

## **A Rapid Assessment of Vascular Plants in Mt. Kiamo, Mindanao, Philippines**

**FULGENT P. CORITICO**

ORCID No. 0000-0003-3876-6610

[cfulgent@gmail.com](mailto:cfulgent@gmail.com)

Center for Biodiversity Research and Extension in Mindanao  
Central Mindanao University, Musuan, Maramag  
Bukidnon, Philippines

**VICTOR B. AMOROSO**

ORCID No. 0000-0001-8865-5551

[victorbamoroso@gmail.com](mailto:victorbamoroso@gmail.com)

Center for Biodiversity Research and Extension in Mindanao,  
Central Mindanao University, Musuan, Maramag,  
Bukidnon, Philippines

### **ABSTRACT**

A rapid assessment was conducted to determine the richness of vascular plants in Mt. Kiamo, Mindanao, Philippines. Repeated transect walks revealed 3 vegetation types, viz., Mossy-pygmy forest, Montane forest and Agro-ecosystem. A total of 251 species belonging to 82 families and 168 genera were documented. Of these, 95 species are ferns, 6 species are lycophytes, 6 gymnosperms and 144 angiosperms. Eight species are broadly distributed Philippine endemics and four are found only on Mindanao. New species and new records of plants were also documented in the area. Of the 17 threatened species recorded, 3 are critically endangered, 8 are endangered and 6 are vulnerable.

**Keywords:** survey, threatened, endemic plants, Mindanao, Philippines

## INTRODUCTION

The Philippines is home of about 13, 500 species of plants, comprising 5% of the world's total of plant species (DENR/UNEP 1997) and is one of the world's 25 biodiversity hotspots (Myers et al. 2000). The present situation of Philippine biodiversity in mountain ecosystems is critical and truly alarming due to different threats. Habitat destruction is considered to be a major threat to biodiversity loss which includes, logging and shifting cultivation (Catibog-Sinha & Heaney 2006), and over-exploitation of forest resources (Amoroso et al. 2011).

Floristic studies were conducted in different forests ecosystem in the Philippines, Mt. Makiling (Fernando et al. 2004; Gruezo 2000; Pancho and Gruezo 2006), Palanan, Isabela (Co et al. 2006). In Mindanao, studies on plant diversity were conducted in different mountain ecosystems viz. Mt. Malindang, Mt. Hamiguitan and Mt. Kitanglad (Amoroso et al 2006, 2009, 2010). But still many of mountain ecosystems in the island remain unexplored.

Mt. Kiamo is one of the remaining mountain ecosystems in the province of Bukidnon which is geographically located between 08°15.301'N, 125°09.321'E with the highest point of 1,800 masl. The mountain is located in the eastern part of Bukidnon facing Mt. Kitanglad in the Western part and Mt. Tago in the north eastern part. It is one of the mountain ecosystems which exhibit a unique floral species, but poorly explore. Part of the range was burned during the late 1980's (E. Libuhan, pers comm.), and presently with rapid conversion of forests lands into agricultural lands led to the removal of the lowland dipterocarp forest in the area. Thus, there is an urgent need to do floristic study as basis for the proper management of forest resources.

## OBJECTIVES OF THE STUDY

This study was conducted to determine the vegetation types and richness of vascular plants in Mt. Kiamo, Kibalabag, Malaybalay, Bukidnon including the assessment of conservation status of the species.

## MATERIALS AND METHODS

### **Inventory and Collection**

An inventory of vascular plants was conducted through repeated transect walks from Barangay Kibalabag to the highest peak of Mt. Kiamo last March 2012 (see

Figure 1). The vegetation types were determined based on the dominant species of plants in the area. Vegetative and reproductive parts of trees were collected by cutting the branches. Small ferns and other flowering plants were collected by uprooting the whole plant, removing the soil, and pressing the plant intact. For the tree ferns, each entire frond was collected and cut into five parts: leaf apex, middle pinna, lower pinna, basal pinna, and stipe (Amoroso et al. 2016). All specimens were processed with the wet method (Hodge 1947). Herbarium specimens were deposited at the Central Mindanao University Herbarium (CMUH).

