

New record of Philippine endemic *Ficus* species in Mt. Malindang, Mindanao, Philippines

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Abstract

Mt Malindang is one of the key biodiversity areas in the Philippines. Comprehensive studies on trees including *Ficus* species were done in the northern part of the protected area. The present study determined the distribution, abundance, diversity, and importance of *Ficus* species in the two-hectare permanent monitoring plot established in the southern portion of Mt. Malindang. There were seven species of *Ficus* found, and all have medicinal uses. *Ficus nota*, a non-endemic species, is the most abundant, most diverse and with highest importance value among the species observed. The Philippine endemics, *F. balet* and *F. pseudopalma* were found in the present study and nowhere in the northern part of Mt. Malindang. This additional information will enrich the existing data of Mt. Malindang and will help local communities, protected area managers and other stakeholders in the implementation of conservation and management interventions to protect the *Ficus* species and Mt. Malindang as a whole.

Keywords: diversity, importance, *Ficus*, Mt. Malindang, protected area

1. Introduction

The Philippines is one of the biodiversity-rich countries in the world (Barcelona *et al.*, 2013) [22]. It is a home of about 8000 to 10,000 plants (Madulid, 1995) [19]. *Ficus* belongs to Family Moraceae comprises of about 850 species of woody trees, shrubs vines and epiphytes worldwide (Latayada *et al.*, 2016; Saddoud *et al.*, 2008; Gandhi *et al.*, 2019) [17, 14]. About 97 species of *Ficus* were distributed in the Philippine archipelago (Barcelona (2011) [22].

According to Pothasin *et al* (2014) [23], *Ficus* in the tropical riparian vegetation influences several important ecological functions such as stream bank stabilization, reduction of flood velocities and shading. These tropical figs may be designated both umbrella and keystone species because of their ability to provide food in a wide variety and numerous fruit-eating animals (Catibog Sinha *et al.*, 2005) [8]. The study of Somashekhar (2013) [20] and Arcibal *et al* (2016) revealed that some *Ficus* species have medicinal contents. The variety of benefits derived from the fig trees triggered to identify this remarkable species of trees.

In Mindanao, Mt. Malindang Range Natural Park is considered as one of the key biodiversity areas (Ong *et al.*, 2002) [21]. The presence of the diverse species of plants inside the park led to the declaration of Mt. Malindang in 2011 as 29th ASEAN Heritage Park (DENR, 2016) [21]. Intensive studies were conducted in the northern part of Mt. Malindang (Amoroso *et al.*, 2006) [1], in northeastern (Gomez-Roxas *et al.*, 2005) [6], and in northwestern (Arances *et al.*, 2004) [2]. With the vast area of Mt.

Malindang, which is 53,262 hectares, previous studies cannot represent the whole protected area.

This study was conducted to determine the distribution, abundance, diversity, and importance of *Ficus* species in the two-hectare permanent monitoring plot established in the southern portion of Mt. Malindang Range Natural Park. Comprehensive information is essential for the local communities, protected area managers and other stakeholders in the implementation of conservation and management interventions to protect the *Ficus* species and Mt. Malindang as a whole.

2. Materials and Methods

The study was conducted in Brgy. Fertig Hills (formerly known as Hoyohoy), Tangub City. This is located in the southern part of Mt. Malindang Range Natural Park (MMRNP) in the province of Misamis Occidental, Philippines. After a reconnaissance survey, a two-hectare plot was established as the permanent monitoring plot for Biodiversity Assessment and Monitoring System (BAMS) or BAMS site of the MMRNP-Protected Area Office. The duration study was from June 6, 2018 to June 30, 2018. The plot was divided into 200 of 10m x 10m grid/quadrat. Corner and center coordinates and elevation were determined using the Geographical Positioning System (GPS) instrument.

All *Ficus* trees were identified and recorded to include diameter at breast height (dbh), total height and merchantable height for trees whose diameter is \geq to 10 cm dbh. All recorded data were stored in a Microsoft Excel

database and analyzed quantitatively using Microsoft Excel Statistics. Density, relative density, basal area, dominance, relative dominance, frequency, relative frequency, and importance value index were computed.

Description of forest formation type of 2.0-hectare permanent monitoring plot was described using the work of Fernando *et al.* (2017) [13]. The species diversity was computed and interpreted using the Shannon Diversity index (H). The classification scheme developed by Fernando *et al.* (1998) [13] was used as shown in table 1.

