

Taxonomic List and Conservation Status on the Beach Forest Flora of Homonhon Island, Philippines

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ABSTRACT

Background and Objectives: Limited studies have been done on Philippines Island beach forest species. Here, we reported a preliminary study on the Beach Forest of Homonhon Island, Philippines.

Materials and Methods: To document the beach flora species, 10 × 10 m quadrats were made in a 2-km transect with a 20 quadrats per sampling area. A total of 50 quadrats were established with 100-meter interval, except in Pagbabangnan beach forest with only 10 quadrats due to the inaccessibility of the area. The beach forests were located in the barangays of Habag (sandy shore), Casuguran (intertidal pool) and Pagbabangnan (rocky shore), in the island of Homonhon, Philippines.

Results: A total of 44 families, 89 genera and 103 beach forest species were identified. The most numbered family is Euphorbiaceae (9), Leguminosae (8) species, Compositae and Poaceae (7) and Rubiaceae (6), Malvaceae (5) Araceae, Convolvulaceae (4), while the rest of the genera have three to fewer species. Among sites, Habag beach forest is the most diverse with 38 families, 80 genera, 95 species followed by Pagbabangnan beach forest with 25 families, 32 genera and 32 species and Casuguran beach forest with 21 families, 30 genera, 33 species. **Conclusion:** The findings of the study would be a great help to at least fill the gap on the scarcity of data on the beach flora species in the Philippine Island. The forest of Homonhon Island are affected by mining activities, with the depressing threats of extinction at hand. It is hope that the findings of this study will encourage more researchers to perform floristic survey on the Philippine beach forest to catalogue the species before they become prey to extinction.

Key words: Beach forest, Island, Sandy shore, Intertidal pool, Rocky shore.

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INTRODUCTION

Philippine island is considered a center of biological evolution, because of the effect of archipelagic nature

that leads on the divisions of biodiversity^[1,2] resulting to a diverse distribution of flora and fauna.^[3] This reason caught the attention of many scientist to conduct more floristic study in the Philippines, but very limited studies have been explored for beach forest species. In fact, the Philippine flora is composed of more than 14,000 species which represents 5% of the world's flora. ^[4]A total of 282 families, 1923 genera and 4742 species are endemic to the Philippines.^[5]

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Many forest ecosystems in the Philippines undergone floristic surveys. However, still many forests have not been fully explored due to inaccessibility of its mountainous areas^[6,7] *e.g.* beach forest ecosystem, has a minimal information on the beach flora species resulting to scarcity of data in the Philippine Forestry Statistics.^[8] The Beach forest in the Philippines describe as a green fronts long coastline with 36,300 km long.^[9] Beach forest flora is usually growing along the sand dunes and rocks on sandy shores towards the high tidal zones, and are usually exposed to salt spray,^[10] strong wind, and drought.^[11] The littoral creepers, shrubs, and trees is usually located on the supratidal vegetation which reduces the effect of strong winds, coastal erosion, and wave actions during typhoons, storms and tropical cyclone on the island.^[12] Moreover, due to its location in the Pacific Ring of Fire, Philippines beach forest is vulnerable to natural disasters such as earthquake and tsunami.^[13] In fact, coastal cover in some towns in the province of Eastern Samar, Philippines declined from 1987–2016, as consequence from human activities and frequent tropical cyclones.^[14] There are many benefits of coastal vegetation, from traditional to industrial applications. However, this may lead to possible alarming degradation if excessive exploitation arise.^[15] Thus, this paper provide a taxonomic list of the beach forest flora of Homonhon Island, and to assess their conservation status which serves as baseline data and information of Homonhon beach flora before they become vulnerable to extinction due to these environmental situation and anthropogenic threats.

MATERIALS AND METHODS

Study area

Homonhon Island is part of the municipality of Guiuan, Eastern Samar, Philippines. It is located on the east side of Leyte Gulf and situated 10°44'30" North and 125°43'19" East It has a total land area of 7,400 ha, with a population of 7,000. The island is composed of eight barangays, namely; Casuguran, Inapulangan, Habag, Canuwayon, Bitaugan, Culasi, Pagbabangnan and Cagusuan (Figure 2). The beach forest of Homonhon Island is located in the barangays of Habag considered sandy shore (10°48'55.2"N, 125°42'33.1"E), Casuguran, which is a intertidal pool (10°44'22.2"N, 125°44'56.7"E) and Pagbabangnan, which is considered rocky shore (10°41'31.4"N, 125°47'20.9"E).