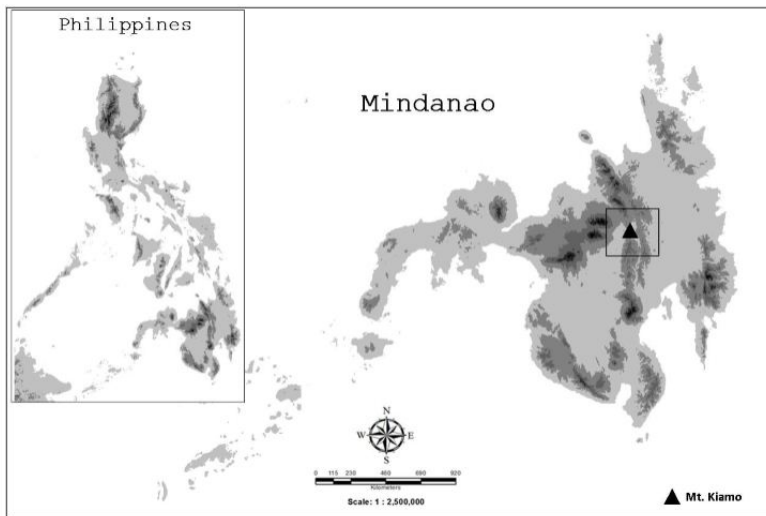


Figure 1. Location map of Mt. Kiamo, Bukidnon, Mindanao Philippines

### Species Identification and Assessment of the Conservation Status

Species were identified using the following monographs, floras, and other publications: Copeland (1958-1961); Hovenkamp et al. (1998); Nooteboom (1998); Zhang & Nooteboom (1998); Holttum (1959, 1978, 1981, 1991); Kramer (1971); Zamora and Co (1986); Zamora et al. (2000); Cootes (2001), Berg and Corner (2005); Middleton (2007); McPherson and Amoroso (2012) and digitized plant specimens available in Global Plants on JSTOR. The classification systems for ferns and lycophytes used are those of Smith et al. (2006). The assessment of the conservation status of the species was mainly based on the national list of threatened Philippine plants (Fernando et al. 2008).

## RESULTS AND DISCUSSION

### Vegetation Types

Mt. Kiamo is characterized by 3 vegetation types namely: Agro-ecosystem, Montane forest and Mossy-pygmy forest. The different vegetation types are described below (see Figure 2):

a. **Agro-ecosystem** - located at 08°15'27 N, 125°10'08 E with altitude ranging from 1,181-1,491 masl. Dominated by different agricultural crops, such as; *Zea mays* L., *Allium sepa* L., *Lycopersicum esculentum* Mill., *Sechium edule* Sw.etc. Some economic fruit trees; *Artocarpus heterophyllus* Lamk., *Psidium guajava* L., and *Lansium domesticum* Corr. Serr. This area is dominated also by different invasive alien species such as, *Lantana camara* L., *Piper aduncum* L. and *Impatiens balsamina* Elm. Grasses highly dominated in the area followed by the *Pteridium aquilinum*. The original vegetation is said to be lowland dipterocarp forest but it has been logged and converted to agricultural land. The area is located about 200 meters away from the village. This agroecosystem is comparable to Mt. Kitanglad and Mt. Malindang as reported by Amoroso et al. (2011).

b. **Montane Forest** - located at 08°15'11 N, 125°09'28 E with altitude ranging from 1,567-1,623 masl; characterized by taller trees with bigger dbh (diameter at breast height) ranging from 10-100 cm diameter with height ranging 16-40 m. Dominated by *Lithocarpus* spp., *Agathis philippinensis* Warb, *Phyllocladus hypophyllus* Hook. f. *Syzygium* spp., tree ferns such as *Sphaeropteris* spp. and *Alsophila* spp. Trees are also covered with some mosses and ferns. Generally, the montane forests in the Philippines are characterized by the presence of *Lithocarpus* spp., *Syzygium* spp., gymnosperms such as *Agathis philippinensis* Warb, *Phyllocladus hypophyllus* Hook. f. including tree ferns of family Cyatheaceae and Dicksoniaceae (Whitford 1991; Gruezo 1997; Buot and Okitsu 1998; Fernando et al. 2004; Amoroso et al. 2011).

