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# Floristic Composition, Vegetation Structure, and Diversity Pattern of Mt. Calavite Wildlife Sanctuary: Basis for Management and Conservation Planning

Pastor L. Malabrigo, Jr. 1,2, Adriane B. Tobias 1,3 and Jeferson C. Boncodin Deferson C. Bonc

# INTRODUCTION

Biodiversity assessment, which provides data necessary to understand species diversity and distribution pattern, is a prerequisite prior to management and conservation planning. The conduct of biodiversity assessment is recognized globally as a fundamental activity to sustainable biodiversity conservation (Humphries *et al.* 2003; Margules & Pressey 2000; Williams *et al.* 1993). It also serves as a stepping stone and a gateway to discover many of the undescribed species on earth. However, its application is often neglected particularly in tropical countries, including the Philippines, where a substantial fraction of the world's unique species are found (Gordon & Newton 2006). Limitations on technical and financial capacity, presence of aggravating threats, and scarcity of information in biologically—rich countries have placed the conservation efforts to languish.

The Philippines, regarded as one of the conservation priority areas, harbors 6,694 endemic species (Mittermeier *et al.* 2011; Myers *et al.* 2000). These species are facing imminent risk of extinction due to continuous habitat degradation and land use change (Leimu *et al.* 2010; Pereira *et al.* 2010; Sala *et al.* 2000). The government established Protected Areas (PAs) and Key Biodiversity Areas (KBAs) in the country to halt biodiversity loss and protect the remaining biodiversity corridors (Ambal *et al.* 2012; Bagarinao 1999; BMB 2015). Ironically, vegetation structure and species diversity of some PAs and KBAs have not

<sup>1</sup>Department of Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Baños <sup>2</sup>Museum of Natural History, University of the Philippines Los Baños, <sup>3</sup>Graduate School, University of the Philippines Los Baños, College, 4031, Laguna, Philippines Corresponding author: abtobias@up.edu.ph

#### **ABSTRACT**

Mt. Calavite Wildlife Sanctuary (MCWS) is regarded as home to more than a hundred species of plants, but its floristic composition, vegetation structure, and diversity pattern remained unclear since its declaration as a protected area. After the recent plant diversity assessment conducted following the prescribed methodology by the DENR-Biodiversity Management Bureau, the conservation value of the mountain was emphasized. This paper provides a concrete evidence that MCWS is home to diverse yet unique species of plants. A total of 181 morpho-species belonging to 67 families were recorded. MCWS now holds a large number of species of at least 250 morpho-species based on the assessment and gathered secondary data. Thirty-three (33) are threatened and forty-six (46) species are endemic to the Philippines. Four (4) species are known to occur only in MCWS, namely - Ardisia calavitensis Merr., Peristrophe cordatibractea Merr., Urophyllum mindorense Merr., and Cyrtochloa mindorensis S. Dranf. Majority of the species (about 67%) recorded are nonendemic indigenous. Dominant species in MCWS from 200 masl to 600 masl were also revealed. Mostly are species belonging to Fabaceae, Lauraceae, Malvaceae, Moraceae, Myrtaceae, Phyllanthaceae, Rubiaceae, Sapindaceae, and Sterculiaceae. MCWS, being comprised of a mosaic of different vegetation from grassland to secondary forest, has generally a stunted vegetation due to harsh environmental condition. The stratum of the forest of MCWS is unique because some species were recorded to a particular forest layer, allowing other species to coexist. Plant diversity pattern of MCWS showed weak correlation to elevation. The need to protect the mountain is further supported by the computed Shannon index (H = 4.41)that indicates very high diversity.

**Keywords:** alpha diversity, elevational gradient, Mindoro island, protected area, threatened plants

been well-documented, or worst, still unexplored. Among 170 terrestrial PAs in the Philippines, plant diversity assessment in recent decade had only been conducted in at least 19 PAs (Abraham *et al.* 2010; Alcantara *et al.* 2014; Amoroso 2012; Amoroso & Aspiras 2011; Azuelo *et al.* 2010; Buot Jr. 2008; Buot Jr. & Subilla 2012; Callicdan *et al.* 2015; Canencia & Daba 2015; Gascon *et al.* 2013; Gruezo 2010; Hamann 2000; Malabrigo Jr. 2013; Malabrigo Jr. *et al.* 2016; Obemio *et al.* 2016; Partosa & Delos Reyes 2013; Quimio 2016; Raterta *et al.* 2014; Sopsop 2011; Sopsop & Sopsop 2015).

Mt. Calavite Wildlife Sanctuary (MCWS) is among the PAs where the totality of species that thrives in the mountain and vegetation structure remain obscure. Contrary to other mountains in the island of Mindoro such as in Mt. Halcon (Ames 1908; Brotherus 1908; Copeland 1907; Merrill 1907; Villanueva & Buot Jr. 2018), there is no available literature that discussed the

floristic composition and plant diversity pattern of MCWS specifically. Earliest description about the vegetation of Mindoro dates back in late 19<sup>th</sup> century stating the abundance and variety of species in immediate forests (Philippine Islands. Inspección General de Montes 1875). In 1915, Merill had collections of five specimens of noteworthy species from MCWS. Three of which were described as new species, namely – Ardisia calavitensis Merr. [Primulaceae], Peristrophe cordatibractea Merr. [Acanthaceae], and Urophyllum mindorense Merr. [Rubiaceae], with narrow endemism occurring only at 600-700 masl of Mt. Calavite (Merrill 1915). Six years later, a new species, Cyrtochloa mindorensis S. Dranf. [Poaceae], was described from the type specimen collected by Ramos in the same mountain on April 1921 (Dransfield 2003).

The vast tract of land of MCWS is estimated to serve as a habitat to more than a hundred species of flora and fauna (DENR Region IV-B 2016). Based on the Resource and Socio-Economic Assessment conducted by Mindoro Biodiversity Conservation Foundation Inc. (2014), a total of 154 plants (19 endemic, 3 threatened) were recorded in MCWS. Merrill (1923-1926), on the other hand, listed in his book (An Enumeration of Philippine Flowering Plants, Vols. 1 to 4) a total of 1,288 species in Mindoro island while Rojo (1998) listed 313 tree species in his Lexicon of Philippine Trees, the forester's main book. Throughout the island of Mindoro, 174 plants were identified as threatened species (Villanueva & Buot Jr. 2015). The gap between these reported data act as a barrier to fully recognize the conservation value of MCWS, a declared protected area, as well as understand the role of vegetation structure in forest management. It is therefore crucial to conduct a plant diversity assessment in this sanctuary, which is believed to be rich in biodiversity. This study aimed to provide a more updated and comprehensive baseline information on the floristic composition, vegetation structure, and plant diversity pattern of MCWS for the formulation of sustainable forest management and implementation of effective strategy for the conservation of threatened species.

# METHODOLOGY

#### Study Area

The study was conducted in MCWS (Figure 1), originally known as "kalawit" meaning "hook" because of the shape of the north-west tip of Mindoro island (Postma 1997). Majority of its area lies in Barangay Harrison, Paluan, province of Occidental Mindoro. It is bounded by the Verde Island Passage, Mindoro Strait, and the West Philippine Sea. It covers a total of 18,016 ha with slope classes ranging from 0 to 40%. Its elevation reaches >1400 masl at the highest point. Based on the Modified Corona Climate Classification of PAG-ASA, the entire municipality of Paluan has Type I climate. Hence, two pronounced seasons are observed in MCWS, where rainfall reaches its peak from May to October while the lowest is usually from January to April (MBCFI 2014).

# **Vegetation Survey**

Vegetation survey was conducted in January 2017. The team followed the prescribed methodology by DENR-Biodiversity Management Bureau (BMB) on plant diversity assessment (Cruz et al. 2017). A 2-km transect, which was previously established for faunal diversity assessment with elevation from 200 masl to 700 masl, was used. A total of nine quadrats (20m x 20m) were laid out along the transect at every 250m interval.

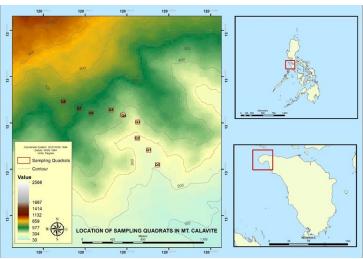


Figure 1. Location of the sampling quadrats along Mt. Calavite Wildlife Sanctuary.

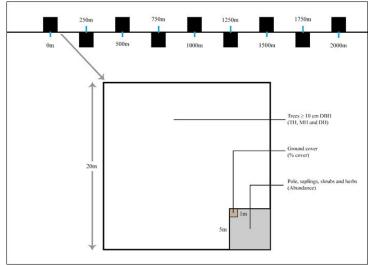


Figure 2. The modified belt transect method employed in the plant diversity survey.

Using the nested quadrat sampling technique (Figure 2), the vegetation structure and species composition of different plant communities were assessed and characterized. Merchantable height (MH) and total height (TH) of trees inside the 20m x 20m quadrat with diameter-at-breast height (DBH) of >10cm were measured. On the other hand, the abundance of plants classified as shrubs, poles, and saplings inside the 5m x 5m quadrat was recorded, while percentage cover of understorey species (grasses and other plants with <1cm height) inside the 1m x 1m quadrat was measured. All trees with height of ≥1m within the quadrats were tagged with markers to ease the monitoring of species composition over time. In addition, all species along the transect encountered through opportunistic survey were recorded.

# **Species Identification**

Initial identification of species recorded in MCWS was conducted with aid of photographs and dried specimens collected in the study site. Photos of species, especially those that were flowering and fruiting, were taken and compared to online images (i.e. Co's Digital Flora of the Philippines and

Phytoimages). Collected dried specimens were systematically processed at the Taxonomy Laboratory of the Department of Forest Biological Sciences in the College of Forestry and Natural Resources, University of the Philippines Los Baños. Digital herbarium specimens of type materials were accessed mainly through the Kew Herbarium Catalogue and Global Plants on JSTOR to confirm identification. Protologues and monographs (Flora Malesiana, An Enumeration of Philippine Flowering Plants, Lexicon of Philippine Trees and Leaflets of Philippine Botany) were also consulted for the verification of specific epithet of the species. Nomenclatural status of the species identified were reviewed through the International Plant Names Index (IPNI) and The Plant List. Distribution and endemism of plants were determined using online databases (The Catalogue of Life, Tropics and Global Biodiversity Information Facility) while classification of the conservation status was based from the Updated National List of Threatened Plants in the Philippines (DAO 2017–11) and the *IUCN Red List* (IUCN 2018–2).

# **Data Analysis**

Data gathered in the field were tabulated and analyzed to characterize floral composition within the study area. The relative density, relative dominance, and relative frequency values for each tree species were determined to obtain their Importance Value (IV), which is the standard measurement in forest ecology to determine the rank relationships of species. These also indicate different aspect of the species importance in a community. Importance values were determined using the following formula (Kuchler *et al.* 2006):

$$Density = \frac{no.of\ individuals\ of\ a\ species}{total\ area\ of\ sampling\ quadrats}$$

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

$$Frequency = \frac{no.of\ quadrats\ in\ which\ species\ were\ recorded}{total\ no.of\ quadrats}$$

$$Relative\ Frequency = \frac{frequency\ of\ a\ species}{total\ frequency\ of\ all\ species} x\ 100$$

$$Dominance = \frac{basal\ area\ of\ volume\ of\ a\ species}{total\ area\ of\ sampling\ quadrats}$$

$$Relative\ Dominance = \frac{dominance\ of\ a\ species}{total\ dominance\ of\ all\ species} x\ 100$$

Importance Value = Relative Density + Relative Frequency + Relative Dominance

Furthermore, cluster analysis was done to relate the floristic composition along elevation to general forest condition. Using the Paleontological Statistics (PAST version 3.23) software package for education and data analysis (Hammer & Harper 2006), the similarity of each quadrat was calculated with the Bray–Curtis index of similarity. The data set used was the abundance of tree species across the quadrats. A dendrogram was then generated through unweighted pair–group method (UPGMA). Dominant species per quadrat were determined using the calculated relative dominance of trees. Diversity indices (Shannon, Simpson's and Evenness) of the sampling quadrats were computed based on the presence and absence data of all recorded species per quadrat.

# RESULTS AND DISCUSSION

# **Vegetation Structure**

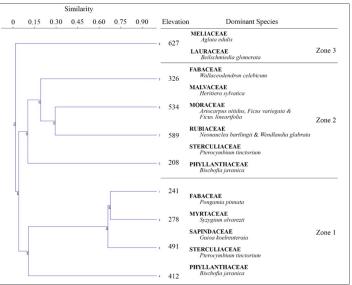
MCWS is generally composed of two forest formations, *viz*. tropical moist deciduous forest (TMDF) and tropical lower montane rainforest (TLMR). TMDF can be generally observed at the lower elevation of the mountain while TLMR occurs at

elevation higher than 1000 masl. Vegetation survey for this study only covered the TMDF, which commonly occurs in areas with seasonally dry climates where water availability can be periodically limiting to forest plants (Fernando 2004), as in the case of Palawan and Occidental Mindoro. MCWS is comprised of a mosaic of different vegetation from grassland to second growth forests representing different stages of recovery from the previous human and natural disturbances.

# **Floristic Composition**

A total of 181 morpho-species belonging to 133 genera and 67 families were recorded through quadrat sampling method and opportunistic survey, majority of which (134 species) were found within the sampled quadrats. Genera with highest species representation were Ficus (8 species), Aglaia (6), Litsea (6) and Syzygium (5). In terms of plant families, Rubiaceae (12 species), Moraceae (12), Meliaceae (11), Phyllanthaceae (10), Sapindaceae (10), and Lauraceae (10) had the highest number of species. This closely resembles that of Mt. Malarayat-Malepunyo in Batangas (Lunar & Arcega 2011) and Mt. Malinao in Albay (de Guzman et al. 2014), where the same plant families were most represented. Species with highest number of individuals were alahan (Guioa koelreuteria), Psychotria sp., alvarez malaruhat (Syzgygium alvarezii), mamalis (Pittosporum pentandrum), and lanipa (Wendlandia glabrata). All of these are pioneer species, which reflect the general floristic composition of the study site as a young secondary forest.

Aside from species richness, the floristic composition of MCWS can also be characterized with dominant species per quadrat. Based on the generated dendrogram through cluster analysis using UPGMA with Bray-Curtis index of similarity, the sampled quadrats were divided into three zones (Figure 3). The first zone (241 masl to 491 masl) was dominated by bani (Pongamia pinnata), alvarez malaruhat (Syzygium alvarezii), alahan (Guioa koelreuteria), taluto (Pterocymbium tinctorium), and tuai (Bischofia javanica). Similar species from this zone also dominated the second zone (208 masl to 589 masl). Banuyo (Wallaceodendron celebicum), dungon (Heritiera sylvatica), kubi (Artocarpus nitidus), tangisang bayawak (Ficus variegata),



**Figure 3.** Dendrogram of 9 sampling quadrats generated through UPGMA using Bray–Curtis Similarity Index. Bootstrapping was done at n = 1000; correlation = 0.97.

basikong kalawang (Ficus linearifolia), uisak (Neonauclea Tree Flora bartlingii), lanipa (Wendlandia glabrata), taluto (P. tinctorium), and tuai (Bischofia javanica) had the highest relative dominance in Zone 2. Lastly, the third zone (627 masl) was dominated by alauihau (A glaia edulis) and tirukan (Beilschmiedia glomerata).