The elevation of the beach forest ranges from 11 to 24 m a.s.l. The islands' climate is classified under the Type II climate, characterized by no dry season but with a very pronounced maximum rainfall from

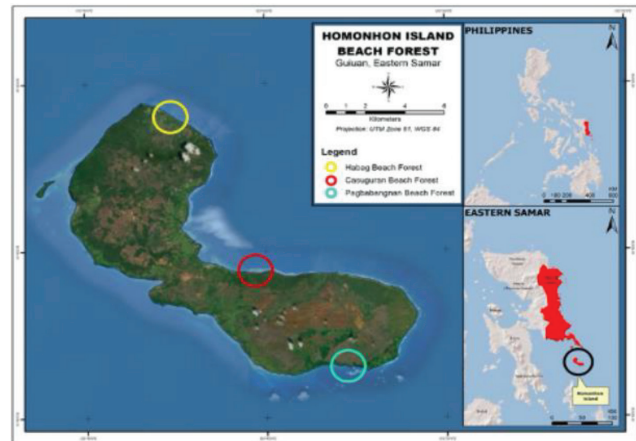


Figure 1: Map of Homonhon Island showing were the sampling done and its location on the Philippine archipelago and Eastern Samar.

Habag Beach Forest



Casuguran Beach Forest



Pagbabangnan Beach Forest

Figure 2: View of selected study sites. A. Habag Beach Forest. B. Casuguran Beach Forest. C. Pagbabangnan Beach Forest (Photographed D.N. Tandang)

November to January. The northeast monsoon prevails during the rainy months of November to January while the westerly winds prevail during the months of February to October with less rainfall. We conducted floristic survey in October 2016 on the beach Forest of Homonhon Island and assess the conservation status of these flora.

The survey, collection, processing of specimens and specimen identification

To satisfy the legal requirement of the Wildlife Resources Conservation and Protection Act (RA 9147),

prior informed consent were secured from the Mayor's office of Guiuan Eastern Samar and submitted research proposal to the Department of Environment and Natural Resources-Tacloban City of Region 8 to obtain Gratuitous Permit No. R08-37 for us to perform the study in Homonhon Island. The floristic survey was performed in October 2016. A 2-km transect were established with 10 × 10 m quadrat.^[13] At each site, 20 quadrats were made per sampling area. However, only 10 quadrats were established in Pagbabangnan beach forest due to the inaccessibility of the area. A total of 50 quadrats of 10 × 10 m with 100-meter interval was done to document the beach forest flora of Homonhon Island. Plant specimens collected were properly labeled with collection number and processed for herbarium preparation and placed at the University of Santo Tomas Herbarium (USTH). The collections were then identified utilizing taxonomic keys and species descriptions, and/or using available online resources such as thephilippineplants.org^[5] or types from virtual herbaria for image comparisons and authenticated by the National Museum of the Philippines.

RESULTS

The beach forest of Homonhon Island has a total of 103 species, categorized into 44 families and 89 genera. Among the 102 species, 32 are classified as trees, 29 shrubs, 39 herbs, 9 vines, 1 epiphyte and 1 fern. Only 6 species were recorded as Philippine endemic namely; *Artocarpus multifidus* F.M. Jarrett, *Ficus pseudo-palma* Blanco, *Ficus gigantifolia* Merr. *Myrsine mindanaensis* (Elmer) Pipoly *Tylophora flexuosa* R. Br. and *Syzygium macgregorii* (C.B.Rob.) Merr. The IUCN and DENR Administrative Order No. 2017-01 served as reference to assess the conservation status of each species in the island. As a result a total of 29 species are in the IUCN Red List (2020-1) of these 24 species are least concerned, 2 near threatened, 2 vulnerable, 1 other threatened species while 3 species were assessed by DAO 2017-11 list 2 endangered, 1 vulnerable. Based on the Global Invasive Species database there are 4 species present on the area, namely; *Chromolaena odorata* (L.) R.M.King and H.Rob., *Leucaena leucocephala* (Lam.) de Wit, *Imperata cylindrica* (L.) Raeusch., *Lantana camara* L., and *Psidium guajava* Mill. However, (10) species identified only to their genus level due to insufficient features for proper identification these are *Callicarpa* sp., *Cayratia* sp., *Ficus* sp., *Glochidion* sp., *Ipomoea* sp., *Fimbristylis* sp., *Nephrolepis* sp., *Nervilia* sp., *Schefflera* sp., *Villaria* sp. The collection number were assigned for each specimen due to the accession number is still in progress.

