trumpet tree	Southeast Asia, including the Philippines. It is also found in the northeast tip of Australia and Papua New Guinea and Palau	LC
Bombacaceae	*Camptostemon philippinensis* (S.Vidal) Becc.	Gapas-gapas	This species is patchily distributed in Indonesia (Borneo and Sulawesi), and the Philippines	En
Combretaceae	*Lumnitzera littorea* (Jack) Voigt	Tabao	Throughout the Philippines. Also tropical Asia, to Australia and Polynesia	LC
	Lumnitzera racemosa Willd.	Culasi	Luzon (Rizal, Bataan, Quezon) Mindoro, Panay, Negros, Cebu and Mindanao. Also eastern tropical Africa, Australia and Polynesia	LC
Euphorbiaceae	*Excoecaria agallocha* Linnaeus	Buta-buta	Throughout the Philippines. Also India, Malaysia, Australia and Polynesia.	LC
Lythraceae	*Pemphis acidula* J.R. & G. Forst.	Bantigi	Throughout the Philippines. Also tropical Africa, tropical Asia.	LC
Meliaceae	*Xylocarpus granatum* Koen.	Tabigi	Throughout the Philippines. Also East Africa, India and some countries in Southeast Asia	LC
	Xylocarpus moluccensis (Lamk.) M. Roem.	Piag-ao	Luzon (Quezon and Bataan), Palawan, Mindoro, Mindanao and the Sulu Archipelago. Also Madagascar to India through Malaysia to Polynesia	LC
Myrsinaceae	*Aegiceras corniculatum* (Linnaeus) Blco.	Saging-saging, tinduk-tindukan	Batanes islands to Palawan, Mindanao and Sulu Archipelago. Also Sri Lanka, India to southeastern China throughout Malaysia to Australia	LC
Rhizophoraceae	*Bruguiera cylindrica* (Linnaeus) Blume	Pototan-lalake	Throughout the Philippines. Also India, Southeast Asia through Malaysia and Australia	LC
	Bruguiera gymnorrhiza (L) Lamk.	Pototan-busain	Throughout the Philippines. Also Africa, Madagascar, Seychelles, Southeast Asia, through Malaysia, Australia and Polynesia	LC
	Bruguiera parviflora (Roxb.) W. & A. ex Griff	Langarai	Throughout the Philippines. India, Southeast Asia, Australia and New Caledonia.	LC

	Bruguiera sexangula (Lour.) Poir.	Pototan	Widespread and found in Asia, Northeast Australia, Papua New Guinea, and the Solomon Islands. In China, this species is restricted to Hainan Island, where it is uncommon.	LC
	Ceriops zippeliana (Griff.) Ding Hou	Baras-baras	Throughout the Philippines. Also India, Southeast Asia, through Malaysia and Australia.	NT
	Ceriops tagal (Perr.) C.B. Rob.	Tungog, tangal	Throughout the Philippines. Also tropical Africa, Madagascar and most part Southeast Asia	LC
	Rhizophora apiculata Blume	Bakhawlalake	Throughout the Philippines. Also some parts of Southeast Asia, through Australia and the Pacific Islands	LC
	Rhizophora mucronata Lamk.	Bakhaw babae	Throughout the Philippines. Extra-Philippine distribution including tropical Africa, Madagascar and Seychelles	LC
Rubiaceae	*Scyphiphora hydrophyllacea* Gaertn.	Nilad, taguisa	Luzon to Palawan and Mindanao. Also in India, Southeast Asia, Australia and New Caledonia.	LC
Sonneratiaceae	*Sonneratia alba* J. Smith	Pagatpat	Widespread in East Africa, Seychelles and Madagascar, India, Sri Lanka and throughout Southeast Asia to tropical Australia, New Caledonia, Palau, the Federated States of Micronesia, Marshall Islands, Papua New Guinea, Solomon Islands, Vanuatu, Kiribati, and China (Hainan Island).	LC
	Sonneratia caseolaris (L.) Engl.	Pedada	Throughout the Philippines.	LC