c. **Mossy-Pygmy Forest**- located at 08°15'24 N, 125°08'51 E with altitude ranging from 1,729-1,800 masl. This is an intermediate vegetation between mossy and pygmy forests with the presence of some bonsai trees. The area is partially open dominated by grasses, some ferns and pitcher plants (*Nepenthes* spp.). It has the presence of *Scaevola micrantha* C.Presl, *Leptospermum flavescens* J.Sm. and

*Alyxia concatenata* (Blco.) Merr., *Alpinia vulcanica* Elmer and other bonsai trees like *Dacrydium elatum* (Roxb.) Wall. that are indicators of an ultramafic forest. This unique vegetation type is also observed in Mt. Hamiguitan Range Wildlife Sanctuary (Amoroso et al. 2009).

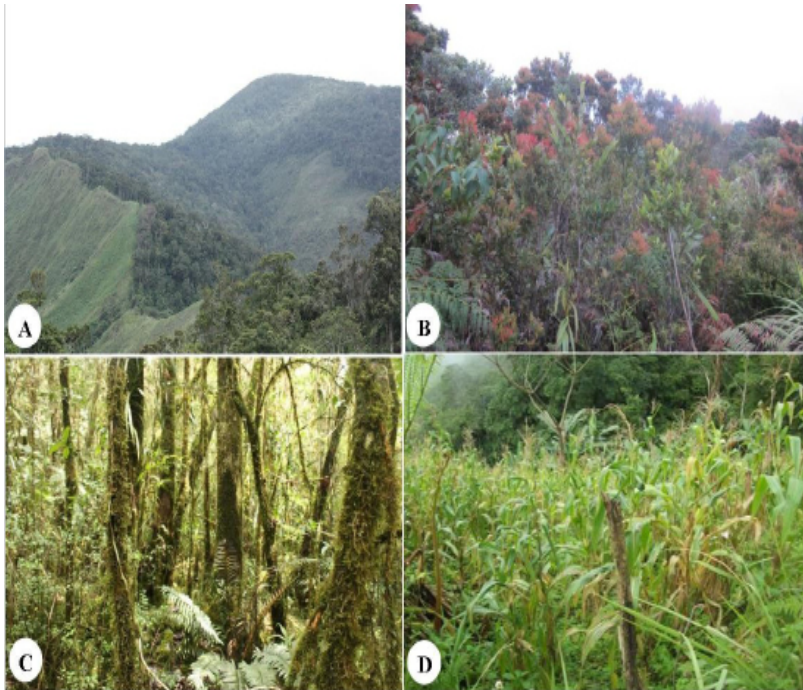


Figure 2. A. Panoramic view of Mt. Kiamo, and its vegetation types, B. Mossy-pygmy forest, C. Montane forest and D. Agroecosystem

### Species Richness

Two hundred fifty one species belonging to 82 families and 168 genera are recorded. Of these, 95 species are ferns, 6 species are lycophytes, 144 angiosperms and 6 species are gymnosperms (Table 1). The families of ferns with the highest number of species are Polypodiaceae (17 species), Hymenophyllaceae (11), Aspleniaceae (7) and Cyatheaceae (7). These families of ferns are also the same families found in the Philippines with the highest number of species (Salgado 1990), and they are also common families found in Mindanao (Amoroso et al. 2016). For the angiosperms, Orchidaceae (14), Myrtaceae (8), Rubiaceae (7) and Moraceae (7) has the most number of species while family Podocarpaceae has

the most number of species for the gymnosperms with 5 species. These families of angiosperms and gymnosperms were also observed in the different Mindanao Long Term Ecological Research (LTER) sites viz., Mt. Kitanglad, Mt. Apo, Mt. Malindang and Mt. Hamiguitan (Amoroso et al. 2006; 2009; 2011).

