

Towards the conservation of endemic melastomes: IUCN red list assessment of three species from the Andaman and Nicobar Islands, India

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Abstract

This study presents the first comprehensive IUCN Red List assessments of three endemic species of Melastomataceae, *Medinilla balakrishnanii*, *Osbeckia saddlepeakensis*, and *Sonerila andamanensis*, from the Andaman and Nicobar Islands, based on field explorations, herbarium studies, and literature review. All three species have restricted distributions, small population size, and face ongoing threats leads habitat quality reduction. According to IUCN criteria, each species qualifies under threatened categories, underscoring the urgent need for targeted conservation actions focused on both species and habitat protection.

Keywords: Critically Endangered, IUCN, *Medinilla*, Melastomataceae, *Osbeckia*, *Sonerila*

Introduction

Andaman & Nicobar Islands are geologically isolated from continental landmass and the islands considered as one of the Union territories of India. The landmass consists of 572 islands, islets, and various rocks, that collectively cover a geographical area of 8,249 square kilometers. Approximately 80 per cent of the mainland is occupied by dense humid tropical forests. Additionally, the coastline of this extensive group of landmasses stretches for 1,962 kilometers that is equivalent to 25 % of coastal area of Indian Mainland. Floristic vegetation of Andaman group of islands is similar to Myanmar region and are belongs to Indo-Burma biodiversity hotspot whereas Nicobar group of islands are part of Sundaland hotspot and show more floristic affinity towards Indonesian and Malaysian region ^[1, 2, 3].

Melastomataceae, the Melastome family, of the order Myrtales, encompasses c. 5000 species worldwide, distributed within 190 genera, have pantropical distribution with extension to temperate North America and the Middle East ^[4]. In India, the family is represented by 172 taxa, among them 114 are endemic ^[5]. The habitat varies from herbs to small trees and majority of the endemism has concentrated in the Western Ghats. According to Sampath Kumar *et al* ^[6], a total of 28 taxa under 10 genera have been recorded from the Andaman and Nicobar Islands, with the highest number of species reported under the genus *Memecylon*. The genera *Medinilla*, *Osbeckia*, and *Sonerila* are represented by 3, 2, and 1 species respectively. Among these, each genus includes a single endemic species: *Medinilla balakrishnanii* Jayanthi, Karthig., Sumathi & Diwakar; *Osbeckia saddlepeakensis* Prashob, Manudev, Sibichen & Nampy; and *Sonerila andamanensis* Stapf & King. Based on a review of the available literature and the IUCN Red List, no formal threat assessments have been published for these endemic Melastomataceae species in the Andaman and Nicobar Islands.

Methodology

Field explorations were carried out to confirm the current occurrence of the target species. In addition to confirming their presence, detailed observations were made on population size, habitat conditions, and ongoing threats. To complement field data, secondary information was gathered from published literature ^[2, 6, 7, 8, 9] and herbarium specimens housed in major Indian herbaria, including CAL, MH, PBL, CALI, and DEV. Distribution maps depicting the Area of Occupancy (AOO) and Extent of Occurrence (EOO) were generated using the GeoCAT platform ^[10]. The Red List status of these endemic species was evaluated from a global perspective, following the IUCN Red List Categories and Criteria ^[11] and the latest guidelines issued by the IUCN Standards and Petitions Committee ^[12]. This systematic approach ensures that the threat assessments are contribute to global biodiversity conservation efforts.

Results & Discussion

By considering the restricted distribution and ongoing threats, for the first time a proper threat assessment is proposed here for three Indian endemic Melastomataceae species in global perspective for future conservation initiatives.

Taxonomic Treatment

***Medinilla balakrishnanii* Jayanthi, Karthig., Sumathi & Diwakar, Nelumbo 51: 1. 2009; Mao *et al.* (Eds), Fl. Andaman & Nicobar Islands 2: 26. 2023. (Fig.1 a)**

Epiphytic, scandent shrub. Stem terete, slightly quadrangular when young, glabrous with lenticellated bark. Leaves simple, opposite or ternate, coriaceous, petiolate, exstipulate; lamina elliptic-oblong, 10–18 x 5–9 cm, apex acuminate, margins entire, base cuneate; 5–7 nerved, prominent, impressed above, raised beneath; petiole ridged, up to 5 cm long. Inflorescence axillary, fascicled, few-flowered cyme from leafless nodes, pedunculate. Flowers bisexual, creamy white, pedicellate. Hypanthium campanulate, furfuraceous, 5-denticulate. Petals 5, free,

membranous, elliptic ovate. Stamens 10, unequal (5+5); anthers elongated with lateral appendages. Ovary 5–6 celled, ovules in axile placentation; style up to 1.5 cm long; stigma punctiform.

