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Floristic diversity assessment of Caramoan National Park, Camarines Sur, Philippines

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ABSTRACT. Biodiversity degradation primarily due to continuous deforestation makes every floristic diversity assessment even more important. Despite being proclaimed as a protected area and amidst various scientific tools for diversity studies, not a single comprehensive floristic study has been conducted in Caramoan National Park (CNP) to determine the ecologically important species needing conservation prioritization. For a floristic inventory, two 2-km transects were established inside the park following the methodology stipulated in the Biodiversity Management Bureau Technical Bulletin 2016-05. Results revealed that the park is home to 91 species of plants. *Pterocymbium tinctorium*, *Macaranga bicolor*, and *Mallotus philippensis* dominate the park's forested area. The most speciose family were Moraceae, Malvaceae, and Euphorbiaceae. The tree with the largest recorded diameter is *Ceodes umbellifera*, with 95.5 cm. Further, analysis showed that CNP has a very high biodiversity value of 3.761. Despite the small forest area, the study proved that CNP harbors a significant number of threatened, endemic, and indigenous plant species that could contribute to the ecosystem's overall health.

Keywords: *floral assessment, forest over limestone, protected area*

INTRODUCTION

Caramoan National Park (CNP) is one of the proclaimed protected areas (PAs) in Region 5 or Bicol Region as mandated by the National Integrated Protected Areas System. It is a 347 ha natural protected area composed of a hilly peninsula with deep forges and rough, rocky terrain, lowland forests, and distinct microhabitats such as mangrove forests, sand dunes, and beaches (Clores *et al*. 2021). Despite being proclaimed as a protected area, CNP is still understudied regarding plant resources. Aside from the study conducted by Balete *et al*. (2013), which focused on the diversity and distribution of small mammals in the Bicol volcanic belt and cited various common trees in CNP, no plant diversity assessment that follows standard methodology in assessing floristic diversity has been done in the PA. Balete *et al*. (2013) noted that the common trees near the coast of Cabugao Bay in CNP are figs (*Ficus*), dao (*Dracontomelon dao* (Blanco) Merr. & Rolfe), narra (*Pterocarpus indicus* Willd.), molave (*Vitex parviflora* A. Juss), *Syzygium* sp., and *Sterculia* sp. Similarly, much of the available floristic information in the Philippines is focused on timber trees under economic aspects (Langenberger 2006). The Protected Area Management Board (PAMB) is primarily impeded by the lack of complete floristic information to produce sound conservation and management strategies. At the same time, the people of nearby barangay and vicinities are being deprived of the potential benefits that can be obtained from the existing plant resources. Hence, it is high time that a floristic study is conducted in the area. This study aims to assess the floral diversity of CNP, which can be used as baseline data for developing a management plan for the protected area. Specifically, it intends to identify the

floral species present in the area; describe forest structure and determine the rate of endemism and conservation status of the identified flora; and lastly, analyze the floral species diversity.

METHODOLOGY

Study site

According to Proclamation No. 291, series of 1938, CNP has 347 ha (Official Gazette 2021). It is geographically located at the eastern portion of the municipality of Caramoan, province of Camarines Sur, between 124°59" E longitude (**Figure 1**) and 13°46" N latitude with a maximum elevation of 475 meters above sea level (m asl). The type of ecosystem includes mangroves, sand dunes, beaches, and a limestone forest with steep, sharp limestone karsts (Balete *et al*. 2013; Bradecina 2014).

Vegetation survey

Following the methodology stipulated in the Technical Bulletin No. 2016-05 of the Biodiversity Management Bureau or BMB (2016), the team employed a modified belt transect and nested quadrat sampling to conduct a floral inventory of CNP. Two (2) km transects were established in selected portions of the PA, where nine nested quadrats (20 m × 20 m) were laid out at every 250 m interval (**Figure 2**). Using the nested quadrat, the various plant communities' species composition and vegetation structure were identified and characterized. Inside the 20 m x 20 m quadrat, woody plants with a diameter at breast height (DBH) of ≥10 cm were identified and measured. Parameters such as DBH, merchantable height (MH), and total height (TH) were obtained. On the other hand, the abundance of understory plants (shrubs, poles, and saplings with > 1 m in height and <10 cm in diameter) inside the 5 m x 5 m quadrat were recorded. Percentage cover of ground cover species, including grasses and other plant species with <1 m height, was determined inside the 1 m x 1 m quadrat (**Figure 3**). An opportunistic sampling involving listing and photo documentation of different species outside the established transects was also carried out to account for the maximum possible species in CNP.