Table 1: Description of species diversity

Relative Values	Shannon (H') Index
Very High	3.5 and above
High	3.0 – 3.49
Moderate	2.5 – 2.99
Low	2.0 – 2.49
Very Low	1.9 and below

3. Results and Discussion

The present study identified seven species of *Ficus* with 317 individuals in established two-hectare monitoring plot in the southern part of Mt. Malindang (Table 1). Among the recorded species, *Ficus nota* is the most abundant. *Ficus septica* followed it while the least abundant is *Ficus ampelas*.

The basal area has a significant role in estimating tree cover as an indicator of forest disturbance (Cade, 1997) [7]. In the study, *F. balete* had the largest basal area among the seven species. This means that documented *F. balete* are large individuals in the southern part of Mt. Malindang. To improve the diversity of trees in this part of Mt. Malindang, the variability in tree basal area must be reduced through regulating local disturbances (Sagar & Singh, 2006) [26].

Concerning frequency, *Ficus septica* occurred many times in the 200 plots with a relative frequency of 38.84 and *F. ampelas* had the least occurrence (0.45). This implies that *F. septica* is widely distributed and abundant in the two-hectare permanent monitoring plot.

In terms of species dominance, the *Ficus balete* had the highest relative dominance, with a percentage of 32.55 despite its limited number. The *F. nota* got the highest relative density of 39.75. According to the study of Naiman J. *et al.* (2005) [25], the density and basal area of riparian forest are higher than that of the upland wood because of the relatively favorable growing condition.

With the given basal area, frequency and density, the study found out that *F. nota* had the highest importance value of

106.62. It indicates that this species is well represented in the two-hectare permanent monitoring plot in the southern part of Mt. Malindang.

Of the *Ficus* species identified in the present study, two are endemics to the Philippines namely *Ficus balete* and *Ficus pseudopalma*. These are the *Ficus* species only found in the Philippines and nowhere else in the world. The study of Lubos *et al.* (2015) [18], observed that *F. balete* was the habitat of *Psilotum nudum*, known to be the most primitive and rootless vascular plant. Protection and conservation of *F. balete* should be followed to prevent the rare vascular plant from extinction.

Aside from being a habitat of other significant plants, *Ficus* is essential in the tropical rainforests as a primary food source among frugivores (Aribal *et al.*, 2016) [3]. In lowland Bolivia, *Ficus* are known to be the staple food of the Peruvian spider monkeys (*Ateles chamek*) and the fallback food in times of fruit scarcity by Neotropical frugivores (Felton *et al.* (2008) [12].

Based on interviews conducted, all *Ficus* found in Mt. Malindang are of medicinal importance. Mostly of the indigenous people who are residents in the barangays in Mt. Malindang considered *Ficus septica* to cure headaches, asthma and Kalugo. While *Ficus balete* used to apply poultice of bark for fractures, minor wounds, liver related problems. *Ficus nota* roots used for post-natal treatment while *Ficus ampelas*, *Ficus invochurata* and *Ficus Psuedoplama* their latex used to cure wounds, boils and anti anemic.

This finding conforms to the existing works that *F. nota* and *F. septica* have bioactive components as antibacterial, antifungal, and potential cytotoxic properties (Latayada & Uy (2016; Baumgartner *et al.* (1990) [5]. Also, the works of De Las Llagas *et al.* (2014) specified that *F. pseudopalma* has potential against Gram-positive bacteria.

Consolidating all the existing data of Mt. Malindang, this park is the home of about 26.80% (26) of *Ficus* species (Table 2) of the recorded 97 species in the Philippines (Barcelona 2011) [22]. It is remarkable that this present study identified two more species namely *F. balete* and *F. pseudopalma* as additional record to the existing works of Amoroso *et al.* (2006) [2], Gomez-Roxas *et al.* (2005) [6] and Arances *et al.* (2004) [1]. Though comprehensive studies were conducted in the Northern part, thus recorded greater number of species, the two Philippine endemic species were found concentrated in the southern part only and are not found in Northern and neighboring region.

Table 1: *Ficus* species recorded in the southern part of Mt. Malindang Range Natural Park.