The species richness of ferns and lycophytes closely resembles with that of Mt. Iraya and vicinity, Batan Island, Batanes (Barcelona 2003) and Mt. Pangasugan, Leyte (Belonias and Banoc 1994) with 89 and 94 species respectively. However, it is considerably lower compared with the different mountain ecosystems in Mindanao. (Amoroso et al. 1996; 2011). The richness of plants was based only in the established trail of Mt Kiamo. Therefore, there is a need to conduct additional sampling efforts to increase the number of species recorded in the area.

Table 1. Total number of genera and species of vascular plants documented from Mt. Kiamo, Bukidnon, Philippines

Family	Number of Genera	Number of Species
<b>Ferns and Lycophytes</b>		
Aspleniaceae	1	7
Athyriaceae	1	2
Blechnaceae	1	3
Cyatheaceae	3	7
Davalliaceae	2	3
Dennstaedtiaceae	3	3
Dipteridaceae	1	1
Dryopteridaceae	4	6
Gleicheniaceae	3	4
Hymenophyllaceae	3	11
Lindsaenaceae	3	6
Lomariopsidaceae	1	2
Lycopodiaceae	3	3
Marattiaceae	2	2
Oleandraceae	1	2
Ophioglossaceae	2	3
Osmundaceae	1	1
Plagiogyriaceae	1	4
Polypodiaceae	13	17
Pteridaceae	2	3
Schizaeaceae	1	1
Selaginellaceae	2	3
Thelypteridaceae	1	4
Woodsiaceae	1	3
	<b>56</b>	<b>101</b>

<b>Gymnosperms</b>	<b>Number of Genera</b>	<b>Number of Species</b>
Araucariaceae	1	1
Podocarpaceae	5	5
	<b>6</b>	<b>6</b>
<b>Angiosperms</b>	<b>Number of Genera</b>	<b>Number of Species</b>
Acanthaceae	1	1
Aceraceae	1	1
Actinidiaceae	1	1
Alliaceae	1	1
Apocynaceae	3	3
Aquifoliaceae	1	1
Araceae	4	5
Araliaceae	2	3
Arecaceae	3	3
Balanophoraceae	1	1
Balsaminaceae	1	1
Bignoniaceae	1	1
Casuarinaceae	1	1
Clethraceae	1	1
Chloranthaceae	1	1
Clusiaceae	1	1
Cucurbitaceae	2	2
Cunoniaceae	1	1
Dilleniaceae	1	1
Elaeocarpaceae	1	1
Ericaceae	1	2
Euphorbiaceae	3	3
Fabaceae	2	2
Fagaceae	1	2
Flacourtiaceae	1	1
Gesneriaceae	3	4
Goodeniaceae	1	1
Hydrangeaceae	1	1
Lauraceae	2	3
Loganiaceae	1	1
Melastomataceae	3	5
Meliaceae	2	6
Moraceae	2	7

Musaceae	1	1
Myrsinaceae	2	3
Myrtaceae	5	8
Nepenthaceae	1	6
Orchidaceae	9	14
Pandanaceae	2	2
Piperaceae	1	1
Poaceae	3	3
Polygalaceae	1	1
Proteaceae	1	1
Rosaceae	1	1
Rubiaceae	6	7
Sapotaceae	2	2
Saxifragaceae	1	3
Simaroubaceae	1	1
Solanaceae	2	2
Staphyleaceae	1	1
Sterculiaceae	1	1
Theaceae	4	4
Urticaceae	4	6
Verbenaceae	2	2
Winteraceae	1	1
Zingiberaceae	2	4
	106	144
<b>Total</b>	<b>168</b>	<b>251</b>

### Noteworthy and New Record Species

It is noteworthy that two new species of pitcher plants of the genus *Nepenthes* was discovered by the authors together with their research collaborators. The species include *Nepenthes pulchra*, the species epithet was derived from the Latin “pulcher” (beautiful) and refers to the attractive pitchers that are noteworthy for their striking colouration, impressive size and form (Gronemeyer et al. 2011a). The other species is *Nepenthes ceciliae*, named after the late Philippine botanist Cecilia Beltran-Amoroso, who conducted extensive *ex-situ* conservation studies on many species of *Nepenthes* in Mindanao and other threatened, endemic and economically important plants from across the Philippines (Gronemeyer et al. 2011b). These two new species are found only in the Mossy-Pygmy forest near the summit of Mt. Kiamo (see Figure 3).