Species identification

Species recorded were initially identified with the aid of dichotomous keys and other related published literature, such as Flora Malesiana, An Enumeration of Philippine Flowering Plants, Revised Lexicon of Philippine Trees, and Leaflets of Philippine Botany. Photos of specimens were compared to online images such as Co's Digital Floral of the Philippines (www.philippineplants.org) and Phytoimages (www.phytoimages.sir.edu). Online databases such as the International Plant Names Index (www.ipni.org) and Plants of the World Online (www.plantsoftheworldonline.org) were consulted for the nomenclature of the species identified. The geographical distribution and endemism of each taxon were determined using online databases such as Co's Digital Flora of the Philippines and Global Biodiversity Information Facility (www.gbif.org). At the same time, the classification of conservation status was based on the Updated National List of Threatened Plants in the Philippines (DAO 2017–11) and the IUCN Red List (IUCN 2021–1).

Data analysis

The data collected in the field were tabulated and analyzed to characterize the floral species composition within the area. For the determination of diversity indices such as the Shannon–

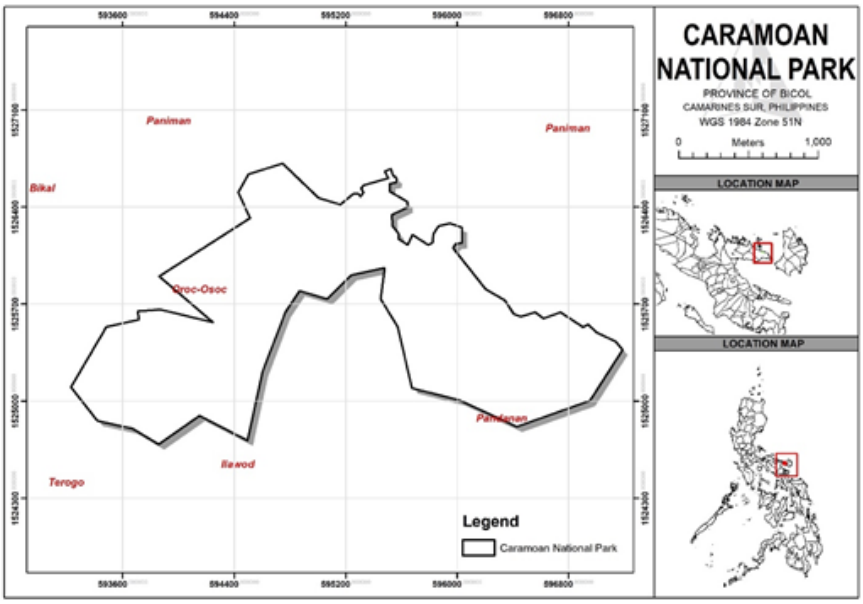

Figure 1. Geographical location of Caramoan National Park.

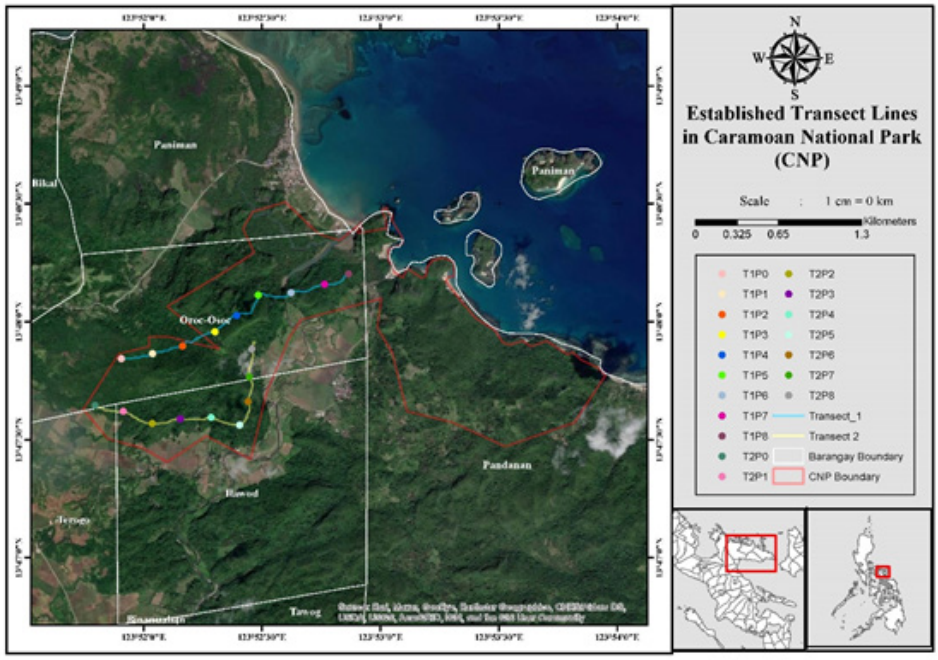

Figure 2. Established transect lines in Caramoan National Park.

