

HOYAS OF MINDORO ISLAND, PHILIPPINES: CONSERVATION CONCERNS

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ABSTRACT – This study provides a list of Hoyas that can be found in Mindoro Island, a distinct biogeographical region of the Philippines. Upon carrying out an exhaustive review of literature available about Hoyas, this study came up with 18 species of Hoyas, 15 of which are reported to be endemic. The ecosystem degradation especially in the forests of Mindoro has threatened the survival of the Hoyas of the island. Recent efforts in the form of policies has been implemented to prevent the conversion of forest ecosystems in the Philippines, but much effort has still to be done for the conservation of Hoyas. Evaluation on the listed endemic species for conservation is also recommended to further intensify the conservation efforts.

Keywords: Hoya, Mindoro, Philippines, forest conversion, conservation

INTRODUCTION

Hoya R. Br. is a genus of flowering plants that belongs to family Apocynaceae (Subfamily Asclepiadoideae). Commonly known as wax plant or simply Hoyas, these plants are known to be Asiatic, Pacific, N. Australian and Oceanic in distribution (Kloppenburger, 2012). Hoyas are popularly used as ornamental plants, and some of its species have ethnomedicinal records like *Hoya parasitica* Wall. leaf extract for fever and body pain (Atiqur Rahman and Wilcock, 2007); *Hoya vanuatensis* T. Green young leaf cold maceration as oxitocic agent (Bradacs et al., 2011); *Hoya globulosa* Hook. f. leaf paste for bone fracture (Das et al., 2008); *Hoya coronaria* Blume. crushed leaves for cuts and wounds (Samuel et al., 2010); and *Hoya potsii* Trail leaves as invigorant and cure for injury, gynecological diseases, rheumatoid arthritis, digestive disorders (Zheng and Xing, 2009).

The Philippines is one of the countries with the highest *Hoya* species diversity (Kloppenburger and Siar, 2008). Hoyas can be found throughout the archipelago at all altitudes and at diverse habitat types such as forests, swampy thickets, limestone cliffs and boulders, or even on cliffs (Kloppenburger, 2012; Merrill, 1923-1926). There are more than a hundred species of *Hoya* that had been recorded in the country, and it is believed that more species await to be discovered (Aurigue, 2013).

Incidentally, the Philippines belongs to a region having the highest proportion of threatened vascular plant species and second highest proportion of country-endemic vascular plant species (Sodhi et al., 2010). In terms of endangered habitats and species, the Philippines is considered as one of the eight biodiversity hottest hotspots in the world (Myers et al., 2000). While it is evident that the Philippines is blessed with high diversity of plants, there still remains the fact that the Philippines has one of the most number of threatened species and habitats (Fernando et al., 2008).

This paper provides an enumeration of Hoyas that are found in Mindoro, one of the islands in the Philippines suffering from ecosystem degradation. Some of the species that are listed in the paper can only be found in the island. While Mindoro is of great interest to many conservationists and plant hobbyists because of its unique biogeographical features, it had undergone drastic alteration of landscape (Schult, 2001) which can be a threat to many plant species including Hoyas. This paper will also address conservation concerns for the Hoyas in the island as these plants are in possible danger of extinction.

MATERIALS AND METHODS

Mindoro (Fig. 1) is the seventh largest island in the Philippines. It is geopolitically composed of two provinces, Oriental Mindoro (land area: 423,838 ha) and Occidental Mindoro (586,571 ha). According to the 2015 Census of Population and Housing, the population of the two provinces is around 844,000 and 487,000 respectively (Philippine Statistics Authority, 2016). Because of its high mountain range in the middle of the island, the two provinces have different climactic conditions. Under the modified Coronas classification (as cited by PAGASA, n. d.), Oriental Mindoro is experiencing Type III climate (no very pronounced maximum rain period with a dry season lasting from only one to three months). Most of the areas in Occidental Mindoro, on the other hand, has Type I climate (two pronounced season, dry from November to April and wet during the rest of the year), while some of its eastern side has Type III climate. This climate differences resulted to differences in vegetation types on both sides. The eastern side has a rich forest vegetation while the western side is mostly dominated by grassland areas (Mandia, 1998).

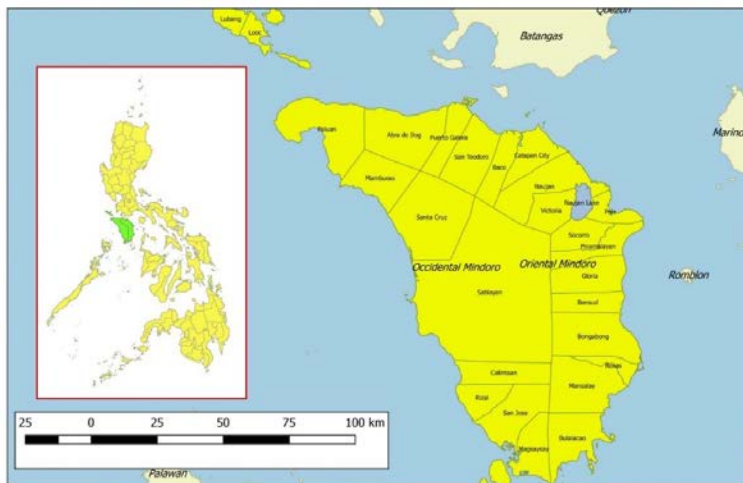


Figure 1. Map of Mindoro Island. (Drawn by the first author using QGIS v. 2.14).

This study made use of several literature publications about Hoyas, (Aurigue, 2013; Merrill, 1923-1926; Kloppenburg 2015; 2014; 2012; 1992; 1990a; 1990b; 1990c; 1990d; 1990e; Robinson, 1911; Schlechter, 1906), some of which came from classic literature about botany. From these references, the distribution of Hoyas were identified. The list of Hoya species that are found in Mindoro were summarized in Table 1. Other significant information were also noted in the table including their geographic distribution, conservation status (based on Fernando et al., 2008) and references where these species are mentioned. Under the geographic distribution column, other notable remarks were also recorded in including its altitude and if the species is endemic or indigenous.

RESULTS AND DISCUSSION

There are 18 species that were recorded in Mindoro (Table 1). Among these species, 15 are endemic to the Philippines and three are indigenous. It is also notable that there are three species in the list that are classified as threatened DENR Department Administrative Order (DAO) 2007-01 (Fernando et al., 2008). These are *Hoya alagensis* Kloppenb. (Endangered), *Hoya halconensis* Kloppenb. (Endangered, Figure 2-b), and *Hoya paziae* Kloppenb. (Vulnerable, Figure 2-e). Interestingly, these plants were first discovered in Mindoro.

Table 1. Checklist of Hoya species in Mindoro, Philippines.

SPECIES	GEOGRAPHIC DISTRIBUTION	CONSERVATION STATUS*	REFERENCES
<i>Hoya alagensis</i> Kloppenb.	Alag River, Baco, Oriental Mindoro; 150 masl.; endemic	EN	Fraterna 1 (3) Philipp. Hoya Sp. Suppl.: I (1990)
<i>Hoya brittonii</i> Kloppenb.	Badoc, Calapan, Mindoro Creek, Mindoro, endemic	NA	Fraterna 1992 (4): tab I (1992)
<i>Hoya camphorifolia</i> Warb.	Luzon (Benguet, Tayabas, Sorsogon); Mindoro; low altitude -370 masl.; endemic	NA	Enum. Philipp. Fl. Pl. iii. 351 (1923)
<i>Hoya cembra</i> Kloppenb.	Alag River, Baco, Oriental Mindoro; 300 masl.; endemic	NA	Fraterna 1 (3) Philipp. Hoya Sp. Suppl.: II (1990)
<i>Hoya cumingiana</i> Decne.	Luzon (Benguet, Bontoc, Bataan, Rizal, Camarines), Mindoro, Ticao, Palawan; low altitude -200 masl.; indigenous	NA	Enum. Philipp. Fl. Pl. iii. 351 (1923)

Table 1. Checklist of *Hoya* species in Mindoro, Philippines.(Continuation)