Note: LC: Least Concern, NT: Near Threatened, En: Endangered, Vul: Vulnerable

RESULTS AND DISCUSSION

The survey and documentation of mangrove species in the Katunggan Coastal Eco-Park in Lebak, Sultan Kudarat identified a total of 29 species of mangroves and belonging to 16 genera representing 14 families including: Acanthaceae, Pteridaceae, Myrsinaceae, Avicenniaceae, Bignoniaceae, Bombacaceae, Rhizophoraceae, Euphorbiaceae, Combretaceae, Arecaceae, Lythraceae, Sonneratiaceae, Rubiaceae and Meliaceae. Among the documented mangrove families, Rhizophoraceae had the most number of species with 8 under 3 genera while the least number of species was in Arecaceae, Bombacaceae, Bignoniaceae, Euphorbiaceae, Lythraceae, Myrsinaceae, and Rubiaceae with only one species per family. The complete list of species identified per family is presented in Table 1.

Most of the recorded mangroves in the area are widespread across Southeast Asia and its neighboring tropical countries. The area also harbors some threatened mangrove species which at least 3.45% species are considered as Near Threatened (*Ceriops zippelliana)*, 3.45 % species is vulnerable (*Avicennia rumphiana)* and an endangered species *Camptostemon philippinensis* is also 3.45% (Figure 2). The remaining 89.65% is considered Least Concern.

The mangrove forest in Katunggan coastal eco-park harbors 29 species of mangroves found in the Philippines and this serves as the baseline data of the site. The high species present in the area can be incorporated with the local government successful efforts in restoring and conserving this ecosystem. Numerous mangrove seedlings and saplings can also be observed in the area which will be the next generation of the mangrove and will be added to their population succession. Though the species number was lower compared to other mangrove ecosystems in the country, such as Pagbilao Bay in Quezon Province which has 37 species (Almazol et al. 2013); Panay with 34 species (Primavera et al. 2004), Guimaras with 30 species (Sadaba et al. 2009) and Davao Gulf with 30 species (Flores 2003), however, it is also considered higher compared to Bohol with 26 species (Mapalo 1992), Samar Island with 22 species (Mendoza & Alura 2001), Ibajay in Aklan Province with 22 species (Primavera 2000), Palawan with 22 species (Arquiza 1999), Danao Bay with 20 species (De Guzman 2004), Alabel and Maasim, Sarangani Province with only 12 species (Natividad et al. 2014), Bacolod, Lanao del Norte with only 11 species (Benecario et al. 2016) and in Hagonoy Davao del Sur with only 7 species (Jumawan et al. 2015).

