

Research Article

Checklist of Parasitic Plants in Marilog District, Southern Philippines

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ABSTRACT

Parasitic plants are interesting flowering plants that are present around the world, except in the coldest regions. These species are categorized either as hemiparasites or holoparasites depending on their mode of nutrition to their hosts. Botanical fieldworks through repeated transect walks and opportunistic samplings were carried out in the five forest patches of the three Barangays in Marilog District, Davao City, Philippines on February 2018 to September 2019. Data revealed that there were six species of parasitic plants in the area belonging to five genera in four families. These species include *Balanophora papuana* Schltr. (Balanophoraceae), *Amyema curranii* (Merr.) Danser, *Amyema seriata* (Merr.) Barlow and *Decaisnina ovatifolia* (Merr.) Barlow (Loranthaceae), *Mitrostemon yamamotoi* Makino (Mitrostemonaceae), and *Christisonia schortechinii* Prain (Orobanchaceae). *Amyema seriata* was the most frequently encountered species, whereas *A. curranii* and *M. yamamotoi* (collected only in Site 2 – Mount Malambo) and *C. schortechinii* (collected only in Site 5 – Sitio Matigsalug) were less frequently recorded. Host plants of these species are provided in this paper and the habitat and ecology for each species are discussed. It is imperative that Mount Malambo, the only place where *M. yamamotoi* was documented, should be protected and conserved since this species is rare in the wild. The rapid habitat destruction and conversion of forest lands into agricultural and residential properties in areas near these mountains may lead to depletion of these species. Thus, conservation management strategies of these parasitic plants should be relayed to different policy makers and local people in the area.

Keywords: Parasitic Plants; Hemiparasites; Holoparasites; Biodiversity Conservation; Habitat Destruction.

INTRODUCTION

The world is full of fascinating floras extending from various carnivorous plants to different parasitic plants. Parasitic plants exist almost around the globe and are classified as hemiparasites (photosynthetic) or holoparasites (non-photosynthetic), and are also classified based on their host dependency. Some economically important parasitic plants, such as *Striga* Lour. and *Cuscuta* L. are completely dependent on their host plants for survival and are termed as obligatory parasites. On the other hand, other parasitic plants, such as *Triphysaria versicolor*

Fisch. & C.A.Mey. and *Phtheirospermum japonicum* (Thunb.) Kanitz of the family Orobanchaceae, can complete their life cycle in the absence of their host plants, but are able to parasitize under certain conditions (Kolka & Melnyk, 2018). Such parasites are classified as facultative parasites (Heide-Jørgensen, 2008; Spallek et al., 2013).

Parasitic plants are known to have an invasive organ called haustorium, penetrating the host plant tissue for water, nutrients, and sugar source (Rubiales & Heide-Jørgensen, 2011). Basically, all haustoria are just modified roots (Nickrent, 2002). Parasitic plants occur all over the world in all types of plant communities, except for the aquatic ecosystem. About 4,500 species of parasitic plants are known to science around the world (Rubiales & Heide-Jørgensen, 2011). Hence, this study aimed to increase our understanding of parasitic plants in the Philippines by collecting data on the distribution of these plants in Mindanao Island.

Marilog Forest Reserve in Davao City has a total land area of 63,000 ha and is dominated by the Manobo-Matigsalug tribal communities. This forest reserve hosts diverse unbotanized flora and in 2018, two plant species were reported and hold new records in the Philippines (see Amoroso et al., 2018a; Acma et al., 2019). Studies on tree species diversity and stand structure (Coritico et al., 2022) and diversity of ferns and lycophytes (Rufila et al., 2022) were also recently conducted in the forest patches of Marilog District. Further, this area is home to enigmatic and vivid-looking parasitic plants which were recently collected during repeated botanical fieldwork. Thus, this paper reports the parasitic plants in Marilog District, which bears significance as they act as keystone resources and structures in forest ecosystems (Watson, 2001).

