

Floral Diversity and Habitat Assessment at Mt. Malarayat Brgy. Malitlit, Lipa City, Batangas

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INTRODUCTION

Mt. Malarayat is the largest forest reserve in the province of Batangas (Figure 1) which was declared a forest reserve in 1928 primarily for watershed and timber production functions (Lunar 2014). It is one of the least botanized mountains in Luzon. Except for some non-systematic and non-comprehensive rapid surveys conducted in Brgy. Sto. Nino and Talisay (Lunar & Arcega 2011), no true plant diversity assessment has been done yet in the mountain. As such, is safe to say that information on the plant diversity of Mt. Malarayat is still lacking. Without the knowledge of the various plant species present in the forest reserve, the people of the nearby barangays are being deprived of the potential benefits that can be derived from the existing plant resources. It is for this reason that Health for the Future Foundations Inc. and PUSOD Inc. spearheaded a plant diversity assessment in Mt. Malarayat, Lipa City, Batangas.

METHODOLOGY

The study team employed a rapid plant diversity assessment to conduct a floral inventory of Mt. Malarayat floral. An existing Biodiversity Monitoring System (BMS) transect for wildlife monitoring was used for the plant survey. All plant species were identified within the 10 m width (5 m from each side of the trail) of the approximately 2.3 km BMS transect. Trees with diameter of not less than 10 cm were measured. Parameters

ABSTRACT

Mountain ecosystem assessments are usually based on species or taxonomic groups, structural characters of forest ecosystems and/or biodiversity indicators derived from taxonomic variables. Amidst advanced science tools for species diversity studies, forest biodiversity data in the light of ecology and taxonomy for promoting conservation and enhancing biodiversity management especially in urban and urbanizing areas, are few. In Mt. Malarayat, Brgy. Malitlit, Lipa City, Batangas, a rapid plant diversity survey was conducted to provide the needed biodiversity information. An approximately 2.3 km BMS transect was established and all plant species were identified within the 10-meter width (5 meters from each side of the trail). Height and diameter of trees with diameter of not less than 10 cm were measured. Additional transect surveys, as well as opportunistic approach, were conducted on other forested areas to account for other species outside the BMS. A total of 264 morpho-species, belonging to the seed plants (angiosperms and gymnosperms), ferns and their allies were recorded from the area. Results of the rapid plant survey revealed that Mt. Malarayat has high biodiversity value. Despite the limited survey time and efforts, the study also revealed that Mt. Malarayat is still home to a significant number of threatened, endemic, and indigenous forest tree species that could contribute to overall health and balance of the city environment. The City's effort to strengthen conservation and management of these precious resources is the key to biodiversity resilience in a city environment. The quality of the environment depends on how these floral resources are managed and protected against loss and extinction.

Keywords: BMS, floral diversity, Mt. Malarayat

such as diameter at breast height (DBH), total height (TH), and merchantable height (MH) were recorded. Since the whole BMS transect is basically a scrubland heavily dominated by *ipil-ipil* (*Leucaena leucocephala* (Lam.) de Wit.) and *kakawate* (*Gliricidia sepium* (Jacq.) Walp.), the team decided not to count the number of individuals for each species. Instead, dominant species were noted.

To augment the data gathered from BMS transect, the forested area at the higher elevation of the mountain was also surveyed. Three 10 x 100 m transects were established and surveyed at three portions of the forest with different vegetation/stand maturities (Table 1). One of the transects was established along the transition area between the grassland and the secondary forest while the other two transects covered the early second growth forest. Similar with the survey along the BMS transect, all plant species along these transects were identified. Diameter and height of trees with diameter ≥ 10 cm were measured and recorded. In addition, abundance or count of each species more than 1 m in height was obtained

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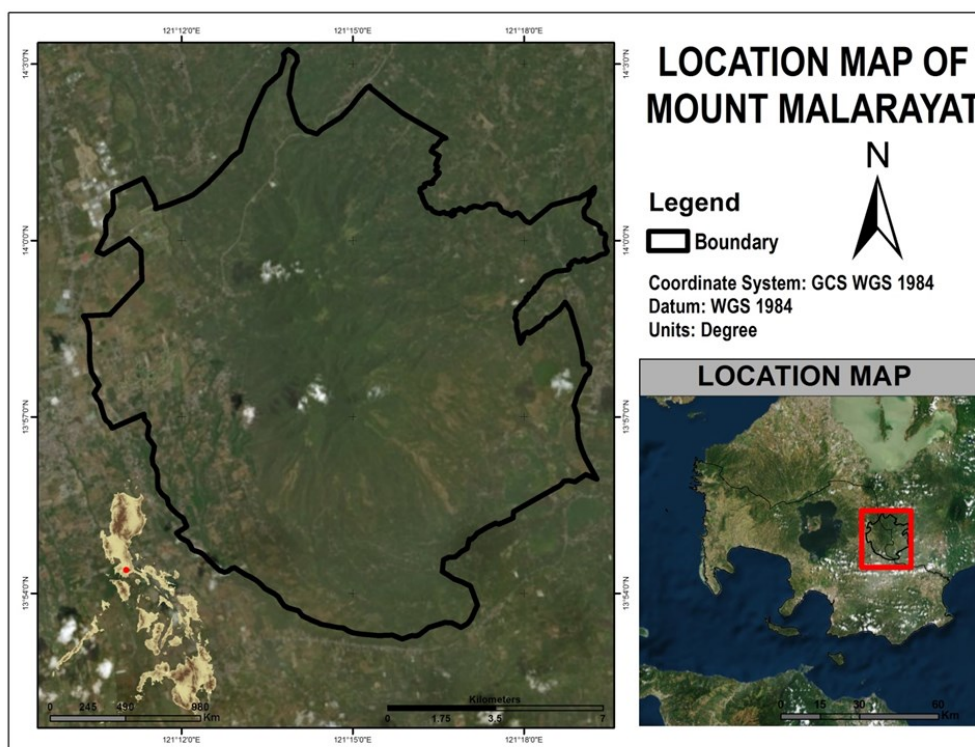


Figure 1. Location map of Mt. Malarayat.

to have a good idea of the stand structure and species composition of the forest.