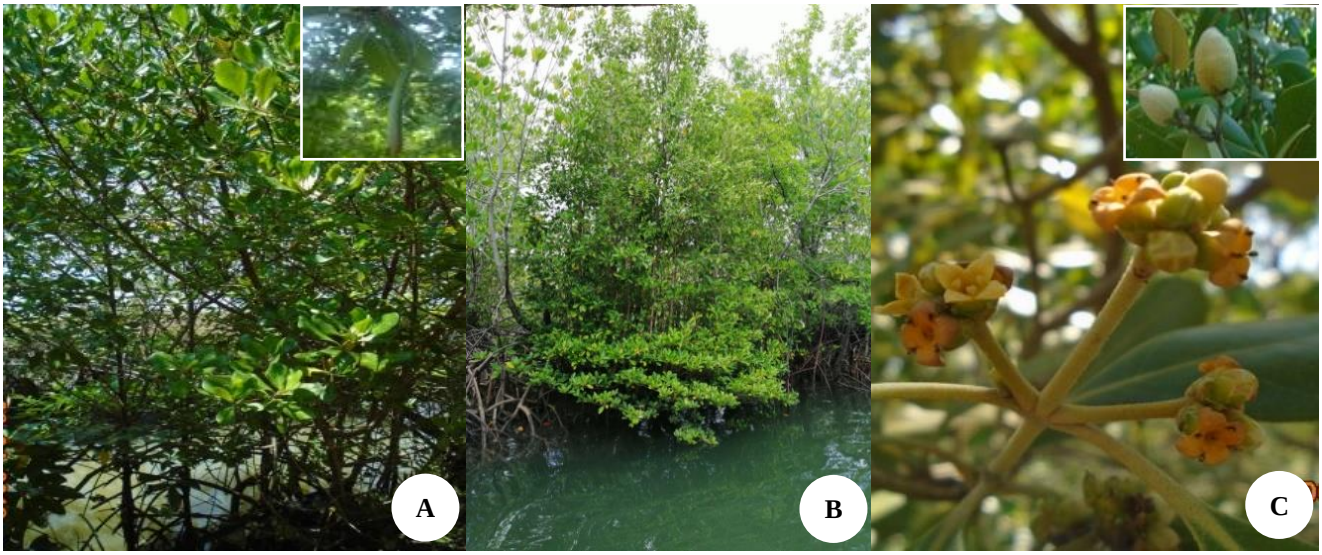

Figure 2. Photographs of mangrove species with conservation concern according to IUCN RedList. A. *Ceriops zippeliana* (NT); B. *Camptostemon philippinensis* (EN) and C. *Avicennia rumphiana* (VU)

The mangrove forest in Katunggan coastal eco-park harbors 29 species of mangroves found in the Philippines and this serves as the baseline data of the site. The high species present in the area can be incorporated with the local government successful efforts in restoring and conserving this ecosystem. Numerous mangrove seedlings and saplings can also be observed in the area which will be the next generation of the mangrove and will be added to their population succession. Though the species number was lower compared to other mangrove ecosystems in the country, such as Pagbilao Bay in Quezon Province which has 37 species (Almazol et al. 2013); Panay with 34 species (Primavera et al. 2004), Guimaras with 30 species (Sadaba et al. 2009) and Davao Gulf with 30 species (Flores 2003), however, it is also considered higher compared to Bohol with 26 species (Mapalo 1992), Samar Island with 22 species (Mendoza & Alura 2001), Ibajay in Aklan Province with 22 species (Primavera 2000), Palawan with 22 species (Arquiza 1999), Danao Bay with 20 species (De Guzman 2004), Alabel and Maasim, Sarangani Province with only 12 species (Natividad et al. 2014), Bacolod, Lanao del Norte with only 11 species (Benecario et al. 2016) and in Hagonoy Davao del Sur with only 7 species (Jumawan et al. 2015).

However, the number of species recorded in this study might be higher if more intensive survey were conducted. The high species present in Katunggan Coastal Eco-park suggests that this area could be one of the most important mangrove ecosystems in Mindanao and even in the country. The comparison between different mangrove areas, only means that few mangrove sites have been explored and documented where in fact most of the natural stands of mangrove can be found in the coastal areas of Mindanao. It is also noted in the study that only one individual of *Pemphis acidula* was documented, this is probably because this mangrove species is locally threatened because of exploitation for decorative purposes such as bonsai. Locally known as bantigue bonsai, this mangrove species is listed in DENR Administrative Order 2017-11 as a threatened Philippine plant. It is also listed in the International Union for Conservation of Nature Red List of Threatened Species where recent records of it being collected, sold and transport are seized (Panay News, 2018). Even in the very alarming rate of anthropogenic disturbances, the fear of losing this threatened ecosystem is near to possibility. And with the fact that it remains unexplored, we may yet lose another treasure trove without even knowing.

Based on observations and field notes of the study, it found that the community is aware of the importance of the mangroves but not all have concerns to the policies being implemented by the government to protect and conserve mangroves. There are still threats visible and can be observed in the area such as arising numbers of agricultural fish ponds and degradation of mangroves or deforestation.

Conclusion and recommendation

Mangroves species present in Katunggan Coastal Eco-Park is indeed rich and the data presented here qualifies the support of this claim. Successful restoration and conservation of the local government can be observed in the Katunggan coastal eco-park. These can be supported by the high species present and the observable number of saplings. Awareness on the ecosystem function of mangroves is limited only to the people who stay near the forest and for those who are working in the eco-park. On the other hand, those people who do not involve protection and conservation inflict destruction and disturbances. This became a big problem when implementing conservation efforts in the area.

The species richness of mangrove in the area must serve as baseline information for further enhanced interventions and strong implementation of existing laws for its proper management and conservation. Local government officials and people in the community must work together in the preservation of this threatened ecosystem by performing

each role that will subsequently lead to sustainable use of the resources both the flora and fauna. The result of this study may be useful when developing management plan to give direction in prioritizing interventions for the conservation and appropriate utilization of services that mangrove ecosystem could provide for them. This study recommends conduct of ecological researches on mangrove in the area and in-depth assessment of threats may be considered as well.

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