There are three new records of tree ferns, *Sphaeropteris robinsonii* R.M.Tryon (Luzon) a new record for the Island of Mindanao, *Alsophila rufopannosa* R.M.Tryon (Zamboanga Peninsula), new record for the province of Bukidnon and *Alsophila commutata* Mett. (Malay Peninsula, Sumatra and Borneo), a new record for the Philippines (Coritico et al. 2017) (Figure 4). This new record of *A. commutata* may be regarded a strong floristic connection between Mindanao



Island with Borneo, Java and Australasia as observed in mosses (Tan et al. 2015).

The broadly Philippine endemic species include *Nepenthes alata* Blanco, *Nepenthes truncata* Macfarlane (Nepenthaceae), *Paphiopedilum adductum* Asher, *P. haynaldianum* (Rchb.f.) Stein., *Bulbophyllum pardalotum* Garay, Hamer & Siegerist, (Orchidaceae), *Sphaeropteris robinsonii* (Copel.) R.M.Tryon (Cyatheaceae), *Dillenia philippinensis* Rolfe (Dilleniaceae), *Vaccinium halconense* Merr (Ericaceae), whereas the Mindanao endemic species include, *Alsophila rufopannosa* (Christ) R.M.Tryon (Cyatheaceae), *N. mindanaoensis* Sh.Kurata, *N.surigaoensis* Elmer (Nepenthaceae) and *Coelogyne confusa* Ames. (Orchidaceae).



Figure 3. Threatened species of plants in Mt. Kiamo., A. *Nepenthes ceciliae*, B. *N. pulchra*, C. *N. truncata*, D. *N. surigaoensis*, E. *N. mindanaoensis*, F. *N. alata*, G. *Paphiopedilum adductum*, H. *P. haynaldianum*, I. *Huperzia squarrosa*, J. *Botrychium daucifolium*, K. *Ophioglossum pendulum*, and L. *Aglaomorpha splendens*



Figure 4. New records of tree ferns in Mt. Kiamo, Bukidnon, Philippines.,  
A. *Alsophila rufopannosa*, B. *Sphaeropteris robinsonii* and *Alsophila commutata*  
( 1-habit, 2- lamina outline, 3-stipe, 4-pinnule with sori)

## Conservation Status of the Species

The preliminary list of Philippine threatened plants published by Fernando et al., (2008) assessed the species based on the 1994 IUCN Categories and Criteria including various information from scientific literature and their knowledge and expertise on the taxa. Most of the new record and new species of plants in the Philippines were also assessed as threatened species (e.g. Coritico and Fleichman 2016, Gronemeyer et al. 2014, Alejandro et al. 2013, Ariola and Alejandro 2013, Obico and Alejandro 2013) by looking into its population and continuing destruction of the forest ecosystems.

A total of 17 species of plants are threatened. Of these, 3 species are critically endangered, 8 endangered and 6 vulnerable species (Table 2). The critically endangered species includes the two orchids viz., *Paphiopedilum adductum* Asher and *P. haynaldianum* (Rchb.f.) Stein and a pitcher plant, *Nepenthes pulchra* Gronem., S.McPherson, Coritico, Micheler, Marwinski & V.B.Amoroso. A high priority for protection should be strictly implemented in order to conserve these endemic and threatened species of plants. In addition, ex-situ and in-situ conservation are the best strategies to properly protect and conserve the species and their habitats.

Table 2. Conservation status of vascular plants in Mt. Kiamo, Bukidnon, Philippines

Species	Conservation Status
<i>Aglaomorpha splendens</i> (Hook. & Bauer) Copel.	Vulnerable
<i>Alsophila fuliginosa</i> Christ	Endangered
<i>Alsophila rufopannosa</i> (Christ) R.M. Tryon	Vulnerable
<i>Belvisia platyrhynchos</i> (Kunze) Copel.	Vulnerable
<i>Botrychium daucifolium</i> Wall. ex Hook. & Grev.	Vulnerable
<i>Hyperzia phlegmaria</i> (L.) Rothm	Endangered
<i>Hyperzia squarrosa</i> (G Forst.) Trevis	Endangered
<i>Nepenthes ceciliae</i> Gronem., Coritico, Micheler, Marwinski, Acil & V.B.Amoroso	Endangered
<i>Nepenthes mindanaoensis</i> Sh.Kurata	Vulnerable
<i>Nepenthes pulchra</i> Gronem., S.McPherson, Coritico, Micheler, Marwinski & V.B.Amoroso	Critically Endangered
<i>Nepenthes truncata</i> Macfarlane	Endangered
<i>Nepenthes surigaoensis</i> Elmer	Endangered
<i>Ophioglossum pendulum</i> L.	Endangered
<i>Paphiopedilum adductum</i> Asher	Critically Endangered
<i>Paphiopedilum haynaldianum</i> (Rchb.E.) Stein	Critically Endangered
<i>Sphaeropteris glauca</i> (Blume) R.M.Tryon	Endangered
<i>Sphaeropteris robinsonii</i> (Copel.) R.M.Tryon	Vulnerable

## CONCLUSION

Mt. Kiamo has three (3) vegetation types namely: Mossy-pygmy forest (1,792 masl), Montane forest (1,567 masl) and Agro-ecosystem (1,181 masl). A total of 251 species belonging to 83 families and 168 genera were documented. Eight species are Philippine endemics, and four are found only on Mindanao. Assessment of the conservation status revealed a total of seventeen nationally threatened species. Mt. Kiamo is the home of threatened and endemic species of plants, and these data are very useful for the local government unit to formulate policies for protection and conservation of these remaining important plant resources. It is further recommended that an extensive sampling will be conducted to document the flora of the landscape fully.

## ACKNOWLEDGEMENTS

We would like to thank the Department of Environment and Natural Resources (DENR) for the permit, Central Mindanao University (CMU) and Center for Biodiversity Research and Extension in Mindanao (CEBREM) for the logistic support and to Captain SHEMEUL Lagunday and the local guides in Kibalabag for assistance during the conduct of the fieldwork. This study was partially funded by the Department of Science and Technology-Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARRD).

## LITERATURE CITED

- Alejandro GJD, Arenas EH, Cremen CM, Arriola AH. 2013. A new record of pyrostria (Vanguerieae-Rubiaceae) from the Philippines inferred from molecular and morphological data. *Philippine journal of systematic Biologist*. 8: 1-12.
- Amoroso VB, Acma FM, Pava HP. 1996. Diversity status and ecology of pteridophytes in three forests in Mindanao. In: *Pteridology in Perspective*. Camus JM, Johns RJ eds. Royal Botanic Gardens, Kew. p. 53-60.

- Amoroso VB, Ruba RP, Demetillo MT, Stortelder A, Lagunzad DA, Aranico EC, Arances JB, Ruffla LV, Kessler PJA, Tan BC, Roscom BA, Gorne ND, Opiso GS, van den Berg A, Gruezo WSm, Co LL, Alava CG. 2006. Plant diversity in the northern landscape of Mt. Malindang Range and Environs, Misamis Occidental, Philippines. SEAMCO SEARCA. College Laguna. PDM Press, Quezon City, Philippines.
- Amoroso VB, Obsioma LD, Arlalejo JB, Aspiras RA, Capili DP, Polizon JJA, Sumile EB. 2009. Inventory and conservation of endangered, endemic and economically important flora of Hamiguitan Range, southern Philippines. *Blumea* 54(1- 3):71-76.
- Amoroso VB, Laraga SH, Calzada BV. 2011. Diversity and assessments of plants in Mt. Kitanglad Range Natural Park, Bukidnon, southern Philippines. *Gard. Bull. Singapore* 63(1, 2): 219–236.
- Amoroso VB, Amoroso CB, Coritico FP. 2012. Diversity and status of plants in three mountain ecosystems in southern Mindanao, Philippines. *Asian Journal of Biodiversity*. 3(1): 50–73.
- Amoroso VB, Acma FM, Dela Cruz RY, Coritico FP, Nietes AD, Hamo GB, Lumista HP. 2015. Diversity of herbaceous pteridophytes in four Mindanao long term ecological research (LTER) sites, Philippines. *Asia Life Sci.* 24: 69–85.
- Amoroso VB, Coritico FP, Fritsch PW. 2016. Species richness and conservation status of ferns and lycophytes in Mt. Hamiguitan Range Wildlife Sanctuary, Davao Oriental, Philippines. *Philippine Journal of Science*. 145 (2), 17-23.
- Arriola AH, Alejandro GJD. 2013. A new species of *Psydrax* (Vanguerieae, Rubiaceae) from Luzon, Philippines. *Phytotaxa*. 149:1 27-30.
- Barcelona JF. 2003. The taxonomy and ecology of the pteridophytes of Mt. Iraya & vicinity, Batan Island, Batanes Province, Northern Philippines. In: *Pteridology in the New Millenium*. Chandra S, Srivastava M eds. The Netherlands. Kluwer Academy Publishers. p. 299–325.

- Belonias BS, Banoc LM. 1994. Species diversity and distribution of pteridophytes in Mt. Pangasugan. *Ann. Trop. Res.* 16: 30–38.
- Berg CC, Corner EJH. 2005. *Moraceae (Ficus) Flora Malesiana, Ser. I.17:2.*
- Buot Jr IE, Okitsu S. 1998. Vertical distribution and structure of the three vegetation in montane forest of Pulog, Cordillera mountain range and the highest mountain in Luzon Is., Philippines. *Vegetation Science* 15:19- 32.
- Catibog-Sinha CS, Heaney LR. 2006. *Philippine biodiversity: principles and practice.* Quezon City: Haribon Foundation for the Conservation of Natural Resources Inc.
- Co LL, LaFrankie JV, Lagunzad DA, Pasion KAC, Consunji HT, Bartolome NA, Yap SL, Molina JE, Tongco MDC, Ferreras UF, Davies SJ, Ashton PS. 2006. *Forest trees of Palanan, Philippines: A study in population ecology.* Center for Integrative and Development Studies, University of the Philippines-Diliman, Quezon City, Philippines. 313 pp.
- Cootes JE. 2001. *The Orchids of the Philippines*, 231 pp., Times Edition, Singapore.
- Copeland EB. 1958-1961. *Fern flora of the Philippines*, 3 volumes. Manila: Manila Bureau of Printing. 555 p.
- Coritico FP, Amoroso VB, Lehnert M. 2017. New records, names and combinations of scaly tree ferns (Cyatheaceae) in eastern Malesia. *Blumea* 62: 92-96.
- Coritico FP, Fleischmann A. 2016. The first record of the boreal bog species *Drosera rotundifolia* L. (Droseraceae) from the Philippines, and a key to the Philippine sundews. *Blumea* 61: 24–28.
- DENR/UNEP. Department of Environment and Natural Resources/United Nations Environment Program. 1997. *Philippine Biodiversity: An assessment and Action Plan.* Manila: Bookmark.Inc.

- Fernando ES, Sun BY, Suh MH, Kong HY, Koh KS. 2004. Flowering plants and ferns of Mt. Makiling, ASEAN-Korea Environmental Cooperation Unit Seoul National University, Korea.
- Fernando ES, Co LL, Lagunzad DA, Gruezo WS, Barcelona JF, Madulid DA, Lapis AB, Texon GI, Manila AC, Zamora PM. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sci. Suppl.* 3: 1–52.
- Gronemeyer T, McPherson S, Coritico F, Micheler M, Marwinski D, Amoroso V. 2011a. *Nepenthes pulchra*, a new pitcher plant species from Mount Kiamo, Mindanao. In: McPherson, S.R. *New Nepenthes: Volume One*. Redfern Natural History Productions, Poole. Pp. 424–439.
- Gronemeyer T, Coritico F, Micheler M, Marwinski D, Acil R, Amoroso V. 2011b. *Nepenthes ceciliae*, a new pitcher plant species from Mount Kiamo, Mindanao. In: McPherson, S.R. *New Nepenthes: Volume One*. Redfern Natural History Productions, Poole. Pp. 412–423.
- Gronemeyer T, Coritico FP, Wistuba A, Marwinski D, Gieray T, Micheler M, Mey FS, Amoroso VB. 2014. Four new species of *Nepenthes* L. (Nepenthaceae) from the central mountains of Mindanao, Philippines. *Plants*. 3(2):284-303.
- Gruezo WSM. 1997. Floral diversity profile of Mount Makiling Forest Reserve, Luzon, Philippines. Pages 153-175 in Dove MR, Sajise PE, eds. *The conditions of biodiversity maintenance in Asia - The Policy Linkages Between Environmental Conservation and Sustainable Development*.
- Gruezo WSM, Zamora PM. 2000. Conservation status of Philippine Biota. 2. Saranga philippinensis Merr., Family Pandanaceae. *Asia Life Sciences* 9(2):189-204.
- Hodge WH. 1947. The use of alcohol in plant collecting. *Rhodora* 49: 207–210.
- Holttum RE. 1959. *Gleicheniaceae*. *Flora Malesiana, Series 2, 1*: 1–36.
- Holttum RE. 1981. *Thelypteridaceae*. *Flora Malesiana, Series. 2, 1*: 331–599.