MATERIALS AND METHODS

Entry protocol

Prior to conducting the study, necessary permits were obtained from the respective agencies, such as Barangay resolutions from Barangay Baganihan, Barangay Datu Salumay, and Marahan Proper; Prior Informed Consent (PIC); and Memorandum of Agreement (MOA) among Central Mindanao University, the Matigsalug-Manobo Tribal People Council of Elders Davao, Inc. (MAMATRIPCEDI), and Local Government Units (LGU's) of Marilog District, Davao. A Wildlife Gratuitous Permit (WGP) was obtained from the Department of Environment and Natural Resources (DENR) - Region XI and was used as the collecting permit. Collection of specimens was done between March and November 2019.

Site description

This study was conducted at Barangay Baganihan and Barangay Datu Salumay, which are situated in the northern part and Marahan Proper in the southern part of Marilog District, Davao City (Fig. 1). Sites 1–4 are tropical lower montane rainforests, while Site 5 is a mixed to agro forest ecosystem with elevations ranging from 1,000–1,345 m asl. Among the sites, site 2 had the highest elevation ranging from 1,197–1,345 m asl.

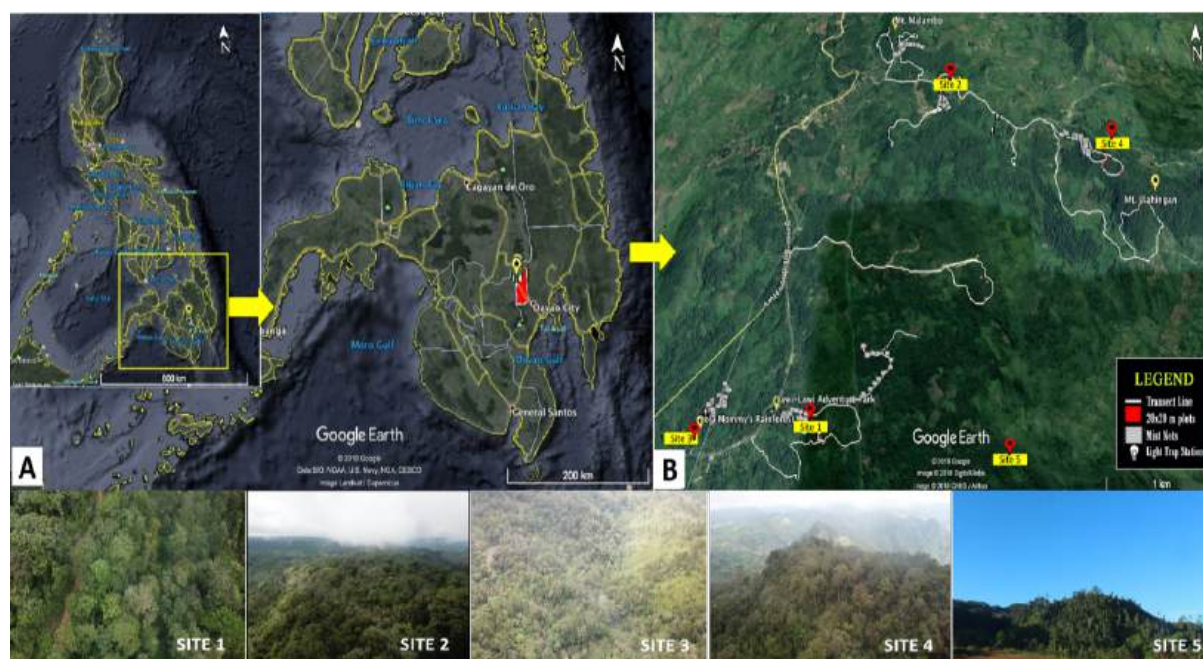


Figure 1: Study site. **A** – Map of the Mindanao Island (inset: Philippine map); **B** – Map of Marilog District showing the forest trails (white lines) and five sampling sites (yellow boxes) (©2018 Google, image ©2018 CNES/Airbus).

