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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: 65-70.* The coastal wetlands of the Philippines are dominated by mangrove ecosystems 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 rehabilitating and conserving mangrove forests, but no research has been done. Thus, this study was conducted to document different mangrove species, 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. These 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. Still, not all have concerns about the government's conservation and protection policies. 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 conservation and rehabilitation activities with the joint effort of both the government and local communities to save and protect this mangrove ecosystem.

Keywords: Baseline, conservation, identification, mangroves, restoration

INTRODUCTION

Governments are promoting rehabilitation and restoration of mangrove ecosystems, 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. However, 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 has been increasingly attracting greater interest because of the highly productive, extremely sensitive, and fragile environment (Donoso 2018). Mangroves comprised of only 65-69 species are well known for their floral diversity of vascular plants that 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 continue 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, 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 than 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 waves, carbon sequestration, and the biodiversity contained in mangrove forests will be diminished or lost (Duke et al. 2007) even in the Philippines.

According to the latest Philippine mangroves checklist 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 to strengthen further the efforts being done in the conservation and protection of this ecosystem.

MATERIALS AND METHODS

Study period and location

The study was conducted during the summer between April-May 2018 in Katunggan Coastal Eco Park in Sultan Kudarat. one of the provinces in the Philippines situated in mainland Mindanao. During these months, most of the mangrove species in the area are in flower, which helped the researchers identify. 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 to 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 1,000-ha mangrove forest (Figure 1). The Local Government Unit manages the Katunggan Coastal Ecopark 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 walking on the park and in other parts of the mangrove forest in Barangay Taguisa, Lebak, and 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 made in the area. Morphological characteristics of leaves, flowers, and propagules were noted and used to identify 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 identify the species further. Voucher specimens were also collected.

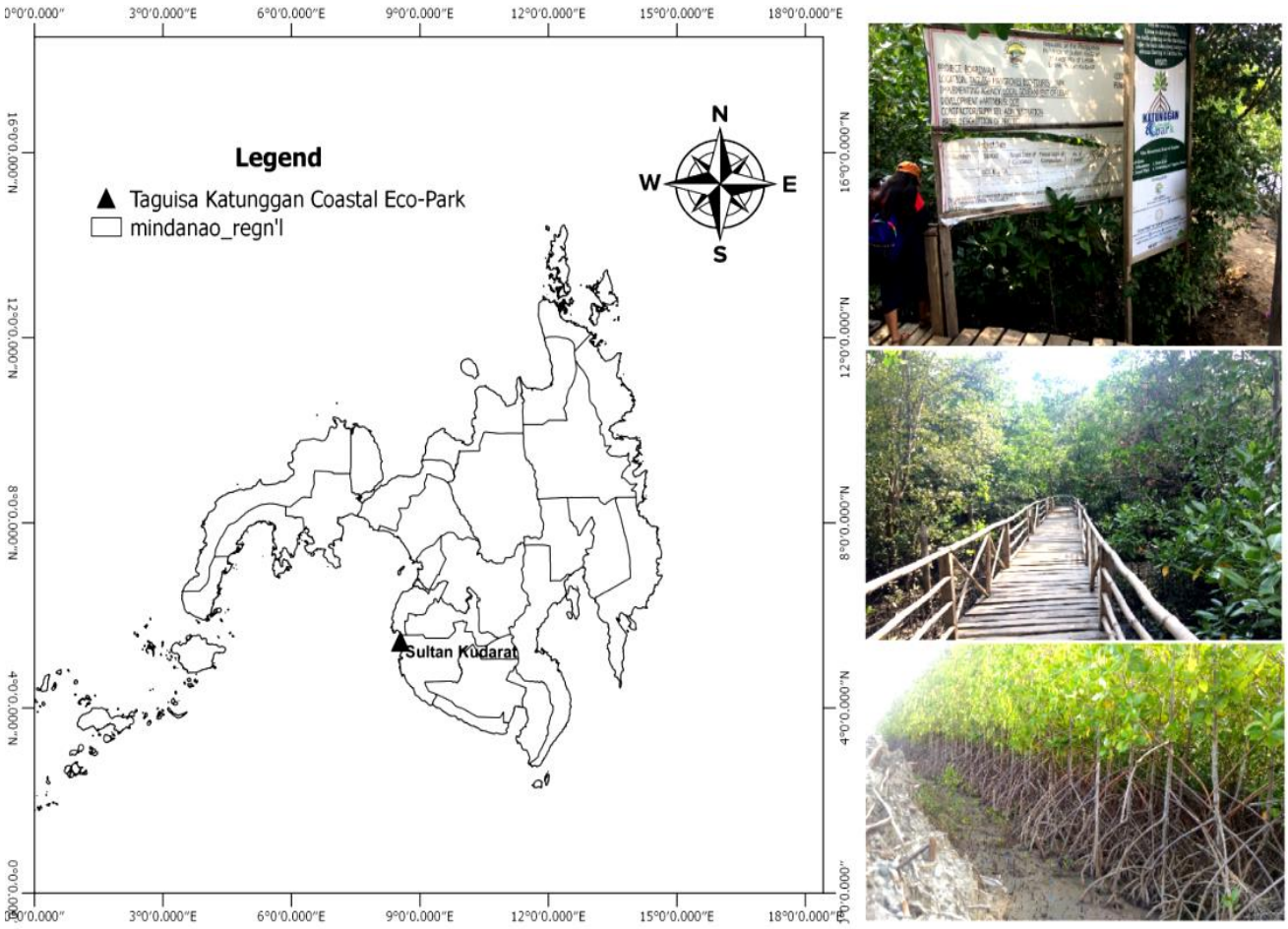

Figure 1. Map of the study site in Taguisa, Lebak Sultan Kudarat, Mindanao, Philippines