Weiner index, Simpsons Index, and Evenness index, the Paleontological Statistics (PAST ver. 3.2) software package for education and data analysis (Hammer & Harper 2001) was used. The relative density, relative dominance, and relative frequency values for each tree species were determined to obtain their importance value (IV) – a standard ecological measurement to determine the rank relationships of species. Importance values were determined using the following formula from Curtis & McIntosh (1951):

$$\text{Density} = \frac{\textit{Number of individuals of a species}}{\textit{Total area sampled}}$$

$$\text{Relative Density} = \frac{\textit{Density of a species}}{\textit{Total density of all species}} \times 100$$

$$\text{Frequency} = \frac{\textit{Number of plots in which species occurs}}{\textit{Total number of plots sampled}}$$

$$\text{Relative Frequency} = \frac{\textit{Frequency of a species}}{\textit{Total frequency of all species}} \times 100$$

$$\text{Dominance} = \frac{\textit{Basal area or volume of a species}}{\textit{Total area sampled}}$$

$$\text{Relative Dominance} = \frac{\textit{Dominance of a species}}{\textit{Total dominance of all species}} \times 100$$

$$\text{Importance Value} = \text{Relative Density} + \text{Relative Frequency} + \text{Relative Dominance}$$

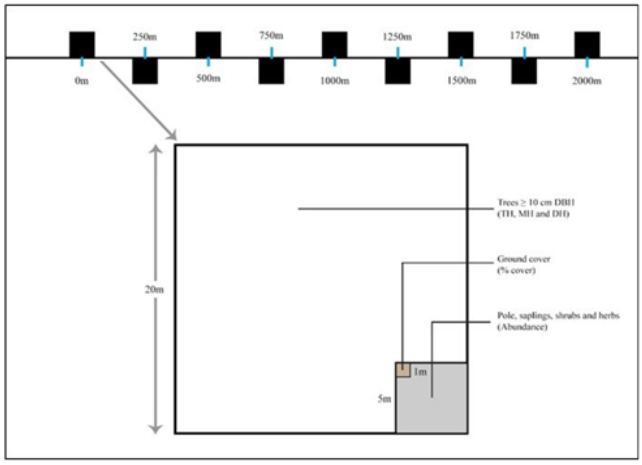

Figure 3. The modified belt transect method employed in the study.

RESULTS AND DISCUSSION

General vegetation

The type of forest formation in the area is generally forest over limestone (FOL), typically found in low-elevation areas either in coastal areas or on the border of uplifted hills (Fernando 2008). The general vegetation of CNP can be characterized as a young secondary forest dominated by several common pioneer species in the country, such as *Pterocymbium tinctorium* (Blanco) Merr. and *Kleinhovia hospita* L.

Floristic composition

The CNP is home to at least 91 species from 76 genera and 46 families. A total of 85 morpho-species belonging to 70 genera and 44 families were encountered from the 18 sampling plots. There were additional eight species from eight genera and eight families recorded from opportunistic sampling. Hence, 91 species were recorded in CNP. The complete list of species recorded in CNP is presented in **Appendix 1**. The most speciose families are Moraceae (10 species), Malvaceae (6 species), and Euphorbiaceae (6 species). On the other hand, the most speciose genus is *Ficus*, with seven species.

Tree flora

One hundred fifty-four tree individuals with DBH ≥10 cm were recorded within the 0.72 ha (18 sampling quadrats) limestone forest of CNP. It comprises 57 species belonging to 45 genera and 31 families. Two species (*Syzygium* sp. and *Glycosmis* sp.) were not identified up to species level due primarily to the absence of reproductive structures (flowers and fruits), which are of prime importance in species identification.

Importance value

To determine which tree species dominate the area, importance value was computed. The importance value is the standard measurement in ecology that determines the rank relationship of every species (Malabrigo *et al*. 2016). It measures species dominance in its basal area, density, and frequency of occurrence relative to other species present in the area.

