INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 22, No. 1, p. 27-34, 2023

RESEARCH PAPER OPEN ACCESS

# Mangrove Flora in the Coastal Municipalities of Sultan Kudarat Province, Philippines

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**Key words:** Aquatic, Coastal areas, Environment, Southern Philippines, Sustainable development

http://dx.doi.org/10.12692/ijb/22.1.27-34 Article published on January 02, 2023

## Abstract

Mangroves play vital role for ecological balance. It provides human the fresh air to breath and protects from threat of typhoons and tsunami. Mangrove also serves as the breeding ground of various species of fish and other aquatic organisms. This study aimed to provide a systematic and scientific recording of the mangrove species in the Southern part of the Philippines. Using a descriptive research design, the prevailing mangrove flora in the coastal municipalities of Sultan Kudarat Province, Philippines was identified and documented. It was conducted in three sampling sites in the municipalities of Kalamansig, Lebak and Palimbang, Sultan Kudarat. Results of the study revealed that there were thirty – one (31) species of mangroves identified; of which twenty-four (24) species were present in Kalamansig, thirty (30) species in Lebak and twenty (20) species in Palimbang belonging to fifteen (15) genera and fourteen (14) families.

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## Introduction

Philippines has about 7, 100 islands surrounding the mainland of Luzon in the north, the Visayas in the middle, and Mindanao in the south (Brown and Fisher, 1920). More than 70 percent of the Philippine mangrove forests have already been denuded and converted for aquaculture or reclaimed for other land uses (Government of the Philippines DENR). Mangroves in Mindanao have been drastically reduced to 95.80 $m^3$ per hectare for old-growth and 32.81 $m^3$ per hectare for young-growth mangrove swamps in Mindanao (Brown and Fisher, 1920).

The Philippines has been constantly listed as one of the top biodiversity hot spots of the world (Myers 1988, 1990; Myers *et. al.*, 2000; Mittermeier *et. al.*, 2004; 2011; Marchese, 2015). This is due to its archipelagic orientation and tropical climate. Its coastline stretches to about 36,000 km covering more than 7,000 islands (Garcia *et. al.*, 2014). All these intrinsic features of Philippines help make it a very adaptable location for mangroves to thrive in. In 1920, assessment of the total mangrove coverage for the entire country amassed an estimated total of 400,000-500,000 hectares (Brown and Fischer, 1918; Chapman, 1976; Primavera, 2000; Garcia *et. al.*, 2014). Furthermore, the Philippines holds approximately 50% of the known mangrove species in the world (Primavera *et al.*, 2004; Garcia *et. al.*, 2014) including endangered, vulnerable and threatened ones (Spalding *et. al.*, 2010).

According to Tomlinson (1986), a major and minor mangrove in the Philippines has a total of 40 species belonging to 16 families. Another 20–30 species of shrubs and vines can be classified as mangrove associates (Arroyo, 1979; Fernando and Pancho, 1980). The diversity of mangrove flora in the coastal area of Sultan Kudarat is not yet scientifically recorded. In August 1979, a rich mangrove in the municipality of Lebak was destroyed by tidal waves that hit the town following the magnitude 7.9 earthquake. Rehabilitation activities were then started in 1994, wherein at present being maintained by fishers' organization and Local Government Unit (LGU).

In the municipality of Palimbang and Kalamansig, mangroves are maintained by locals with the support of the Local Government Unit (LGU). This is to protect the mangroves from invaders which are commonly used as the underground foundation of building and presently become a promising sanctuary of birds and fish species. Also, it contributes to protect and preserve the coastline from soil erosion, sea waves and in climate change. It is then estimated that these mangroves in both natural and plantation mangrove forest are grown within 20 to 25 years.

These potential aspects of mangrove research are known to be limited in the Philippines especially in southern remote areas. With this information, mangrove forest found within132 kilometers irregular length of coastline along the municipalities of Kalamansig, Lebak, and Palimbang, Sultan Kudarat is considered as a promising area for research.