However, not all species have a collection number by reason of that the identification of the familiar and common species recorded were done on the field. Thus, photo-documentation were provided in lieu of the identified species on the area (Table 1). Among the three sites, Habag beach forest is the most diverse with 38 families, 80 genera, 95 species followed by Pagbabangnan beach forest with 25 families, 32 genera, 32 species and Casuguran beach forest with families 21, 30 genera, 33 species (e.g. Figure 3).

DISCUSSION

The high species diversity of Habag beach forest can be attributed to the fact that this area was not affected by mining activities, as a result the forest can be considered as primary-intact forest, while the Pagbabangnan and Casuguran beach forest were affected by mining activities, resulting in low species diversity. The common species in the three sites were *Cocos nucifera* L., *Euphorbia atoto* G.Forst., *Hibiscus tiliaceus* L. ssp. *tiliaceus*., *Ipomoea pescaprae* (L.) R. Br., *Macaranga tanarius* (L.) Müll. Arg., *Pandanus tectorius* Parkinson ex Du Roi., *Premna serratifolia* L., *Scaevola taccada* (Gaertn.) Roxb., *Vigna marina* (Burm.) Merr. On the other hand, the most numbered family of species is Euphorbiaceae (9), Leguminosae (8) species, Compositae and Poaceae (7) and Rubiaceae (6), Malvaceae (5) Araceae, Convolvulaceae (4), while the rest of the genera have three to fewer species (e.g. Figure 4). Some of the documented species on the beach forest were *Crinum asiaticum* L., *Cassytha filiformis* L., *Euphorbia atoto* G. Forst., *Leucaena leucocephala* (Lam.) de Wit., *Poikilospermum suaveolens* (Blume) Merr. *Commersonia bartramia* (L.) Merr.(e.g. Figure 5). Noteworthy that this study recorded once more the *Cocos nucifera* L., Niu Kafa Type (e.g. Figure 6) which was first recorded on the Suluan Island and Quinapondan, Eastern Samar many years ago.^[6] As one of the pioneering studies in the Philippine beach forest the result of this study can be translate into valuable information for policy making and management in the conservation of the beach flora species of Homonhon Island which is also considered understudied forest ecosystem in the country. Some of the studies conducted on the Philippine beach forest in Dinagat Island and Guiuan, Eastern Samar.^[8,14] Therefore, there is a need to perform further floristic inventory to fill the gap on the scarcity of data on Philippines beach forest before these native species become extinct due environmental threats. Likewise, the government agencies in the locality should secure a strict implementation of necessary protection measure in the

Table 1: The Beach Flora Species of Homonhon Island, Guiuan Eastern Samar.

Family	Species	Local Name	Habitat	IUCN 2021-1	Conservation status DAO 2017-11	Collection number	Endemicity	Invasive Alien Species
Amaryllidaceae	<i>Crinum asiaticum</i> L.		H					
Anacardiaceae	<i>Buchanania arborescens</i> Blume		T					
Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Yahong-yahong	H	LC				
Apocynaceae	<i>Catharanthus roseus</i> (L.) G. Don. <i>Plumeria rubra</i> L. <i>Tylophora flexuosa</i> R. Br.		H T V	LC LC			E	
Araceae	<i>Alocasia macrorrhizos</i> (L.) G. Don <i>Cytosperma merkusii</i> (Hassk.) Schott		H H		RO 006 RO 010			
Araliaceae	<i>Schefflera</i> sp.		E					
Arecaceae	<i>Cocos nucifera</i> L. <i>Cocos nucifera</i> L., Niu Kafa Type		T T					
Boraginaceae	<i>Tournefortia argentea</i> L. f.		T	LC	RO 024			
Cannabaceae	<i>Parasponia rugosa</i> Blume		T					
Caricaceae	<i>Carica papaya</i> (L.)		H					
Casuarinaceae	<i>Casuarina equisetifolia</i> L.	Agoho	T					
Clusiaceae	<i>Calophyllum inophyllum</i> L.		T					
Combretaceae	<i>Terminalia catappa</i> (L.)	Talisay	T	LC				
Commelinaceae	<i>Commelina diffusa</i> Burm.f.		H	LC				
Compositae	<i>Chromolaena odorata</i> (L.) R.M.King & H. Rob. <i>Cyanthillium cinereum</i> (L.) H. Rob. <i>Emilia sonchifolia</i> (L.) DC. ex DC. <i>Mikania cordata</i> (Burm.f.) B. L. Rob. <i>Synedrella nodiflora</i> (L.) Gaertn. <i>Tridax procumbens</i> (L.) L. <i>Wollastonia biflora</i> (L.) DC.		S H H H H V H					IAS
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam. <i>Ipomoea pescaprae</i> (L.) R. Br. <i>Ipomoea trilobal</i> L. <i>Ipomoea</i> sp.		V V V V		RO 034			
Cycadaceae	<i>Cycas edentata</i> de Laub.		S	NT	VU RO 071			
Cyperaceae	<i>Fimbristylis</i> sp. Vahl. <i>Machaerina disticha</i> (C.B. Clarke) T. Koyoma		H H					
Dioscoraceae	<i>Tacca leontopetaloides</i> (L.) Kuntze		H	LC				

Continued....

Euphorbiaceae	<i>Acalypha americana</i> Roxb. <i>Acalyph indica</i> L. <i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss. <i>Euphorbia atoto</i> G. Forst. <i>Euphorbia cyphophora</i> Murray. <i>Euphorbia hirta</i> L. <i>Euphorbia prostata</i> Alton. <i>Jatropha curcas</i> L. <i>Macaranga tanarius</i> (L.) Müll.Arg.							RO 024		
Hernandiaceae	<i>Hernandia ovigera</i> L.									
Goodeniaceae	<i>Scaevola taccada</i> (Gaertn.) Roxb. <i>Scaevola micrantha</i> Presl.							RO 018		
Lamiaceae	<i>Callicarpa pedunculata</i> R. Br. <i>Callicarpa</i> sp. <i>Premna serratifolia</i> L.							RO 049		
Lauraceae	<i>Cassytha filiformis</i> L.									
Leguminosae	<i>Alysicarpus vaginalis</i> (L.) DC. <i>Canavalia rosea</i> (Sw.) DC. <i>Dendrobium umbellatum</i> (L.) Benth. <i>Desmodium triflorum</i> (L.) DC. <i>Leucaena leucocephala</i> (Lam.) de Wit <i>Pongamia pinnata</i> (L.) Pierre <i>Sophora tomentosa</i> L. <i>Vigna marina</i> (Burm.) Merr.									
Lythraceae	<i>Pemphis acidula</i> J.R. Forst. & G. Forst.							RO 033		
Malvaceae	<i>Abroma augusta</i> (L.) L.f. <i>Commersonia batramia</i> (L.) Merr. <i>Corchorus olitorius</i> L. <i>Hibiscus tiliaceus</i> (Willd.) Hochr <i>Pachira aquatica</i> Aubl.									
Moraceae	<i>Artocarpus multifidus</i> F.M. Jarrrett <i>Ficus gigantifolia</i> Merr. <i>Ficus pseudopalma</i> Blanco <i>Ficus septica</i> Burm.f. <i>Ficus variegata</i> Blume								E E E	
Myrtaceae	<i>Psidium guajava</i> L. <i>Syzygium macgregorii</i> (C.B.Rob.) Merr. <i>Xanthostemon verduganianus</i> Náves ex Fern.-Vill.									IAS
Nephrolepidaceae	<i>Nephrolepis</i> sp.									
Orchidaceae	<i>Nervilia</i> sp.									
								RO 031		
								RO 022		