Results from the cluster analysis and dominance of species per zone provided an interesting revelation on seed dispersal mechanism of dominant trees in MCWS. Taluto (*P. tinctorium*) was found to be dominant from 208 masl to 534 masl. Its wide dominance indicates the spatial pattern of the distribution of its seeds, which was likewise true for tuai (B. javanica). On the other hand, the dominance of alahan (G. koelreuteria) and alvarez malaruhat (S. alvarezii) was restricted in Zone 1. This could be attributed to heterogeneity in environmental conditions along elevational gradient, which may be unsuitable for the two species to grow at their optimum height and DBH. It was, however, important to note that seedlings of alahan were sparsely distributed to four quadrats unlike alvarez malaruhat, which was only recorded in Q4 with seedlings extending to Q5. Moraceae and Rubiaceae started to become dominant in Zone 2, a young secondary and understocked forest adjacent to a grassland dominated by pioneer species. Zone 3 has remarkably unique species such as tirukan (B. glomerata), santiki (Cledion lanutang mangyan (Polvalthia javanicum), Litsea sp., mindorensis), paginga (Discocalyx cybianthoides), and Sauropus macranthus.

The floristic composition of MCWS seemed to be unique from nearby mountains in Mindoro island. Mt. Ilong in Halcon Range was already dominated by fruit trees from 100 masl to 400 masl while at 500 masl to 1000 masl, Cyathea contaminans, Astronia sp., Syzygium sp., Garcinia binucao, and Ficus irisana were dominant (Villanueva & Buot Jr. 2018). Ashton (2003) reported that the lower montane forest in Southeast Asia is dominated by dipterocarps or "oak-laurel" assemblage. A striking observation on the floristic composition of MCWS from 200 masl to 600 masl, where no single species from Dipterocarpaceae and Fagaceae were recorded, suggests a different and more unique forest formation, which is a tropical moist deciduous forest. This forest formation is known to occur only in the western side of the archipelago, including Mindoro, Palawan, and Zambales, where water is very limiting (Fernando 2004). Species from Lauraceae has already been recorded at lower elevation but started to become more diverse and dominant at 600 masl. This showed a transition to tropical lower montane rainforest that occur at 800 masl to 1300 masl (Fernando 2004).

Since the study only covered a certain elevation range, some species that are most probably occurring at higher elevation were not recorded. Collating the data from previous plant diversity assessments including the work of Merrill (1923–1926) is a crucial work to bridge the gap among the data needed to fully realize the conservation value of the mountain. MCWS now holds more than 250 morpho-species belonging to 74 families (Appendix 1). This accounts for approximately 20% of the total plants recorded by Merrill in Mindoro island. This is also relatively higher than in Mt. Data National Park (Buot Jr. & Subilla 2012), Mts. Banahaw-San Cristobal Protected Landscape (Gascon et al. 2013), Rasa Island and Wildlife Sanctuary (Sopsop 2011), Samar Island National Park (Quimio 2016), Mt. Kitanglad Range Natural Park (Opiso et al. 2014), and Mt. Matutum Protected Landscape (Obemio et al. 2016).

A total of 79 tree species with 232 individuals were recorded to have a DBH of ≥10cm. All the sampled quadrats except Q6 had more than 20 individuals of trees. The average number of trees per quadrat was 25 individuals. If translated to the average density, about 0.06 tree/m<sup>2</sup> or 6 trees for every 100 m<sup>2</sup> were expected to be observed in MCWS. This was relatively higher than in Kaliwa River Watershed in Sierra Madre Mountain Range (Malabrigo et al. 2014) and was still considered as lowdensity. Quadrats with more than 25 individuals were Q3, Q4 and O8. Alvarez malaruhat (Syzygium alvarezii) was the most represented tree species with 17 individuals (N) in Q4 followed by dungon (*H. sylvatica*) (N = 6) in Q3, and malasaging (A. edulis) (N = 5). Individuals with largest diameter ranging from 10.5 cm to 81.8 cm were taluto (P. tinctorium). The average DBH of all trees was 20 cm while the average height was 6.1 m. This clearly showed that the vegetation in MCWS was stunted, which was most probably due to steep slope, location of the vegetation surveyed, and harsh environment since most of the species were located along the ridge and riverbanks. Tree height undeniably provided competitive advantages (i.e. light capture for photosynthesis). However, this could be counterbalanced by the harsh environment in MCWS where strong wind was prevalent. Trees in MCWS would allocate resources for support and maintenance costs rather than for primary growth in order to adapt to the usual environmental condition (King 1990). Trees with greatest height such as Sandoricum koetjape (55 m), P. tinctorium (32), and Pittosporum pentandrum (32) were recorded in Zone 1.

Considering the density, occurrence, and dominance of trees in MCWS, species with highest IV were determined (Table 1). Majority of the 10 most important species were also listed as dominant species in Zones 1 and 2. This confirmed that the relative dominance of each species contributed most to their IV. The removal of these trees would have the most significant effect on the alteration of the natural vegetation in the mountain. Furthermore, the listed species with highest IV provided a basis on what species can be used for restoration of forest patches in MCWS.

# Intermediate and Understorey Species

Abundance and richness in the understorey species of MCWS did not have much significant difference from the trees. A total of 261 individuals belonging to 81 morpho-species were recorded. The average density was relatively higher than that of trees at 0.0725 individual/m<sup>2</sup> or seven individuals for every 100 m<sup>2</sup>. Interestingly, only three in the 10 most abundant understorey species (alahan, lanipa and mamalis) (Table 2) were included in the list of trees with highest IV. This could signify three things: 1) understorey layer is unique from the canopy layer of MCWS; 2) seedlings from dominant trees in the mountain were not able to establish successfully; and 3) the vegetation survey was conducted outside the seedfall season.

#### **Ground Cover**

A total of 20 ground species belonging to 19 families were recorded from the nine 1 m<sup>2</sup> subplots established within the 20m x 20m quadrats. Data showed that majority of the ground floor was covered by forest litter (Table 3) that inhibited growth of other species in MCWS. Hence, only few ground species were recorded and there was only one exotic species (Pseuderanthemum variabile) recorded. This was found in Q1. Malasaging (Aglaia edulis), litlit (Piper interruptum), and kamagsa (Rourea minor) were among the species with the

Table 1. Top 10 trees with highest Importance Value (IV).

| Species                                 | Common<br>Name       | Family         | Count | RD   | Rdom  | RF   | IV    |
|---|----------------------|----------------|-------|------|-------|------|-------|
| Pterocymbium tinctorium Merr.           | Taluto               | Sterculiaceae  | 8     | 3.45 | 28.83 | 2.40 | 34.68 |
| Syzygium alvarezii (C.B.Rob.) Merr.     | Alvarez<br>malaruhat | Myrtaceae      | 17    | 7.33 | 16.02 | 0.80 | 24.15 |
| Pittosporum pentandrum (Blanco) Merr.   | Mamalis              | Pittosporaceae | 9     | 3.88 | 7.20  | 4.00 | 15.07 |
| Guioa koelreuteria (Blanco) Merr.       | Alahan               | Sapindaceae    | 14    | 6.03 | 5.42  | 3.20 | 14.65 |
| Pongamia pinnata (L.) Pierre            | Bani                 | Fabaceae       | 11    | 4.74 | 6.76  | 1.60 | 13.10 |
| Barringtonia racemosa (L.) Blume ex DC. | Putat                | Lecythidaceae  | 8     | 3.45 | 3.05  | 4.80 | 11.30 |
| Neonauclea bartlingii (DC.) Merr.       | Uisak                | Rubiaceae      | 8     | 3.45 | 3.70  | 3.20 | 10.35 |
| Bischofia javanica Blume                | Tuai                 | Phyllanthaceae | 6     | 2.59 | 5.15  | 2.40 | 10.14 |
| Wendlandia glabrata DC.                 | Lanipa               | Rubiaceae      | 9     | 3.88 | 2.37  | 2.40 | 8.65  |
| Ficus variegata Blume                   | Tangisang<br>bayawak | Moraceae       | 6     | 2.59 | 2.93  | 2.40 | 7.92  |

Table 2. Ten most abundant understorey species.

| Scientific Name                       | Common Name | Family         | Abundance | Frequency |
|---------------------------------------|-------------|----------------|-----------|-----------|
| Psychotria sp. 1                      | (blank)     | Rubiaceae      | 20        | 7         |
| Lepisanthes fruticosa (Roxb.) Leenh.  | Balinaunau  | Sapindaceae    | 15        | 7         |
| Guioa koelreuteria (Blanco) Merr.     | Alahan      | Sapindaceae    | 11        | 6         |
| Severinia disticha (Blanco) Swingle   | Maladayap   | Rutaceae       | 10        | 3         |
| Tabernaemontana pandacaqui Lam.       | Pandakaki   | Apocynaceae    | 10        | 5         |
| Champereia manillana (Blume) Merr.    | Malalukban  | Opiliaceae     | 9         | 5         |
| Wendlandia glabrata DC.               | Lanipa      | Rubiaceae      | 9         | 2         |
| Pittosporum pentandrum (Blanco) Merr. | Mamalis     | Pittosporaceae | 8         | 3         |
| Heritiera sylvatica S.Vidal           | Dungon      | Malvaceae      | 7         | 3         |
| Olea borneensis Boerl.                | Kuratan     | Oleaceae       | 7         | 1         |

Table 3. Relative cover (RC) of all species recorded in 1 x 1m.

| Scientific Name                            | <b>Common Name</b> | Family         | Sum of %Cover | Relative Cover |
|--|--------------------|----------------|---------------|----------------|
| Litter                                     | _                  | _              | 5.7           | 63.3           |
| Rocks                                      | _                  | _              | 1.8           | 20             |
| Bare                                       | _                  | _              | 0.3           | 3.3            |
| <i>Aglaia edulis</i> (Roxb.) Wall.         | Malasaging         | Meliaceae      | 0.1           | 1.1            |
| <i>Arcangelisia flava</i> (L.) Merr.       | Lagtang            | Menispermaceae | 0.1           | 1.1            |
| Cinnamomum mercadoi S.Vidal                | Kalingag           | Lauraceae      | 0.1           | 1.1            |
| Microsorum longissimum Fee                 | Pakong bato        | Polypodiaceae  | 0.1           | 1.1            |
| Piper interruptum Opiz                     | Litlit             | Piperaceae     | 0.1           | 1.1            |
| Rourea minor (Gaertn.) Alston              | Kamagsa            | Connaraceae    | 0.1           | 1.1            |
| <i>Aglaia leucophylla</i> King             | Bubunaw            | Meliaceae      | 0.05          | 0.6            |
| Aporosa sphaeridiophora Merr.              | Kaliuas            | Phyllanthaceae | 0.05          | 0.6            |
| Ficus sp. 1                                | Ficus sp.          | Moraceae       | 0.05          | 0.6            |
| Garcinia dulcis (Roxb.) Kurz               | Taklang–anak       | Clusiaceae     | 0.05          | 0.6            |
| <i>Heritiera sylvatica</i> S.Vidal         | Dungon             | Malvaceae      | 0.05          | 0.6            |
| Leea guineensis G. Don                     | Mali–mali          | Vitaceae       | 0.05          | 0.6            |
| Pipturus sp. 1                             | _                  | Urticaceae     | 0.05          | 0.6            |
| Pseuderanthemum variabile (R.Br.)<br>Radlk | _                  | Acanthaceae    | 0.05          | 0.6            |
| Solanum verbascifolium L.                  | Malatalong         | Solanaceae     | 0.05          | 0.6            |
| Terminalia nitens C.Presl                  | Malagabi           | Combretaceae   | 0.05          | 0.6            |
| Champereia manillana (Blume) Merr.         | Malalukban         | Opiliaceae     | 0.03          | 0.3            |
| Flemingia strobilifera (L.) W.T.Aiton      | Payang payang      | Fabaceae       | 0.03          | 0.3            |
| Pittosporum pentandrum (Blanco) Merr.      | Mamalis            | Pittosporaceae | 0.02          | 0.2            |
| Tabernaemontana pandacaqui Lam.            | Pandakaki          | Apocynaceae    | 0.02          | 0.2            |

highest relative cover. These species were found in at least two quadrats while the rest were limited to one quadrat.

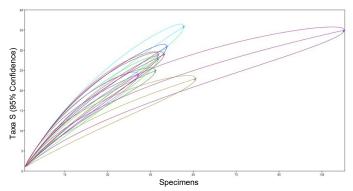
#### **Plant Diversity**

Plant diversity of MCWS varied from moderate to high. Q6, being dominated by lanipa and uisak, has the lowest value of Shannon index (2.60) while Q3 has the highest Shannon index. In Q6, only 23 species with 61 individuals were recorded. Its low Shannon index and species richness was understandable because it was characterized as an understocked forest adjacent to grassland. Whereas, highest number of species was recorded in Q3. Through an individual-based rarefaction model (Colwell et al. 2012); Walters 2004), the data shown in Table 4 was further elaborated in Figure 4. This supported the result of the computed Shannon index. If more individuals would be encountered in Q3, the number of species in this quadrat would more likely increase. Based on Simpson index, Q0 had the highest value while Q6 had the lowest. Simpson index indicates rarity of species occurring across quadrats while the Evenness index indicated how species were represented by several individuals. Q6 still has the lowest value of Evenness index. Thus, a certain species in this quadrat was over dominating and the number of individuals did not evenly represent all the species. In general, plant diversity in MCWS was very high (H–4.41) if the data would be treated collectively.

Plant diversity pattern along the altitudinal gradient has gained attention in recent decades (Aiba & Kitayama 1999; Ashton 2003; Kitayama 1992; Vázquez & Givnish 1998). Decreasing species richness at higher elevations was found to be the usual pattern of plant diversity. Linear relationship of diversity indices to elevation in MCWS is shown in **Figure 5**. The trendlines showed a negative relationship but the R<sup>2</sup> values depict weak correlation. In Mt. Ilong (Villanueva & Buot Jr. 2018), the diversity pattern was positively related to elevation where highest species richness was found at higher elevation, which was due to modification of the natural vegetation of its forest landscape. Forest degradation due to anthropogenic activities was cited as the main driver of this pattern, which was also similar in the case of the other mountains in the Philippines (Buot Jr. 2008; Buot Jr. & Okitsu 1998; Buot Jr. and Osumi 2011; Sopsop 2011).