Local Name	Scientific Name	Distribution	Abundance	Basal Area	Species Density	Relative Density	Frequency	Occurrence	Relative frequency	Dominance	Relative Dominance	Importance Value	Shannon Diversity index
Balite	<i>Ficus balete</i>	Philippine Endemic	17	1.530	0.085	5.363	0.08	16	7.306	0.008	32.551	45.220	0.157
Bosiong	<i>Ficus fistulosa</i>	Non-endemic	17	0.257	0.085	5.363	0.07	14	6.393	0.001	5.478	17.234	0.157
Hatanak	<i>Ficus ampelas</i> Burm.fil.	Non-endemic	1	0.002	0.005	0.315	0.005	1	0.457	0.00001	0.042	0.814	0.018
Lagnob	<i>Ficus septica</i>	Non-endemic	126	0.763	0.63	39.748	0.435	87	39.726	0.004	16.231	95.704	0.367
Niog-niog	<i>Ficus pseudopalma</i>	Philippine Endemic	15	0.233	0.075	4.732	0.07	14	6.393	0.001	4.957	16.082	0.131
	<i>Ficus</i>	Non-	13	0.40	0.065	4.101	0.045	9	4.110	0.002	8.686	16.897	0.131

Sagahis	<i>ivolucrata</i>	endemic		8									
Tubog	<i>Ficus nota</i> (Bl.) Merr	Non-endemic	128	1.507	0.64	40.379	0.39	78	35.616	0.008	32.055	108.050	0.366
TOTAL	7 species	2 Philippine endemics	317	4.700	1.585	100.000	1.095	219	100.000	0.023	100.000	300.000	1.327

Table 2: Comparison of the distribution of *Ficus* species recorded in Mt. Malindang Range Natural Park, Philippines

No.	Species Name	Southern (Present study)	Northern (Amoroso et al., 2006) [2]	Northeastern (Gomez-Roxas et al., 2005) [6]	Northern (Arances et al., 2004) [2]
1	<i>Ficus ampelas</i> Burm. fil.	+	+	-	-
2	<i>Ficus aurantiaca</i>	-	-	-	+
3	<i>Ficus baleta</i>	+	-	-	-
4	<i>Ficus benjamina</i>	-	-	+	
5	<i>Ficus bennedykii</i> var. <i>Coreacea</i>	-	+	-	+
6	<i>Ficus botryocarpa</i> Mig. var. <i>Botryocarpa</i>	-	+	-	+
7	<i>Ficus calycina</i>	-	-	-	
8	<i>Ficus cardinalicarpa</i> Elm.	-	+	-	+
9	<i>Ficus cf aurita</i>	-	-	+	-
10	<i>Ficus cumingii</i> Miq. ar. <i>Cumingii</i>	-	+	-	-
11	<i>Ficus fistulosa</i>	+	+	-	-
12	<i>Ficus glandulifera</i> (Wall. ex. Mig) King var. <i>caminguinensis</i> (Merr) Corner	-	+	-	-
13	<i>Ficus grossivenis</i>	-	+	-	-
14	<i>Ficus guyeri</i> var. <i>Guyeri</i>	-	-	+	-
15	<i>Ficus involucrate</i>	+	-	+	-
16	<i>Ficus irisina</i> var. <i>Irisana</i>	-	+	-	+
17	<i>Ficus latsoni</i>	-	+	-	-
18	<i>Ficus magnolifolia</i>	-	+	-	-
19	<i>Ficus minahassae</i> (Teysm. & de Vriese) Mig	-	+	-	-
20	<i>Ficus nota</i> (Bl.) Merr	+	+	-	+
21	<i>Ficus odorata</i>	-	-	-	+
22	<i>Ficus pseudopalma</i>	+	-	-	-
23	<i>Ficus septic</i>	+	+	+	+
24	<i>Ficus variagata</i> var. <i>Syncomoroides</i>	-	+	-	+
25	<i>Ficus variagata</i> var. <i>Variagate</i>	-	+	-	-
26	<i>Ficus virgata</i> var. <i>Virgata</i>	-	-	+	-
	Total	7	16	6	9

+Present; - absent

5. Conclusion

Mt. Malindang has a total of 26 *Ficus* species, this information further significantly contribute to the diversity of tree species of the park. This data is an avenue to the stakeholders for further protection and better management of *Ficus* species in Mt. Malindang. The importance of this species will be tapped consistent with existing laws rules and regulation governing the PA.

6. Acknowledgement

The researchers would like to acknowledge the Department of Environment and Natural Resources in the Province of Misamis Occidental and MMRNP-Protected Area Office for the funding; Local Government Unit of Tangub City, Barangay Fertig Hills (Hoyohoy) and Misamis University for the cooperation and support.

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