## Materials and methods

*Study Area*

Three sampling station (barangay) were established in every coastal municipality of Kalamansig, Lebak and Palimbang, Sultan Kudarat based on the individual identification of mangrove species. For each station, a 100m x 10m belt transect walk was laid parallel to the shoreline. This transect walk was divided into 10 sampling plots.

This method permitted sampling of mangrove trees at different zonation. Figure1. The Philippine map showing the location of the province of Sultan Kudarat where the sampling sites were established. In Kalamansig, Sultan Kudarat area; Station 1 at Brgy. Santa Clara, a rehabilitated mangrove forest; Station 2 at Brgy. Pag-asa, and Station 3 at Brgy. Santa Maria, a natural mangrove forest. In Lebak, Sultan Kudarat area; Station 1 at Brgy. Datu Karon, wherein there is a diverse family that found, and the mangroves are naturally grown. Illegal logging exists in the mangrove that can be considered an alarming problem. Station 2 at Brgy. Kinudalan with both

rehabilitated and natural mangrove forest and Station 3 at Brgy. Taguisa that once devastated by tsunami 1976. In Palimbang, Sultan Kudarat, Station 1 at Brgy. Baliango, Station 2 at Brgy. Baranayan and Station 3 at Brgy. San Roque a natural mangrove forest. Figure 2. A-B. Kalamansig, Sultan Kudarat area. C-D. Lebak Sultan Kudarat area. E-F. Palimbang, Sultan Kudarat area.