# **Noteworthy Species**

It is important to always consider the endemism and conservation status of species that thrives in MCWS in crafting conservation policies and forest management plan. Species with restricted



**Figure 4.** Individual—based rarefaction model in quadrats surveyed in MCWS.

distribution particularly those that can only be found in MCWS and in Mindoro island, and those that are currently classified under the list of threatened species need immediate protection. This study revealed that MCWS was home to a total of 33 threatened species. Following the list of DAO 2017-11, 3 were endangered; eight were vulnerable; and 11 were other threatened species. On the other hand, IUCN listed one as critically endangered and 13 vulnerable species. Other noteworthy species in MCWS were Peristrophe cordatibractea, Cyrtochloa mindorensis, Urophyllum mindorense, and Ardisia calavitensis. These species have narrow endemism mainly due to its restricted population in MCWS. This also indicated the importance of MCWS in future taxonomic revision and nomenclatural assessment of the species where type description were based from the specimen collected in the mountain. Puyaka (A. calavitensis) was first described in 1922 based on the type specimen (A00025374) collected by Ramos (39632 Ramos) in MCWS. The species was described by Merrill (1922) as an affinity of A. pirifolia (now A. squamulosa) but could be distinguished by its longer petioles, eglandular petals and distant primary nerves. With recent taxonomic combinations and synonymy in Ardisia spp. (Ming 1999), it would be significant work to revisit the species and examine its morphological characters. Overall, there were 44 species recorded that were endemic to the Philippines, 169 native plants, and 16 exotics. It as remarkable to note that a total of 46 species were new records to MCWS.

Table 4. Diversity indices of each quadrat with details on elevation and number of species recorded.

| Quadrat | Coor         | dinates       | Elevation | No. of  | No. of      | Simpson | Shannon | Evenness |  |
|---------|--------------|---------------|-----------|---------|-------------|---------|---------|----------|--|
| Quadrat | Northing     | Easting       | (masl)    | Species | Individuals | (1–D)   | (H)     | (e^H/S)  |  |
| 0       | 13°26'57.99" | 120°25'27.40" | 208       | 29      | 48          | 0.96    | 3.24    | 0.88     |  |
| 1       | 13°27'4.63"  | 120°25'27.39" | 241       | 31      | 51          | 0.95    | 3.19    | 0.78     |  |
| 2       | 13°27'10.04" | 120°25'18.22" | 278       | 25      | 47          | 0.95    | 3.05    | 0.84     |  |
| 3       | 13°27'17.36" | 120°25'18.44" | 328       | 36      | 57          | 0.95    | 3.36    | 0.80     |  |
| 4       | 13°27'20.49" | 120°25'11.74" | 412       | 35      | 113         | 0.93    | 3.05    | 0.60     |  |
| 5       | 13°27'22.76" | 120°25'6.40"  | 491       | 28      | 48          | 0.92    | 3.00    | 0.72     |  |
| 6       | 13°27'21.40" | 120°24'57.31" | 534       | 23      | 61          | 0.88    | 2.60    | 0.58     |  |
| 7       | 13°27'23.40" | 120°24'51.93" | 589       | 29      | 50          | 0.95    | 3.22    | 0.86     |  |
| 8       | 13°27'57.99" | 120°24'44.76" | 627       | 24      | 41          | 0.94    | 2.99    | 0.83     |  |
| Overall |              |               |           | 134     | 516         | 0.98    | 4.41    | 0.61     |  |

Value interpretation for H: Very High =  $\geq$ 3.5 above, High = 3.0–3.49, Moderate = 2.5–2.99, Low = 2.0–2.49, Very Low =  $\leq$ 1.9 and below (Fernando E.S. 1998)

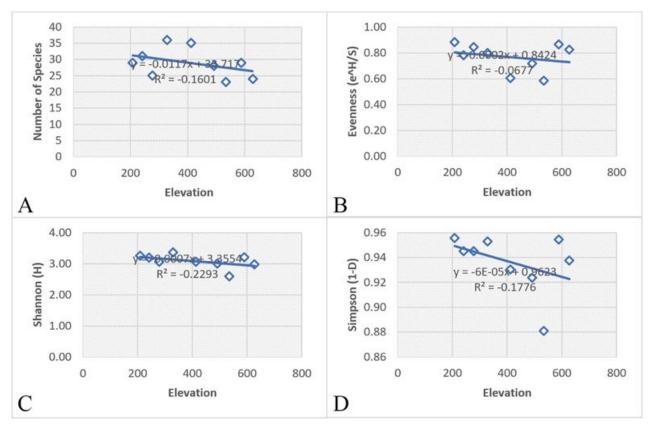


Figure 5. Linear relationship of a) number of species, b) Evenness index, c) Shannon index and d) Simpson index to elevational gradient.

#### CONCLUSION

This study provided concrete data for the conservation of MCWS. Despite past disturbances, a large number of species were still recorded. MCWS serves as home to at least 250 morpho-species of plants about 19% of which are endemic to the Philippines while 13% are threatened. It is therefore highly justified to consider MCWS as an ecologically critical area. It is imperative that PAMB and all other concerned stakeholders exert their best efforts to protect and conserve the area. One of the important findings of the study was the presence of 46 species that were new records to the area of Calavite. Though, the primary reason for this is the obvious scarcity of flora exploration in the island (except from the study of MBCFI), MCWS will now be listed as native habitat of these species. Considering the paucity of biological information in the flora of MCWS, the information incorporated in this paper should find its way into the mainstream of the science of biodiversity conservation. Results from this study should serve as guide and reference, not only for the MCWS staff but also to the general public, particularly to those involved in forest and native tree conservation.

# RECOMMENDATIONS

Similar studies should be conducted in other protected areas in the Philippines using the prescribed method of BMB on plant diversity assessment to obtain comparable data and information. Future studies in MCWS may be geared towards seed dispersal mechanism and seed shadows of dominant trees in the mountain. Results of the study provided basis for seed collections, population dynamics, and effective seedling production. Furthermore, the functional plant ecology (i.e. responses of plants to heterogenous microclimate conditions, interactions and

facilitation in plant communities, variations in the architecture of plant crowns along elevation), and forest vegetation dynamics in MCWS are also interesting to explore given the location of the mountain at the northwestern point of Mindoro island, described as a very dangerous corner due to strong monsoon winds. A detailed taxonomic work on the flora of MCWS is also recommended to enrich database on Philippine biodiversity and provide identification keys to all species.

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Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary.

| NO. | SCIENTIFIC NAME  | LOCAL<br>NAME      | FAMILY        | HISTO<br>REC<br>1 2 | RICA<br>ORD<br>3 |   | IUCN<br>2018–2 | DAO<br>2017–11 | ENDEMISM | DISTRIBUTION  |
|-----|--|--------------------|---------------|---------------------|------------------|---|----------------|----------------|----------|---|
| 1   | Peristrophe cordatibractea Merr.                             |                    | ACANTHACEAE   | √                   |                  |   | NA             |                | PE**     | MINDORO: Occidental Mindoro (Mt. Calavite)  |
| 2   | Pseuderanthemum<br>variabile (R.Br.) Radlk                   |                    | ACANTHACEAE   |                     | ✓                |   | NA             |                | EX       |   |
| 3   | Deeringia polysperma (Roxb.) Moq.                            |                    | AMARANTHACEAE |                     | ✓                |   | NA             |                | NE       | BATANES to MINDANAO and PALAWAN   |
| 4   | Buchanania<br>arborescens (Blume)<br>Blume                   | Balinsud*          | ANACARDIACEAE | ✓                   | ✓                |   | NA             |                | NE       | Throughout the PHILIPPINES  |
| 5   | Koordersiodendron pinnatum Merr.                             | Amugis             | ANACARDIACEAE | ✓                   | ✓                |   | NA             | OTS            | NE       | LUZON: Cagayan to PALAWAN and MINDANAO  |
| 6   | Mangifera altissima<br>Blanco                                | Pahotan            | ANACARDIACEAE |                     | ✓                |   | VU             | VU             | NE       | LUZON: Ilocos Sur, Cagayan, Nueva<br>Ecija, Zambales, Rizal, Laguna, Quezon,<br>Camarines, MINDORO, PALAWAN,<br>SIBUYAN.  |
| 7   | Mangifera indica L.  | Mangga             | ANACARDIACEAE | ✓                   | ✓                |   | DD             |                | EX       |   |
| 8   | Semecarpus cuneiformis Blanco                                | Ligas              | ANACARDIACEAE | ✓                   | ✓                |   | NA             |                | NE       | LUZON: Ilocos Norte, Ilocos Sur, Abra, Mountain Province, Benguet, La Union, Cagayan, Isabela, Nueva Vizcaya, Pangasinan, Zambales, Bataan, Nueva Ecija, Pampanga, Bulacan, Rizal, Laguna, Quezon, Sorsogon, MINDORO, PALAWAN, BALABAC, ROMBLON, PANAY, GUIMARAS, NEGROS, CEBU, LEYTE, MINDANAO: Zamboanga, Misamis, Davao. |
| 9   | Dasymaschalon<br>clusiflorum (Merr.) Merr.                   | Malaates           | ANNONACEAE    |                     | ✓                | ✓ | NA             |                | PE       | Luzon: Bataan (Mt Mariveles; Lamao<br>River) Camarines Sur, Benguet, Baguio,<br>BABUYAN ISLS to PALAWAN and<br>MINDANAO   |
| 10  | Goniothalamus elmeri<br>var. gitingensis                     |                    | ANNONACEAE    | ✓                   |                  | ✓ | NA             |                | PE       | SIBUYAN (Mt Giting-giting),<br>MINDANAO: Zamboanga  |
| 11  | Miliusa vidalii J.Sinclair.                                  |                    | ANNONACEAE    |                     | ✓                | ✓ | NA             |                | PE       | LUZON: Bataan, Sorsogon.  |
| 12  | Mitrephora lanotan Merr.                                     | Anolang            | ANNONACEAE    | ✓                   | ✓                |   | VU             | OTS            | PE       | LUZON: Ilocos Norte, Ilocos Sur,<br>Apayao, Pangasinan, Nueva Ecija,<br>Zambales, Bataan, Bulacan, Rizal,<br>Laguna, Quezon, POLILLO,<br>MINDORO, MINDANAO, PALAWAN   |
| 13  | Monoon oblongifolium<br>(C.B.Rob.) B.Xue &<br>R.M.K.Saunders | Lanutan            | ANNONACEAE    | ✓                   |                  | ✓ | NA             |                | PE       | LUZON: Nueva Vizcaya, Tayabas,<br>Camarines, POLILLO, NEGROS,<br>LEYTE, SAMAR, BASILAN,<br>MINDANAO   |
| 14  | Polyalthia<br>mindorensis Merr.                              | Lanutan<br>mangyan | ANNONACEAE    | ✓                   | ✓                |   | NA             |                | PE       | MINDORO   |
| 15  | Polyalthia sp.   |                    | ANNONACEAE    |                     | ✓                |   |                |                |          | AUZOV C   |
| 16  | (Roxb.) Thwattes   | Baling-manok       | ANNONACEAE    | ✓                   |                  | ✓ | NA             |                | NE       | LUZON: Cagayan to Laguna, MINDANAO: Cotabato  |
| 17  | Uvaria littoralis (Blume) Blume                              | Susung–<br>kalabau | ANNONACEAE    | ✓                   | ,                | ✓ | NA             |                | NE       | LUZON: Cagayan to PALAWAN and MINDANAO  |
| 18  | Xylopia sp. 1  Alstonia macrophylla  Wall. ex G. Don         | Batino             | ANNONACEAE    |                     | ✓<br>✓           |   | LC             |                | NE       | LUZON: Ilocos Norte, Cagayan, Isabela, Rizal, Laguna, Quezon, Batangas, Camarines, MINDORO, PALAWAN (Mt Pulgar = Thumb Peak, Irawan, Impapai Forest, Victoria Mtns, Brookes's Point), ROMBLON, PANAY, GUIMARAS, MINDANAO  |
| 20  | Alstonia scholaris (L.) R.<br>Br.                            | Dita               | APOCYNACEAE   | ✓                   | ✓                |   | LC             |                | NE       | LUZON (Cagayan) to PALAWAN and MINDANAO   |

Where: Historical record (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), Endemism (PE\*\* – known only from MCWS, PE\* – known only from Mindoro island, PE – known only from the Philippines, NE – native to the Philippines and EX – exotic, introduced), and Conservation status (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed).

Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME  | LOCAL<br>NAME       | FAMILY       | HISTORICAL<br>RECORD<br>1 2 3 4 | IUCN DAO<br>2018–2 2017–11 | ENDEMISM | DISTRIBUTION   |
|-----|--|---------------------|--------------|---------------------------------|----------------------------|----------|--|
| 21  | Ochrosia oppositifolia<br>(Lam.) K. Schum.                   |                     | APOCYNACEAE  | ,                               | NA                         | NE       | LUZON: Ilocos Norte, Ilocos Sur,<br>Cagayan, Isabela, Bataan, Rizal, Laguna,<br>Quezon, Batangas, Camarines Norte,<br>MINDORO, PALAWAN, MASBATE,<br>SIBUYAN, NEGROS, SAMAR,<br>MINDANAO: Surigao |
| 22  | Tabernaemontana<br>pandacaqui Lam.                           | Pandakaki           | APOCYNACEAE  | √<br>√ √                        | NA                         | NE       | Throughout the PHILIPPINES   |
| 23  | Voacanga globosa<br>(Blanco) Merr.                           | Bayag–usa           | APOCYNACEAE  | <b>√</b>                        | NA                         | PE       | LUZON (widespread especially along<br>the E half), POLILLO, MINDORO,<br>MASBATE, PANAY, NEGROS, CEBU,<br>BILIRAN, LEYTE, SAMAR,<br>DINAGAT and MINDANAO  |
| 24  | Aglaonema sp.  |                     | ARACEAE      | <b>√</b>                        |                            |          |  |
| 25  | Amorphophallus<br>paeoniifolius (Dennst.)<br>Nicolson        | Apong–apong         | ARACEAE      | ✓                               | LC                         | NE       |  |
| 26  | Epipremnum pinnatum (L.) Engl.                               | Tibatib             | ARACEAE      | ✓ ✓                             | NA                         | NE       | LUZON: La Union, Mountain Province,<br>Benguet, Cagayan, Isabela, Nueva<br>Vizcaya, Zambales, Bataan, Rizal,<br>Laguna, Quezon, Sorsogon, POLILLO,<br>PALAWAN, NEGROS, LEYTE,<br>MINDANAO: Davao |
| 27  | Polyscias nodosa (Blume)<br>Seem.                            | Malapapaya          | ARALIACEAE   | ✓ ✓                             | LC                         | NE       | LUZON: Benguet, Pangasinan,<br>Zambales, Bataan, Rizal, Quezon,<br>Laguna, Batangas, Sorsogon,<br>PALAWAN, LEYTE, BASILAN,<br>MINDANAO.  |
| 28  | Calamus sp.  |                     | ARECACEAE    | ✓                               |                            |          |  |
| 29  | Blumea balsamifera (L.)<br>DC.                               | Sambong             | ASTERACEAE   | <b>√</b>                        | NA                         | NE       | LUZON, MINDORO, CULION, PALAWAN, BALABAC, NEGROS, LEYTE, SAMAR, CAMIGUIN, SIARGAO, MINDANAO, BASILAN, SULU, TAWI-TAWI  |
| 30  | Blumea laciniata (Wall. ex Roxb.) DC.                        |                     | ASTERACEAE   | <b>√</b>                        | NA                         | NE       | LEYTE, LUZON, CULION,<br>BALABAC, SAMAR, SIARGAO,<br>MINDANAO.   |
| 31  | Chromolaena odorata (L)<br>R.M.King & H.Rob.                 |                     | ASTERACEAE   | , ✓                             | NA                         | EX       |  |
| 32  | Cyanthillium cinereum (L.) H.Rob.                            | Tagulinau           | ASTERACEAE   | <b>v</b><br>✓                   | NA                         | NE       | Throughout the PHILIPPINES   |
| 33  | Elephantopus tomentosus L.                                   |                     | ASTERACEAE   | <b>√</b>                        | NA                         | EX       |  |
| 34  | Mikania cordata<br>(Burm.f.) B.L.Rob.                        |                     | ASTERACEAE   | ✓                               | NA                         | EX       |  |
| 35  | Oroxylum indicum (L.)<br>Kurz                                | Pingka–<br>pinkahan | BIGNONIACEAE | ✓                               | NA                         | NE       | N LUZON: Cagayan to PALAWAN and MINDANAO   |
| 36  | Radermachera<br>quadripinnata (Blanco)<br>Seem. ssp. pinnata | Banai-banai         | BIGNONIACEAE | <b>√</b>                        | NA                         | NE       | LUZON: Cagayan to Bicol Peninsula,<br>MINDORO, NEGROS, BILIRAN,<br>LEYTE, SAMAR, CAMIGUIN,<br>MINDANAO.  |
| 37  | Cordia dichotoma<br>G.Forst.                                 | Anonang             | BORAGINACEAE | √ √                             | NA                         | NE       | Throughout the PHILIPPINES   |
| 38  | Canarium asperum Benth.                                      | Pagsahingin         | BURSERACEAE  | <b>√</b>                        | LC                         | NE       | Throughout the PHILIPPINES   |
| 39  | Canarium luzonicum<br>(Blume) A. Gray                        | Piling liitan       | BURSERACEAE  | ✓                               | VU                         | NE       | LUZON, ALABAT, MINDORO,<br>MASBATE, TICAO, BOHOL,<br>MINDANAO.   |
| 40  | Celtis luzonica Warb.  | Malaikmo            | CANNABACEAE  | <b>√</b>                        | VU                         | NE       | LUZON, MINDORO, MASBATE,<br>SAMAR, MINDANAO  |