An opportunistic flora survey involving listing and photo documentation of the different species found outside the transects were also carried out to account for maximum possible species in the area.

Data analysis

Information gathered in the field were tabulated and analyzed to characterize every species recorded from the study area. The status of plant diversity was assessed using parameters such as species abundance, dominance, density and their relative values. The relative values are used to obtain the Importance Value (IV), which is the standard measurement in forest ecology to determine the rank relationships of species.

The relative frequency, relative density, relative dominance, and importance values were determined using the following formulas:

$$\text{Density} = \frac{\text{number of individuals}}{\text{area sampled}}$$

$$\text{Relative Density} = \frac{\text{density for a species}}{\text{total density for all species}} \times 100$$

$$\text{Frequency} = \frac{\text{number of plots in which species occur}}{\text{total number of plots sampled}}$$

$$\text{Relative Frequency} = \frac{\text{frequency value for a species}}{\text{total frequency for all species}} \times 100$$

$$\text{Dominance} = \frac{\text{basal area or volume for a species}}{\text{area sampled}}$$

$$\text{Relative Dominance} = \frac{\text{dominance for a species}}{\text{total dominance for a species}} \times 100$$

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

Table 1. Coordinates of transects surveyed.

Transect Name	COORDINATES			
	START		END	
	Latitude	Longitude	Latitude	Longitude
BMS Transect	13.928	121.240	13.946	121.237
Forest Transect 1	13.949	121.243	13.950	121.244
Forest Transect 2	13.951	121.241	13.952	121.241
Forest Transect 3	13.955	121.244	13.955	121.244

In addition, the ecological importance of the vegetation in the area, endemism, and ecological status of the different species were determined based on the most recent taxonomic publications as well as global and national assessments (IUCN 2017–3; DAO 2017–11). Family names followed the latest Angiosperm Phylogeny Group classification version 14 (Stevens 2001 onwards) while the common names were adapted from Rojo (1999).

RESULTS AND DISCUSSION

Plant Diversity

Results of the rapid plant survey revealed that Mt. Malarayat has remarkable plant diversity despite the limited survey time and effort. A total of 264 morpho-species belonging to the seed plants (angiosperms and gymnosperms), ferns, and their allies were recorded in the area (Appendix 1). Some specimens were not identified to the species level and were tentatively assigned to the most probable taxon (family or genus). Most of these are in their juvenile stage (seedlings or saplings) or are sterile specimens (without flowers or spores), as identification of plant species is very much dependent on the reproductive structures.

BMS transect

The area surveyed was a scrubland composed of pioneer species of trees, shrubs, and grasses. The whole transect was heavily dominated by small diameter *ipil-ipil* (*Leucaena leucocephala*) and *kakawate* (*Gliricidia sepium*) and a number of pantropic exotic weeds such as cogon (*Imperata cylindrica*), *talahib* (*Saccharum spontaneum*), *gonoi* (*Chromolaena odorata*), *uoko* (*Mikania cordata*), and coronitas (*Lantana camara*). An edible vine and a highly invasive species, passion fruit (*Passiflora edulis*), was also observed dominating and invading the crown of many small trees in the area.

A total of 147 angiosperm species were encountered from the BMS transect distributed as follows: 96 tree species, 23 herbaceous, 10 shrubs, 9 vines, 4 grasses, 2 palms, and 3 ferns. Of the total number of species identified, 88 are non-endemic indigenous, 17 are endemic to the country, while 37 are exotics.

Forested area

Results of the survey revealed that the forested area contains more native species than the BMS transect. A total of 181 morpho-species were recorded from the three transects in the more natural forested areas. About 86% (155/181) of which is indigenous species, including 30 Philippine endemics.

Majority (131/181) of the species recorded from the forested area belong to tree species, unlike in the BMS transect having more of non-tree species. However, only 23 individuals belonging to 11 species were recorded to have diameter of >10 cm. This is understandable since the transects surveyed were basically very young secondary forest. The most important species based on the computed IV (Table 2) were *balobo* (123.83), *anuling* (51.172), and *pagsahingin bulog* (23.638).

Ecologically Important Species

Endemic Species

The geographical distribution of plant species has been very useful for assessing biodiversity values of regions, countries, and islands. Species confined to a particular site should be given particular conservation management strategies as they are more vulnerable to disturbance due to their narrow range (Malabrigo 2013).

There are at least 39 Philippine endemics that are found in Mt. Malarayat (Table 3). Some of the notable endemics are threatened tree species such as kangko (*Aphanamixis polystachya*), antipolo (*Artocarpus blancoi*), kalulot (*A. rubrovenius*), piling-liitan (*Canarium luzonicum*), kalingag (*Cinnamomum mercadoi*), katmon (*Dillenia philippinensis*), balobo (*Diplodiscus paniculatus*), and duguan (*Myristica philippensis*).

Table 2. The top 10 tree species based on Importance Value in Mt. Malarayat, Lipa City, Batangas.