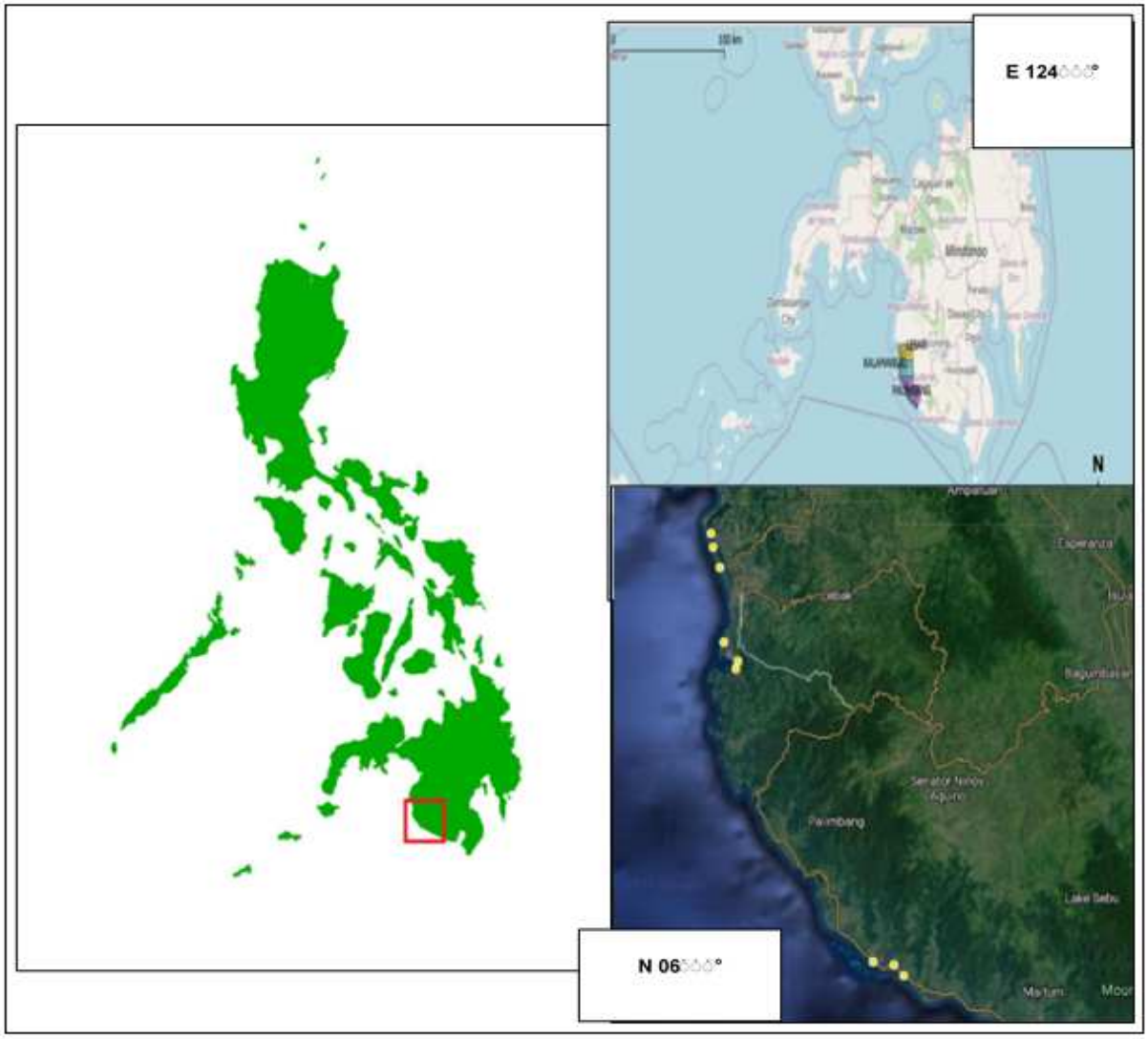


**Fig. 1.** The Philippine map showing the location of the province of Sultan Kudarat.

*Identification of mangroves species*

The mangrove species were preliminary determined using the field guide manual to Philippine Mangroves by Primavera (2004) using the proper herbarium process and documented the leaf, flowers, stem, fruits, and whole plant of mangrove plants. The mangrove samples were brought to the Museum of Natural History, University of the Philippines, Los Banos, Laguna and Department of Biology, College of Arts and Sciences, University of Southern Mindanao, Kabacan, North Cotabato, Philippines for proper identification and confirmation.

**Results and discussion**

A total of thirty-one (31) species were identified under the family Acanthaceae, Pteridaceae, Myrsinaceae, Avicenniaceae, Rhizophoraceae, Bombacaceae, Euphorbiaceae, Malvaceae, Combretaceae, Arecaceae, Lythraceae, Meliaceae, Rubiaceae, and Sonneratiaceae. Table 1 shows the list of mangrove species, and mangrove family in the coastal municipalities of Kalamansig, Lebak, and Palimbang, Sultan Kudarat with their conservation status. The identification was based on fruiting, flowering, stem and roots of mangrove species.

**Table 1.** List of identified mangroves in the coastal municipalities of Kalamansig, Lebak, and Palimbang, Sultan Kudarat, Philippines.