**Historical record** (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), **Endemism** (PE\*\* – known only from MCWS, PE\* – known only from Mindoro island, PE – known only from the Philippines, NE – native to the Philippines and EX – exotic, introduced), and **Conservation status** (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed). Where:

Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME  | LOCAL<br>NAME     | orded in Mt. Calavite W FAMILY | HISTORIC<br>RECORI | ΑL | IUCN | DAO<br>2 2017–11 | ENDEMISM | DISTRIBUTION  |
|-----|--|-------------------|--------------------------------|--------------------|----|------|------------------|----------|---|
| 41  | Celtis philippensis Blanco                               | Magabuyo          | CANNABACEAE                    | 1 2 3              | 4  | LC   | 2 2017-11        | NE       | N LUZON to MINDANAO and PALAWAN.  |
| 42  | Capparis micracantha A.DC.                               | Bayabas–uak       | CAPPARACEAE                    | ·<br>✓             |    | NA   |                  | NE       | N LUZON to MINDANAO.  |
| 43  | Euonymus indicus B.<br>Heyne ex Wall.                    | Malasanki         | CELASTRACEAE                   | ✓                  |    | LC   |                  | NE       | LUZON: Nueva Ecija, Bataan, Rizal,<br>Laguna, Quezon, Camarines,<br>Sorsogon, ALABAT, MINDORO,<br>PANAY, NEGROS, LEYTE,<br>SAMAR, CAMIGUIN, BASILAN,<br>MINDANAO            |
| 44  | Maranthes corymbosa<br>Blume                             | Liusin            | CHRYSOBALANACEAE               | ✓                  | ✓  | LC   |                  | NE       | PALAWAN   |
| 45  | Garcinia binucao<br>(Blanco) Choisy                      | Binukau           | CLUSIACEAE                     | ✓                  |    | NA   |                  | NE       | LUZON: Cagayan to Sorsogon,<br>MINDORO, BURIAS, PANAY,<br>GUIMARAS, NEGROS  |
| 46  | Garcinia dulcis (Roxb.)<br>Kurz                          | Taklang–anak      | CLUSIACEAE                     | ✓                  | ✓  | NA   |                  | NE       | LUZON: Cagayan to Sorsogon,<br>PALAWAN, BALABAC and<br>MINDANAO   |
| 47  | Garcinia rubra Merr.                                     | Kamandiis         | CLUSIACEAE                     | ✓                  |    | NA   |                  | PE       | LUZON: Apayao, Cagayan, Isabela,<br>Rizal, Quezon, Laguna, Camarines,<br>Sorsogon, MINDORO,<br>CATANDUANES, LEYTE, SAMAR,<br>CAMIGUIN, MINDANAO,<br>BASILAN.                |
| 48  | Terminalia calamansanay<br>(Blanco) Rolfe                | Mala-kalumpit     | COMBRETACEAE                   | ✓                  |    | NA   |                  | NE       | Throughout the PHILIPPINES  |
| 49  | Terminalia catappa L.                                    | Talisai           | COMBRETACEAE                   | ✓                  |    | NA   |                  | NE       | Throughout the PHILIPPINES  |
| 50  | Terminalia nitens C.Presl                                | Malagabi          | COMBRETACEAE                   | ✓                  |    | NA   |                  | NE       | LUZON to PALAWAN and MINDANAO   |
| 51  | Rourea minor (Gaertn.)<br>Alston                         | Kamagsa           | CONNARACEAE                    | ✓                  |    | NA   |                  | NE       | N to C LUZON: Cagayan to Laguna,<br>Camarines, LUBANG, MINDORO,<br>PALAWAN, CUYO, BANTAYAN,<br>PANAY, LEYTE, MINDANAO:<br>Agusan.   |
| 52  | Merremia tridentata (L.)<br>Hallier f.                   |                   | CONVOLVULACEAE                 | ✓                  |    | NA   |                  | NE       | Throughout the PHILIPPINES  |
| 53  | Alangium javanicum (Blume) Wangerin                      | Putian            | CORNACEAE                      | ✓                  |    | LC   |                  | NE       | LUZON: Cagayan to Sorsogon,<br>POLILLO, MINDORO, PANAY,<br>MINDANAO.  |
| 54  | Caldcluvia celebica<br>(Blume) Hoogland                  | Bognag            | CUNONIACEAE                    | ✓                  |    | NA   |                  | NE       | LUZON to MINDANAO   |
| 55  | Fimbristylis dichotoma (L.) Vahl                         |                   | CYPERACEAE                     | ✓                  |    | LC   |                  | NE       | Throughout the PHILIPPINES  |
| 56  | Pteridium aquilinum (L.)<br>Kuhn                         |                   | DENNSTAEDTIACEAE               | ✓                  |    | LC   |                  | NE       |   |
| 57  | Hopea acuminata Merr.                                    | Mangga-<br>chapui | DIPTEROCARPACEAE               | <b>√</b>           |    | CR   | EN               | PE       | BABUYAN ISLS: Calayan, LUZON,<br>MINDORO, SAMAR, LEYTE,<br>MINDANAO: Zamboanga, Misamis,<br>Cotabato, Davao   |
| 60  | Diospyros discolor Willd.                                | Kamagong          | EBENACEAE                      | ✓                  |    | NA   | VU               | NE       | BATAN, N LUZON to PALAWAN   |
| 61  | Diospyros kurzii Hiern                                   |                   | EBENACEAE                      | ✓                  | ✓  | NA   | OTS              | NE       | PALAWAN (Mt Pulgar, Bacungan,<br>Aborlan)   |
| 62  | Elaeocarpus calomala<br>(Blanco) Merr.<br>var.postulatus | Maglumboi         | ELAEOCARPACEAE                 | ✓                  |    | NA   |                  | PE       | LUZON: Nueva Ecija, Aurora,<br>Laguna, Sorsogon, MINDORO:<br>Mindoro Oriental (Mt Halcon),<br>SIBUYAN (Mt Giting-giting),<br>CAMIGUIN, MINDANAO:<br>Bukidnon (Mt Kitanglad) |

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Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME                                      | LOCAL<br>NAME     | FAMILY        | HISTO<br>REC<br>1 2 | RIC.<br>ORE<br>3 |          | IUCN DAO<br>2018–2 2017–1 | ENDEMISM | DISTRIBUTION   |
|-----|--|-------------------|---------------|---------------------|------------------|----------|---------------------------|----------|--|
| 63  | Blumeodendron tokbrai<br>(Blume) Kurz                |                   | EUPHORBIACEAE |                     | ✓                | <b>√</b> | NA                        | NE       | LUZON: Bataan and Quezon   |
| 64  | Cleidion javanicum Blume                             | Santiki           | EUPHORBIACEAE |                     | <b>√</b>         | •        | LC                        | NE       | NORTH LUZON to PALAWAN and MINDANAO  |
| 65  | Macaranga bicolor Mull–Arg.                          | Binunga           | EUPHORBIACEAE | ✓                   |                  |          | VU                        | PE       | LUZON: Cagayan, Isabela, Apayao,<br>Nueva Vizcaya, Bulacan, Bataan,<br>Quezon, Laguna, Camarines, Sorsogon,<br>POLILLO, MINDORO, PANAY,<br>BILIRAN, LEYTE, SAMAR,<br>SIBUYAN, MINDANAO.  |
| 66  | Macaranga tanarius (L.)<br>Mull. Arg.                | Binunga           | EUPHORBIACEAE | ✓                   | ✓                |          | NA                        | NE       | Throughout the PHILIPPINES   |
| 67  | Mallotus cumingii<br>Muell.Arg.                      | Apanang           | EUPHORBIACEAE |                     | ✓                |          | LC                        | NE       | LUZON (Cagayan to Sorsogon),<br>MINDORO, MASBATE, PANAY,<br>NEGROS, CEBU, LEYTE, SAMAR,<br>MINDANAO  |
| 68  | Mallotus philippensis (Lamk) Muell.Arg.              | Banato            | EUPHORBIACEAE |                     | ✓                |          | NA                        | NE       | Throughout the PHILIPPINES   |
| 69  | Alysicarpus vaginalis (L.) DC.                       |                   | FABACEAE      | ✓                   |                  |          | NA                        | NE       | Throughout the PHILIPPINES   |
| 70  | Archidendron clypearia (Jack) I.C.Nielsen var. casai | Barokmok*         | FABACEAE      | ✓                   |                  |          | NA                        | NE       | BATANES, LUZON (throughout),<br>MINDORO, PALAWAN, LEYTE,<br>CAMIGUIN, MINDANAO.  |
| 71  | Crotalaria albida Roth                               |                   | FABACEAE      | ✓                   |                  | ✓        | LC                        | NE       | PHILIPPINES. LUZON: Cagayan to Batangas, CULION  |
| 72  | Cynometra iripa Kostel.                              | Nanot             | FABACEAE      |                     | ✓                | ✓        | LC                        | NE       | TABLAS, PANAY, MINDANAO.   |
| 73  | Desmodium triflorum (L.) DC.                         | Pakpak–<br>langau | FABACEAE      | ✓                   |                  |          | LC                        | NE       | Throughout the PHILIPPINES   |
| 74  | Flemingia strobilifera (L.) W.T.Aiton                | Payang<br>payang  | FABACEAE      |                     | ✓                |          | NA                        | NE       | Throughout the PHILIPPINES   |
| 75  | <i>Intsia bijuga</i> (Colebr.)<br>Kuntze             | Ipil              | FABACEAE      | ✓                   | ✓                |          | VU                        | NE       | Throughout the PHILIPPINES   |
| 76  | Millettia ahernii Merr. & Rolfe                      | Balok             | FABACEAE      | ✓                   |                  | ✓        | NA                        | PE       | LUZON: Ilocos Norte, Ilocos Sur,<br>Cagayan, Zambales, Rizal, Cavite,<br>Quezon  |
| 77  | Mimosa pudica L.                                     | Makahiya          | FABACEAE      | ✓                   |                  |          | LC                        | EX       |  |
| 78  | Pongamia pinnata (L.)<br>Pierre                      | Bani              | FABACEAE      | ✓                   | ✓                |          | LC                        | NE       | Throughout the PHILIPPINES   |
| 79  | Strongylodon<br>macrobotrys A. Gray                  | Tayabak           | FABACEAE      | ,                   |                  |          | NA EN                     | PE       | LUZON: Benguet (Baguio), Cagayan (Baguio Cove; Peñablanca), Aurora (Casiguran), Bataan (Lamao River), Rizal (Mt Irid), Laguna (Mt Makiling; Paete–Piapi), Cavite, Quezon (Mt Binuang; Lucban; Guinayangan; Sampaloc; Kabibihan), Sorsogon (Mt Bulusan), CATANDUANES, MINDORO: Mindoro Occidental (Mt Calavite), Mindoro Oriental (Baco River Mansalay, Mt Yagaw) |
| 80  | Wallaceodendron<br>celebicum Koord.                  | Banuyo            | FABACEAE      | <b>√</b>            | ✓                | ✓        | NA VU                     | NE       | PHILIPPINES. BABUYAN ISLS<br>(CAMIGUIN), LUZON: Benguet<br>(Baguio), Cagayan, Isabela, Aurora,<br>Quezon, Camarines, BURIAS,<br>MASBATE, NEGROS, CEBU,<br>SAMAR.   |
| 81  | Clerodendrum<br>mindorense Merr.                     | Bagab*            | LAMIACEAE     |                     | ✓                |          | NA                        | PE       | LUZON: Mountain Province,<br>MINDORO: Mindoro Oriental   |
| 82  | Hyptis brevipes Poit.                                | Niog-niogan       | LAMIACEAE     | ✓                   |                  |          | NA                        | EX       |  |
| 83  | Hyptis spicigera Lam.                                |                   | LAMIACEAE     | ✓                   |                  |          | NA                        | EX       |  |