Based on the computed IV, *Pterocymbium tinctorium* is the most important/dominant species in CNP with the computed relative dominance, relative density, and relative frequency values of 18.22%, 16.45%, and 10%, respectively. The dominance of *P. tinctorium* is expected since this species normally thrives in a limestone forest, especially along coastal hills (Singh *et al*. 2013). The elevation of each established plot and transects ranged from 54–150 m asl, which is the natural habitat of *P. tinctorium* (Pelser *et al*. 2011). Other species with high importance value include *Kleinhovia hospita* (22.53%), *Sterculia comosa* (15.29%), *Alchornea rugosa* (13.41%), and *Melanolepis multiglandulosa* (11.12%). These species are some of the most common and pioneer species in the country, reflecting the young secondary growth forests in the area. The top 10 most important species recorded in CNP are listed in **Table 1**.

Intermediate and understory

A total of 55 individuals of intermediate and understory belonging to 35 species, 32 genera, and 21 families were recorded inside the 18 5 m x 5 m sampling plots. The most abundant species observed in the area was *Leea guineensis* from the family Vitaceae with 14 individuals. *Alchornea rugosa* (13 individuals) and *Mallotus philippensis* (8 individuals) followed this (both from the family Euphorbiaceae). **Table 2** shows the top 10 most abundant understory species in the study area. Same with the canopy trees, the most abundant understory species are the common opportunistic gap species.

Table 1. Top 10 species with highest importance value (IV) in Caramoan National Park.

Rank	Species name	RDom	RDen	RFre	IV
1	*Pterocymbium tinctorium*	18.22	16.45	10.00	44.67
2	*Kleinhovia hospita*	7.62	8.55	6.36	22.53
3	*Sterculia comosa*	5.48	5.26	4.55	15.29
4	*Alchornea rugosa*	3.60	5.26	4.55	13.41
5	*Melanolepis multiglandulosa*	4.44	3.95	2.73	11.12
6	*Dendrocnide meyeniana*	3.32	3.95	3.64	10.91
7	*Magnolia liliifera*	3.12	2.63	3.64	9.39
8	*Ceodes umbellifera*	4.72	0.66	3.64	9.02
9	*Alangium chinense*	3.13	3.95	1.82	8.90
10	*Ficus variegata*	3.04	1.32	1.82	6.18

Legend: RDom – Relative Dominance; RDen – Relative Density; RFre – Relative Frequency
IV – Importance Value

Table 2. Top 10 most abundant understory species.

Scientific name	Family name	Number of individuals
Leea guineesis	Vitaceae	14
Alchornea rugosa	Euphorbiaceae	13
Mallotus philippense	Euphorbiaceae	8
Dysoxylym arborescens	Meliaceae	5
Magnolia liliifera	Magnoliaceae	5
Palaquium philippense	Sapotaceae	5
Polyscias nodosa	Araliaceae	5
Pometia pinnata	Sapindaceae	5
Pterocymbium tinctorium	Malvaceae	5
Alangium chinense	Cornaceae	3

Ground cover

Sixteen species from 16 genera and 15 families were observed in 18 sampling plots (1 m x 1 m) established. In terms of coverage, the area (18 m²) was mainly covered by leaf litter which covered about 30.5%, followed by *Selaginella plana* (19.83%), limestone karsts (17.17%), and *Elatostema* species (15.56%). The floral diversity of the forest floor is high, with the Simpson's value of 0.8865 and an evenness index of 0.7358, which suggests high variability in the area covered by each species.

Forest structure

CNP is primarily characterized by dense vegetation of small-sized trees. The presence of large trees was rarely observed in the area. This is one of the characteristics of a forest over limestone, mainly because of the very thin soil that could not support the luxuriant growth of trees (Fernando *et al*. 2008; Lillo *et al*. 2018).

To further characterize the stand structure in the forests of CNP, the tree diameter classification of Malabrigo *et al*. (2016) was adopted for this study. The majority (78%) of the trees recorded were classified as small trees. Most of which are species of *Pterocymbium tinctorium* with 17 individuals and *Kleinhovia hospita* with 11 individuals. On the other hand, 20.1% or 31 individuals fall under medium-sized trees, and 1.3% or two individuals recorded fall under large trees. Additionally, the average diameter of recorded trees was 23.1 cm, classified as small trees. As shown in **Table 3**, the number of individuals decreases as the diameter increases.

The trees with the largest recorded diameter are anuling (*Ceodes umbellifera*) from quadrat 0 of transect 2, banilad (*Sterculia comosa*) from quadrat 4 of transect 1, and patangis (*Magnolia liliifera*) of quadrat 0 of transect 2. The top 10 trees with the highest DBH recorded are listed in **Table 4**.