Botanical fieldwork

Field expeditions were carried out at Sitio New Calinan, Barangay Baganihan (Site 1), Mount Malambo, Barangay Datu Salumay (Site 2), Lola Mommy’s Rainforest, Barangay Baganihan (Site 3), Mount Ulahingan, Barangay Datu Salumay (Site 4), and Sitio Matigsalug, Marahan Proper (Site 5) in Marilog District, Davao City, Philippines. Repeated transect walks and opportunistic samplings were carried to survey and collect parasitic plants in the area. A 2 km transect line was employed using a rope and was established in 100 m from the main trail. The 2 km transect line provides proper estimate of plant species present in a particular study area following the study of Amoroso et al. (2018b), Coritico et al. (2022), and Rufila et al. (2022). Parasitic plants encountered along the transect were recorded and documented. On the other hand, opportunistic sampling was done whenever parasitic plants were observed away from the established transect (Amoroso et al., 2018b).

Species were listed using a field notebook and pencil. Habitat of each species and detailed floral structures were photographed to clearly distinguish the diagnostic characteristics of each species. Furthermore, habitat characterization including the vegetation types and host plants were noted.

Identification of the specimens

The digital database from Co’s Digital Flora of the Philippines (Pelser et al., 2011) and related published articles (Mendez et al., 2018; Amoroso et al., 2018a; Pelser et al., 2011) were used for the identification and classification of the collected species.

Assessment of conservation status and endemism

The conservation status of parasitic plants in Marilog District was assessed following the status listed by Fernando et al. (2022) and the IUCN (2023). The endemism of each species was listed following Pelser et al. (2011).

RESULTS AND DISCUSSION

Species composition and occurrence

A total of six species distributed in five genera and four families of parasitic plants were collected in Marilog Forest Reserve, Southern Philippines. Of these, three parasitic plants are categorized as hemiparasitic, namely, *Amyema curranii* (Merr.) Danser, *A. seriata* (Merr.) Barlow, and *Decaisnina ovatifolia* (Merr.) Barlow. Meanwhile, the other three species are categorized as holoparasitic and these are *Balanophora papuana* Schltr., *Mitrastemon yamamotoi* Makino and *Christisonia schortechinii* Prain (Table 1). The data gathered is much lower as compared to 4,500 known parasitic plants around the world (Rubiales & Heide-Jorgensen, 2011); in China with 678 species (Zhang et al., 2018). However, considering these species that occur in a small forest reserve, it is already noteworthy because the area houses diverse parasitic plants distributed in different families.

Table 1: Parasitic plants recorded in Marilog District, Davao City.

Mode of Parasitism	Family	Species
Hemiparasitic	Loranthaceae	<i>Amyema curranii</i> (Merr.) Danser
		<i>A. seriata</i> (Merr.) Barlow
		<i>Decaisnina ovatifolia</i> (Merr.) Barlow
Holoparasitic	Balanophoraceae	<i>Balanophora papuana</i> Schltr.
	Mitrastemonaceae	<i>Mitrastemon yamamotoi</i> Makino
	Orobanchaceae	<i>Christisonia schortechinii</i> Prain

The occurrence of parasitic plants differs in each site (Table 2). The most recorded species was *A. seriata* which is present in sites 1, 4, and 5, whereas the least noted species was *A. curranii* and *M. yamamotoi* (collected only in Site 2 – Mount Malambo) and *C. scortechinii* (collected only in Site 5 – Sitio Matigsalug). The diverse parasitic plants in the area could be due to the fact that there were nine species of host plants recorded, in which these species were found to occur in the sampling sites. Furthermore, according to Nickrent (2002), some factors, such as ratio of parasites to hosts, number of individual parasites in a host, and length of time required for the life cycle of parasitic plants could affect the occurrence and number of species.

Table 2: Species occurrence of parasitic plants in five forest patches of Marilog District, Davao City.