Species	Common name	Count	RDen	RF	RDom	IV
<i>Diplodiscus paniculatus</i> Turcz.	Balobo	9	39.13	20.00	64.70	123.83
<i>Pisonia umbellifera</i> (J.R. Forst. & G. Forst.) Seem.	Anuling	2	8.70	13.33	29.14	51.17
<i>Canarium gracile</i> Engl.	Pagsahingin bulog	2	8.70	13.33	1.61	23.64
<i>Melanolepis multiglandulosa</i> (Reinw. ex Blume) Rchb. & Zoll.	Alim	2	8.70	13.33	0.84	22.87
<i>Ficus nota</i> (Blanco) Merr.	Tibig	2	8.70	6.67	0.94	16.31
<i>Canarium luzonicum</i> (Blume) A. Gray	Pagsahingin liitan	2	8.70	6.67	0.84	16.21
<i>Ficus variegata</i> Blume	Tangisang bayawak	1	4.35	6.67	0.89	11.91
<i>Parartocarpus venenosus</i> Becc.	Malanangka	1	4.35	6.67	0.57	11.59
<i>Persea americana</i> Mill	Avocado	1	4.35	6.67	0.29	11.31
<i>Albizia procera</i> (Roxb.) Benth.	Akleng parang	1	4.35	6.67	0.16	11.18

* RDen – relative density, RF – relative frequency, RDom – relative dominance, IV –importance value

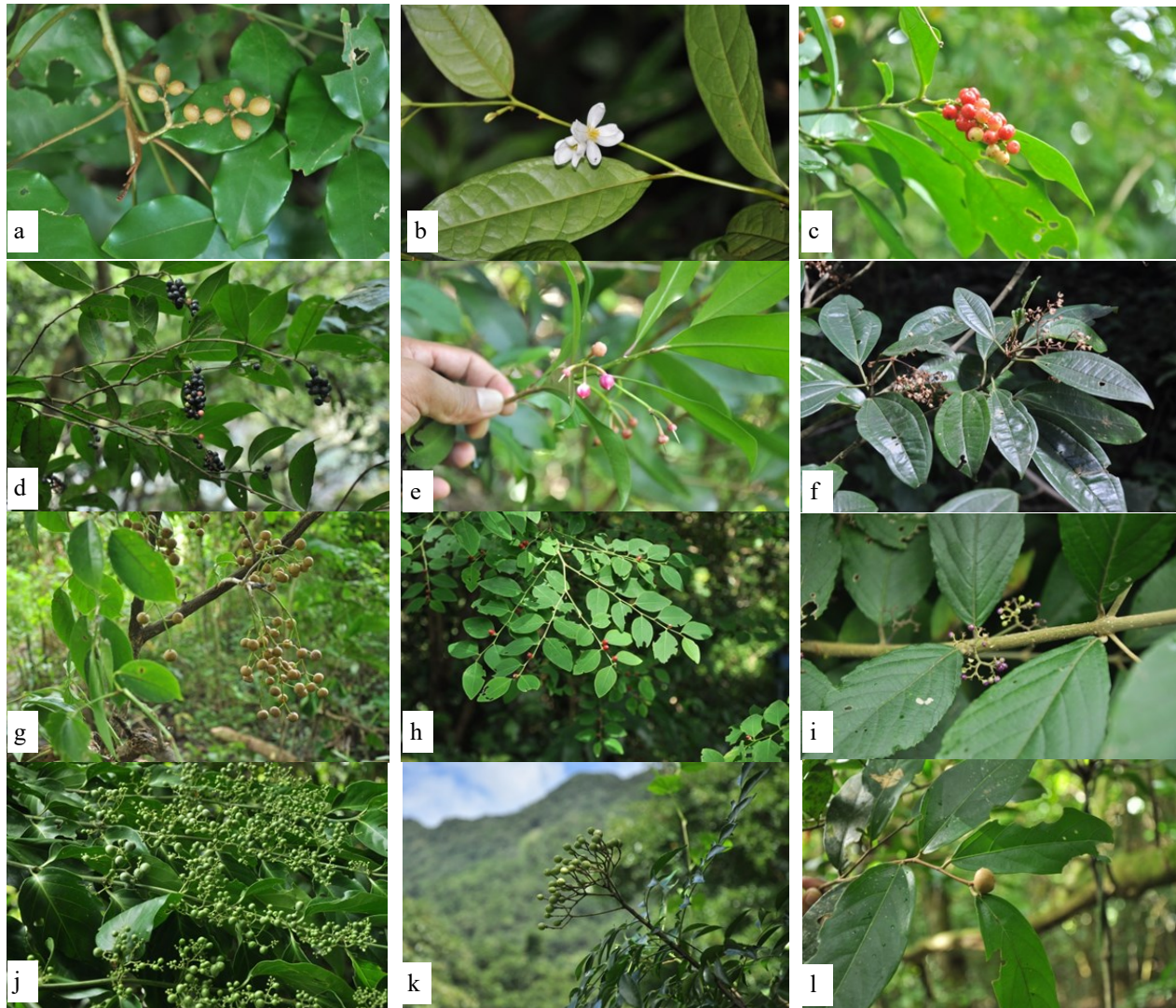
Table 3. List of endemic plant species found in the area (Pelser *et al.* 2011 onwards).