Pandanaceae	<i>Pandanus tectorius</i> Parkinson ex Du Roi.	LC	S				
Passifloraceae	<i>Turnera subulata</i> Sm.		H				
Phyllanthaceae	<i>Bryonia vitis-idaea</i> (Burm.f.) C.E.C. Fisch. Blume. <i>Glochidion</i> sp. <i>Phyllanthus niruri</i> L.	LC	S S S		RO 047 RO 056		
Poaceae	<i>Chrysopogon aciculatus</i> (Retz.) Trin. <i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. <i>Imperata cylindrica</i> (L.) Raeusch. <i>Paspalum conjugatum</i> P.J. Bergius <i>Saccharum spontaneum</i> L. <i>Themeda gigantea</i> (Cav.) Hack. ex Duthie <i>Zoysia matrella</i> (L.) Merr.	Damo	H H H H H H H				IAS
Primulaceae	<i>Myrsine mindanaensis</i> (Elmer.)		S		RO 006	E	
Rubiaceae	<i>Guettarda speciosa</i> L. <i>Morinda citrifolia</i> L. <i>Leptopetalum strigosum</i> (Bartl. ex DC.) Neupane & N. Wikstr. <i>Spermococce ocymoides</i> Burm.f. <i>Timonius finlaysonianus</i> (Wall. ex G. Don) Hook.f. <i>Villaria</i> sp.		T T H H S S				
Salicaceae	<i>Casearia grewiifolia</i> Vent.		T	LC			
Sapotaceae	<i>Planchonella obovata</i> (R.Br.) Pierre		T				
Solanaceae	<i>Physalis angulata</i> L.		H	LC			
Sterculiaceae	<i>Sterculia ceramica</i> R. Br.		T				
Urticaceae	<i>Pipturus arborescens</i> (Link.) C. B. Rob. <i>Poikilospermum suaveolens</i> (Blume) Merr.		T T		RO 031		
Verbenaceae	<i>Lantana camara</i> L. <i>Phyla nodiflora</i> (L.) Greene <i>Stachytarpheta jamaicensis</i> (L.) Vahl. <i>Vitex triflora</i> Vahl.		H H S S	LC			IAS
Vitaceae	<i>Cayratia</i> sp.		H		RO 015		

Note: Plant families are alphabetically arranged, followed by species for each family, local name, habit (T: tree, S: shrub, H: herb, V: vine, E: Epiphyte, F: fern), proposed conservation status based on * IUCN Red List and DENR Administrative Order 2017-11 (Threatened Species, VU: Vulnerable, EN: Endangered, CR: Critically Endangered, LC: Least Concern, OTS: other Threatened Species)

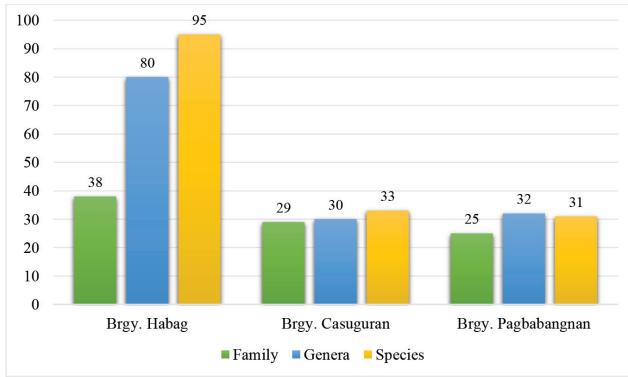


Figure 3: Number of Family, Genera and Flora Species on the beach Forest of Homonhon Island.

island to prevent further destruction and disturbance of the beach forest.

Some of the studies conducted on the beach forest was on Coastal, New Zealand^[16] Northern Tohoku, Japan;^[7] Danube Delta coast, Romania;^[17] Phang Nga, Thailand.^[8] The above-mentioned studies are not focused mainly on the identification of the beach forest species. On the other hand, in the Philippines the Dinagat Island beach forest;^[10] the beach forests on Guiuan, Eastern Samar.^[17] There are limited published data on the list of Philippine beach forest species. Therefore, the findings of this study would serve as a baseline information on the flora species on Homonhon Island.