| Scientific Name | Common Name | Family | Area | | |
|---|---|---|---|---|---|
| | | | Kalamansig | Lebak | Palimbang |
| 1.*Acanthus volubilis* | Lagiwliw/ragoyroy | Acanthaceae | / | / | / |
| 2.*Acanthus ilicifolius* | Lagiwliw/ragoyroy | Acanthaceae | / | / | / |
| 3.*Acanthus ebracteatus* Vahl | Lagiwliw/ragoyroy | Acanthaceae | / | / | / |
| 4.*Acrostichum aureum* | Palaypay | Pteridaceae | / | / | / |
| 5.*Acrostichumspeciosum* | Palaypay | Pteridaceae | / | / | / |
| 6.*Aegicera scorniculatum* (L.) Blanco | Saging-saging | Myrsinaceae | / | / | / |
| 7.*Avicennia alba Blume* | Bungalon | Avicenniacea | / | / | / |
| 8.*Avicennia marina* (Forssk.) Vierh | Apiapi | Avicenniacea | / | / | / |
| 9.*Avicennia officianalis* L. | Miapi | Avicenniacea | / | / | / |
| 10.*Bruguiera cylindrica*(L.) Blume | Pototan | Rhizophoraceae | / | / | X |
| 11.*Bruguiera gymnorrhiza* (L.) Lam. | Busain | Rhizophoraceae | / | / | X |
| 12.*Brugiera sexangula* (Lour.) Poir. | Pototan | Rhizophoraceae | / | / | / |
| 13.*Camptostemon philippinensis* (Vldal) Becc. | Gapas-gapas | Bombacaceae | X | / | X |
| 14.*Ceriops decandra* (Griff.) W.Theob | Baras-baras | Rhizophoraceae | / | / | / |
| 15.*Ceriopstagal* (Perr.) C.B.Rob | Tungog | Rhizophoraceae | X | / | / |
| 16.*Ceriops zippelliana* Blume | | Rhizophoraceae | X | / | X |
| 17.*Excoecaria agallocha* L. | Lipata | Euphorbiaceae | X | / | / |
| 18.*Heritiera littoralis* Aiton | Dungon | Malvaceae | / | / | / |
| 19.*Lumnitzera littorea* (Jack) Voigt | Tabao | Combretaceae | / | / | X |
| 20.*Lumnitzera racemosa* Willd | Culasi | Combretaceae | / | / | X |
| 21.*Nypa fruticans* Wurmb | Nipa | Arecaceae | / | / | / |
| 22.*Pemphis acidula* J.R Forst & G. Forst | Bantigi | Lythraceae | / | / | X |
| 23.*Rhizophora apiculata* Blume | Bakhaw lalaki | Rhizophoraceae | / | / | / |
| 24.*Rhizophora mucronata Lam* | Bakhaw babae | Rhizophoraceae | / | / | / |
| 25.*Rhizophora stylosa* Griff | Bakhaw bato | Rhizophoraceae | / | / | / |
| 26.*Scyphiphora hydrophyllacea* C.F. Gaertn. | Nilad | Rubiaceae | / | / | X |
| 27.*Sonneratia* sp. | | Sonneratiaceae | X | / | X |
| 28. *Sonneratia alba* Sm | Pagatpat | Sonneratiaceae | / | / | / |
| 29. *Sonneratia caseolaris* (L.) Engl | Pedada | Sonneratiaceae | / | / | / |
| 30.*Xylocarpus granatum* J.Koenig | Tabigi | Meliaceae | X | / | / |
| 31.*Xylocarpus rumphii* (Kostel) Mabb | | Meliaceae | X | / | X |

| Legend |
|---|
| Present (/) |
| Not present (X) |

There were thirty (30) identified in species level and one (1) identified in genus level. Based on Table 1, Kalamansig area has twenty-four (24) mangrove species presents; in Palimbang area has twenty (20) mangrove species presents; and in Lebak area has the highest number of identified mangrove species with a total of thirty (30) species and one (1) genus (*Sonneratia sp*.) that was found in Lebak area only. Figure 3 shows the mangrove tree that only identified in its genus level (*Sonneratia sp* ) that belongs Family Sonneratiaceae. Transect walk in three sampling areas of the three coastal municipalities revealed a total of 31 species, belonging to fifteen (15) genera and fourteen (14) families. Of these, three (3) species

were herbs, two (2) were ferns and twenty-six (26) were mangrove trees. The families with the highest number of species were Rhizophoraceae nine (9) species; Acanthaceae, Avicenniaceae and Sonneratiaceae with three (3) species respectively.

The most abundant species across the seven stations were *Nypa fruticans, Bruguiera sexangula, Avicennia lanata* and *Xylocarpus granatum*. Highest diversity was recorded at 0.099 individuals per 500 $m^2$ for *Nypa fruticans* (Baleta and Casalamitao, 2016). In the mangrove flora in Aurora, the study showed that there are 30 major mangrove species; three species which had the highest density, frequency, dominancy and importance values (IV) are *Avicennia marina*, *Lumnitzera littorea* and *Rhizophora apiculata*, while *Ceriops decandra*, *Pemphis acidula* and *Sonneratia caseolaries* are the species that had the lowest importance percentage values, respectively. In the diversity and species composition of mangroves in Barangay Imelda, Dinagat Island, Philippines the highest species composition were: *Rhizophora mucronata, R. stylosa, R. apiculata, Bruguiera gymnorrhiza* and *B. sexangula*. On the other hand, *R. apiculata, B. gymnorrhiza* and *X. granatum* were the top three species of true mangroves having the highest population (Cañizares and Seronay, 2016).