Common Name	Scientific Name	Family Name
Gabing tigre	<i>Alocasia zebrina</i>	Araceae
Tagbak	<i>Alpinia elegans</i>	Araceae
Tagpo	<i>Ardisia squamulosa</i>	Myrsinaceae
Kaong	<i>Arenga pinnata</i>	Arecaceae
Antipolo	<i>Artocarpus blancoi</i>	Moraceae
Anubing	<i>Artocarpus ovatus</i>	Moraceae
Kalulot	<i>Artocarpus rubrovenius</i>	Moraceae
Astronia	<i>Astronia cumingiana</i>	Melastomataceae
Himbabao	<i>Broussonetia luzonica</i>	Moraceae
Piling liitan	<i>Canarium luzonicum</i>	Burseraceae
Pugahan	<i>Caryota cumingii</i>	Arecaceae
Talitan	<i>Casearia fuliginosa</i>	Salicaceae
Kalingag	<i>Cinnamomum mercadoi</i>	Lauraceae
Cynometra	<i>Cynometra inequifolia</i>	Fabaceae
Dasymaschalon	<i>Dasymaschalon clusiflorum</i>	Annonaceae
Katmon	<i>Dillenia philippinensis</i>	Dilleniaceae
Diospyros	<i>Diospyros kurzii</i>	Ebenaceae
Balobo	<i>Diplodiscus paniculatus</i>	Malvaceae
Niog–niogan	<i>Ficus pseudopalma</i>	Moraceae
Pakiling	<i>Ficus odorata</i>	Moraceae
Niog–niogan	<i>Ficus pseudopalma</i>	Moraceae
Is is	<i>Ficus ulmifolia</i>	Moraceae
Gatasan	<i>Garcinia venulosa</i>	Clusiaceae
Mabunot	<i>Gomphandra luzoniensis</i>	Stemonuraceae
Amuyong	<i>Goniothalamus amuyon</i>	Annonaceae
Alopayi	<i>Homalomena philippinensis</i>	Araceae
Mayanman	<i>Ixora longistipula</i>	Rubiaceae
Patangis	<i>Magnolia candolii</i>	Magnoliaceae
Duguan	<i>Myristica philippinensis</i>	Myristicaceae
Puso puso	<i>Neolitsea vidalii</i>	Lauraceae
Wisak	<i>Neonaclea media</i>	Rubiaceae
Malabunga	<i>Notaphoebe malabonga</i>	Lauraceae
Tagotoi	<i>Palaquium foxworthyi</i>	Sapotaceae
Anolang	<i>Papulathia lanceolata</i>	Annonaceae
Lamog	<i>Planchonia spectabilis</i>	Lecythidaceae
Kulatingan	<i>Pterospermum obliquum</i>	Malvaceae
Tapinag bundok	<i>Sterculia montana</i>	Malvaceae
Sakat	<i>Terminalia nitens</i>	Combretaceae
Loher's ayo	<i>Tetrastigma loheri</i>	Vitaceae

Threatened Species

The conservation status of species is based on the most recent recommendations of the Philippine Plant Conservation Committee (PPCC) officially issued as DENR Administrative Order (D A O) No. 2017-11 better known as "Updated National List of Threatened Philippine Plants and their Categories" (DENR 2017). The listing of threatened species of the IUCN red list was also used as reference.

Twenty-four species recorded during the field survey were listed either under the Philippine Red List (DAO 2017-11) or the IUCN Red List of Threatened Species (IUCN 2017-3) (Table 4). Noteworthy among the list are the two endangered (EN) species namely tindalo (*Azelia rhomboidea*) and molave (*Vitex parviflora*).



Some of the documented flowering/fruiting plants during the survey: a) salakin pula (*Aglaia elliptica*), b) bagang aso (*Anaxagorea luzonensis*), c) bignai (*Antidesma bunius*), d) bignai pugo (*Antidesma pentandrum*), e) tagpo (*Ardisia squamulosa*), f) talanak (*Astronia candolleana*), g) tuai (*Bischofia javanica*), h) matang-hipon (*Breynia vitis-idaea*), i) tambabasi (*Callicarpa formosana*), j) tadiang anuang (*Canthium monstrosum*), k) kalomata (*Clausena brevistyla*), l) balobo (*Diplodiscus paniculatus*)

Table 4. List of threatened species recorded from the survey area based on IUCN 2017–3 and DAO 2017–11.

Species	Common name	Family	IUCN 2017–3	DAO 2017–11
<i>Afzelia rhomboidea</i> (Blanco) S.Vidal	Tindalo	Fabaceae	VU	EN
<i>Aglaia edulis</i> (Roxb.) Wall.	Malasaging	Meliaceae		OTS
<i>Aglaia rimosa</i> (Blanco) Merr.	Bayanti	Meliaceae		OTS
<i>Alangium longiflorum</i> Merr.	Malatapai	Connaraceae	VU	OTS
<i>Aphanamixis polystachya</i> (Wall.) R.Parker	Kangko	Meliaceae		OTS
<i>Artocarpus blancoi</i> (Elmer) Merr.	Antipolo	Moraceae	VU	
<i>Artocarpus rubrovenius</i> Warb.	Kalulot	Moraceae	VU	OTS
<i>Canarium luzonicum</i> (Blume) Miq.	Piling liitan	Burseraceae	VU	OTS
<i>Cinnamomum mercadoi</i> S.Vidal	Kalingag	Lauraceae	VU	OTS
<i>Cynometra inaequifolia</i> A. Gray	Dila–dila	Fabaceae	VU	VU
<i>Dillenia philippinensis</i> Rolfe	Katmon	Dilleniaceae	VU	
<i>Diospyros discolor</i> Willd.	Kamagong	Ebenaceae		VU
<i>Diospyros pilosanthera</i> Blanco	Bolong–eta	Ebenaceae		VU
<i>Diospyros pyrrhocarpa</i> Miq.	Anang	Ebenaceae		VU
<i>Diplodiscus paniculatus</i> Turcz.	Balobo	Malvaceae	VU	
<i>Ficus ulmifolia</i> Lam.	Is–is	Moraceae	VU	
<i>Koordersiodendrom pinnatum</i> (Blanco) Merr.	Amugis	Anacardiaceae		OTS
<i>Litchi chinensis</i> Sonn. ssp. <i>philippinensis</i> (Radlk.) Leenh.	Alupag	Sapindaceae		VU
<i>Myristica philippensis</i> Lam.	Duguan	Myristicaceae	VU	OTS
<i>Pterocarpus indicus</i> Willd.	Narra	Fabaceae	VU	VU
<i>Syzygium nitidum</i> Benth.	Makaasim	Myrtaceae		VU
<i>Terminalia nitens</i> C. Presl	Sakat	Combretaceae	VU	
<i>Toona calantas</i> Merr. & Rolfe	Kalantas	Meliaceae		VU
<i>Vitex parviflora</i> Juss.	Molave	Lamiaceae	VU	EN