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Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| App | chaix 1. Summary of al                            | x 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (C HISTORICAL HIGH |               |            |   |   | ,              |     |          |  |
|-----|---|--|---------------|------------|---|---|----------------|-----|----------|--|
| NO. | SCIENTIFIC NAME                                   | LOCAL<br>NAME  | FAMILY        | REC<br>1 2 |   |   | IUCN<br>2018–2 |     | ENDEMISM | DISTRIBUTION   |
| 84  | Premna cumingiana<br>Schauer                      | Magilig  | LAMIACEAE     | ✓          |   |   | LC             |     | NE       | Throughout the PHILIPPINES   |
| 85  | Premna odorata Blanco                             | Alagau   | LAMIACEAE     |            | ✓ |   | LC             |     | NE       | Throughout the PHILIPPINES   |
| 86  | Teijsmanniodendron<br>ahernianum (Merr.)<br>Bakh. | Dangula  | LAMIACEAE     |            | ✓ | ✓ | LC             |     | NE       | BABUYAN ISLS, LUZON: Pangasinan,<br>Cagayan, Isabela, Zambales, Laguna,<br>Quezon, Camarines, Albay, Sorsogon,<br>LUBANG, SIBUYAN, PANAY,<br>NEGROS, LEYTE, SAMAR,<br>MINDANAO: Zamboanga, Davao,<br>Agusan, Surigao)                  |
| 87  | Vitex parviflora A.Juss.                          | Molave   | LAMIACEAE     | ✓          | ✓ |   | VU             | EN  | NE       | Throughout the PHILIPPINES   |
| 88  | Actinodaphne tayabensis<br>(Elmer) Merr.          | Gibuaya  | LAURACEAE     |            | ✓ |   | NA             |     | PE       | LUZON: Laguna, Quezon (Mt<br>Banahaw), Sorsogon (Mt Bulusan),<br>MINDORO, NEGROS, MINDANAO:<br>Davao, Surigao  |
| 89  | Beilschmiedia glomerata<br>Merr.                  | Tirukan  | LAURACEAE     |            | ✓ | ✓ | NA             |     | NE       | LUZON: Ilocos Sur, Bataan, Laguna  |
| 90  | Cinnamomum mercadoi<br>S.Vidal                    | Kalingag   | LAURACEAE     |            | ✓ |   | VU             | OTS | PE       | BABUYAN ISLS and N LUZON to MINDANAO.  |
| 91  | Cryptocarya acuminata<br>Merr.                    | Karaskas*  | LAURACEAE     |            | ✓ |   | NA             |     | PE       | LUZON: Isabela, Pampanga,<br>MINDORO: Mt Halcon  |
| 92  | Cryptocarya oblongata<br>Merr.                    | Purihan  | LAURACEAE     | ✓          |   | ✓ | NA             |     | PE       | LUZON: Aurora, Laguna  |
| 93  | Cyrptocarya glauca<br>Merr.                       | Baliglarin   | LAURACEAE     | ✓          |   | ✓ | NA             |     | NE       | LUZON: Bataan, Pampanga, Rizal,<br>Laguna, Quezon, SIBUYAN,<br>MINDANAO: Zamboanga   |
| 94  | Litsea anomala Merr.                              | Mapipi   | LAURACEAE     |            | ✓ | ✓ | NA             |     | PE       | LUZON: Sorsogon  |
| 95  | Litsea fulva (Blume)<br>Villar                    | Limbahan   | LAURACEAE     |            | ✓ |   | NA             |     | NE       | LUZON: Ilocos Norte, Pangasinan,<br>Nueva Ecija, Zambales, Bataan, Rizal,<br>Laguna, Batangas, Sorsogon,<br>MINDORO, SIBUYAN, PALAWAN,<br>NEGROS, LEYTE, MINDANAO  |
| 96  | Litsea glutinosa (Lour.)<br>C.B. Rob.             | Sablot   | LAURACEAE     |            | ✓ |   | NA             |     | NE       | Cagayan, Isabela, Laguna, Quezon,<br>Camarines, Albay, Sorsogon,<br>MINDORO, LEYTE, SAMAR,<br>MINDANAO: Cotabato, Davao, Agusan<br>del Norte India to S China through<br>Malesia to tropical Australia. Throughout<br>the PHILIPPINES, |
| 97  | Litsea luzonica (Blume)<br>FernVillar             | Malasiko   | LAURACEAE     |            | ✓ |   | NA             |     | PE       | N LUZON to PALAWAN and<br>MINDANAO, in most or all islands and<br>provinces.   |
| 98  | Litsea sp.  |  | LAURACEAE     |            | ✓ |   |                |     |          |  |
| 99  | Litsea varians (Blume)<br>Boerl.                  |  | LAURACEAE     |            | ✓ | ✓ | NA             | OTS | NE       | PALAWAN, LEYTE   |
| 100 | Barringtonia racemosa (L.) Blume ex DC.           | Putat  | LECYTHIDACEAE | ✓          | ✓ |   | NA             |     | NE       | Throughout the PHILIPPINES   |
| 101 | Lygodium circinatum (Burm. f.) Sw.                |  | LYGODIACEAE   | ✓          |   |   | NA             |     | NE       | Throughout the PHILIPPINES   |
| 102 | Lygodium japonicum (Thunb.) Sw.                   |  | LYGODIACEAE   | ✓          |   |   | NA             |     | NE       | Throughout the PHILIPPINES   |
| 103 | Lagerstroemia speciosa (L.) Pers.                 | Banaba   | LYTHRACEAE    |            | ✓ |   | NA             |     | NE       | LUZON, MINDORO, PALAWAN,<br>LEYTE, MINDANAO, SAMAR   |
| 104 | Magnolia liliifera Baill.                         | Anobling   | MAGNOLIACEAE  | ✓          |   |   | LC             |     | NE       | CAMIGUIN DE BABUYANES,<br>DALUPIRI, LUZON, MINDORO:<br>Paluan (Mt. Calavite) BUSUANGA,<br>PALAWAN, PANAY: Capiz, NEGROS,<br>SAMAR, TAWI-TAWI   |

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| NO. | SCIENTIFIC NAME                             | LOCAL<br>NAME     | FAMILY          | HISTO<br>REC<br>1 2 |   |   | IUCN<br>2018–2 | DAO<br>2017–11 | ENDEMISM | DISTRIBUTION  |
|-----|---|-------------------|-----------------|---------------------|---|---|----------------|----------------|----------|---|
| 105 | Heritiera sylvatica<br>S.Vidal              | Dungon            | MALVACEAE       | ✓                   |   |   | NA             |                | NE       | LUZON (Cagayan to Albay),<br>MINDORO, MASBATE, PANAY,<br>SAMAR  |
| 58  | Pterospermum<br>diversifolium Blume         | Bayok             | MALVACEAE       | ✓                   | ✓ |   | NA             |                | NE       | LUZON: Cagayan to Camarines,<br>MINDORO, PALAWAN, TICAO,<br>MASBATE, GUIMARAS, NEGROS,<br>MINDANAO, BASILAN   |
| 59  | Pterospermum niveum<br>S.Vidal              | Bayok-<br>bayokan | MALVACEAE       |                     | ✓ |   | NA             |                | NE       | LUZON: Abra, Cagayan to Camarines,<br>CATANDUANES, MINDORO,<br>MINDANAO: Zamboanga, Misamis,<br>Cotabato, Agusan  |
| 106 | Pterospermum obliquum<br>Blanco             |                   | MALVACEAE       | ✓                   |   |   | LC             |                | NE       | LUZON: Ilocos Norte, Ilocos Sur,<br>Mountain Province, Benguet, La Union,<br>Cagayan, Nueva Ecija, Zambales.<br>Pampanga, Bataan, Bulacan, Rizal,<br>Laguna, Quezon, MINDORO,<br>PALAWAN, BURIAS, GUIMARAS,<br>SAMAR, MINDANAO: Zamboanga   |
| 107 | Sida rhombifolia L.                         | Eskobang-<br>haba | MALVACEAE       | ✓                   |   |   | NA             |                | NE       | Throughout the PHILIPPINES  |
| 108 | Sterculia oblongata R.<br>Br.               | Banilad           | MALVACEAE       |                     | ✓ |   | NA             |                | NE       | BATAN, BABUYAN ISLS, LUZON<br>(Cagayan to Sorsogon), MINDORO,<br>BUSUANGA, CULION, NEGROS,<br>LEYTE, SAMAR, MINDANAO: Lanao   |
| 109 | Memecylon paniculatum<br>Jack               | Kulis             | MELASTOMATACEAE |                     | ✓ |   | NA             |                | NE       | LUZON: Cagayan, Isabela, Nueva<br>Vizcaya, Zambales, Bataan, Bulacan,<br>Rizal, Laguna, Quezon, Batangas,<br>Camarines, POLILLO, MINDORO,<br>PALAWAN, BALABAC, NEGROS,<br>LEYTE, SIARGAO, MINDANAO:<br>Agusan, Surigao  |
| 110 | Aglaia cumingiana Turcz                     | Alauihau          | MELIACEAE       |                     | ✓ | ✓ | VU             | OTS            | NE       | LUZON: Ilocos Norte, Benguet,<br>Cagayan, Isabela (Palanan), Nueva<br>Vizcaya, Pangasinan, Nueva Ecija,<br>Bulacan, Rizal, BANCALAN, PANAY,<br>NEGROS, MINDANAO: Davao (Mt<br>Apo, Todaya)  |
| 111 | Aglaia edulis (Roxb.)<br>Wall.              | Malasaging        | MELIACEAE       |                     | ✓ |   | NT             | OTS            | NE       | LUZON: Cagayan to Sorsogon,<br>MINDORO, MASBATE, BURIAS,<br>NEGROS, LEYTE, SAMAR,<br>MINDANAO: Davao del Sur (Mt Apo),<br>BASILAN   |
| 112 | Aglaia elliptica (C.DC.)<br>Blume           | Salaking pula     | MELIACEAE       |                     | ✓ |   | LC             |                | NE       | LUZON: Cagayan, Isabela (Palanan), Aurora (Mt Dingalan), Quezon (Mt Tulaog, Mt Binuang, Mt Banahaw), Bataan (Lamao), Bulacan, Rizal, Laguna (Mt Makiling), Sorsogon (Mt Bulusan), CATANDUANES, MINDORO, PALAWAN (Victoria Peak, Addison Peak), PANAY, GUIMARAS, NEGROS: Negros Oriental (Cuernos Mtns), LEYTE (Dagami, Mt Ibuni), MINDANAO: Agusan del Norte (Mt Urdaneta), Davao del Sur (Mt Apo), BASILAN |
| 113 | Aglaia leucophylla King                     | Bubunaw           | MELIACEAE       |                     | ✓ | ✓ | NT             |                | NE       | BASILAN, MALAMAUI,<br>MINDANAO: Lanao, Davao, Agusan<br>del Norte   |
| 114 | Aglaia luzoniensis (Vidal)<br>Merr. & Rolfe | 1                 | MELIACEAE       |                     | ✓ | ✓ | NT             |                | NE       | LUZON: Cagayan to Sorsogon,<br>southward to PALAWAN and<br>MINDANAO   |

Historical record (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), Endemism (PE\*\* – known only from MCWS, PE\* – known only from billippines, NE – native to the Philippines and EX – exotic, introduced), and Conservation status (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed). Where:

Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME                             | LOCAL<br>NAME | FAMILY         | HISTORICAL<br>RECORD | IUCN<br>2018–2 2 | DAO END | EMISM | DISTRIBUTION  |
|-----|---|---------------|----------------|----------------------|------------------|---------|-------|---|
| 115 | Aglaia rimosa (Blanco)<br>Merr.             | Bayanti       | MELIACEAE      | ✓                    | NT               |         | NE    | BATAN, BABUYAN ISLS, LUZON: Ilocos Norte, Benguet, Pangasinan, Cagayan, Isabela, Nueva Vizcaya, Aurora, Nueva Ecija, Bataan, Rizal, Laguna, Quezon, Cavite, Batangas, Camarines, Albay, Sorsogon, ALABAT, MINDORO, PALAWAN, ROMBLON, SIBUYAN, TICAO, PANAY, GUIMARAS, NEGROS, SIBUTU, MINDANAO (Davao, Agusan)  |
| 116 | Aphanamixis polystachya<br>(Wall.) R.Parker | Salakin       | MELIACEAE      | <b>√</b>             | NT               | OTS     | NE    | LUZON: Ilocos Norte, Benguet (Sablan), Cagayan, Isabela, Pampanga (Mt Pinatubo), Bataan (Lamao), Laguna (Mt Makiling), Sorsogon (Mt Pocdal), POLILLO, MINDORO, PALAWAN (Irawan), LEYTE, SAMAR, BASILAN, MINDANAO: Davao del Sur (Mt Apo, Todaya), Agusan del Norte (Mt Urdaneta), Surigao. In primary forests, usually at low and medium elevation, ascending to 1220m. |
| 117 | Chisocheton cumingianus<br>(C.DC.) Harms    | Balukanag     | MELIACEAE      | ✓ ✓                  | NA               |         | NE    | LUZON: Benguet, Cagayan, Isabela to<br>Albay, Sorsogon, CATANDUANES,<br>PALAWAN, CEBU, LEYTE, SAMAR,<br>CAMIGUIN, MINDANAO  |
| 118 | Chisocheton pentandrus<br>(Blanco) Merr.    | Anablog*      | MELIACEAE      | <b>√</b> √           | LC               |         | NE    | BABUYAN ISLS, LUZON<br>(widespread), MINDORO,<br>MASBATE, PANAY, NEGROS,<br>LEYTE, SAMAR, MINDANAO.   |
| 119 | Dysoxylum arborescens (Blume) Miq.          | Kalimutain    | MELIACEAE      | ✓                    | NA               |         | NE    | N LUZON to PALAWAN,<br>MINDANAO and SULU<br>ARCHIPELAGO.  |
| 120 | Sandoricum koetjape<br>(Burm.f.) Merr.      | Santol        | MELIACEAE      | ✓                    | LC               |         | NE    | LUZON: Nueva Vizcaya, Zambales,<br>Nueva Ecija, Aurora, Bataan, Rizal,<br>Laguna, Camarines, Sorsogon,<br>MINDORO, PALAWAN, NEGROS,<br>SAMAR, MINDANAO  |
| 121 | Arcangelisia flava (L.)<br>Merr.            | Lagtang       | MENISPERMACEAE | <b>√</b>             | NA               |         | NE    | BATANES to PALAWAN and MINDANAO   |
| 122 | Artocarpus blancoi (Elmer) Merr.            | Antipolo      | MORACEAE       | ✓ ✓                  | VU               |         | PE    | BATAN, LUZON, MINDORO,<br>PALAWAN, NEGROS, CEBU,<br>MINDANAO.   |
| 123 | Artocarpus heterophyllus<br>Lam.            | Nangka        | MORACEAE       | ✓                    | NA               |         | EX    |   |
| 124 | Artocarpus nitidus Trecul                   | Kubi          | MORACEAE       | ✓ ✓                  | NA               |         | NE    | LUZON: Ilocos Norte (Burgos), Abra,<br>Pangasinan, Bataan (Lamao), Laguna<br>(Mt Makiling; Calauan), Cavite<br>(Maragondon), Batangas (Balayan;<br>Lobo), Albay, TABLAS, PANAY: Iloilo<br>(Miag-ao), GUIMARAS (Buenavista,<br>Barrio Salvacion, Sitio Lande), CEBU  |

Where: **Historical record** (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), **Endemism** (PE\*\* – known only from MCWS, PE\* – known only from Mindoro island, PE – known only from the Philippines, NE – native to the Philippines and EX – exotic, introduced), and **Conservation status** (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed).

Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME  | LOCAL<br>NAME        | FAMILY       | HISTO<br>REC<br>1 2 |   | ) | IUCN DAO<br>2018–2 2017–11 | ENDEMISM | DISTRIBUTION   |
|-----|--|----------------------|--------------|---------------------|---|---|----------------------------|----------|--|
| 125 | Artocarpus ovatus Blanco                                   | Anubing              | MORACEAE     |                     | ✓ |   | NA                         | PE       | LUZON: Abra (Manabo), Kalinga (Lubuagan), Benguet, Isabela (San Mariano), Nueva Vizcaya (near Dupax), Nueva Ecija, Zambales (Mt Pinatubo), Bataan (Lamao), Pampanga, Bulacan (Angat), Rizal (Mt Angilog, Montalban, Antipolo, Bosoboso), Laguna (Los Baños, Mt Makiling, Sta Maria, Mabitac), Quezon (Laguimanoc = Padre Burgos, Lucban), Camarines Sur (Mt Bagacay, Mt Isarog), Sorsogon (Mt Bulusan), CATANDUANES, MINDORO: Mindoro Oriental (Mansalay, Manaul & Mt Yagaw), PALAWAN (Irawan), BALABAC (Cape Melville), MARINDUQUE, SIBUYAN (Mt Giting-giting), MASBATE, TICAO, PANAY: Iloilo, NEGROS: Negros Occidental (Danao; Cadiz), Negros Oriental (Cuernos Mtns), CEBU |
| 126 | Ficus callosa Willd.                                       | Kalukoi              | MORACEAE     |                     | ✓ |   | NA                         | NE       | Throughout the PHILIPPINES   |
| 127 | Ficus gul Lauterb. & K. Schum                              | Butli                | MORACEAE     |                     | ✓ |   | LC                         | NE       | Throughout the PHILIPPINES except PALAWAN  |
| 128 | Ficus linearifolia Elmer                                   | Basikong<br>kalawang | MORACEAE     |                     | ✓ | ✓ | NA                         | PE       | LUZON, NEGROS, LEYTE   |
| 129 | Ficus nota (Blanco)<br>Merr.                               | Tibig                | MORACEAE     | ✓                   | ✓ |   | NA                         | NE       | Throughout the PHILIPPINES   |
| 130 | Ficus ruficaulis Merr.                                     | Tabgun               | MORACEAE     |                     | ✓ | ✓ | NA                         | NE       | LUZON, MINDANAO  |
| 131 | Ficus septica Burm. f.                                     | Hauili               | MORACEAE     | ✓                   | ✓ |   | NA                         | NE       | Throughout the PHILIPPINES   |
| 132 | Ficus sp. 1  |                      | MORACEAE     |                     | ✓ |   |                            |          |  |
| 133 | Ficus variegata Blume                                      | Tangisang<br>bayawak | MORACEAE     |                     | ✓ |   | NA                         | NE       | Throughout the PHILIPPINES   |
| 134 | Endocomia<br>macrocoma (Miq.)<br>W.J.de Wilde ssp. prainii | Yabnob               | MYRISTICACAE | ✓                   |   |   | NA                         | NE       | LUZON (Quezon, Camarines provinces),<br>MINDORO, PANAY, SAMAR,<br>LEYTE, CAMIGUIN DE MINDANAO  |
| 135 | Myristica glomerata<br>(Blanco) Kudo & Masam.              | Tambalau             | MYRISTICACAE | <b>✓</b>            |   |   | NA                         | NE       | BATAN, BABUYAN ISLS (CALAYAN, CAMIGUIN), LUZON: Ilocos Norte, Apayao, Benguet, Cagayan, Isabela, Nueva Vizcaya, Aurora, Nueva Ecija, Tarlac, Zambales, Bataan, Rizal, Cavite, Laguna, Batangas, Quezon, Camarines Norte, Camarines Sur, Albay, Sorsogon, POLILLO, ALABAT, CATANDUANES, MINDORO, PALAWAN, MARINDUQUE, SIBUYAN, TICAO, PANAY: Capiz, Aklan, Iloilo, GUIMARAS, NEGROS, CEBU, BILIRAN, LEYTE, SAMAR (Catarman, Mt Cansayao), TAWI-TAWI., BASILAN, MINDANAO: Zamboanga del Norte, Zamboanga del Sur, Lanao del Sur (Camp Keithley), Cotabato (Carmen), Davao del Sur (Mt Apo; Sta Cruz), Davao Oriental (Mati), Agusan del Norte, Surigao del Norte                 |

Historical record (1 — Recorded by Merrill, 1923–1926; 2 — MBCF1, 2014; 3 — this study; 4 — new record to the island of Mindoro), Endemism (PE\*\*-known only from MCWS, PE\* — known only from Mndoro island, PE — known only from the Philippines, NE — native to the Philippines and EX — exotic, introduced), and Conservation status (OTS — Other Threatened Species, VU — Vulnerable, EN — Endangered, CR — Critically Endangered, LC — Least Concern, NT — Near Threatened, DD — Data Deficient and NA — Not Assessed). Where:

Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| zhh | Chaix 1. Summary Of al                            |                      | orded in Mt. Calavite W | HISTO |     |   |                | ,              |          |   |
|-----|---|----------------------|-------------------------|-------|-----|---|----------------|----------------|----------|---|
| NO. | SCIENTIFIC NAME                                   | LOCAL<br>NAME        | FAMILY                  |       | ORD |   | IUCN<br>2018–2 | DAO<br>2017–11 | ENDEMISM | DISTRIBUTION  |
| 136 | Myristica philippinensis<br>Gand*                 | Talang-<br>bundok    | MYRISTICACAE            | ✓     | ✓   |   | LC             | OTS            | NE       | Throughout the PHILIPPINES except PALAWAN   |
| 137 | Decaspermum fruticosum J.R.Forst. & G.Forst.      | Patalsik             | MYRTACEAE               |       | ✓   |   | NA             |                | NE       | Throughout the PHILIPPINES  |
| 138 | Psidium guajava L.                                | Bayabas              | MYRTACEAE               | ✓     |     |   | NA             |                | EX       |   |
| 139 | Syzgyium mananquil (Blanco) Merr.                 | Manangkil            | MYRTACEAE               |       | ✓   |   | NA             |                | PE       | LUZON (Cagayan to Sorsogon),<br>MINDORO, LEYTE, MINDANAO  |
| 140 | Syzygium alvarezii<br>(C.B.Rob.) Merr.            | Alvarez<br>malaruhat | MYRTACEAE               |       | ✓   |   | NA             |                | PE       | LUZON: Mountain Province, Benguet,<br>Nueva Vizcaya, Nueva Ecija, Laguna,<br>MINDORO, PANAY   |
| 141 | Syzygium hughcumingii<br>Merr.*                   | Duhat                | MYRTACEAE               | ✓     |     | ✓ | NA             |                | PE       | LUZON: Laguna, Quezon,<br>Camarines Sur   |
| 142 | Syzygium lineatum (DC.)<br>Merr. & L.M. Perry     | Lubeg                | MYRTACEAE               | ✓     | ✓   |   | NA             |                | NE       | Throughout the PHILIPPINES  |
| 143 | Syzygium<br>phanerophlebium<br>(C.B.Rob.) Merr.   | Malayambo            | MYRTACEAE               |       | ✓   |   | NA             |                | PE       | LUZON: Cagayan, Aurora, Nueva<br>Ecija, Rizal, Laguna, Sorsogon,<br>MINDORO, BILIRAN, LEYTE,<br>SAMAR, MINDANAO   |
| 144 | Syzygium sp. 1                                    |                      | MYRTACEAE               |       | ✓   |   |                |                |          |   |
| 145 | Syzygium sp. 2                                    |                      | MYRTACEAE               |       | ✓   |   |                |                |          |   |
| 146 | Pisonia umbellifera (J.R. Forst & G. Forst) Seem. | Anuling              | NYCTAGINACEAE           |       | ✓   |   | NA             |                | NE       | Throughout the PHILIPPINES  |
| 147 | Strombosia<br>philippinensis S.Vidal              | Tamayuan             | OLACACEAE               |       | ✓   |   | NA             |                | NE       | LUZON, MINDORO, SIBUYAN,<br>CATANDUANES, LEYTE,<br>MINDANAO, BASILAN  |
| 148 | Olea borneensis Boerl.                            | Kuratan              | OLEACEAE                |       | ✓   |   | NA             |                | NE       | LUZON: Ilocos Norte, Isabela,<br>Cagayan, Zambales, Bataan,<br>Pampanga, Rizal, Laguna, Batangas,<br>Camarines, MINDORO, PALAWAN,<br>GUIMARAS, SIBUYAN,<br>MINDANAO: Agusan, Lanao del<br>Norte   |
| 149 | Champereia manillana (Blume) Merr.                | Malalukban           | OPILIACEAE              |       | ✓   |   | NA             |                | NE       | BATANES to MINDANAO and PALAWAN   |
| 150 | Crypteronia paniculata<br>Blume                   |                      | PENAEACEAE              | ✓     |     | ✓ | NA             |                | NE       | LUZON: Cagayan, Abra, Mountain<br>Province, Benguet, La Union,<br>Pangasinan, Zambales, Bulacan,<br>Camarines, Sorsogon, PALAWAN,<br>NEGROS   |
| 151 | Adinandra elliptica<br>C.B.Rob.                   | Puyaka*              | PENTAPHYLACACEAE        | ✓     |     |   | NA             |                | PE       | LUZON: Benguet (Sablan, Baguio),<br>Nueva Vizcaya, Nueva Ecija (Mt<br>Umingan), Sorsogon, MINDORO:<br>Mindoro Occidental (Mt Calavite),<br>PANAY: Antique, NEGROS: Negros<br>Oriental (Cuernos Mtns),<br>MINDANAO: Misamis, Bukidnon (Mt<br>Lipa), Davao (Mt Apo) |

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Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).  HISTORICAL WAY BEE |  |                     |                |   |          |   |        |                |                         |   |
|---|--|---------------------|----------------|---|----------|---|--------|----------------|-------------------------|---|
| NO.   | SCIENTIFIC NAME                                | LOCAL<br>NAME       | FAMILY         |   | COR      | D | L<br>4 | IUCN<br>2018–2 | DAO<br>2017–11 ENDEMISM | DISTRIBUTION  |
| 152   | Antidesma bunius (L.)<br>Spreng.               | Bignai*             | PHYLLANTHACEAE | ✓ | <b>~</b> | , | ✓      | NA             | NE                      | LUZON: Cagayan, Abra, Mountain<br>Province, Benguet, La Union,<br>Pangasinan, Zambales, Bulacan,<br>Camarines, Sorsogon, PALAWAN,<br>NEGROS   |
| 153   | Antidesma ghaesembilla<br>Gaertn.              | Barongasi*          | PHYLLANTHACEAE | ✓ |          |   |        | NA             | NE                      | Throughout the PHILIPPINES  |
| 154   | Antidesma montanum<br>Blume**                  | Timbabasi           | PHYLLANTHACEAE | ✓ | <b>√</b> | , |        | LC             | NE                      | LUZON: Ilocos Norte, La Union, Pangasinan, Cagayan, Zambales, Bataan, Bulacan, Rizal, Cavite, Laguna, Quezon, Albay, Apayao, Benguet, Nueva Vizcaya, Quezon, Camarines, Rizal, Sorsogon, Isabela, BATANES, BABUYAN ISLS, BALABAC, BASILAN, MINDORO, NEGROS, CEBU, BOHOL, LEYTE, MINDANAO: Agusan del Norte, Surigao del Norte, Zamboanga, Lanao, Cotabato, PALAWAN  |
| 155   | Antidesma pleuricum Tul.                       | Malabignai          | PHYLLANTHACEAE |   | ✓        | • |        | NA             | NE                      | LUZON: Ilocos Norte, Cagayan,<br>Bataan, Laguna, Quezon, Camarines,<br>Sorsogon, Albay, ALABAT,<br>MINDORO, BURIAS, TICAO,<br>CATANDUANES, SAMAR,<br>SIARGAO, SULU ARCHIPELAGO,<br>MINDANA  |
| 156   | Antidesma sp. 1                                |                     | PHYLLANTHACEAE |   | ✓        | , |        |                |                         |   |
| 157   | Aporosa sphaeridiophora<br>Мет.                | Kaliuas             | PHYLLANTHACEAE |   | ✓        | , | ✓      | NA             | PE                      | LUZON: Benguet, Cagayan, Zambales,<br>Bataan, Quezon, Laguna, Sorsogon,<br>PALAWAN, PANAY, NEGROS,<br>LEYTE, SAMAR, MINDANAO: Lanao<br>del Sur.   |
| 158   | Bischofia javanica Blume                       | Tuai                | PHYLLANTHACEAE | ✓ | <b>√</b> | , |        | NA             | NE                      | Throughout the PHILIPPINES  |
| 159   | Breynia vitis-idaea<br>(Burm.f.) C.E.C. Fisch. | Matang-ulang        | PHYLLANTHACEAE |   | ✓        | , |        | NA             | NE                      | BATAN and N LUZON to PALAWAN and MINDANAO   |
| 160   | Bridelia insulana Hance                        | Subiang             | PHYLLANTHACEAE |   | ✓        | , | ✓      | NA             | NE                      | LUZON: Cagayan, Tayabas, Laguna,<br>Batangas, Camarines, PALAWAN,<br>TABLAS, LEYTE, MINDANAO:<br>Zamboanga, Misamis, Cotabato, SULU<br>ARCHIPELAGO  |
| 161   | Glochidion rubrum<br>Blume                     | Matang-hipon        | PHYLLANTHACEAE |   | <b>√</b> | , |        | NA             | NE                      | N LUZON to PALAWAN and MINDANAO   |
| 162   | Phyllanthus albus<br>(Blanco) Mull.Arg.        | Bagang-<br>bagang   | PHYLLANTHACEAE | ✓ | <b>√</b> | , |        | NA             | NE                      | LUZON: Cagayan to Sorsogon,<br>MINDORO, PANAY, LEYTE,<br>SAMAR, SIARGAO, DINAGAT,<br>MINDANAO   |
| 163   | Phyllanthus amarus<br>Schumach & Thonn.        | Sampasampal<br>ukan | PHYLLANTHACEAE | ✓ |          |   |        | NA             | EX                      |   |
| 164   | Sauropus macranthus<br>Hassk.                  |                     | PHYLLANTHACEAE |   | ✓        | , |        | LC             | NE                      | LUZON, MINDORO, CALAMIANES,<br>PALAWAN, MINDANAO  |
| 165   | Piper interruptum Opiz                         | Litlit              | PIPERACEAE     |   | <b>√</b> | , |        | NA             | NE                      | Throughout the PHILIPPINES  |
| 166   | Piper merrillii C.DC.                          |                     | PIPERACEAE     | ✓ |          |   |        | NA             | PE                      | LUZON: Isabela (San Mariano), Quezon (Mt Binuang), Laguna (San Antonio), ALABAT, MINDORO: Mindoro Occidental (Mt Calavite), Mindoro Oriental (Baco River; Mt Halcon), PALAWAN (Mt Capoas), PANAY: Antique (Culasi), Aklan (Mt Magosolon; Libacao), Capiz (Jamindan), NEGROS: Negros Occidental (Mt Kanlaon; Mt Silay), BOHOL: Bohol (Valencia), LEYTE: Leyte (Dagami), SAMAR (Cauayan; Catubig River), MINDANAO: Davao Oriental (Mt Galintan) |