Species	Site				
	1	2	3	4	5
<i>Amyema curranii</i> (Merr.) Danser	X	/	X	X	X
<i>Amyema seriata</i> (Merr.) Barlow	/	X	X	/	/
<i>Balanophora papuana</i> Schltr.	X	/	X	/	X
<i>Christisonia schortechinii</i> Prain	X	X	X	X	/
<i>Decaisnina ovatifolia</i> (Merr.) Barlow	X	/	X	/	X
<i>Mitrastemon yamamotoi</i> Makino	X	/	X	X	X

Remarks: / means present; X means absent.

Hemiparasitic plants

(i) *Amyema curranii* (Fig. 2)

This species has a creeping stem with multiple haustoria. Leaves oblanceolate to lanceolate, umbel inflorescence with 8–15 pink flowers having a yellowish corolla apex. Fruits green when young and red when ripe. *A. curranii* parasitizes on *Melastoma malabatricum* L. and *Lithocarpus* spp. According to Pelser et al. (2011), this species occurs in Luzon in Benguet province and is endemic to the Philippines. Recently, Tubongbanua et al. (2023) documented the presence of this species in Marilog District, Davao City.



Figure 2: *Amyema curranii*. A – Habit; B – Inflorescence; C – Close up view of the inflorescence.

(ii) *Amyema seriata* (Fig. 3)

This species has a solitary haustorial attachment to its host. Leaves obovate to oblanceolate, umbel inflorescence with 5–10 red flowers with dark red corolla apex. *Amyema seriata* parasitizes on *M. malabatricum* and *Ficus* spp. This species was recorded only in Mindanao in Zamboanga del Norte and is endemic to the Philippines (Pelsler et al. 2011). This species was also recorded by Tubongbanua et al. (2023) in Marilog District, Davao City.



Figure 3: *Amyema seriata*. A – Habit; B – Inflorescence; C – Close up view of the inflorescence.

(iii) *Decaisnina ovatifolia* (Fig. 4)

Decaisnina ovatifolia has a solitary haustorium with erect stems attached. Leaves lanceolate. Inflorescence umbel with 3–4 red flowers. This species parasitizes on *Macaranga sinensis* Baill. Muell. Arg. and *Lithocarpus caudatifolius* (Merr.) Rehder. The species was also recorded in Bohol and Lanao del Norte, which is endemic to the Philippines (Pelser et al., 2011).