CONCLUSION AND RECOMMENDATION

Results of the rapid plant survey revealed that Mt. Malarayat has high biodiversity value. Despite the limited survey time and efforts, the number of Philippine endemics and threatened species in the area were found to be relatively high. Considering the number of threatened and ecologically important species found in the area, it is highly justified to consider Mt. Malarayat as an ecologically critical area. All the concerned people of the nearby barangays should by all means exert their best effort to protect and conserve the area.

It is very important to emphasize that the area covered by the survey is a very small fraction of the target site, yet a significant number of ecologically important species were recorded. A more comprehensive plant diversity assessment including that of Barangays Sto. Niño and Talisay, is strongly recommended to better account for the floral diversity of Mt. Malarayat.

Lastly, considering the paucity of biological information in the flora of Mt. Malarayat, information that were initially gathered should be supplemented by additional survey information to develop a good reference document. A laymanized pictorial guide on the flora of Mt. Malarayat can be developed to increase the knowledge and appreciation of the stakeholders on the beauty and importance of the native trees of the Mt. Malarayat.

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Appendix 1. Taxonomic list of all the species encountered in the study area.

Common Name	Scientific Name	Family Name
Acacia	<i>Acacia auriculiformis</i>	Fabaceae
Alambrillong gubat	<i>Adiantum caudatum</i>	Pteridaceae
Kaikai	<i>Adiantum philippense</i>	Pteridaceae
Adiantum	<i>Adiantum sp.</i>	Pteridaceae
Tindalo	<i>Afzelia rhomboidea</i>	Fabaceae
Tuhod Manok	<i>Ageratum conyzoides</i>	Asteraceae
Malasaging	<i>Aglaia edulis</i>	Meliaceae
Malasaging liitan	<i>Aglaia elliptica</i>	Meliaceae
Bayanti	<i>Aglaia rimosa</i>	Meliaceae
Aglaonema	<i>Aglaonema sp.</i>	Araceae
Bagaloan	<i>Alangium chinense</i>	Cornaceae
Malatapai	<i>Alangium longiflorum</i>	Cornaceae
Akle	<i>Albizia acle</i>	Fabaceae
Akleng parang	<i>Albizia procera</i>	Fabaceae
Ibu	<i>Alectryon glaber</i>	Sapindaceae
Gabing tigre	<i>Alocasia zebrina</i>	Araceae
Barotongol	<i>Alophyllus cobbe</i>	Sapindaceae
Tagbak	<i>Alpinia elegans</i>	Araceae
Dita	<i>Alstonia scholaris</i>	Apocynaceae
Devil's tounge	<i>Amorphophallus paeoniifolius</i>	Araceae
Tibatib	<i>Amydrium medium</i>	Araceae
Galo	<i>Anacolosa frutescens</i>	Olacaceae
Bagang Aso	<i>Anaxagorea luzonensis</i>	Annonaceae
Guyabano	<i>Annona muricata</i>	Annonaceae
Atis	<i>Annona squamosa</i>	Annonaceae
Bignai	<i>Antidesma bunius</i>	Phyllanthaceae
Bignai Pugo	<i>Antidesma pentandrum</i>	Phyllanthaceae
Kangko	<i>Aphanamixis polystachya</i>	Meliaceae
Alasiis	<i>Aphananthe philippinensis</i>	Cannabaceae
Albutra	<i>Arcangelisia flava</i>	Menispermaceae
Katagpo	<i>Ardisia clementis</i>	Myrsinaceae
Aunasin	<i>Ardisia pyramidalis</i>	Myrsinaceae
Tagpo	<i>Ardisia squamulosa</i>	Myrsinaceae
Kaong	<i>Arenga pinnata</i>	Arecaceae
Antipolo	<i>Artocarpus blancoi</i>	Moraceae
Nangka	<i>Artocarpus heterophyllus</i>	Moraceae
Anubing	<i>Artocarpus ovatus</i>	Moraceae
Kalulot	<i>Artocarpus rubrovenius</i>	Moraceae
Badling	<i>Astronia cumingiana</i>	Melastomataceae
Baccaurea	<i>Baccaurea sp.</i>	Phyllanthaceae
Alibangbang	<i>Bauhinia malabarica</i>	Fabaceae
Tuai	<i>Bischofia javanica</i>	Phyllanthaceae
Malabulak	<i>Bombax ceiba</i>	Malvaceae
Matang hipon	<i>Breynia vitis-idaea</i>	Phyllanthaceae
Bridelia	<i>Bridelia stipularis</i>	Phyllanthaceae
Brommelia	<i>Brommelia sp.</i>	Brommeliaceae
Himbabao	<i>Broussonetia luzonica</i>	Moraceae
Balinghasai	<i>Buchanania arborescens</i>	Anacardiaceae
Tambabasi	<i>Callicarpa formosana</i>	Lamiaceae
Callicarpa	<i>Callicarpa sp.</i>	Lamiaceae
Bitanghol	<i>Calophyllum blancoi</i>	Clusiaceae

Appendix 1. Taxonomic list of all the species encountered in the study area (Con't).