Flowering & Fruiting: December–April.

Habitat: Distribution restricted to the Great Nicobar Islands, found in dense evergreen forest as an epiphytic scandent shrub at an elevation of c. 600 m. One of the host trees for this rare plant is *Knema andamanica* (Warb.) W.J.de Wilde^[13].

Distribution: INDIA (Andaman & Nicobar Islands). Endemic.

Specimen Examined: INDIA: Andaman & Nicobar: Great Nicobar, Mt. Thullier, 02.06.2002, J. Jayanthi, K. Karthigeyan & R. Sumathi 19354 (CAL, PBL).

Note on Threat Assessment as per IUCN Guidelines

Distribution of this species is restricted to Mount Thullier in Nicobar Islands and no one recorded the presence either from the type locality or from other locations after discovery. So, here only one location is considered for assessment. The estimated area of occupancy (AOO) of the species is 4 km² only (Fig. 2 a). During species discovery, this plant was noticed as an interior forest member and no threats were observed in the habitat^[13]. They observed 50 or less mature individuals in the type locality (Dr. Jayanthi, pers. comm.). Human interference is very less pointing that this plant will not face any human induced threats in near future. Additionally, the type locality is isolated and occupied as a part of Nicobar Island. Current ongoing threats and population status of the species are unknown.

Considering its restricted distribution and vulnerability, the species is assessed as Critically Endangered (CR D).

***Osbeckia saddlepeakensis* Prashob, Manudev, Sibichen & Nampy**, Phytotaxa 344(2): 185. 2018; Prashob & Sibichen, Rheede 29(4): 246. 2019; Mao *et al.* (Eds.), Fl. Andaman & Nicobar Islands 2: 31. 2023. (Fig.1 b & c) An annual herb with 2–8 cm height. Stems branched, quadrangular, sparsely hairy. Leaves simple, opposite, chartaceous, densely hairy on both surfaces, petiolate; lamina ovate, apex acute, margins ciliate, base obtuse; veins 3, prominent, raised beneath, basally fused. Inflorescence terminal, 2–5 flowered, clustered. Flowers bisexual, small, tetramerous, bracteate, sub-sessile. Hypanthium somewhat obconic, covered with shortly stalked, stellate headed, caducous emergences on lower portion, glabrous above; inter-sepal emergences short-stalked. Sepals 4, lanceolate, caducous. Petals 4, free, obovate, ciliate at apex, pink. Stamens 8, isomorphic; filaments short, glabrous; anthers dithecous, ovate, yellow, dehiscence via apical pore; pore single. Ovary united with hypanthium, 4-locular; style glabrous; stigma capitate. Fruits capsules, 4-ribbed; seeds many, curved.

Flowering & Fruiting: August–October.

Habitat: Distribution of this geographically isolated species is restricted to Andaman & Nicobar Islands, found as an undergrowth in evergreen forest on ‘Saddle peak’ mountain at an elevation between 600–700 m^[14].

Distribution: INDIA (Andaman & Nicobar Islands). Endemic.

Specimen examined: INDIA: Andaman & Nicobar: North Andaman Islands, Saddle peak, 29.09.2010, Santhosh Nampy & K.M. Manudev 3526 (CAL, CALI, DEV, MH)



Fig 1: *Medinilla balakrishnanii* Jayanthi, Karthig., Sumathi & Diwakar. a: Isotype (PBL digital image); *Osbeckia saddlepeakensis* Prashob, Manudev, Sibichen & Nampy (b & c) b: Habit, c: Flower enlarged; *Sonerila andamanensis* Stapf & King (d & e) d: Habit, e: Inflorescence