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	Southeast 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. This species is restricted to Hainan Island in China, 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 parts of 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 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 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 neighboring tropical countries. The area also harbors some threatened mangrove species, which at least 3.45% of 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's 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 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 and 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).

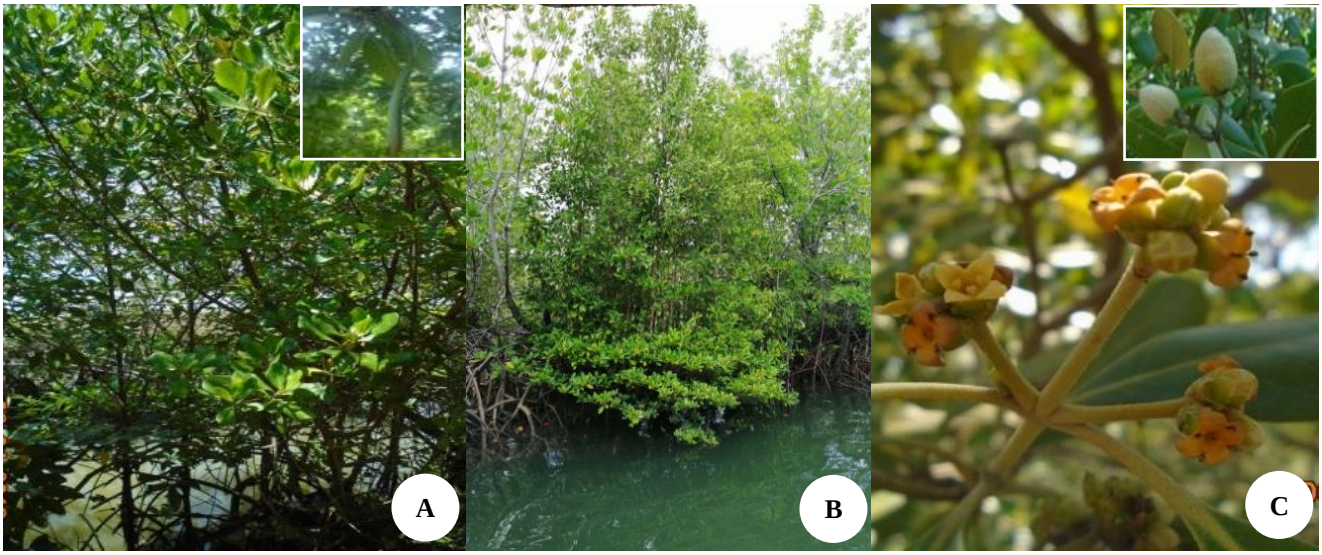

Figure 2. Photographs of mangrove species with conservation concern according to IUCN red list. A. *Ceriops zippeliana* (NT); B. *Camptostemon philippinensis* (EN), and C. *Avicennia rumphiana* (VU)

However, the number of species recorded in this study might be higher if a more intensive survey were conducted. The high species present in Katunggan Coastal Eco-park suggests that this area could be one of Mindanao's most important mangrove ecosystems and even in the country. The comparison between different mangrove areas only means that few mangrove sites have been explored and documented where most of the natural stands of mangrove can be found in the coastal areas of Mindanao. The study also noted 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 transported are seized (Panay News, 2018). Even in the very alarming rate of anthropogenic disturbances, the fear of losing this threatened ecosystem is near to a 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, the community is aware of the importance of the mangroves. Still, not all have concerns about 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 rising numbers of agricultural fish ponds and degradation of mangroves or deforestation.

Conclusion and recommendation

The mangrove species present in Katunggan Coastal Eco-Park are indeed rich, and the data presented here qualifies the support of this claim. Successful local government restoration and conservation 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 of the ecosystem function of mangroves is limited only to the people who stay near the forest and those working in the eco-park. On the other hand, those who do not involve protection and conservation inflict destruction and disturbances. This became a big problem when implementing conservation efforts in the area.

The mangrove species richness 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 to preserve this threatened ecosystem by performing each role that will subsequently lead to sustainable use of the resources, both flora, and fauna. The result of this study may be useful when developing a management plan to prioritize interventions for the conservation and appropriate utilization of services that the mangrove ecosystem could provide for them. This study recommends conducting ecological research on mangroves in the area, and an in-depth assessment of threats may be considered well.

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