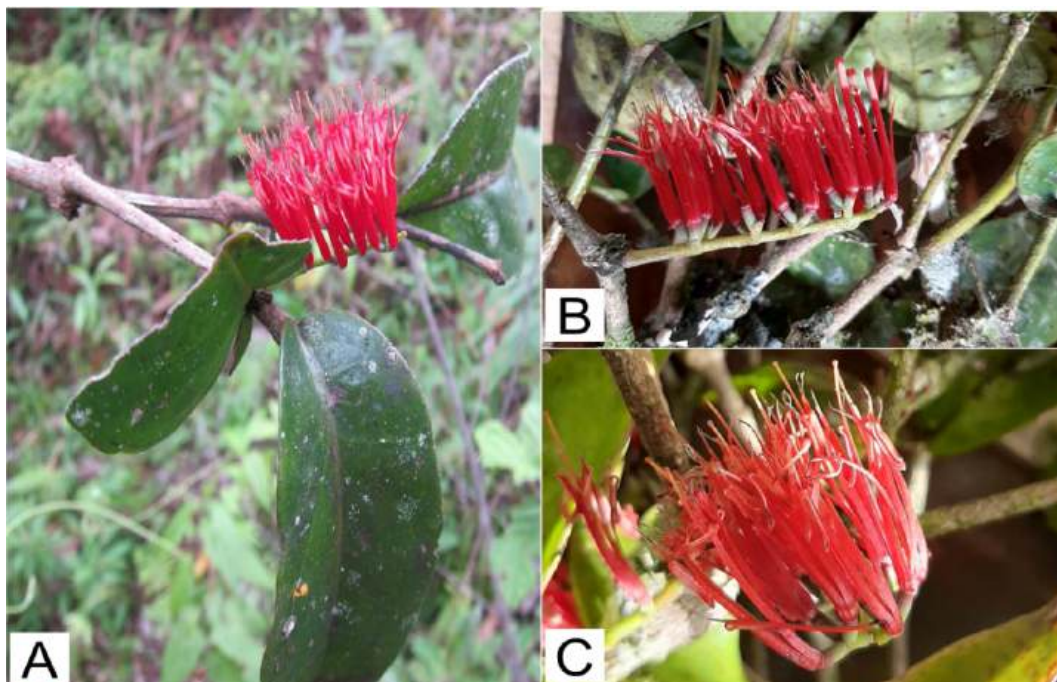


Figure 4: *Decaisnina ovatifolia*. A – Habit; B – Inflorescence; C – Close up view of the inflorescence.

Holoparasitic plants

(iv) *Balanophora papuana* (Fig. 5)

Balanophora papuana was first described by Schlechter in year 1913 based on two specimens of New Guinea, Schlechter 18250 from Finisterre Gebirges 1300 m asl, collected in September 1908 which was a male plant and Schlechter 18602 from Bismark, 1400 m asl, collected in November 1908 which was a female plant (Schlechter, 1913; Damayanto & Raistiwi, 2019). In the Philippines, *B. papuana* was reported parasitizing on roots of *Ficus* spp. (Amoroso & Semitara, 1999). This species is a dioecious plant with red-orange reproductive parts. In Marilog District, this species was also recorded parasitizing on the roots of *Ficus* sp. and *L. caudatifolius*.



Figure 5: *Balanophora papuana*. A – Habit; B – Male inflorescence; C – Female inflorescence.

(v) *Christisonia schortechinii* (Fig. 6)

Christisonia scortechinii was recorded parasitizing on the roots of bamboo species and is almost covered by leaf litter at 1,421 m asl. Only two populations of this species were recorded in the mountain site which was covered by *Lithocarpus* leaf litter. The individuals of the first population were also near the inflorescence of the ginger species – *Etilingera philippinensis* (Ridl.) R.M.Sm. (Zingiberaceae) in which the inflorescence of *E. philippinensis* are borne adjacent to its main rhizome at ca. 1 m (Fig. 6A). Meanwhile, the second population was found at ca. 200 m away from the first population (Fig. 6B & C). The bamboo species serving as the host for this species was identical to the one previously reported by Mendez et al. (2018) in Cinchona Forest Reserve, Bukidnon, Philippines.



Figure 6: *Christisonia schortechinii*. **A** – Habit of *C. schortechinii* (white flowers) with inflorescence of *Etilingera philippinesis* (red flowers); **B** – Anterior view of the flower; **C** – Inflorescence.

(vi) *Mitrastemon yamamotoi* (Fig. 7)

Mitrastemon yamamotoi grows mainly on the roots of *Lithocarpus* spp., *Ficus* spp., *M. sinensis*, *Palaquium philippense* (Perr.) C.B.Rob., and *Tetrastigma* sp. as reported by Amoroso et al. (2018a). This species was found along the trail near the summit of Mount Malambo in Barangay Datu Salumay. It is quite unique that a dense population of this species was found parasitizing on these host plants under the shades of their canopy.