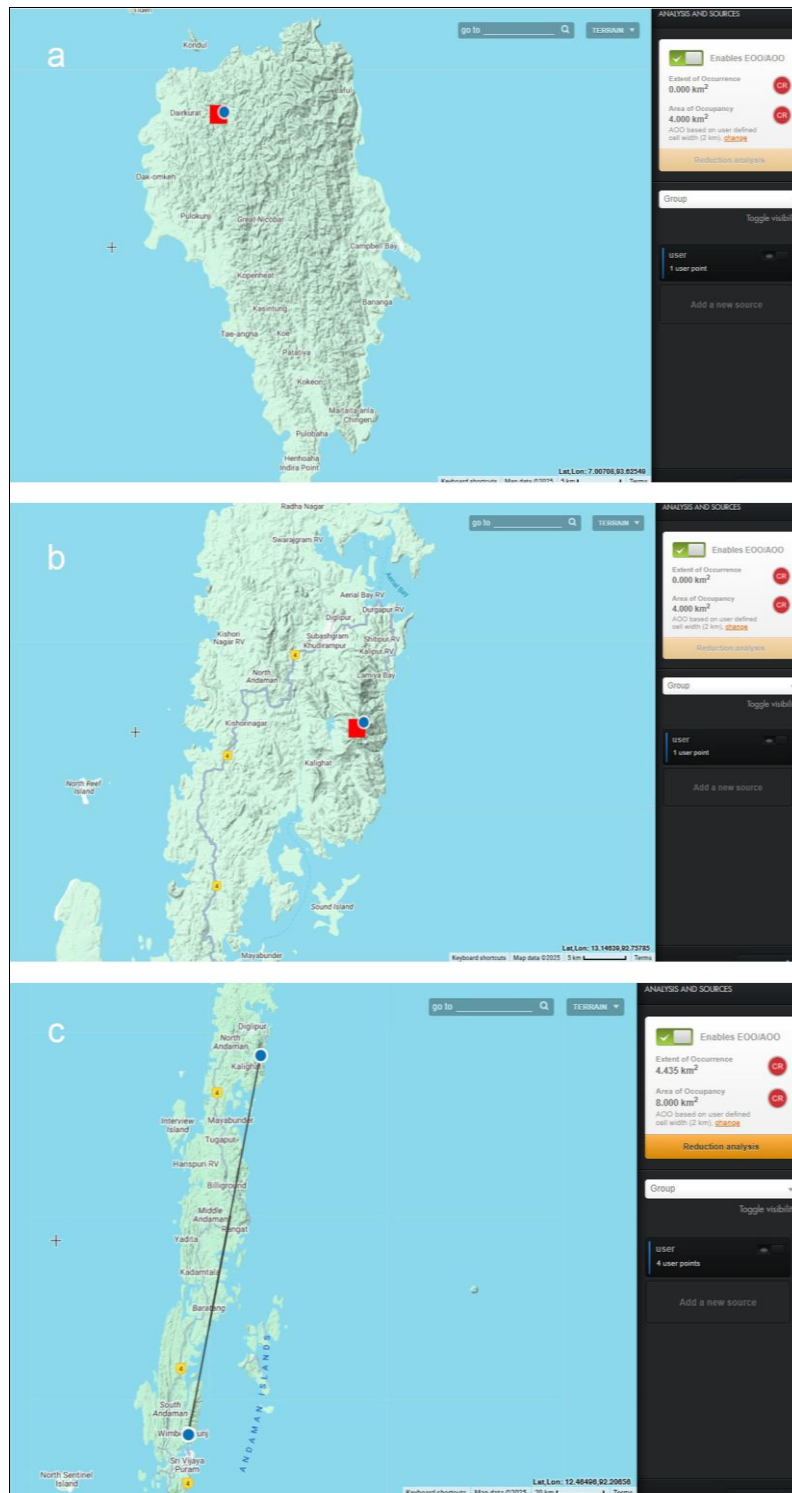


Fig 2: Distribution maps (created in GeoCAT platform) with Area of occupancy (AOO) and Extent of occurrence (EOO): a: *Medinilla balakrishnanii* Jayanthi, Karthig., Sumathi & Diwakar.; b: *Osbeckia saddlepeakensis* Prashob, Manudev, Sibichen & Nampy; c: *Sonerila andamanensis* Stapf & King

Note on Threat Assessment as per IUCN Guidelines

Osbeckia saddlepeakensis is reported from Saddle Peak Mountain in North Andaman Islands and no additional location, beyond type locality, was recorded since species discovery. A count of 10-20 mature individuals was noticed on the way to Saddle peak Mountain and only one location is considered here for assessment. Based on the current records, the estimated area of occupancy (AOO) of the species is 4 Km² only (Fig. 2 b). Saddle peak National Park and its vicinity are one of the famous tourist zones in Andaman Island. Anthropogenic interferences, especially in

mountain trekking path, are observed and habitat quality is reducing due to tourism and other developmental activities. This rare plant has a restricted distribution and they are geographically isolated. Hence, the threat status of the species is assessed here as Critically Endangered (CR B1ab(iii) 2ab(iii), D).

***Sonerila andamanensis* Stapf & King**, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 69: 26. 1900; S.P. Mathew & Lakshmin., Taprobanica 5(1): 71. 1913; Mao *et al.* (Eds), Fl. Andaman & Nicobar Islands 2: 32. 2023. (Fig.1 d & e)

A perennial, caulescent, erect or procumbent herb with thick root stock. Stems sub-terete or quadrangular, simple to branched, densely pubescent, fleshy, woody and glabrous towards base when mature. Leaves simple, decussate, chartaceous, sparsely hairy on both surfaces; petiole fleshy, 1–2 cm long, canaliculate above; lamina ovate to elliptic, 2–9 x 1.5–4 cm, apex acute, margins finely serrulate, base rounded or sub-cordate; veins pinnate, 1–3 pairs, prominent, raised beneath. Inflorescence terminal, 5–20 flowered, unbranched, scorpioid cymes; peduncle quadrangular, longer than petiole. Flowers bisexual, small, bracteate; pedicel sub-terete, sparsely pubescent. Hypanthium campanulate, sparsely covered with gland-tipped trichomes, 3-ribbed. Calyx lobes 3, triangular, acute at apex. Petals 3, free, pale pink, elliptic to ovate, mucronate at apex, mid rib prominent beneath with trichomes. Stamens 3 with short filaments; anthers lanceolate, yellow. Ovary united with hypanthium, 3-locular; style pale pink; stigma capitate. Fruits capsules, 6-ribbed, obconic, glabrous; seeds many, obovoid.

Flowering & Fruiting: September–November.

Habitat: Distribution of this geographically isolated species is restricted to inland evergreen forest of Andaman Island, found in shades at an elevation between 400–750 m. The associated species are *Cyanotis villosa* (Spreng.) Schult. & Schult.f., *Digitaria ciliaris* (Retz.) Koeler and *Impatiens* sp. [15].

Distribution: INDIA (Andaman & Nicobar Islands). Endemic.

Specimens Examined: INDIA: Andaman & Nicobar: North Andaman Islands, Saddle peak, 730 m, 02.12.1976, *N.P. Balakrishnan & N.G. Nair* 4791 (PBL); Mt. Harriet National Park, 400 m, 13.12.1989, *Sam P. Mathew* 20459 (PBL); Saddle peak, 450 m, 29.09.2010, *Manudev K.M. & Santhosh Nampy* 3512 (DEV); Mt. Harriet National Park, Mount Carpenter, 315 m, 21.02.2014, *C. Murugan & Gautam Anuj Ekka* 31537 (PBL); Saddle peak, 730 m, 07.07.2019, *A. Amrutha, P. Saumya & S. Resmi* 168292 (CALI).

Note on Threat Assessment as per IUCN Guidelines

The occurrence of *Sonerila andamanensis* has been reported from two sites in Andaman. This species was initially collected by King's Collectors from Mount Harriet, which is considered the type locality. In 1976, the species was relocated in the Saddle Peak mountains [7]. On the basis of information gathered from the local people, this species has fewer than 50 mature individuals. Based on available records, the estimated Area of Occupancy (AOO) is 8 km² only (Fig. 2 c). Saddle Peak and Mount Harriet, located in the Andaman Islands, are popular tourist destinations. However, anthropogenic interference, particularly along trekking paths, poses a significant threat to the restricted plant population in the area. This threat is especially concerning due to the plant's delicate texture and small habit size. Additionally, tourism and developmental activities are adversely affecting the habitat quality. The isolated habitat and restricted population size further increase the risk of extinction. For the current assessment, 2 locations are considered. Therefore, the threat status of *S. andamanensis* is assessed as Endangered (EN B1ab(iii)+2ab(iii)).

Conclusion

This study revealed that all three species possess restricted distribution range and multiple anthropogenic and natural threats cause habitat quality reduction. The findings highlight the urgent need for targeted conservation measures, including regular monitoring of known population, habitat protection, ex situ conservation, and incorporation of these species into regional conservation planning. Further field surveys are required to find additional sub-population and threats on species as well as habitat. Conservation of these endemic melastomes is essential not only for preventing species loss but also for maintaining the unique floristic diversity of the Andaman & Nicobar Islands.

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