

# SABAH'S PLANT CONSERVATION JOURNEY IN SAFEGUARDING THREATENED PLANT SPECIES

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## ABSTRACT

Over the past five years, the Sabah Forestry Department has conducted a collaborative project with Botanic Gardens Conservation International (BGCI), aimed at completing conservation status assessments for Sabah's plant species. This effort has resulted in the assessment, submission, and publication of the status for approximately 400 species on the IUCN Red List of Threatened Species. Thereafter, threatened species requiring protection and conservation measures have been identified and prioritised. About 70% of Sabah's endemic tree species, which is more than 200 species, fall into threatened categories, comprising 39 Critically Endangered (CR), 26 Endangered (EN), and 139 Vulnerable (VU) species. This paper will highlight the conservation initiatives funded by The National Conservation Trust Fund for Natural Resources (NCTF) focusing on targeted threatened species in recent years. Successful establishment of *in situ* monitoring plots and *ex situ* collections have been achieved for the endangered *Phyllanthus rufuschaneyi*. Search operations have been conducted for critically endangered and rare species, *Elaeocarpus pinosukii* and *Ilex mesilauensis*, at their recorded single locality, which has undergone significant habitat change. Unfortunately, these search operation efforts did not yield success, potentially heightening the risk of their extinction. In addition, baseline data surveys have been conducted *in situ* for seven hyper-endemic species at Marai Parai, western Kinabalu Park. These initiatives underscore the need for substantial resources, including funding, manpower, and technical expertise, to effectively carry out conservation activities on varying scenarios of many threatened species in Sabah.

**Keywords:** Threatened plants, plant conservation, IUCN Red List, Sabah.

## 1. INTRODUCTION

Identifying threatened species through comprehensive conservation status assessments is a critical first step in plant conservation efforts. This process plays a fundamental role in both global and national strategies for plant conservation, enabling the prioritization of species most at risk of extinction and in greatest need of conservation intervention. By understanding which species are most threatened, conservation resources can be more effectively allocated to safeguard biodiversity.

In 2009, the Sabah Plant Red List initiative had started as a joint effort between the Sabah Forestry Department (SFD) and Universiti Malaysia Sabah (UMS) to assess the conservation status of plant species in Sabah, with an initial focus on the endemic dipterocarp species. Assessment by Maycock et al. (2012) identified 32 dipterocarp species in Sabah as threatened, due to habitat loss. Since then, numerous conservation efforts have been implemented, including both *in situ* monitoring and the establishment of *ex situ* collections for the most threatened dipterocarp species, such as *Dipterocarpus lamellatus* and *D. ochraceus* (Khoo et al., 2022a; Khoo et al., 2022b; Majapun et al., 2021).

A significant expansion of the Sabah Plant Red List initiative took place in 2018, when a collaboration with Botanic Gardens Conservation International (BGCI) began, aiming to assess an additional 100 endemic tree species. This partnership has since broadened to include assessments beyond Sabah's endemic trees. To date, more than 400 global IUCN Red List assessments tree species in Sabah have been completed, submitted, and published on the IUCN website. This work has contributed to the Global Tree Assessment (GTA) initiative, which has compiled the conservation assessment of over 50,000 tree species worldwide (BGCI, 2021).

Nearly all of the estimated 300 tree species endemic to Sabah have now been assessed, with approximately 70% classified as threatened. Of the 291 endemic species assessed, 39 are listed as Critically Endangered (CR), 26 as Endangered (EN), and 139 as Vulnerable (VU) (Pereira et al., 2023). These findings have greatly aided the SFD in formulating species-specific conservation strategies. This paper will highlight one such initiative, funded by the National Conservation Trust Fund for Natural Resources (NCTF), which focuses on the conservation of targeted threatened species from year 2022 to 2024.

## 2. CONSERVATION INITIATIVES

Plant conservation strategies should be customised to the specific needs of each threatened species, as the conservation requirements and challenges vary greatly depending on the distribution and occurrences of the plants. Some species can benefit from a combination of *in situ* and *ex situ* approaches, where *in situ* conservation protects plants in their natural habitats, while *ex situ* methods provide an additional safeguard. However, other species are much more elusive, rare or exceptional, making direct conservation interventions more challenging. As a result, conservation efforts are often constrained by the unique circumstances of each species, requiring targeted and flexible approaches to conserve them.