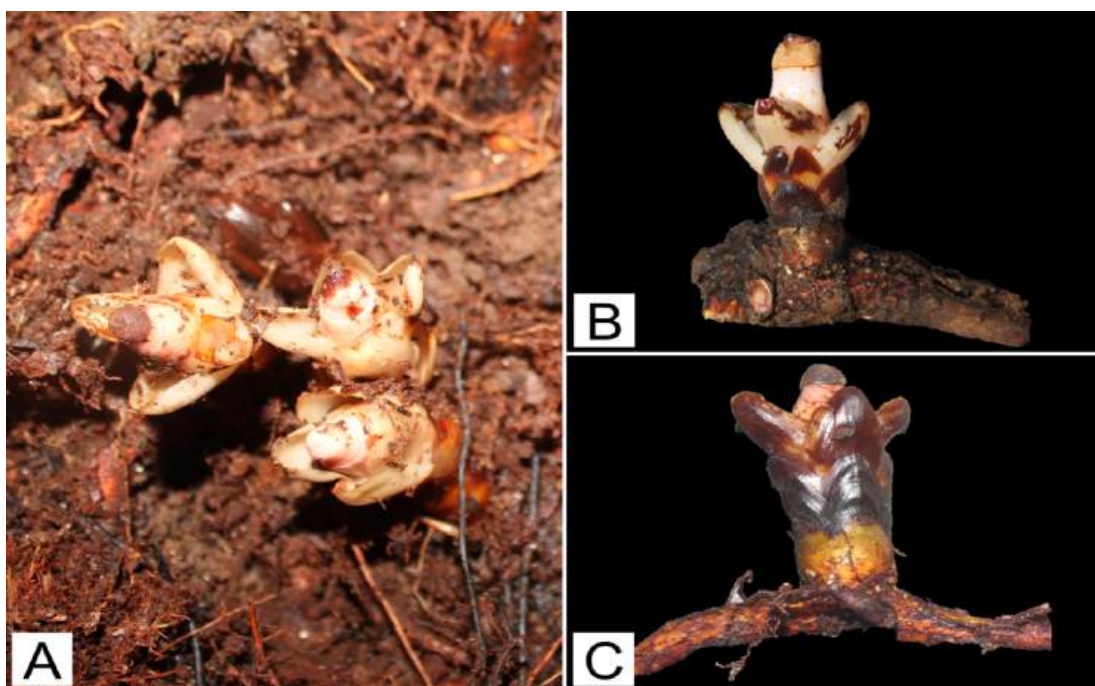


Figure 7: *Mitrastemon yamamotoi*. **A** – Habit; **B–C** Flower (lateral view).

Assessment of conservation status and endemism

Out of the six species collected, none of them were identified as threatened parasitic plants, and these species are not included in the IUCN (2023) list. However, three of these, *A. curanii*, *A. seriata*, and *D. ovatifolia* which are all from the Loranthaceae family, are endemic to the Philippines. Meanwhile, the other three species are native to the Philippines, namely, *B. papuana*, *C. scortechinii*, and *M. yamamotoi* (Table 3).

Table 3: Assessment of Conservation Status and Endemism Parasitic Plants in Marilog Forest Reserve, Southern Philippines.

No.	Species	Status
1	<i>Amyema curanii</i> (Merr.) Danser	Endemic to the Philippines
2	<i>Amyema seriata</i> (Merr.) Barlow	Endemic to the Philippines
3	<i>Balanophora papuana</i> Schltr.	Native to the Philippines
4	<i>Christisonia schortechinii</i> Prain	Native to the Philippines
5	<i>Decaisnina ovatifolia</i> (Merr.) Barlow	Endemic to the Philippines
6	<i>Mitrastemon yamamotoi</i> Makino	Native to the Philippines

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, this study provides valuable insights into the world of parasitic plants within Marilog Forest Reserve, Southern Philippines. The documentation of six species, representing five genera from five different families, is a noteworthy contribution, particularly within a specific geographic region of the country. Given the limited attention parasitic plants have received in the Philippines, this paper serves to enhance our understanding of these understudied species. It is highly recommended that future field expeditions are conducted within these sites and their neighbouring areas. These expeditions should focus on comprehensive data collection, including phenology and host plant associations, as well as the creation of voucher specimens for further research and conservation efforts. This work is a significant step towards expanding our knowledge of parasitic plants in the Philippines.

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