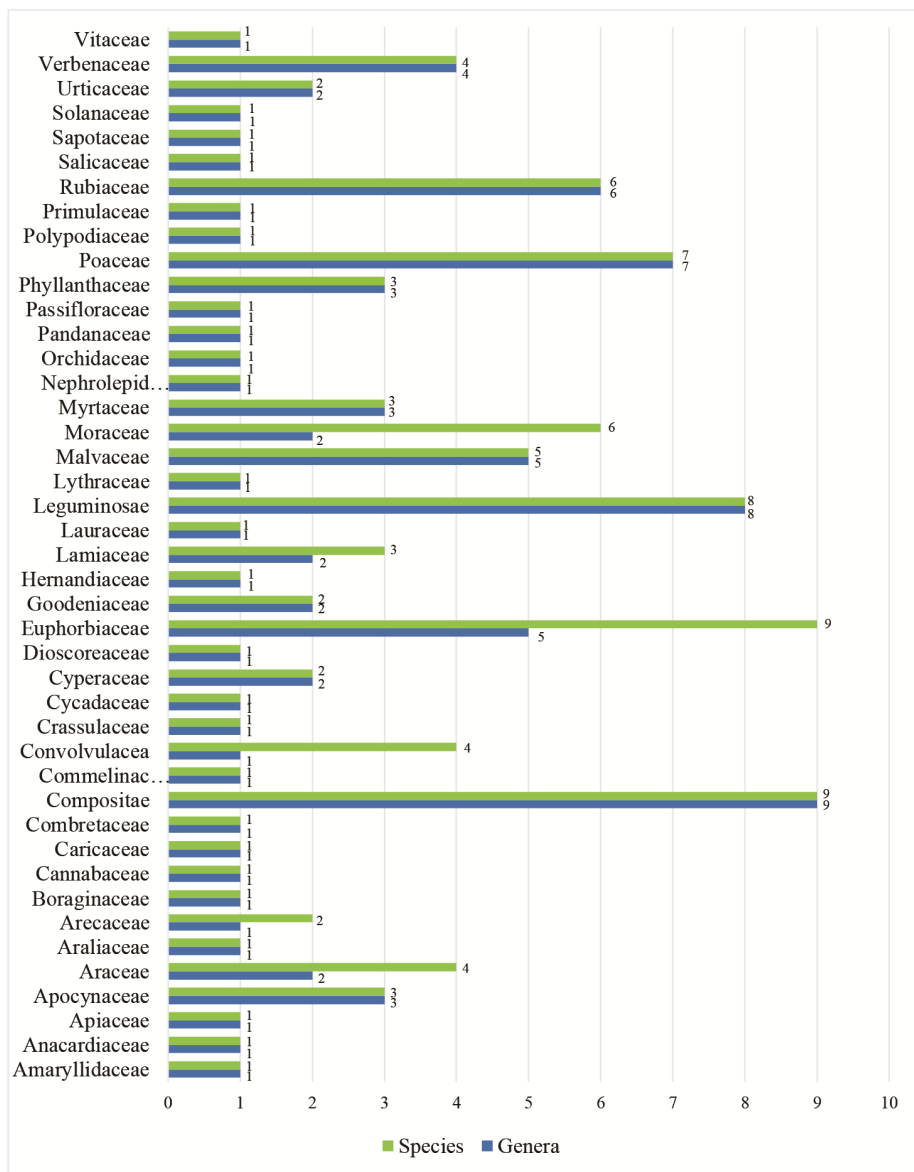


Figure 4: Representation of vascular families, genera and species recorded in the 10x10 m plots on the beach Forest of Homonhon Island.