### 2.1 *In situ* baseline data collection

For many threatened plant species, the only available data comes from herbarium specimen collections, providing limited information about their historical localities. The current status of their occurrence and population sizes is often unknown. In habitats that are unprotected and have undergone significant changes due to anthropogenic activities, populations are inferred to be declining. As a result, field survey is a crucial first step in determining how many remaining populations and individuals of the target species still exist in their original habitats. In this project, we have surveyed several areas and establish a number of plots for all 11 target species. The number of individuals in each plot was counted to estimate their population density within the surveyed areas. This baseline data is essential for understanding the current status of each target species.

#### 2.1.1 *Phyllanthus rufuschaneyi*

When *Phyllanthus rufuschaneyi* was initially described as a new species, it was classified as Critically Endangered (CR) due to its main population being located outside any protected areas and being threatened by forest fires (Bouman et al., 2018). In 2021, Tsen et al. revised its conservation status to Endangered (EN), stating the second population near a protected area and the likelihood of finding additional populations with more extensive field surveys.

As part of the NCTF project, six plots were established, recording a total of 1,910 individuals of *P. rufuschaneyi*, consisting of 1,023 saplings and 887 mature trees (Table 1). Of the six plots, only one plot, Plot 4, lies within a protected area at the boundary of Kinabalu Park. The remaining five plots are located on stateland, some of which are in close proximity to human settlements and main roads. Our observations show that this species has the ability to colonize areas previously affected by fire, producing a significant number of individuals, albeit in very restricted and specific locations. With this expanded distribution range and colonisation ability, we propose downlisting the conservation status of *P. rufuschaneyi* to a lower risk category.

**Table 1.** Number of *P. rufuschaneyi* individuals recorded from six localities.

Plot Number: Area	Number of saplings	Number of mature trees	Total individual
1: Ulu Lohan	37	124	161
2: Garas Hill	23	286	309
3: Lompoyou	138	118	256
4: Kinabalu Park boundary	531	126	657
5: Togis Hill	203	159	362
6: Pahu Pinawantai	91	74	165
<b>Total</b>	<b>1023</b>	<b>887</b>	<b>1910</b>

### 2.1.2 RTE plants of Marai Parai

During a scientific expedition to Marai Parai, located at the southwestern of Mount Kinabalu, a field survey was conducted to assess the population status of seven Rare, Threatened, and Endangered (RTE) plant species endemic to the area. The target species were *Elaeocarpus inopinatus*, *Hedyotis protrusa*, *Melastoma maraiparaiense*, *Saurauia leopoldii*, *Symplocos trichomarginalis*, *Timonius clementis*, and *Urophyllum lineatum*. Of these, all are listed as Vulnerable (VU) on the IUCN Red List, except for *Hedyotis protrusa* and *Symplocos trichomarginalis*, which have yet to be formally evaluated (IUCN, 2024; Pereira et al., 2023).

Five plots were established, covering all seven target species. The number of individuals or clusters recorded for each species is summarized in Table 2. *Hedyotis protrusa* was counted as clusters instead of individuals to minimize the disturbance to its habit, as it naturally grows in tightly grouped clusters. *Melastoma maraiparaiense* exhibited the highest density, while *Saurauia leopoldii* had the lowest, with only one individual encountered. These findings indicate that conservation efforts should prioritize *Saurauia leopoldii*, as its rarity and low population density suggest it may be the most vulnerable among the species surveyed (Sugau et al., 2024).

**Table 2.** Number of individuals/clusters of each target species in the established plots at Marai Parai.

Plot No.	Target species	Number of individuals/clusters
1	<i>Timonius clementis</i>	73 individuals
	<i>Urophyllum lineatum</i>	27 individuals
2	<i>Melastoma maraiparaiense</i>	25 individuals
	<i>Hedyotis protrusa</i>	6 clusters
3	<i>Symplocos trichomarginalis</i>	10 individuals
4	<i>Elaeocarpus inopinatus</i>	24 individuals
5	<i>Saurauia leopoldii</i>	1 individual

### 2.1.3 *Nepenthes* sp. nov.

A follow-up expedition to investigate a second population of a newly discovered *Nepenthes* species in the Meliau Range was funded under this project. The species' distribution is highly restricted and localized along the small and narrow summit ridge, where only 14 individuals were observed during this expedition. This brings the total number of mature individuals recorded across both known subpopulations to just 39. Such small population sizes, combined with significant poaching threats driven by strong horticultural demand, place this species at high risk. Given these factors, it is proposed that the species be categorized as Critically Endangered under the IUCN Red List criteria.