- Holttum RE. 1978. Lomariopsis group. Flora Malesiana, Series 2, 1: 255–330.
- Holttum RE. 1991. Tectaria group. Flora Malesiana, Series 2, 2: 1–132.
- Hovenkamp PH, Bosman MTM, Hennipman E, Nooteboom HP, Rodl-Linder G, Roos MC. 1998. Polypodiaceae. Flora Malesiana, Series 2, 3: 1–234
- Kramer KU. 1971. Lindsaea Group. Flora Malesiana, Series 2, 1: 177–254.
- Madulid DA. 1995. Plant diversity in the Philippines. pages 105-109 in biodiversity and terrestrial ecosystems. Institute of Botany, Academia Senica. monograph Series no. 14.
- McPherson SR, Amoroso VB. 2011. Field guide to the pitcher plants of the Philippines. Redfern Natural History Productions, Poole.
- Middleton DJ, 2007. Apocynaceae (subfamilies Rauvolfioideae and Apocynaceae). Flora Malesiana, Ser. I 18.
- Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J. 2000. Biodiversity hotspots for conservation priorities. Nature 403:853-858
- Nooteboom HP. 1998. Davalliaceae. Flora Malesiana, Series 2, 3: 235–276. Obico, J.J.A., Alejandro, G.J.D. A new species of Antherosteles (Urophyllaeae, Rubioideae, Rubiaceae) from Mt. Sohoton, Samar, Philippines. Phytotaxa.104: 1 53-57.
- Pancho JV, Gruezo WSM. 2006. Vascular flora of Mount Makiling and vicinity (Luzon:Philippines), Part 3. National Academy of Science and Technology (NAST) Philippines, Department of Science and Technology Bicutan, Taguig City and Institute of Biological Sciences, University of the Philippines Los Baños, College, Laguna, Philippines (Publishers), 626 p.
- Smith AR, Pryer KM, Schuettpelz E, Korall P, Schneider H, Wolf PG. 2006. A classification for extant ferns. Taxon 55: 705–731.



- Tan BC, Shevock JR, Coritico FP, Amoroso VB. 2015. Mosses new for Mindanao Island, The Philippines, III. Bull. Natl. Mus. Nat. Sci., Scr. B., 41(3), 91-97.
- Whitford HN. 1911. The forests of the Philippines. Part I, forest types and products. Philippine Bureau of Forestry Bulletin No. 10,94p, Bureau of Printing, Manila.
- Zamora PM. 2000. Urban ferns and fern allies. Pteridophytes of Diliman and vicinity, Quezon City: UP Center for Integrative and Development Studies and UP Press.
- Zamora PM, Co LL. 1986. Guide to philippine flora and fauna. Economic ferns, endemic ferns, gymnosperms. Quezon City, Philippines: Ministry of Natural Resources and University of the Philippines Natural Resource Center. 382 p.
- Zhang XC, Nootboom HP. 1998. Plagiogyriaceae. Flora Malesiana, Series 2, 3: 295–316.