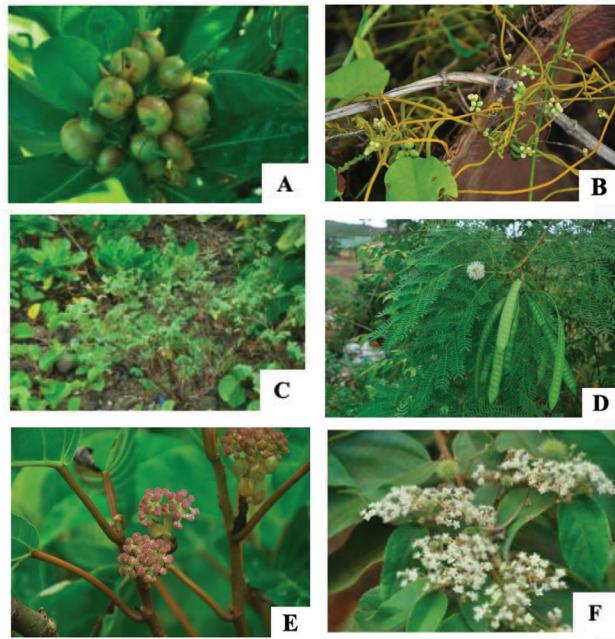


Figure 5: Some species documented on the beach forest of Homonhon Island A. *Crinum asiaticum* L. B *Cassytha filiformis* L., C. *Euphorbia atoto* G. Forst. D. *Leucaena leucocephala* (Lam.) de Wit., E. *Poikilospermum suaveolens* (Blume) Merr. F. *Commersonia bartramia* (L.) Merr. (Photographed D.N Tandang)



Figure 6: *Cocos nucifera* L., Niu Kafa Type found on the Casuguran Beach Forest, Homonhon Island, Guiuan Eastern Samar (Photographed D.N Tandang).

CONCLUSION

The beach Forest of Homonhon Island is located in the barangays of Habag, Casuguran, and Pagbabangnan. A total of 103 species, categorized into 44 families and 89 genera recorded on the island wherein 32 are classified as trees, 29 shrubs, 39 herbs, 9 vines 1 epiphyte and 1 fern. Only 6 species were recorded as Philippine endemic namely; *Artocarpus multifidus* F.M. Jarrett, *Ficus pseudopalma* Blanco, *Ficus gigantifolia* Merr. *Myrsine*

mindanaensis (Elmer) Pipoly *Tylophora flexuosa* R. Br. and *Syzygium macgregorii* (C.B.Rob.) Merr. For the assessment of the conservation status a total of 29 species are in the IUCN Red List (2020-1) of these 24 species are least concerned, 2 near threatened, 2 vulnerable, 1 other threatened species while 3 species were assessed by DAO 2017-11 list 2 endangered, 1 vulnerable. Based on the Global invasive Species database there are 4 species present on the area, namely; *Chromolaena odorata* (L.) R.M.King and H.Rob., *Imperata cylindrica* (L.) Raeusch., *Lantana camara* L., and *Psidium guajava* Mill. Noteworthy that this study recorded once more the *Cocos nucifera* L., Niu Kafa Type.

Significance statement

It is hope that the findings of this study will also encourage researchers to perform more floristic survey on the Philippine beach forest to fill the gap on the scarcity of data on beach flora species. Hopefully, when these data will be made available on hand, this will serve as baseline information among the Philippine beach forest in the country.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

CR: Critically endangered; **DAO:** DENR Administrative Order; **EN:** Endangered; **GP:** Gratuitous permit; **IAS:** Invasive Alien Species; **IUCN:** International Union for Conservation of Nature; **LC:** Least concern; **sp:** Species; **VU:** Vulnerable.

SUMMARY

Homonhon Island harbors a diverse species of flora including species that are unique to the country and species that warrant protection and conservation measures.

This study on the beach forest of Homonhon Island documented 103 species, categorized into 44 families and 89 genera recorded on the island wherein 32 are classified as trees, 29 shrubs, 39 herbs, 9 vines, 1 epiphyte and 1 fern. For the conservation status a total of 29 species are in the IUCN Red List (2020-1) of these 24 species are least concerned, 2 near threatened, 2 vulnerable, 1 other threatened species while 3 species were assessed by DAO 2017-11 list 2 endangered, 1 vulnerable. Based on the Global invasive species database there are 4 species present on the area. The results of this study could be used by the local government unit of Homonhon Island for its projects and decision making aimed towards the recovery of the environment of Homonhon Island particularly those that are affected by mining activities.

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