## 2.2 *In situ* search operation

Multiple search operations were conducted to locate two target species, *Elaeocarpus pinosukii* and *Ilex mesilauensis*, in the original localities at Mesilau and Pinosuk Plateau areas (Fig. 1). *Elaeocarpus pinosukii* has been assessed as *Critically Endangered*, while *Ilex mesilauensis* is categorized as *Data Deficient* (DD) (Damit et al., 2019; Hoo et al., 2019). Both species are only known from a single type specimen collection at their respective locations on the southeastern slopes of Mount Kinabalu. No further records of these species have been documented in the past 50 years, and their original habitat has been severely affected by forest loss and land-use changes due to agricultural expansion and tourism activities. Unfortunately, these strenuous search efforts were unsuccessful, further increasing concerns about the potential extinction of these species.



**Figure 1.** Search operation areas around Mesilau, Pinosuk Plateau and Bambangan Hill, marked with red drop-pins.

### 2.3 *Ex situ* collection establishment

Under this project, approximately 60 seedlings of *Phyllanthus rufuschaneyi* have been planted within the protected area of Bukit Hampuan Forest Reserve, Ranau. This site is located about 1 km from Ulu Lohan, one of the natural populations of the species. In addition, around 500 seedlings are currently being raised in the nursery at Bukit Hampuan. These seedlings will be planted and distributed to potential sites, including the Sepilok Arboretum in Sandakan. Besides Bukit Hampuan, *P. rufuschaneyi* has also been planted at the Monggis Substation on the western edge of Kinabalu Park since 2014. This effort, led by Sabah Parks, is part of the establishment of the Nickel Garden, a collection dedicated to nickel hyperaccumulator plant species. Another planting site for this species is a 1-acre nickel farming trial plot in Kg. Pahu Pinawantai, developed in collaboration between the local community and a private company. While this site is not within a protected area, it is actively maintained by the local community due to its economic potential.

## 3. CONCLUSIONS

The plant conservation initiatives in Sabah have made some progress in safeguarding many of the state's threatened plant species. Through extensive field surveys, the establishment of *in situ* plots, and *ex situ* collections, critical baseline data have been gathered, and some conservation actions have been implemented. The assessment and reclassification of species like *Phyllanthus rufuschaneyi*, and efforts to locate elusive species like *Elaeocarpus pinosukii* and *Ilex mesilauensis*, highlight both the successes and ongoing challenges in plant conservation. While certain species have shown resilience, others remain at high risk of extinction, underscoring the need for continued monitoring. Substantial challenges persist, including habitat loss, limited resources and capacity. To effectively mitigate these threats, ongoing support in terms of funding, technical expertise, and collaboration with local and international conservation bodies is crucial. This work represents an important step forward, but sustained effort will be necessary to conserve many more other threatened species, apart from what have been done on the target species of this project.

## 4. WAY FORWARD

The journey of plant conservation in Sabah, while marked by significant progress, remains far from complete. Moving forward, there are still many threatened species in Sabah that need conservation attention. The combination of *in situ* and *ex situ* conservation methods has proven optimum, but greater efforts are required to expand these approaches on other species. The limited availability of financial and technical resources continues to hinder plant conservation efforts, therefore, continued and increased funding from any sources is crucial. Additionally, capacity-building efforts must be intensified to train local scientists, conservationists, and community members. Comprehensive research and continuous monitoring are key to effective conservation. More resources should be dedicated to studying lesser-known species, improving taxonomic knowledge, and filling data gaps on population dynamics, habitat requirements, and threats. Stronger enforcement of existing conservation laws and the formulation of new policies that protect critical habitats, particularly outside protected areas, are necessary. Sabah's plant conservation efforts will benefit greatly from strengthened collaborations with global conservation networks, universities, and research institutions, to share knowledge, resources, and technologies.

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