Common Name	Scientific Name	Family Name
Haikan	<i>Camellia lanceolata</i>	Theaceae
Pagsahingin	<i>Canarium asperum</i>	Burseraceae
Pagsahingin bulog	<i>Canarium gracile</i>	Burseraceae
Dulit	<i>Canarium hirsutum</i>	Burseraceae
Piling liitan	<i>Canarium luzonicum</i>	Burseraceae
Bandera espanyola	<i>Canna flacida</i>	Cannaceae
Butling babui	<i>Canthium gynochthodes</i>	Rubiaceae
Tadiang anuang	<i>Canthium monstrosum</i>	Rubiaceae
Bakauan gubat	<i>Carallia brachiata</i>	Rhizophoraceae
Papaya	<i>Carica papaya</i>	Caricaceae
Pugahan	<i>Caryota cumingii</i>	Arecaceae
Takipan	<i>Caryota rumphiana</i>	Arecaceae
Talitan	<i>Casearia fuliginosa</i>	Salicaceae
Palawan Cherry	<i>Cassia nodosa</i>	Fabaceae
Malaikmo	<i>Celtis philippinensis</i>	Cannabaceae
Dilang butiki	<i>Centrosema pubescens</i>	Fabaceae
Kuratan	<i>Chionanthus philippinensis</i>	Oleaceae
Karaksan	<i>Chionanthus ramiflorus</i>	Oleaceae
Balukanag	<i>Chisocheton cumingianus</i> ssp. <i>cumingianus</i> <i>Chisocheton pentandrus</i> subsp.	Meliaceae
Katong Matsing	<i>Pentandrus</i>	Meliaceae
Baraw-Baraw	<i>Chloranthus erectus</i>	Chlorantaceae
Gonoi	<i>Chromolaena odorata</i>	Asteraceae
Kalingag	<i>Cinnamomum mercadoi</i>	Lauraceae
Kalomata	<i>Clausena brevistyla</i>	Rutaceae
Santiki	<i>Cleidion spiciflorum</i>	Euphorbiaceae
Bagauak	<i>Clerodendron minahassae</i>	Lamiaceae
Niog	<i>Cocos nucifera</i>	Arecaceae
Kape	<i>Coffea</i> sp.	Rubiaceae
Anonang	<i>Cordia dichotoma</i>	Boraginaceae
Salingogon	<i>Cratoxylum formosum</i>	Clusiaceae
Paguringon	<i>Cratoxylum sumatranum</i>	Clusiaceae
Pako	<i>Cristella dentata</i>	Pteridaceae
Tiaui	<i>Crypteronia paniculata</i>	Crypteroniaceae
Cynometra	<i>Cynometra inequifolia</i>	Fabaceae
Busikad	<i>Cyperus rotundus</i>	Cyperaceae
Dasymaschalon	<i>Dasymaschalon clusiflorum</i>	Annonaceae
Katmon	<i>Dillenia philippinensis</i>	Dilleniaceae
Tugi	<i>Dioscorea esculenta</i>	Dioscoreaceae
Diospyros	<i>Diospyros kurzii</i>	Ebenaceae
Kamagong	<i>Diospyros blancoi</i>	Ebenaceae
Bolong eta	<i>Diospyros pilosanthera</i>	Ebenaceae
Anang	<i>Diospyros pyrrocarpa</i>	Ebenaceae
Balobo	<i>Diplodiscus paniculatus</i>	Malvaceae
Discocalyx	<i>Discocalyx</i> sp.	Myrsinaceae
Bamban	<i>Donax cannaeformis</i>	Marantaceae
Tinaang Pantai	<i>Drypetes maquilingensis</i>	Putranjivaceae
Igyo	<i>Dysoxylum gaudichaudianum</i>	Meliaceae
Kalimutain	<i>Dysoxylum arborescens</i>	Meliaceae
Rarang	<i>Erythrina subumbrans</i>	Fabaceae
Torch ginger	<i>Etlingera elatior</i>	Zingiberaceae
Salisi	<i>Ficus benjamina</i>	Moraceae

Appendix 1. Taxonomic list of all the species encountered in the study area (Con't).