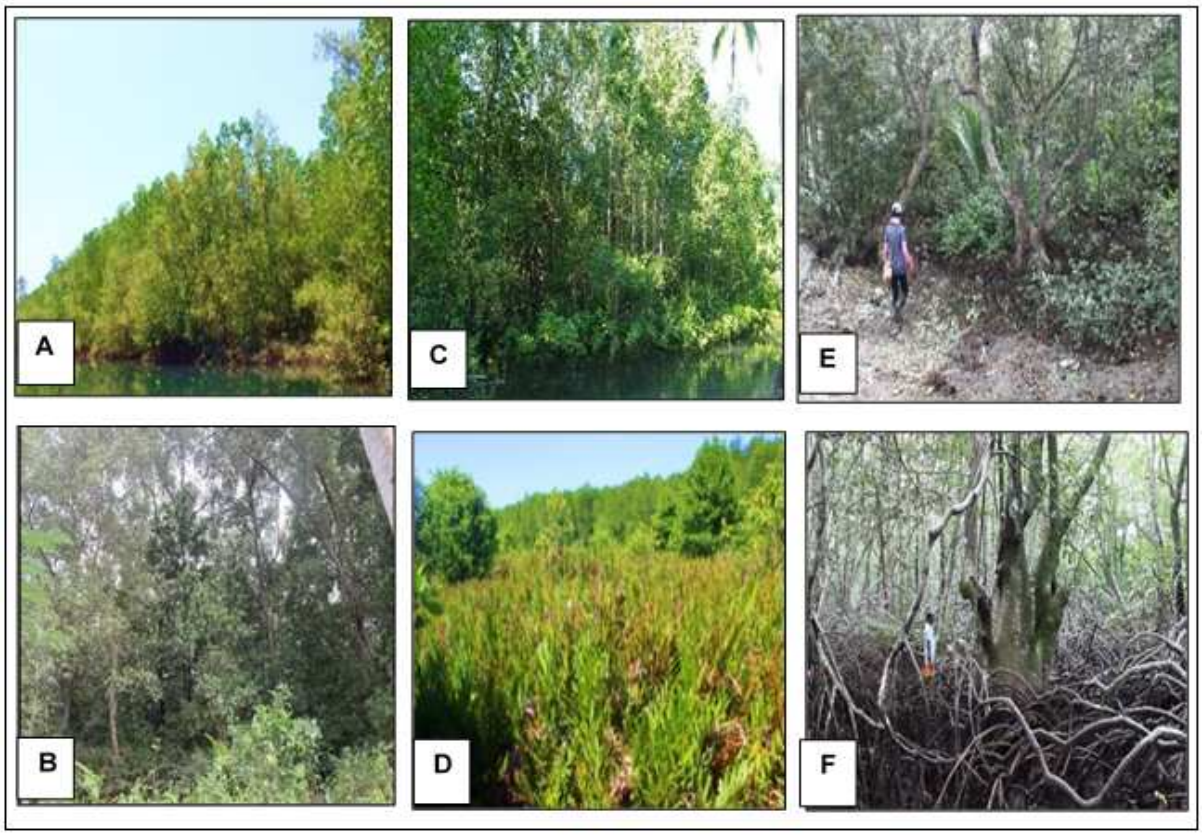


**Fig. 2.** A-B. Kalamansig, Sultan Kudarat area. C-D. Lebak Sultan Kudarat area. E-F. Palimbang, Sultan Kudarat area.

The mangrove diversity, species composition, and habitat in Pamintayan, Dumanquillas Bay, Philippines revealed that the family *Rhizophoraceae* had the highest species composition with two mangrove species: *R. apiculata* and *R. mucronata* as the dominant species (Bitantos *et al.*, 2017). The number of mangrove species in Pamintayan Dumanquillas Bay was lower compared with the other mangrove ecosystems in the country, such as Imelda, Dinagat Island with 10 species (Canizares *et. al.,* 2016), Bacolod, Lanao del Norte with 11 species (Benecario *et. al.*, 2016), and Davao Gulf with 30 species (Flores, 2003) which are in Mindanao. It was lower compared with the mangrove areas in the