SPECIES	GEOGRAPHIC DISTRIBUTION	CONSERVATION STATUS*	REFERENCES
<i>Hoya espaldoniana</i> Kloppenb.	Puerto Galera, Oriental Mindoro, Burdeos, Polillo Island; endemic	NA	Hoya New 2(1): 3. 2014 [Jan 2015] [e-published]; Asia Life Sciences 24(2): 469-476 (2015).
<i>Hoya fischeriana</i> Warb.	Mindoro, Biliran, Dinagat, Mindanao (Surigao, Davao); low altitude - 660 masl.; endemic	NA	Enum. Philipp. Fl. Pl. iii. 352 (1923).
<i>Hoya galeraensis</i> Kloppenb.	Puerto Galera, Oriental Mindoro; endemic	NA	Hoya New 4(1): 43. 2015 [Jan 2015] [e-published]
<i>Hoya gracilis</i> Schlechter	Luzon (Sorsogon), Mindoro, Panay; indigenous	NA	Enum. Philipp. Fl. Pl. iii. 352 (1923)
<i>Hoya halconensis</i> Kloppenb.	Mt. Halcon, Mindoro; 900 masl.; endemic	EN	Fraterna 1 (3) Philipp. Hoya Sp. Suppl.: III (1990)
<i>Hoya incrassata</i> Warb.	Luzon (Rizal, Laguna, Tayabas, Sorsogon), Polillo, Mindoro, Busuanga, Panay, Camiguin de Misamis, Mindanao (Surigao, Agusan); low altitude; indigenous	NA	Enum. Philipp. Fl. Pl. iii. 352 (1923), Philipp. Journ. Sci. 6c. 220 (1911)
<i>Hoya madulidii</i> [Kloppenb.] Kloppenb. & Gilding	Luzon (Ifugao, Quezon, and), Mindanao (Davao Oriental and Zamboanga), Palawan, Mindoro and Sulu; low altitude; endemic	NA	Fraterna 1 (3) Philipp. Hoya Sp. Suppl.: IV (1990)

Table 1. Checklist of Hoya species in Mindoro, Philippines.(Continuation)

SPECIES	GEOGRAPHIC DISTRIBUTION	CONSERVATION STATUS*	REFERENCES
<i>Hoya mcgregorii</i> Schlechter	Baco River, Mindoro; low altitude; endemic	NA	Philipp. Journ. Sci. i. Suppl. 302 (1906)
<i>Hoya meliflua</i> Merr.	Luzon (Apayao, Union, Rizal, Bataan, Laguna), Mindoro, Palawan, Negros, Panay, Leyte; low altitude - 150 masl.; endemic	NA	Enum. Philipp. Fl. Pl. iii. 352 (1923)
<i>Hoya merrillii</i> Schltr.	Luzon (Nueva Vizcaya, Tayabas, Cavite, Camarines), Mindoro, Panay, Mindanao (Davao); low altitude -250 masl.; endemic	NA	Enum. Philipp. Fl. Pl. iii. 353 (1923)
<i>Hoya mindorensis</i> Schlechter	Baco River, Mindoro; low altitude - 70 masl.; endemic	NA	Philipp. Journ. Sci. i. Suppl. 303 (1906), Enum. Philipp. Fl. Pl. iii., 353
<i>Hoya multiflora</i> Blume	Babayan Is., Luzon (most or all provinces), Polillo, Mindoro, Tablas, Samar, Panay, Siargao, Dinagat, Mindanao; 600-660 masl.; indigenous	NA	Philippine Hoya Species 3rd ed (1996) 106-108.
<i>Hoya paziae</i> Kloppenb.	Mt. Halcon, Mindoro, Quezon, Antique; 900 masl.; endemic	VU	Fraterna 1 (3) Philipp. Hoya Sp. Suppl.: VI (1990)

*Conservation status is based from DENR list of threatened species (DAO No. 2007-01, also found in Fernando et al., 2008). EN = Endangered; VU = Vulnerable; NA = Not Assessed.