Common Name	Scientific Name	Family Name
Butli	<i>Ficus gul</i>	Moraceae
Aplas	<i>Ficus irisana</i>	Moraceae
Hagimit	<i>Ficus minahassae</i>	Moraceae
Dungo	<i>Ficus nervosa</i> subsp. <i>pubinervis</i>	Moraceae
Niog–niogan	<i>Ficus pseudopalma</i>	Moraceae
Malatibig	<i>Ficus sattherthwaitei</i>	Moraceae
Tangisang Bayawak	<i>Ficus variegata</i>	Moraceae
Upling gubat	<i>Ficus ampelas</i>	Moraceae
Tibig	<i>Ficus nota</i>	Moraceae
Pakiling	<i>Ficus odorata</i>	Moraceae
Niog–niogan	<i>Ficus pseudopalma</i>	Moraceae
Hauili	<i>Ficus septica</i>	Moraceae
Ficus	<i>Ficus sp.</i>	Moraceae
Is–is	<i>Ficus ulmifolia</i>	Moraceae
Bitongol	<i>Flacourtia rukam</i>	Salicaceae
Payang–Payang	<i>Flemingia strobilifera</i>	Fabaceae
Taklang anak	<i>Garcinia dulcis</i>	Clusiaceae
Gatasan	<i>Garcinia venulosa</i>	Clusiaceae
Kakauate	<i>Gliricidia sepium</i>	Fabaceae
Malabagang	<i>Glochidion album</i>	Phyllanthaceae
Bagnang laparan	<i>Glochidion gigantifolium</i>	Phyllanthaceae
Bagna	<i>Glochidion triandrum</i>	Phyllanthaceae
Gmelina	<i>Gmelina arborea</i>	Lamiaceae
Mabunot	<i>Gomphandra luzoniensis</i>	Stemonuraceae
Amuyong	<i>Goniothalamus amuyon</i>	Annonaceae
Tengang babui	<i>Gonocaryum calleryanum</i>	Cardiopteridaceae
Danglin	<i>Grewia multiflora</i>	Malvaceae
Alahan	<i>Guioa koelreuteria</i>	Sapindaceae
Uas	<i>Harpullia arborea</i>	Sapindaceae
Dungon	<i>Heritiera sylvatica</i>	Malvaceae
Alopayi	<i>Homalomena philippinensis</i>	Araceae
Spider Lily	<i>Hymenocallis littorale</i>	Amaryllidaceae
Cogon	<i>Imperata cylindrica</i>	Poaceae
Mayanman	<i>Ixora longistipula</i>	Rubiaceae
Tan–ag	<i>Kleinhovia hospita</i>	Malvaceae
Tambalau	<i>Knema glomerata</i>	Myristicaceae
Amugis	<i>Koordersiodendrom pinnatum</i>	Anacardiaceae
Banaba	<i>Lagerstroemia speciosa</i>	Lythraceae
Coronitas	<i>Lantana camara</i>	Verbenaceae
Amamali	<i>Leea aculeata</i>	Leeaceae
Mali–mali	<i>Leea guineensis</i>	Leeaceae
Kaliantan	<i>Leea philippinensis</i>	Leeaceae
Ipil–ipil	<i>Leucaena leucocephala</i>	Fabaceae
Arasi	<i>Leucosyke brunnescens</i>	Urticaceae
Alagasi	<i>Leucosyke capitellata</i>	Urticaceae
Alupag	<i>Litchi chinensis</i> subsp. <i>philippinensis</i>	Sapindaceae
Litsea	<i>Litsea varians</i>	Lauraceae
Sablot	<i>Litsea glutinosa</i>	Lauraceae
Lunas	<i>Lunasia amara</i>	Rutaceae
Nito	<i>Lygodium circinnatum</i>	Lygodiaceae
Nitong pula	<i>Lygodium japonicum</i>	Lygodiaceae
Binunga	<i>Macaranga tanarius</i>	Euphorbiaceae
Maesa	<i>Maesa denticulata</i>	Primulaceae
Patangis	<i>Magnolia candolii</i>	Magnoliaceae

Appendix 1. Taxonomic list of all the species encountered in the study area (Con't).

Common Name	Scientific Name	Family Name
Hinlaumo	<i>Mallotus mollissimus</i>	Euphorbiaceae
Banato	<i>Mallotus philippinensis</i>	Euphorbiaceae
Mangga	<i>Mangifera indica</i>	Anacardiaceae
Kamoteng Kahoy	<i>Manihot esculenta</i>	Euphorbiaceae
Alim	<i>Melanolepis multiglandulosa</i>	Euphorbiaceae
Matang-araw	<i>Melicope tryphylla</i>	Rutaceae
Digeg	<i>Memecylon lanceolatum</i>	Memecylaceae
Tulibas	<i>Micromelum minutum</i>	Rutaceae
Uuko	<i>Mikania cordata</i>	Asteraceae
Takulau	<i>Miliusa vidalii</i>	Annonaceae
Bani	<i>Milletia pinnata</i>	Fabaceae
Makahiya	<i>Mimosa pudica</i>	Fabaceae
Alikbangon lalaki	<i>Murdania nudiflora</i>	Commelinaceae
Kamuning	<i>Murraya paniculata</i>	Rutaceae
Musa	<i>Musa acuminata</i>	Musaceae
Saging	<i>Musa sapientum</i>	Musaceae
Tanghas	<i>Myristica elliptica</i> subsp. <i>simiarum</i>	Myristicaceae
Duguan	<i>Myristica philippinensis</i>	Myristicaceae
Puso puso	<i>Neolitsea vidalii</i>	Lauraceae
Wisak	<i>Neonaclea media</i>	Rubiaceae
Kalamansanai	<i>Neonauclea calycina</i>	Rubiaceae
Apanang	<i>Neotrewia cumingii</i>	Euphorbiaceae
Kapulasan	<i>Nephelium ramboutan-ake</i>	Sapindaceae
Malabunga	<i>Notaphoebe malabonga</i>	Lauraceae
Balanti	<i>Omalanthus populneus</i>	Euphorbiaceae
Pinka-pinkahan	<i>Oroxylum indicum</i>	Bignoniaceae
Tagotoi	<i>Palaquium foxworthyi</i>	Sapotaceae
Paleria	<i>Paleria</i> sp.	Thymeleaceae
Anolang	<i>Papulathia lanceolata</i>	Annonaceae
Malanangka	<i>Parartocarpus venenosus</i>	Moraceae
Paspalum	<i>Paspalum</i> sp.	Poaceae
Passionaria	<i>Passiflora edulis</i>	Passifloraceae
Pavetta	<i>Pavetta</i> sp.	Rubiaceae
Pansit-Pansitan	<i>Peperomia pellucida</i>	Piperaceae
Avocado	<i>Persea gratissima</i>	Lauraceae
Phyllanthus	<i>Phyllanthus balgooyi</i>	Phyllanthaceae
Ikmo	<i>Piper betle</i>	Piperaceae
Litlit	<i>Piper interruptum</i> var. <i>loheri</i>	Piperaceae
Dalunot	<i>Pipturus arborescens</i>	Urticaceae
Anuling	<i>Pisonia umbellifera</i>	Nyctaginaceae
Lamog	<i>Planchonia spectabilis</i>	Lecythidaceae
Hanopol	<i>Poikilospermum suaveolens</i>	Urticaceae
Salibangon	<i>Pollia secundiflora</i>	Commelinaceae
Malapapaya	<i>Polyscias nodosa</i>	Araliaceae
Malugai	<i>Pometia pinnata</i>	Sapindaceae
Malugai liitan	<i>Pometia pinnata</i> forma <i>repanda</i>	Sapindaceae
White Nato	<i>Pouteria macrantha</i>	Sapotaceae
Premna	<i>Premna serratifolia</i>	Lamiaceae
Lago	<i>Prunus grisea</i>	Rosaceae
Purple false eranthemum	<i>Pseuderanthemum atropurpureum</i>	Acanthaceae
Dilang baka	<i>Pseudolepanthopus spicatus</i>	Asteraceae
Bayabas	<i>Psidium guajava</i>	Myrtaceae

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Common Name	Scientific Name	Family Name
Psychotria	<i>Psychotria</i> sp.	Rubiaceae
Pakong sundang	<i>Pteris ensiformis</i>	Pteridaceae
Narra	<i>Pterocarpus indicus</i>	Fabaceae
Taluto	<i>Pterocymbium tinctorium</i>	Malvaceae
Bayok	<i>Pterospermum diversifolium</i>	Malvaceae
Kulatingan	<i>Pterospermum obliquum</i>	Malvaceae
Ambal	<i>Pycnarrhena manillensis</i>	Menispermaceae
Banai–banai	<i>Radermachera pinnata</i>	Bignoniaceae
Amlong	<i>Rhaphidophora merrillii</i>	Araceae
Tibatib	<i>Rhaphidophora pinnata</i>	Araceae
Kamagsa	<i>Rourea minor</i>	Connaraceae
Talahib	<i>Sacharrum spontaneum</i>	Poaceae
Santol	<i>Sandoricum koetjape</i>	Meliaceae
Ligas	<i>Semearpus cuneiformis</i>	Anacardiaceae
Ayas–as	<i>Setaria palmifolia</i>	Poaceae
Malarayap	<i>Severinia disticha</i>	Rutaceae
Escobang–haba	<i>Sida acuta</i>	Malvaceae
Tarambulo	<i>Solanum ferox</i>	Solanaceae
Kandilaan	<i>Stachytarpetta jamaicensis</i>	Verbenaceae
Banilad	<i>Sterculia comosa</i>	Malvaceae
Sinaligan	<i>Sterculia ferruginea</i>	Malvaceae
Tapinag bundok	<i>Sterculia montana</i>	Malvaceae
Malabuho	<i>Sterculia oblongata</i>	Malvaceae
Tamayuan	<i>Strombosia philippinensis</i>	Olacaceae
Mahogany	<i>Swietenia macophylla</i>	Meliaceae
Kamay kastila	<i>Syngonium podophyllum</i>	Araceae
Syzygium	<i>Syzygium</i> sp. 1	Myrtaceae
Duhat	<i>Syzygium cumini</i>	Myrtaceae
Makaasim	<i>Syzygium nitidum</i>	Myrtaceae
Alibutbut	<i>Tabernaemontana mucronata</i>	Apocynaceae
Pandakaki	<i>Tabernaemontana pandacaqui</i>	Apocynaceae
Sampalok	<i>Tamarindus indica</i>	Fabaceae
Malakalumpit	<i>Terminalia calamansanai</i>	Combretaceae
Talisai gubat	<i>Terminalia foetidissima</i>	Combretaceae
Sakat	<i>Terminalia nitens</i>	Combretaceae
Ayo	<i>Tetrastigma hermandii</i>	Vitaceae
Loher's ayo	<i>Tetrastigma loheri</i>	Vitaceae
Kalantas	<i>Toona calantas</i>	Meliaceae
Anabiong	<i>Trema orientalis</i>	Cannabaceae
Katap	<i>Trigonostemon philippinensis</i>	Euphorbiaceae
Anonggo	<i>Turpinia ovalifolia</i>	Staphyleaceae
Kullot–Kullot	<i>Urena lobata</i>	Malvaceae
Uvaria	<i>Uvaria</i> sp.	Annonaceae
Alilaua	<i>Villebrunea trinervia</i>	Urticaceae
Molave	<i>Vitex parviflora</i>	Lamiaceae
Wedelia	<i>Wedelia stipularis</i>	Asteraceae
Wendlandia	<i>Wendlandia</i> sp.	Rubiaceae
Lanete	<i>Wrightia pubescens</i> subsp. <i>laniti</i>	Apocynaceae
Yautia	<i>Xanthosoma violaceum</i>	Araceae
Kangai	<i>Zanthoxylum avicennae</i>	Rutaceae
Wandering jew	<i>Zebrina pendula</i>	Araceae