Visayas region including; Ibajay, Aklan Province with 22 species (Primavera, 2000), Samar Island with 22 species (Mendoza and Alura 2001), Bohol with 26 species (Mapalo, 1992), Guimaras with 30 species (Sadaba *et. al.*, 2009), and Panay with 34 species (Primavera *et. al.,* 2004), and in Luzon including Palawan with 22 species (Arquiza, 1999) and Pagbilao Bay, Quezon Province with 37 species (Almazol *et. al.*, 2013). This difference in mangrove species richness could be attributed to the environmental factors present in each area (Tomlinson, 1986), and likewise the size of the mangrove forest area.

**Fig. 3.** The mangrove tree that was identified at the genus level (*Sonneratia sp.)* that belongs to the Family Sonneratiaceae.

The Philippines has at least 40 species belonging to 14 families of around 54 true mangrove species worldwide (Primavera *et. al.,* 2004). This means that the individual mangrove species (31 in total) in Sultan Kudarat Province is considered very high in terms of numbers of individual mangrove species from the total number of the Philippine mangroves.

Based on the foregoing findings, it is concluded that the province of Sultan Kudarat has an abundant mangrove species that are dominated by those belonging in the family Rhizophoraceae. The identified species should be preserved by the locals especially those identified as unique and rare among the three coastal municipalities. Further, species that are not yet found in the three municipalities should be given attention by the concerned agencies for propagation and management.

**Acknowledgment**

This study was funded by the Department of Science and Technology, Grant In – Aid (DOST-GIA) under the Forest and Environment Research Division (FERD) in cooperation with the Department of Environment and Natural Resources (DENR), Local

Government Units through its Municipal Environment and Natural Resources Office (MENRO) of Kalamansig, Lebak and Palimbang, Sultan Kudarat. The authors also acknowledged Mr Arnold Astrolabio for his guidance during the reconnaissance survey and collection of mangrove samples.

**References**

**Almazol AE, Cervancia CR, Buot Jr. IE, Pampolina NM.** 2013. Floristic composition and physiognomy of Pagbilao mangrove, Quezon Province, Philippines. International Journal of Ecology and Conservation **7,** 25-39. https://doi.org/10.771/ijec.v7i.725

**Arquiza YD.** 1999. Rhythm of the sea: coastal environmental profile of San Vicente, Palawan. Coastal Resource Management Project, Cebu City, Philippines, 131 pp. usaid.gov/pdf.docs/PNACJ112.

**Arroyo CA.** 1979 Flora of the Philippines mangrove. Biotrop Spec. Publ. **10,** 33–44.

**Baleta FN, Santiago R, Casalamitao Jr.** 2016. Species composition, diversity and abundance of mangroves along the estuarine Area of Maligaya, Palanan, Isabela, Philippines. International Journal of Fisheries and Aquatic Studies **4(2),** 303-307. https://tinyurl.com/mu6z28n8

**Benecario JB, Torregosa KMY, Orbita MLS, Orbita RR.** 2016. Composition, abundance and distribution of mangroves in Bacolod, Lanao del Norte, Mindanao, Philippines. AES Bioflux **8(1),** 42-49. http://www.aes.bioflux.com.ro/docs/2016.42-49.pdf

**Bitantos BL, Abucay MD, Dacula JA, Recafort RA.** 2017. Mangrove in the grove: diversity, species composition, and habitat in Pamintayan, Dumanquillas Bay, Philippines. Mindanao State University-Buug Campus, Buug, Zamboanga Sibugay, Philippines. AES Bioflux **9(3).**

**Brown WH, Fischer FA.** 1918. Philippine mangrove swamps. Bulletin No. 17, Bureau of Forestry, Department of Agriculture and Natural Resources, Manila, Philippines.