Most hoyas are epiphytic and are usually found on trees in the forests, while some of which are recorded to be thriving in limestone habitat (*Hoya cumingiana* Decne. and *Hoya espadoniana* Kloppenb.). The hoyas in Mindoro can be found in varying altitudes, from low up to 900 masl.

While most of these species thrive in the forests, the threats in the survival of *Hoya* species can be seen in the island's change in landscape over time. Forest conversion is one of the threats for biodiversity not only in Mindoro but in the whole region of Southeast Asia (Sodhi, 2004; Villanueva and Buot, 2015). The forests of Mindoro has been converted into agricultural lands. Most of the areas having intact forests have reduced significantly, and these forests are isolated in its mountain ranges in the central part of the island, including the primary forests of Mt. Halcon (Schult, 2001).







Figure 2. Some of the Hoya species found in Mindoro Island, Philippines: a) *Hoya camphorifolia* Warb., b) *Hoya halconensis* Kloppenb., c) *Hoya multiflora* Blume, d) *Hoya meliflua* Merr., and e) *Hoya paziaae* Kloppenb.

Photo credits: (a, b, e) Edward Agdeppa, (c) Elaine Loreen Villanueva, (d) Inocencio Buot, Jr.

To further explain this land use change, it will be essential to first take a glance at the island's history. During the 1900's, about two-thirds of Mindoro's land area is covered with tropical forests, extending up to its coastal regions (Schult, 2001). Mindoro was one of the major producers of timber in the country, with 44 percent of Mindoro's forests reported to have commercial value (Merritt, 1908). The influx of human settlement in Mindoro during the 1920s has brought economic development to the province, but it also resulted to an increasing man-made disturbance in the forests of the island. This was the period when the migrants who settled in the lowlands outnumbered the Mangyans, the native inhabitants of Mindoro. This period gave way to conversion to agricultural lands, building of infrastructure, and increase in trade of crops. With these development comes the conversion of most of the lands that were once forested, leading to the island's current state of being mainly agricultural economy. During the Japanese occupation in 1940's, the population growth slowed down, but war conflict had only led to the human encroachment of both the Mangyans and lowlanders (Hebling and Schult, 1997). The timber production resumed after the war, and big modern logging companies began to go into the interior of the islands. During the period of Martial Law application for logging concessions in the island becomes easier through Timber Licensing Agreement (TLA). This allowed logging companies to exploit large areas of forests for logging (Vitug, 1998).

Somehow, policies have been implemented in the Philippines in order to safeguard its remaining critical ecosystems. Some areas in Mindoro are declared as protected areas under the National Integrated Protected Areas System (NIPAS) Act of 1992 (RA 7586), like the Apo Reef Natural Park, F. B Harrison Game Refuge and Bird Sanctuary, Mt. Calavite Wildlife Sanctuary, Mts. Iglit-Baco National Park, and Naujan Lake National Park. Ironically, Mt. Halcon, which houses a lot of endemic flora and fauna and a major watershed reserve, is not declared as a protected area under this Act (Gonzales et al., 2000). There are two Hoya species in Table 1 that are reported to be found in Mt. Halcon (*Hoya*

halconensis Kloppenb. and Hoya paziae Kloppenb.) and both are listed as threatened by the DENR (Fernando et al., 2008). As of 2011, the total log ban in the Philippines (E.O. 23 s. 2011) was issued which declares a moratorium the cutting and harvesting of timber in natural and residual forests in the whole country.

CONCLUSION AND RECOMMENDATIONS

This study provided a list of 18 Hoya species that are reported to be found in Mindoro, Philippines, majority of which are listed as endemic in the Philippines. There is a need for these endemic species to be evaluated for conservation. The degradation of forest ecosystems in Mindoro Island has become a threat for these Hoya species, and protecting the remaining forests of the island will help conserve the Hoyas and the flora of Mindoro in general. Strictly implementing policies and promoting activities that will increase awareness of the people will be also be helpful in protecting the Mindoro flora and even its ecosystems in general.

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The second author conceptualized the study. The first author did the review, field work and initiated the drafting of the manuscript for publication under the guidance and mentorship of the second author.

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