Historical record (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), Endemism (PE\*\*-known only from MCWS, PE\* – known only from Mindoro island, PE – known only from the Philippines, NE – native to the Philippines and EX – exotic, introduced), and Conservation status (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed). Where:

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| NO. | SCIENTIFIC NAME                            | LOCAL<br>NAME | FAMILY         | HI       | STO<br>REC<br>2 | RIC | AL | IUCN |     | ENDEMISM | DISTRIBUTION  |
|-----|--|---------------|----------------|----------|-----------------|-----|----|------|-----|----------|---|
| 167 | Piper lessertianum (Miq.)<br>C.DC.         |               | PIPERACEAE     | <b>√</b> |                 |     |    | NA   |     | NE       | LUZON: Apayao (Guiniri), Kalinga (Mt Masingit), Mountain Province (Pininggat), Ifugao (Mt Polis), Cagayan, Aurora (Casiguran), Rizal (Montalban), Quezon (Mt Binuang; Mt Banahaw), Sorsogon (Mt Bulusan), ALABAT, MINDORO: Mindoro Occidental (Mt Calavite), Mindoro Oriental (Mt Halcon), PANAY: Aklan (Mt Magosolon; Libacao), Capiz (Jamindan; Mt Salibongbong; Mt Kinablangan), NEGROS: Negros Occidental (Mt Kanlaon), Negros Oriental (Cuernos Mtns), SAMAR: Northern Samar (Las Navas, Catubig River), MINDANAO: Zamboanga del Sur (Malangas), Lanao del Sur (Camp Keithley), Bukidnon (Mahilucot River), Davao del Sur (Mt Apo), BUCAS GRANDE |
| 168 | Piper sp. 1                                |               | PIPERACEAE     |          |                 | ✓   |    |      |     |          |   |
| 169 | Piper toppingii C. DC.                     |               | PIPERACEAE     | ✓        |                 |     |    | NA   |     | PE       | LUZON: Ilocos Norte (Bangui to<br>Claveria; Mt Palimlim), Mountain<br>Province (Mt Pukis; Mt Masapilid),<br>Ifugao (Mt Polis), Benguet (Mt Pulag;<br>Mt Tonglon = Mt Sto Tomas; Baguio),<br>Nueva Vizcaya (Compote), Rizal (Mt<br>Susong Dalaga; Mt Lumutan; San<br>Isidro), Laguna (Mt Makiling; Mt San<br>Cristobal; San Antonio), MINDORO:<br>Mindoro Occidental (Mt Calavite;<br>Paluan)  |
| 170 | Piper umbellatum L.                        | Kamamba       | PIPERACEAE     |          |                 | ✓   |    | NA   |     | EX       |   |
| 171 | Pittosporum pentandrum (Blanco) Merr.      | Mamalis       | PITTOSPORACEAE |          |                 | ✓   | ✓  | NA   |     | NE       | NEGROS, CEBU, BOHOL,<br>MINDANAO  |
| 172 | Axonopus compressus (Sw.) P.Beauv.         |               | POACEAE        |          | ✓               |     |    | NA   |     | EX       |   |
| 173 | Chrysopogon aciculatus (Retz.) Trin.       |               | POACEAE        |          | ✓               |     |    | NA   |     | NE       | Throughout the PHILIPPINES  |
| 174 | Cyrtochloa mindoroensis S.Dransf.          |               | POACEAE        | ✓        |                 |     |    | NA   |     | PE**     | MINDORO: Mindoro Occidental (Mt Calavite)   |
| 175 | Dinochloa acutiflora<br>(Munro) Soenarko** |               | POACEAE        |          |                 | ✓   |    | NA   | OTS | NE       | BABUYAN ISLS, LUZON: Ilocos<br>Norte, Ilocos Sur, Apayao, Benguet,<br>Cagayan, Isabela, Nueva Vizcaya,<br>Pangasinan, Zambales, Bulacan, Nueva<br>Ecija, Pampanga, Rizal, Bataan, Laguna,<br>Quezon, Camarines, MINDORO,<br>PALAWAN, LEYTE  |
| 176 | Imperata cylindrica (L.)<br>Raeusch.       |               | POACEAE        |          | ✓               |     |    | NA   |     | NE       | BATAN, CEBU, LUZON, ALABAT,<br>MINDORO, PALAWAN, NEGROS,<br>SAMAR, SIARGAO  |
| 177 | Ischaemum rugosum<br>(Salisb.)             |               | POACEAE        |          | ✓               |     |    | NA   |     | NE       | LUZON: Ilocos Norte, Mountain<br>Province, Pangasinan, Rizal, Bataan,<br>POLILLO, CATANDUANES,<br>MINDORO, BUSUANGA,<br>GUIMARAS, SAMAR, MINDANAO   |
| 178 | Paspalidium flavidum<br>(Retz.) A.Camus    |               | POACEAE        |          | ✓               |     |    | LC   |     | NE       | LUZON, MINDORO, PALAWAN,<br>CEBU, BOHOL, LEYTE, CAGAYAN<br>DE SULU, MINDANAO, SULU<br>ARCHIPELAGO   |

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Appendix 1. Summary of all species recorded in Mt. Calavite Wildlife Sanctuary (Con't).

| NO. | SCIENTIFIC NAME                                    | LOCAL<br>NAME       | FAMILY         | HISTOI<br>RECO<br>1 2 |   |    | DAO<br>2017–11 | ENDEMISM | DISTRIBUTION   |
|-----|--|---------------------|----------------|-----------------------|---|----|----------------|----------|--|
| 179 | Poa annua L.                                       |                     | POACEAE        | . <u>~</u>            |   | LC |                | EX       |  |
| 180 | Saccharum spontaneum<br>L.                         |                     | POACEAE        | ✓                     |   | LC |                | NE       | LUZON, MINDANAO, MINDORO,<br>NEGROS, PALAWAN   |
| 181 | Xanthophyllum flavescens<br>Roxb.                  | Bagaulan            | POLYGALACEAE   |                       | ✓ | NA |                | NE       | LUZON: Benguet, Cagayan, Nueva<br>Ecija, Zambales, Bataan, Rizal, Laguna,<br>Albay, Sorsogon, MINDORO,<br>BUSUANGA, CULION, PALAWAN,<br>MASBATE, GUIMARAS, NEGROS,<br>MINDANAO: Zamboanga  |
| 182 | Microsorum longissimum<br>Fee                      | Pakong bato         | POLYPODIACEAE  |                       | ✓ | NA |                | NE       | Throughout the PHILIPPINES   |
| 183 | Ardisia calavitensis Merr.                         | Puyaka*             | PRIMULACEAE    | ✓                     | ✓ | NA |                | PE**     | MINDORO: Paluan (Mt. Calavite)   |
| 184 | Discocalyx cybianthoides<br>(A.DC.) Mez            | Paginga             | PRIMULACEAE    |                       | ✓ | NA |                | NE       | LUZON: Ilocos Norte, Abra, Cagayan,<br>Nueva Vizcaya, Pangasinan, Nueva<br>Ecija, Bataan, Bulacan, Rizal, Laguna,<br>Batangas, Quezon, Sorsogon,<br>MINDORO, MASBATE, LEYTE  |
| 185 | Drypetes littoralis<br>(C.B.Rob.) Merr.            | Balibikan           | PUTRANJIVACEAE |                       | ✓ | NA |                | NE       | LUZON: Ilocos Sur, La Union, Cagayan,<br>Bataan, Laguna, Batangas, Camarines,<br>Sorsogon, MINDORO, PALAWAN,<br>SAMAR, MINDANAO: Misamis   |
| 186 | Alphitonia zizyphoides<br>(Sol. ex Spreng.) A.Gray | Tangulai            | RHAMNACEAE     | ✓                     |   | LC |                | NE       | LUZON: Benguet, Ifugao, Rizal,<br>Laguna, Camarines, MINDORO,<br>PALAWAN, PANAY, GUIMARAS,<br>NEGROS, LEYTE, SAMAR,<br>MINDANAO: Surigao   |
| 187 | Ziziphus talanai Merr.                             | Balakat             | RHAMNACEAE     |                       | ✓ | VU |                | PE       | N LUZON to PALAWAN and MINDANAO  |
| 188 | Carallia brachiata (Lour.) Merr.                   | Bakauan-<br>gubat*  | RHIZOPHORACEAE | ✓                     | ✓ | NA | OTS            | NE       | N LUZON to PALAWAN and MINDANAO  |
| 189 | Rubus buergeri Miq.                                | Sampinit            | ROSACEAE       |                       | ✓ | NA |                | NE       | LUZON: Ilocos Norte (Mt Bubonbilit),<br>Abra, Mountain Province (Bontoc; Mt<br>Data), Ifugao (Mt Polis), Benguet (Mt<br>Tabayoc; Mt Pulag; Pauai; Baguio; Mt<br>Sto. Tomas), Quezon (Mt Banahaw),<br>MINDORO: Mindoro Oriental (Mt<br>Halcon), MINDANAO: Bukidnon (Mt<br>Lipa), Davao (Mt Apo) |
| 190 | Canthium gynochthodes<br>Baill.**                  | Butling-babui       | RUBIACEAE      |                       | ✓ | NA |                | NE       | N LUZON to PALAWAN and MINDANAO  |
| 191 | Canthium monstrosum (A.Rich) Merr.                 | Tadiang-<br>anunang | RUBIACEAE      |                       | ✓ | NA |                | NE       | LUZON: Aurora, Camarines Sur, Ilocos<br>Norte, Ilocos Sur, Abra, La Union,<br>Apayao, Mountain Province, Benguet,<br>Cagayan, Isabela, Nueva Vizcaya,<br>Pangasinan, Zambales, Bataan,<br>Pampanga, Bulacan, Rizal, Laguna,<br>Cavite, Quezon, LEYTE, MINDORO,<br>NEGROS                       |
| 192 | Canthium sp. 1                                     |                     | RUBIACEAE      |                       | ✓ |    |                |          |  |
| 193 | Gardenia merrillii Elm.                            | Tayakan*            | RUBIACEAE      | ✓                     |   | NA |                | NE       | LUZON: Cagayan, Isabela, Quezon,<br>GOLO, MINDORO, CULION,<br>BUSUANGA, PALAWAN,<br>ROMBLON, PANAY, NEGROS,<br>LEYTE, MINDANAO   |
| 194 | Ixora cumingiana Vidal                             | Talab               | RUBIACEAE      |                       | ✓ | NA |                | PE       | LUZON to PALAWAN and MINDANAO  |

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| NO. | SCIENTIFIC NAME  | LOCAL<br>NAME | FAMILY    | HISTORICAL<br>RECORD<br>1 2 3 4 | IUCN DAO<br>2018–2 2017–11 | ENDEMISM | DISTRIBUTION  |
|-----|--|---------------|-----------|---------------------------------|----------------------------|----------|---|
| 195 | Ixora philippinensis<br>Merr.                              | Kamingi       | RUBIACEAE | ✓ ✓                             | NA                         | NE       | BATAN and BABUYAN Islands and N<br>LUZON to PALAWAN, BALABAC,<br>BOHOL, MINDANAO and BASILAN  |
| 196 | Morinda citrifolia L.                                      | Nino          | RUBIACEAE | ✓                               | NA                         | NE       | Throughout the PHILIPPINES  |
| 197 | Morinda citrifolia L.                                      | Nino          | RUBIACEAE | ✓                               | NA VU                      | PE       | BASILAN, LUZON: Isabela (San<br>Mariano; Palanan), Laguna (Mt<br>Banahaw), Pampanga, MINDORO:<br>Mindoro Occidental (Sablayan, Ligaya),<br>Mindoro Oriental (Puerto Galera;<br>Calapan; Baco River; Bongabon and<br>Pinamalayan; SIBUYAN (foothills of Mt<br>Giting-giting), PANAY: Capiz, LEYTE:<br>Leyte (Dagami)   |
| 198 | Mussaenda sp.  |               | RUBIACEAE | ✓                               |                            |          |   |
| 199 | Neonauclea bartlingii<br>(DC.) Merr.                       | Uisak         | RUBIACEAE | ✓ ✓                             | NA                         | PE       | LUZON: Ilocos Norte, Ilocos Sur,<br>Pangasinan, Abra, Mountain Province,<br>Benguet, Nueva Vizcaya, Pampanga,<br>Rizal, CEBU  |
| 200 | Pavetta sp.  |               | RUBIACEAE | ✓                               |                            |          |   |
| 201 | Psychotria diffusa Merr.<br>var. diffusa                   | Batuk-batukan | RUBIACEAE | ✓                               | NA                         | NE       | LUZON: Mountain Province (Mt Data; Mt Polis), Ifugao (Banawe), Benguet (Lepanto; Mt Lusung; Sablan; Baguio; Mt Sto Tomas), Cagayan (Baguio Cove), Isabela (Mt Moises; Sierra Madre at Sangcad near Palanan), Quirino (Mt Alzapan), Bataan (Mt Mariveles), Rizal (Mt Irid; Mt Lumutan; Montalban; Rolay; Oriud; Angilog), Laguna (Paete), Quezon (Infanta; Real, National Botanic Garden; Mt Banahaw; Lucban; Tagkawayan), Camarines Sur (Mt Potianay; Mt Isarog), Sorsogon (Castilla; Mt Bulusan), POLILLO, CATANDUANES, MINDORO: Mindoro Occidental (Mt Calavite), Mindoro Oriental (Mt Halcon), PALAWAN, PANAY: Antique-Capiz (Mt Madia-as), NEGROS: Negros Occidental (Mt Kanlaon National Park), Negros Oriental (Cuernos Mtns), BILIRAN, LEYTE: Leyte (Mt Mamban), SAMAR: Western Samar (Mt Sohoton), MINDANAO: Davao Oriental (Mt Galintan) |
| 202 | Psychotria lanaensis<br>(Merr.) Merr.                      |               | RUBIACEAE | <b>√</b>                        | NA                         | PE       | LUZON: Ifugao (Banawe: Bayninan),<br>MINDORO: Mindoro Occidental (Mt<br>Calavite), SIBUYAN: Mt Giting-giting,<br>DINAGAT: Krominco, Mt Redondo  |
| 203 | Psychotria luzoniensis<br>(Cham. & Schltdl.) Fern<br>Vill. | Altoko*       | RUBIACEAE | ✓                               | NA                         | PE       | Throughout the PHILIPPINES  |
| 204 | Psychotria sp. 1   |               | RUBIACEAE | ✓                               |                            |          |   |
| 205 | Psydrax dicoccos Gaertn.                                   |               | RUBIACEAE | ✓                               | VU                         | NE       | Throughout the PHILIPPINES  |