Table 3. Tree diameter classification with a corresponding number of individuals.

Diameter class	Diameter range (cm)	No. of individuals
Small trees	10 cm – 30 cm	121
Medium-size trees	30.1 cm – 60 cm	31
Large trees	>60 cm	2

Table 4. Top 10 highest diameter at breast height (DBH) recorded.

Transect	Quadrat	Common name	Scientific name	DBH (cm)
2	0	Anuling	*Ceodes umbellifera*	95.5
1	4	Banilad	*Sterculia comosa*	60.2
2	0	Patangis	*Magnolia liliifera*	57.3
1	5	Tangisang bayawak	*Ficus variegata*	54.1
1	0	Alim	*Melanolepis multiglandulosa*	52.2
1	5	Lipang kalabaw	*Dendrochnide meyeniana*	48.7
1	4	Taluto	*Pterocymbium tinctorium*	48.4
2	5	Anubing	*Artocarpus ovatus*	47.7
2	7	Taluto	*Pterocymbium tinctorium*	47.4
1	6	Taluto	*Pterocymbium tinctorium*	44.2

Diversity indices

Two of the most common indices used in diversity assessment studies are Shannon–Weiner Index and Simpson's Index. Species richness and abundance are the two parameters needed for the computation of these indices. Ludwig & Reynolds (1998) state that the Shannon-Wiener Index pertains to the degree of uncertainty of randomly predicting the species in a community. Hence, there are poor predictions of the species in a community when the Shannon–Weiner Index (H') is a high value. On the other hand, Simpson's index pertains to the probability of getting two different species when you draw two individuals in a community. The evenness index tells us how balance the distribution of the number of individuals for every species is.

CNP was found to have an overall Shannon–Weiner index of 3.761. This can be interpreted to have a very high floristic diversity value based on the classification scheme developed by Fernando *et al*. (1998). On the other hand, the area has a Simpson's index of 0.9624 and an evenness index of 0.5811, indicating a high diversity value (**Table 5**). It is important to note that only the recorded trees and understory species were included in this study's computation of diversity indices. Hence, the computed index can still increase with the inclusion of ground cover species. The Shannon–Weiner diversity index of CNP is higher than the Shannon–Weiner diversity indices of other protected areas in Luzon such as Mt. Iraya in Batanes with 3.72 (Pro-Seeds 2018); Mt. Calavite Wildlife Sanctuary in Mindoro with 3.04 (MCRFMI 2018); and Mt. Iglit–Baco National Park in Mindoro with 3.268 (Pro-Seeds 2020) (**Table 6**). This can be generally attributed to the higher number of recorded species in CNP than other cited protected areas.

Table 5. Computed diversity indices of the sampled transects.

Transect number	No. of species	No. of individuals	Diversity index		
			Simpson's index (D')	Shannon-Weiner index (H')	Evenness index (J')
Transect 1	50	143	0.9523	3.450	0.6298
Transect 2	43	125	0.9431	3.309	0.6365
Overall	74	268	0.9624	3.761	0.5811

Table 6. Species richness and diversity indices of selected areas in the country.

Area	Location	Shannon–Weiner Index	Reference
Mt. Iraya	Batanes	3.72	Pro-Seeds, 2018
Mt. Calavite Wildlife Sanctuary	Occidental Mindoro	3.04	MCRFMI, 2018
Mt. Iglit–Baco National Park	Occidental Mindoro	3.268	Pro-Seeds, 2020

Because of its higher species richness, Transect 1 obtained relatively higher biodiversity indices than Transect 2, which can be attributed to the balanced distribution in the number of individuals per species in the area. On the other hand, there is slight dominance of *P. tinctorium*, which constitutes 15% (19/125) of the total individuals in Transect 2, resulting in lower biodiversity indices.

Noteworthy species

Endemic species

One of the very useful information for conservation studies is the geographic distribution of plant species. Those species confined or restricted to small geographical areas (*i.e*., endemic) should be given more conservation importance since these species are more vulnerable to extinction.

According to Fernando *et al*. (2008), the Philippine limestone forest has a very high floral species endemicity. Of the 91 total species recorded, 20 (22%) of which are endemic to the Philippines; two (2.2%) species are exotic, and 68 (74.8%) are non-endemic indigenous species. Endemic species include *Artocarpus rubrovenius*, *Celtis philippensis*, *Chisocheton cumingianus*, *Dendrocnide subclausa*, *Diplodiscus paniculatus*, among others. Exotic species, on the other hand, are *Coffea arabica* and *Artocarpus heterophyllus*. The complete list of endemic species encountered in the study area is shown in **Table 7**.

Table 7. List of Philippine endemic tree species observed in Caramoan National Park.

Number	Species name	Family
1	*Artocarpus rubrovenius*	Moraceae
2	*Canthium brunneum*	Rubiaceae
3	*Celtis philippensis*	Cannabaceae
4	*Chisocheton cumingianus*	Meliaceae
5	*Dasymaschalon clusiflorum*	Annonaceae
6	*Dendrocnide subclausa*	Urticaceae
7	*Diplodiscus paniculatus*	Malvaceae
8	*Goniothalamus amuyon*	Annonaceae
9	*Knema glomerata*	Myristicaceae
10	*Macaranga bicolor*	Euphorbiaceae
11	*Magnolia liliifera*	Magnoliaceae
12	*Neonauclea circumscissa*	Rubiaceae
13	*Mallotus philippensis*	Euphorbiaceae
14	*Palaquium philippense*	Sapotaceae
15	*Polyalthia lanceolata*	Annonaceae
16	*Planchonia spectabilis*	Lecythidaceae
17	*Pterospermum celebicum*	Malvaceae
18	*Saurauia polysperma*	Actinidaceae
19	*Voacanga globosa*	Apocynaceae
20	*Xanthophyllum bracteatum*	Polygalaceae

Threatened species

From the total number of taxa observed, seven species were found to be threatened under the Updated National List of Threatened Philippine Plants and Their Categories (DAO 2017–11) and/or the IUCN Red List of Threatened Species (2021–1). Noteworthy among the list are two prime timber species, narra (*Pterocarpus indicus*) and molave (*Vitex parviflora*). Narra is categorized as vulnerable under DAO 2017–11 and endangered under IUCN, while molave is categorized as endangered under DAO 2017–11 and vulnerable under IUCN. The complete list of threatened plants recorded in CNP is listed in **Table 8**.

Table 8. List of threatened species encountered in Caramoan National Park.

Common name	Species name	Conservation status	
		DAO 2017-11	IUCN 2021-1
Anang	*Diospyros pyrrhocarpa*	VU	LC
Batete	*Kingiodendron alternifolium*	VU	
Malak-malak	*Palaquium philippense*	VU	VU
Lago	*Prunus grisea*	VU	LC
Narra	*Pterocarpus indicus*	VU	EN
Kalantas	*Toona calantas*	VU	DD
Molave	*Vitex parviflora*	EN	LC

Legend: VU – Vulnerable; EN – Endangered; LC – Least Concern; DD- Data Deficient

CONCLUSION AND RECOMMENDATION

This floristic inventory revealed that the Caramoan National Park is home to at least 91 species belonging to 76 genera and 46 families. The area was classified to have a very high floral diversity based on the computed Shannon-Weiner and Evenness index. The general vegetation of CNP is primarily dominated by forest over limestone that can be characterized as young secondary forest. The five most important species are *Pterocymbium tinctorium*, *Kleinhovia hospita*, *Sterculia comosa*, *Alchornea rugosa*, and *Melanolepis multiglandulosa.* The park also contains 20 endemic and seven threatened species. With the provision of primary information on the floristic diversity of CNP, the PAMB will now be able to produce sounder conservation and management strategies.

Results obtained from this floral diversity study may not capture the total diversity of the area due to the limited time for sampling establishment and data collection. Therefore, it is highly recommended to add additional transects in the study area covering all elevation gradients to augment the

information gathered in this research covering every aspect of the protected area.

Important botanical and ecological information derived from this study are highly recommended as reference information in developing and formulating the protected area management plan. At the very least, the noteworthy species identified in this study, including the endemic and threatened species, should be used as flagship species for conservation in the area.

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Appendix 1. Taxonomic list of all species recorded in Caramoan National Park.

Common name	Scientific name	Family name	Type of record (m x m)
Pangi	*Pangium edule* Reinw	Achariaceae	Transect (20 x 20)
	Saurauia polysperma (Blanco) Merr.	Actinidiaceae	Transect (20 x 20)
Ligas	*Semecarus cuneiformis* Blanco	Anacardiaceae	Transect (20 x 20)
Manalu	*Semecarpus longifolius* Blume	Anacardiaceae	Transect (20 x 20)
	Desmos sp.	Annonaceae	Transect (5 x 5)
	Phaeanthus ophthalmicus (Roxb. ex G.Don) J.Sinclair	Annonaceae	Transect (5 x 5)
Anolang	*Polyalthia lanceolata* S.	Annonaceae	Opportunistic
Batino	*Alstonia macrophylla* Wall	Apocynaceae	Transect (20 x 20)
Dita	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Transect (20 x 20)
Bayag-usa	*Voacanga globosa* (Blanco) Merr.	Apocynaceae	Opportunistic
Amlong	*Epipremnum pinnatum* (L.) Engl.	Araceae	Transect (1 x 1)
Alopayi	*Homalomena philippinensis* Engl	Araceae	Transect (1 x 1)
Malapapaya	*Polyscias nodosa* (Blume) Seem.	Araliaceae	Transect (5 x 5)
	Caryota cumingii Lodd	Arecaceae	Transect (1 x 1)
Gonoi	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	Transect (1 x 1)
Malaikmo	*Celtis philippensis Blanco*	Cannabaceae	Opportunistic
Tabon-tabon	*Atuna racemosa* Raf	Chrysobalanaceae	Transect (20 x 20)
Bitanghol	*Calophyllum blancoi* Planch. & Triana	Clusiaceae	Transect (20 x 20)
Salingogon	*Cratoxylum formosum* (Jack) Dyer	Clusiaceae	Transect (1 x 1)
Malakalumpit	*Terminalia calamansanai* (Blanco) Rolfe	Combretaceae	Transect (5 x 5)
Anonang	*Cordia dichotoma* G.Forst	Cordiaceae	Transect (20 x 20)
Bagaloan	*Alangium chinense* (Lour.) Rehder	Cornaceae	Transect (20 x 20)
Putian	*Alangium meyeri* Merr.	Cornaceae	Transect (20 x 20)
Sarat	*Scleria scobiculata* Nees & Meyen	Cyperaceae	Transect (1 x 1)
Anang	*Diospyros pyrrhocarpa* Miq	Ebenaceae	Transect (20 x 20)
Bogus	*Acalypha amentacea* Roxb	Euphorbiaceae	Transect (20 x 20)
Aguioi	*Alchornea rugosa* (Lour.) Müll.Arg.	Euphorbiaceae	Transect (20 x 20)
Hamindang	*Macaranga bicolor* Müll.Arg	Euphorbiaceae	Transect (20 x 20)
Lagapak	*Macaranga hispida* (Blume) Müll.Arg.	Euphorbiaceae	Transect (20 x 20)
Banato	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Transect (20 x 20)
Alim	*Melanolepis multiglandulosa* (Reinw. ex Blume) Rchb. & Zoll.	Euphorbiaceae	Transect (20 x 20)
Salingkugi	*Albizia saponaria* (Lour.) Blume	Fabaceae	Transect (20 x 20)
Batete	*Kingiodendron alternifolium* (Elmer) Merr. & Rolfe	Fabaceae	Transect (5 x 5)
Bani	*Pongamia pinnata* (L.) Pierre	Fabaceae	Transect (5 x 5)
Narra	*Pterocarpus indicus* Willd.	Fabaceae	Transect (20 x 20)
	Clerodendrum luzoniense Merr.	Lamiaceae	Transect (5 x 5)
Molave	*Vitex parviflora* Juss	Lamiaceae	Transect (5 x 5)
Botong	*Barringtonia asiatica* (L.) Kurz	Lecythidaceae	Transect (20 x 20)
Putat	*Barrintonia racemosa* (L.) Blume ex DC.	Lecythidaceae	Transect (20 x 20)
Lamog	*Planchonia spectabilis* Merr.	Lecythidaceae	Transect (20 x 20)
Patangis	*Magnolia liliifera* (L.) Baill.	Magnoliaceae	Transect (20 x 20)
Anilau	*Colona serratifolia* Cav.	Malvaceae	Opportunistic
Balobo	*Diplodiscus paniculatus* Turcz.	Malvaceae	Transect (20 x 20)
Tan-ag	*Kleinhovia hospita* L.	Malvaceae	Transect (20 x 20)
Taluto	*Pterocymbium tinctorium* (Blanco) Merr.	Malvaceae	Transect (20 x 20)
Bayok	*Pterospermum celebicum* Miq.	Malvaceae	Transect (5 x 5)

Appendix 1. Taxonomic list of all species recorded in Caramoan National Park (*Cont.*)

Common name	Scientific name	Family name	Type of record (m x m)
Banilad	*Sterculia comosa* Wall.	Malvaceae	Transect (20 x 20)
Iloilo	*Aglaia argentea* Blume	Meliaceae	Transect (5x5)
Balukanag	*Chisocheton cumingianus* (C.DC.) Harms	Meliaceae	Opportunistic
Kalimutain	*Dysoxylum arborescens* (Blume) Miq.	Meliaceae	Transect (20 x 20)
Kalantas	*Toona calantas* Merr.	Meliaceae	Transect (20 x 20)
Langka	*Artocarpus heterophyllus* Lam.	Moraceae	Transect (20 x 20)
Anubing	*Artocarpus ovatus* Blanco	Moraceae	Transect (20x20)
Isis-ibon	*Ficus cumingii* Miq.	Moraceae	Transect (20 x 20)
Kamahiuan	*Ficus fistulosa* Reinw.	Moraceae	Transect (20 x 20)
Butli	*Ficus gul* Lauterb. & K.Schum.	Moraceae	Transect (20 x 20)
Hagimit	*Ficus minahassae* Teijsm. & Vriese) Miq.	Moraceae	Transect (20 x 20)
Tibig	*Ficus nota* (Blanco) Merr.	Moraceae	Transect (5 x 5)
Tabgun	*Ficus ruficaulis* Merr.	Moraceae	Transect (20 x 20)
Tangisang bayawak	*Ficus variegata* Blume	Moraceae	Transect (20 x 20)
Malanangka	*Parartocarpus venenosus* (Zoll. & Moritzi) Becc	Moraceae	Transect (20 x 20)
Tambalau	*Knema glomerata* (Blanco) Merr.	Myristicaceae	Transect (5 x 5)
Tanghas	*Myristica elliptica* Wall.	Myristicaceae	Opportunistic
	Syzygium sp.	Myrtaceae	Transect (20 x 20)
Anuling	*Ceodes umbellifera* J.R.Forst. & G.Forst	Nyctaginaceae	Transect (20 x 20)
Karaksan	*Chionanthus ramiflorus* Roxb	Oleaceae	Transect (20 x 20)
	Freycinetia sp.	Pandanaceae	Transect (1 x 1)
Bignai kalabau	*Antidesma pleuricum* Tul.	Phyllanthaceae	Opportunistic
	Xanthophyllum bracteatum Chodat	Polygalaceae	Opportunistic
	Maesa cumingii Mez	Primulaceae	Transect (20 x 20)
Lago	*Prunus grisea* (Blume) Kalkm.	Rosaceae	Transect (20 x 20)
	Canthium brunneum (Merr.) Merr	Rubiaceae	Transect (20 x 20)
Malakape	*Canthium diococcum* (Gaertner) Merr.	Rubiaceae	Transect (5 x 5)
Kape	*Coffea arabica* L.	Rubiaceae	Transect (5 x 5)
	Neonauclea circumcissa Ridsdale	Rubiaceae	Transect (5 x 5)
Kalomata	*Clausena brevistyla* Oliv.	Rutaceae	Transect (20 x 20)
	Glycosmis sp.	Rutaceae	Transect (20 x 20)
Oonog	*Osmelia philippina* (Turcz.) Benth.	Salicaceae	Transect (5 x 5)
	Dictyoneura acuminata Blume	Sapindaceae	Transect (20 x 20)
Malugai	*Pometia pinnata* J.R.Forst. & G.Forst.	Sapindaceae	Transect (20 x 20)
Malak-malak	*Palaquium philippense* (Perr.) C.B.Rob.	Sapotaceae	Transect (20 x 20)
Kamariang gubat	*Selaginella plana* (Desv. ex Poir.) Hieron.	Selaginellaceae	Transect (1 x 1)
Malasapsap	*Ailanthus integrifolia* Lam	Simaroubaceae	Transect (20 x 20)
	Tectaria sp.	Tectariaceae	Transect (1 x 1)
Lipang kalabau	*Dendrochnide meyeniana* (Walp.) Chew	Urticaceae	Transect (20 x 20)
Malalipa	*Dendrochnide subclausa* (C.B.Rob.) Chew	Urticaceae	Transect (20 x 20)
	Elatostema sp.	Urticaceae	Transect (1 x 1)
Alilaua	*Villebrunea trinervis* Wedd	Urticaceae	Transect (20 x 20)
Amamali	*Leea aculeata* Blume ex Spreng	Vitaceae	Transect (5 x 5)
Mali-mali	*Leea manillensis* Walp.	Vitaceae	Transect (20 x 20)
Tagbak	*Alpinia elegans* (C.Presl) K.		Transect (1 x 1)