**Brown WH, Fischer AF.** 1920. Philippine mangrove swamps. In: Minor products of Philippine forests I. Brown W. H. (ed), p 9–125, Bureau of Forestry Bull. No. 22, Bureau of Printing, Manila.

**Canizares LP, Seronay RA.** 2016. Diversity and species composition of mangroves in Barangay Imelda, Dinagat Island, Philippines. AACL Bioflux 9 **(3),** 518-526.

**Chapman VJ.** 1976 Mangrove vegetation. Jim. Cramer, New York, 477 p.

**Fernando ES, Pancho JV.** 1980 Mangrove Trees of the Philippines. University of the Philippines, Los Banos. 36-53 p.

**Flores J.** 2003. Final report: status of mangrove ecosystem in Davao Gulf, Philippines. In: Resource and social assessment of Davao Gulf, Philippines. FRMP, 83-117 p.

**Garcia KB, Malabrigo Jr. PL, Gevaña DT.** 2014 Philippines' mangrove ecosystem: status, threats and conservation. In: Mangrove ecosystems of Asia. Faridah-Hanum I., Latiff A., Hakeem K., Ozturk M. (eds), Springer, New York, p 82-94. https://doi.org/10.1007/978-1-4614-8582-7-5

**Mapalo AM.** 1992 Mangrove species distribution in Bohol, Philippines. Ecosystems Research Digest **3(2),** 55-62.

**Marchese C.** 2015 Biodiversity hotspots: a shortcut for a more complicated concept. Global Ecology and Conservation **3,** 297-309. https://doi.org/10.1016/j.gecco.2014.12.008

**Mendoza AB, Alura DP.** 2001 Mangrove structure on the Eastern Coast of Samar Island, Philippines. In: 10th International Soil Conservation Organization Meeting. Stott D. E., Mohtar R. H., Steinhard G. C. (eds), Purdue University & USDA-ARS National Soil Erosion Research Laboratory 423-425 p.

**Mittermeier RA, Robles-Gil P, Hoffmann M, Pilgrim J, Brooks T, Mittermeier CG, Lamoreux J, Da Fonseca GAB.** 2004 Hotspots revisited: earth's biologically richest and most endangered terrestrial ecoregions. CEMEX, Mexico City, Mexico, 392 p. ISBN:968 – 6397 – 77 – 9

**Myers N.** 1988 Threatened biotas: "hot spots" in tropical forests. Environmentalist **8,** 187-208. http://doi.org/10.1007/BF02240252

**Myers N.** 1990. The biodiversity challenge: expanded hot-spots analysis. Environmentalist **10,** 243-256. http://doi.org/10.1007/BF02239720

**Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J.** 2000. Biodiversity hotspots for conservation priorities. Nature **403,** 853-858. http://doi.org/10.1038/35002501

**Primavera JH.** 2000 Development and conservation of Philippine mangroves: institutional issues. Ecological Economics **35,** 91-106. http://dx.doi.org/10.1016/s0921-8009(00)00170-1

**Primavera JH, Sabada RS, Lebata MJHL, Altamirano JP.** 2004 Handbook of Mangroves in the Philippines-Panay. SEAFDEC Aquaculture Department, lloilo, Philippines, 106 p. http://hdl.handle.net/10862/3053

**Sadaba RB, Barnuevo AP, Madas CS, Biñas J, Hortillosa E.** 2009. Assessment of the short-term damage in the Guimaras mangrove forests by the M/T Solar I oil spill. University of the Philippines, Visayas, J Nat Sci Oil Spill Issue, 71-82 p.

**Spalding MD, Kainuma M, Collins L.** 2010 World atlas of mangroves. A collaborative project of ITTO, ISME, FAO, UNEP-WCMC, UNESCO-MAB, UNU-INWEH and TNC. London (UK), Earthscan, London, 319 p. https://doi.org/10.4324/9781849776608

**Tomlinson PB.** 1986. The botany of mangroves. Cambridge University Press, Cambridge. Government of Philippines Department of Environmental and Natural Resources (DENR) https://www.denr.gov.ph/. https://doi.org/10.1017/S026646740000020.17