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| NO. | SCIENTIFIC NAME                                 | LOCAL<br>NAME | FAMILY      | HISTOI<br>RECO | RICA | ΛL | IUCN<br>2018–2 | DAO | ENDEMISM | DISTRIBUTION   |
|-----|---|---------------|-------------|----------------|------|----|----------------|-----|----------|--|
| 206 | Tarenna luzoniensis<br>(Vidal) Bremek.          | Butio         | RUBIACEAE   |                | ✓    | ✓  | NA             |     | PE       | LUZON: Ilocos Norte, La Union, Pangasinan, Apayao, Cagayan, Nueva Vizcaya, Bataan, Rizal, Laguna, Batangas, PALAWAN, SIBUYAN, LEYTE, SAMAR, MINDANAO: Zamboanga, Lanao del Sur, Agusan del Norte, DINAGAT, SIARGAO |
| 207 | Urophyllum mindorense<br>Merr.                  |               | RUBIACEAE   | <b>√</b>       | •    | •  | NA             |     | PE**     | MINDORO: Mindoro Occidental (Mt Calavite)  |
| 208 | Wendlandia glabrata DC.                         | Lanipa        | RUBIACEAE   |                | ✓    |    | NA             |     | NE       | BABUYAN ISLS, LUZON: Ilocos<br>Norte, Abra Ilocos Sur, Mountain<br>Province, Benguet, Nueva Vizcaya,<br>Zambales, Pampanga, Rizal, Camarines,<br>Sorsogon, MINDORO   |
| 209 | Melicope semecarpifolia<br>(Merr.) T.G. Hartley |               | RUTACEAE    |                | ✓    |    | NA             |     | NE       | LUZON: Apayao, Abra, Mountain<br>Province, Benguet, Zambales, Bataan,<br>Pampanga, Nueva Ecija, Rizal, Laguna,<br>Quezon, Sorsogon, MINDORO,<br>PANAY, CAMIGUIN  |
| 210 | Micromelum compressum Merr.                     | Tulibas-tilos | RUTACEAE    |                | ✓    |    | NA             |     | PE       | LUZON to PALAWAN and MINDANAO  |
| 211 | Micromelum minutum<br>Wight & Arn.              | Kulai-manok   | RUTACEAE    |                | ✓    |    | NA             |     | NE       | Throughout the PHILIPPINES   |
| 212 | Severinia disticha<br>(Blanco) Swingle          | Maladayap     | RUTACEAE    |                | ✓    |    | NA             |     | PE       | LUZON (widespread), MINDORO,<br>MASBATE, PANAY, GUIMARAS,<br>NEGROS, CEBU, LEYTE, SAMAR,<br>MINDANAO: Misamis  |
| 213 | Casearia fuliginosa<br>(Blanco) Blanco          | Kaluag        | SALICACEAE  |                | ✓    |    | NA             |     | PE       | LUZON, MINDORO, TICAO,<br>MASBATE, SIBUYAN, SAMAR,<br>DINAGAT, MINDANAO, TAWI-<br>TAWI   |
| 214 | Flacourtia indica<br>(Burm.f.) Merr.            | Bitungul      | SALICACEAE  |                | ✓    |    | NA             |     | NE       | LUZON: Cagayan, Isabela, Zambales,<br>Tarlac, Bataan, Rizal, Batangas,<br>MINDORO  |
| 215 | Scolopia luzonensis<br>Warb.                    | Aninguai      | SALICACEAE  |                | ✓    |    | NA             |     | NE       | LUZON (widespread),<br>CATANDUANES, MINDORO,<br>MASBATE, PANAY, GUIMARAS,<br>MINDANAO  |
| 216 | Allophylus cobbe (L.)<br>Raeusch.               | Barotongol    | SAPINDACEAE | ✓              | ✓    |    | NA             |     | NE       | Throughout the PHILIPPINES   |
| 217 | Dimocarpus longan Lour.                         | Gingging      | SAPINDACEAE | ✓              |      | ✓  | NT             |     | NE       | LUZON: Bataan, Pampanga  |
| 218 | Ganophyllum falcatum<br>Blume                   | Arangen       | SAPINDACEAE |                | ✓    |    | LC             |     | NE       | Throughout the PHILIPPINES   |
| 219 | Glenniea philippinensis (Radlk.) Leenh.         | Mamoko        | SAPINDACEAE |                | ✓    | ✓  | NA             | VU  | NE       | LUZON: Laguna (Mt Makiling),<br>PANAY, DINAGAT   |
| 220 | Guioa koelreuteria (Blanco) Merr.               | Alahan        | SAPINDACEAE |                | ✓    |    | NA             |     | NE       | Throughout the PHILIPPINES   |
| 221 | Guioa pleuropteris<br>(Blume) Radlk.            | Bunsikag      | SAPINDACEAE |                | ✓    | ✓  | NA             |     | NE       | LUZON: Cagayan, Isabela, Aurora,<br>Quezon, Bataan, Laguna, Camarines,<br>PALAWAN, PANAY, NEGROS,<br>LEYTE, MINDANAO: Zamboanga  |
| 222 | Lepisanthes fruticosa (Roxb.) Leenh.            | Balinaunau    | SAPINDACEAE | <b>√</b>       | ✓    | ✓  | LC             |     | NE       | LUZON, PALAWAN, CEBU, LEYTE  |
| 223 | Lepisanthes tetraphylla<br>Radlk.               | Balungai      | SAPINDACEAE | ·              | ✓    |    | NA             |     | NE       | LUZON: Ilocos Norte, Cagayan, Isabela,<br>Nueva Ecija, Bulacan, Rizal, Laguna,<br>Batangas, Quezon, Camarines,<br>MINDORO, NEGROS, LEYTE,<br>MINDANAO: Zamboanga, Agusan   |

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| NO. | SCIENTIFIC NAME                                | LOCAL<br>NAME | FAMILY         | HISTO<br>REG<br>1 2 | ORIC<br>CORI<br>3 |   |    | DAO<br>2017–11 | ENDEMISM | DISTRIBUTION   |
|-----|--|---------------|----------------|---------------------|-------------------|---|----|----------------|----------|--|
| 224 | Litchi chinensis Sonn.*                        | Alupag        | SAPINDACEAE    | <b>√</b>            |                   | ✓ | NA | VU             | NE       | LUZON, SIBUYAN, SAMAR,<br>MINDANAO   |
| 225 | Mischocarpus<br>pentapetalus (Roxb.)<br>Radlk. | Ambalag       | SAPINDACEAE    |                     | ✓                 |   | NA |                | NE       | Throughout the PHILIPPINES   |
| 226 | Nephelium ramboutan-<br>ake (Labill.) Leenh.   | Bulala        | SAPINDACEAE    |                     | ✓                 |   | NA | VU             | NE       | LUZON, MINDORO, PALAWAN,<br>LEYTE, SAMAR, MINDANAO<br>(Davao), BASILAN, SULU<br>ARCHIPELAGO  |
| 227 | Tristira triptera Radlk.                       | Albing        | SAPINDACEAE    |                     | ✓                 |   | NA |                | NE       | Throughout the PHILIPPINES   |
| 228 | Mimusops elengi L.                             | Bansalagin    | SAPOTACEAE     |                     | ✓                 |   | NA |                | EX       |  |
| 229 | Palaquium foxworthyi<br>Merr.                  |               | SAPOTACEAE     |                     | ✓                 | ✓ | NA |                | PE       | LUZON: Zambales, Bataan, Laguna,<br>Quezon, CEBU   |
| 230 | Palaquium philippense<br>(Perr.) C.B. Rob.**   | Malak-malak   | SAPOTACEAE     | ✓                   | ✓                 |   | VU | VU             | PE       | LUZON: Isabela, Bataan, Tarlac,<br>Bulacan, Rizal, Batangas, Quezon,<br>Camarines Sur, Albay, Sorsogon,<br>MINDORO: Mindoro Occidental (Mt<br>Calavite), PANAY: Capiz, NEGROS,<br>LEYTE (Ormoc, Lake Danao),<br>MINDANAO: Davao (Mt Apo) |
| 231 | Pouteria duclitan<br>(Blanco) Bakh.f.**        | Duklitan      | SAPOTACEAE     |                     | ✓                 |   | NA |                | NE       | BABUYAN ISLS, LUZON: Ilocos<br>Norte, Cagayan, Bataan, Laguna,<br>Quezon, Batangas, Camarines,<br>MINDORO, PALAWAN, MINDANAO:<br>Zamboanga, Cotabato   |
| 232 | Smilax sp.                                     |               | SMILACACEAE    |                     | ✓                 |   |    |                |          |  |
| 233 | Solanum<br>verbascifolium L.                   | Malatalong    | SOLANACEAE     |                     | ✓                 |   | NA |                | NE       | Throughout the PHILIPPINES   |
| 234 | Grewia multiflora Juss.                        | Siapo*        | SPARMANNIACEAE |                     | ✓                 |   | NA |                | NE       | LUZON: Cagayan to Quezon,<br>MINDORO, PALAWAN, GUIMARAS,<br>CAMIGUIN, MINDANAO   |
| 235 | Turpinia ovalifolia Elmer                      | Anongo        | STAPHYLEACEAE  |                     | ✓                 |   | NA |                | NE       | LUZON, PALAWAN   |
| 236 | Gomphandra cumingiana<br>(Miers) FernVill.     | Barobo*       | STEMONURACEAE  | ✓                   |                   |   | NA |                | NE       | LUZON: Quezon, Laguna, Camarines,<br>Sorsogon, ALABAT, MINDORO,<br>PALAWAN, BILIRAN, LEYTE,<br>SAMAR, MINDANAO: Agusan del<br>Norte (Mt Urdaneta), Surigao del Norte   |
| 237 | Gomphandra luzoniensis<br>(Merr.) Merr.        | Mabunot       | STEMONURACEAE  |                     | ✓                 |   | NA |                | NE       | LUZON: Ilocos Norte, Ilocos Sur, La<br>Union, Cagayan, Nueva Ecija, Bataan,<br>Rizal, Laguna, Cavite, Batangas,<br>MINDORO, MARINDUQUE,<br>PALAWAN   |
| 238 | Heritiera sylvatica<br>S.Vidal                 | Dungon        | STERCULIACEAE  |                     | ✓                 |   | NA |                | NE       | LUZON (Cagayan to Albay),<br>MINDORO, MASBATE, PANAY,<br>SAMAR   |
| 239 | Pterocymbium tinctorium<br>Merr.               | Taluto        | STERCULIACEAE  | ✓                   | ✓                 | ✓ | NA |                | NE       | BABUYAN ISLS, LUZON (widespread<br>from at least Cagayan to Camarines Sur),<br>PALAWAN, CAMIGUIN,<br>MINDANAO  |
| 240 | Sterculia ceramica R. Br.                      | Banilad       | STERCULIACEAE  |                     | ✓                 |   | NA |                | NE       | BATAN ISLS, LUZON (Widespread, esp. along W part), MINDORO, SIBUYAN, PALAWAN, GUIMARAS, MINDANAO (widespread), SULU  |

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| , ipp | enuix 1. Summai y oi a                  |                    |              |                                 |                            |          |  |
|-------|---|--------------------|--------------|---------------------------------|----------------------------|----------|--|
| NO.   | SCIENTIFIC NAME                         | LOCAL<br>NAME      | FAMILY       | HISTORICAL<br>RECORD<br>1 2 3 4 | IUCN DAO<br>2018–2 2017–11 | ENDEMISM | DISTRIBUTION   |
| 241   | Symplocos polyandra<br>Brand*           | Ditaman            | SYMPLOCACEAE | ✓                               | NA                         | NE       | Throughout the PHILIPPINES   |
| 242   | Dendrocnide meyeniana<br>(Walp.) Chew   | Lipang<br>kalabaw  | URTICACEAE   | ✓<br>✓                          | NA                         | NE       | LUZON: Benguet, Pangasinan<br>(Umingan), Tarlac, Laguna, MINDORO<br>(Baco River), GUIMARAS, LEYTE<br>(Palo)  |
| 243   | Leucosyke capitellata<br>Wedd.          | Alagasi            | URTICACEAE   | <b>√</b>                        | NA                         | NE       | LUZON: Ilocos Norte, Mountain<br>Province, Benguet, Cagayan, Isabela,<br>Nueva Vizcaya, Pangasinan, Bataan,<br>Pampanga, Rizal, Laguna, Cavite,<br>Batangas, Quezon, Camarines, Albay,<br>Sorsogon, POLILLO, MINDORO,<br>PALAWAN, MASBATE, PANAY,<br>NEGROS, CEBU, BOHOL, LEYTE,<br>SAMAR, BASILAN, MINDANAO:<br>Zamboanga, Lanao del Sur, Davao |
| 244   | Pipturus arborescens (Link) C.B. Rob.   | Dalunot            | URTICACEAE   | ✓                               | NA                         | NE       | Throughout the PHILIPPINES   |
| 245   | Pipturus sp. 1                          |                    | URTICACEAE   | ✓                               |                            |          |  |
| 246   | Stachytarpheta<br>jamaicensis (L.) Vahl | Kandikandilaa<br>n | VERBENACEAE  | <b>√</b>                        | NA                         | EX       |  |
| 247   | Ampelopsis sp.                          |                    | VITACEAE     | ✓                               |                            |          |  |
| 248   | Leea guineensis G. Don                  | Mali-mali          | VITACEAE     | ✓                               | NA                         | NE       | Throughout the PHILIPPINES   |
| 249   | Leea indica (Burm.f.)<br>Merr.          | Mamali             | VITACEAE     | <b>√</b>                        | NA                         | NE       | Throughout the PHILIPPINES   |
| 250   | Leea philippinensis Merr                | Taliantan          | VITACEAE     | ✓                               | NA                         | PE       | BATAN, LUZON: Apayao, Benguet,<br>Pangasinan, Cagayan, Isabela, Nueva<br>Ecija, Aurora, Zambales, Rizal, Quezon,<br>Laguna (Mt. Makiling), Mindoro:<br>Mindoro Mindoro Oriental, Mindoro<br>Occidental, MINDANAO:<br>Zamboanga del Norte, Davao,<br>Surigao.   |

Historical record (1 – Recorded by Merrill, 1923–1926; 2 – MBCFI, 2014; 3 – this study; 4 – new record to the island of Mindoro), Endemism (PE\*\*-known only from MCWS, PE\* – known only from Mindoro island, PE – known only from the Philippines, NE – native to the Philippines and EX – exotic, introduced), and Conservation status (OTS – Other Threatened Species, VU – Vulnerable, EN – Endangered, CR – Critically Endangered, LC – Least Concern, NT – Near Threatened, DD – Data Deficient and NA – Not Assessed). Where: