



## POPULAR SCIENCE ARTICLE

## Native Orchids of Northeastern India and their Conservation Realities

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### Abstract

Northeastern India is recognized as one of the most important biogeographic regions of the world due to its exceptional floral diversity and high degree of endemism. Among flowering plants orchids represent one of the most diverse and ecologically significant groups in the region. The varied physiography ranging from tropical plains to alpine mountains coupled with high rainfall and humid climate provides ideal habitats for terrestrial epiphytic and lithophytic orchid species. Indigenous orchids of Northeastern India play crucial roles in forest ecosystems while also holding immense ornamental medicinal cultural and economic value. However rapid habitat degradation climate variability overexploitation and weak conservation implementation have placed many native orchid species under serious threat. This article provides a comprehensive overview of the diversity distribution and ecological significance of indigenous orchid species of Northeastern India and critically examines their present conservation status and challenges. The article further discusses existing conservation approaches identifies gaps and proposes strategies for sustainable management and long-term conservation of orchid genetic resources in the region.

**Key words:** Biodiversity, Endemism, Habitat, Conservation, Threats, Sustainability

### Introduction

Orchids belonging to the family Orchidaceae constitute one of the largest and most evolutionarily advanced families of flowering plants. Globally the family comprises more than 28000 species distributed across diverse ecological zones from tropical rainforests to temperate grasslands and alpine regions. India harbours approximately 1300 orchid species accounting for nearly six percent of the global orchid diversity making it one of the major centers of orchid richness in Asia. Among Indian regions Northeastern India stands out as a hotspot for orchid diversity due to its unique geographic location at the confluence of the Indo Malayan Indo Chinese and Himalayan biogeographic realms.

The Northeastern region comprising Assam Arunachal Pradesh Manipur Meghalaya Mizoram Nagaland Tripura and Sikkim supports more than 800 orchid species of which a significant proportion are indigenous and endemic (Chowdhery, 1998). Orchids in this region exhibit remarkable morphological ecological and reproductive diversity. They occur as epiphytes in subtropical and temperate forests terrestrials in grasslands and forest floors and lithophytes on rocky cliffs and riverbanks. Indigenous

orchids have long been associated with local traditions rituals medicine and livelihoods of tribal communities.

Despite their ecological and cultural significance native orchid species of Northeastern India are increasingly threatened. Deforestation agricultural expansion infrastructure development unregulated collection and climate change have collectively contributed to population decline and habitat fragmentation. Conservation of indigenous orchids therefore has emerged as a priority both from biodiversity and sustainable development perspectives.

### Diversity and Distribution of Indigenous Orchids in Northeastern India

Northeastern India supports nearly sixty percent of the total orchid species recorded in the country highlighting its exceptional richness (Hegde, 2020). The region exhibits high species turnover across altitudinal and climatic gradients. Lowland tropical forests of Assam and Tripura harbour genera such as *Dendrobium*, *Bulbophyllum* and *Aerides* while montane forests of Arunachal Pradesh and Sikkim support *Cymbidium*, *Coelogyne* and *Paphiopedilum* species. Alpine zones above 3000 meters are

characterized by hardy terrestrial orchids such as *Pleione* and *Herminium*. Arunachal Pradesh alone accounts for more than (Hegde, 2020). Many species such as *Paphiopedilum fairrieianum*, *Cymbidium hookerianum* and *Renanthera imschootiana* are narrowly distributed and endemic to specific microhabitats. The high degree of endemism is attributed to geographic isolation complex topography and stable humid conditions that favour speciation.

Orchids in Northeastern India are ecologically specialized and often depend on specific host trees, pollinators and mycorrhizal fungi. Such specialization increases their vulnerability to environmental disturbances. Indigenous species are particularly sensitive to changes in forest structure and microclimate making habitat integrity crucial for their survival.

### **Ecological and Socioeconomic Importance**

Indigenous orchids contribute significantly to ecosystem functioning. As epiphytes they enhance canopy biodiversity and participate in nutrient cycling by trapping organic matter. Their flowers support specialized pollinators including bees, butterflies, moths and birds thereby maintaining pollination networks. Terrestrial orchids often act as indicators of soil health and forest stability.

From a socioeconomic perspective orchids are integral to the cultural heritage of many indigenous communities in Northeastern India. Several species are used in traditional medicine for treating ailments such as fever, wounds, stomach disorders and respiratory problems. Orchids like *Dendrobium nobile* are valued in herbal formulations and are also traded in national and international markets.

The ornamental value of native orchids has generated livelihood opportunities through floriculture and ecotourism. However, unregulated harvesting driven by commercial demand has led to overexploitation of wild populations. The lack of cultivation knowledge and infrastructure further exacerbates pressure on natural habitats.

### **Conservation Status of Indigenous Orchid Species**

A considerable number of orchid species in Northeastern India are currently categorized as threatened under national and international conservation frameworks. Several species are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora which regulates their trade to prevent extinction. Field studies have reported declining populations of many endemic orchids particularly those with restricted distribution and specific habitat requirements.

The conservation status of orchids is often difficult to assess due to limited baseline data and inadequate monitoring. Many species remain poorly studied and undocumented especially in remote forested areas. Habitat loss remains the primary driver of decline followed by illegal collection and climate induced stress.

Climate change poses an emerging threat by altering temperature and precipitation regimes which directly affect orchid phenology distribution and survival. Shifts in flowering time and pollinator availability have already been observed in some high-altitude species (Hegde, 2020). Such changes may disrupt reproductive success and long-term population viability.

### **Major Conservation Challenges**

#### **Habitat Destruction and Fragmentation**

Rapid deforestation due to logging, shifting, cultivation, urbanization and infrastructure development has resulted in significant loss of orchid habitats. Epiphytic orchids are particularly affected by the removal of host trees while terrestrial species suffer from soil disturbance and erosion. Fragmentation isolates populations, reducing genetic diversity and increasing extinction risk.

#### **Overexploitation and Illegal Trade**

High market demand for ornamental and medicinal orchids has led to unsustainable harvesting from the wild. Indigenous communities often lack awareness and alternatives for sustainable utilization. Illegal trade persists despite regulatory mechanisms due to weak enforcement and limited capacity.

#### **Climate Change and Environmental Stress**

Changes in temperature rainfall and humidity affect orchid growth flowering and survival. Species adapted to narrow climatic niches especially those in montane ecosystems are highly vulnerable. Extreme weather events such as prolonged droughts and landslides further degrade habitats.

#### **Limited Research and Documentation**

Inadequate taxonomic ecological and population level studies hinder effective conservation planning. Many indigenous orchid species remain underrepresented in conservation assessments and management plans. Lack of long-term monitoring data limits understanding of population trends and threats.

#### **Policy and Institutional Constraints**

Although several conservation policies exist their implementation on the ground remains weak. Protected areas often lack specific management strategies for orchids. Community participation in conservation programs is limited and benefit

sharing mechanisms are poorly developed.

### Current Conservation Approaches

Conservation of indigenous orchids in Northeastern India involves both *in situ* and *ex situ* strategies. *In situ* conservation through protected areas, biosphere reserves and community conserved forests plays a crucial role in preserving natural habitats. Several orchid rich zones have been identified for priority conservation.

*Ex situ* conservation efforts include botanical gardens, orchidaria tissue culture and seed banks. Research institutions have developed micropropagation techniques for mass multiplication of threatened species reducing pressure on wild populations. However, scaling up these initiatives remains a challenge.

Community based conservation initiatives are gaining recognition as effective approaches. Engaging local communities in sustainable harvesting habitat restoration and ecofriendly orchid cultivation has shown promising results. Awareness programs and capacity building are essential components of such initiatives.

### Strategies for Sustainable Conservation

An integrated conservation framework is required to address the complex challenges facing indigenous orchids. Strengthening habitat protection restoring degraded forests and regulating land use practices are fundamental steps. Scientific research should focus on species ecology reproductive biology and climate resilience.

Promotion of orchid cultivation through training and market support can reduce dependence on wild collection. Development of orchid based ecotourism can generate income while fostering conservation awareness. Policy support for community participation and benefit sharing will enhance long term sustainability.

Regional collaboration among states research institutions and conservation organizations is essential for knowledge sharing and coordinated action. Documentation and digital databases of orchid diversity can support monitoring and policy formulation.

### Conclusion

Indigenous orchid species of Northeastern India represent a unique and irreplaceable component of global biodiversity. Their extraordinary diversity ecological specialization and cultural significance underscore the need for urgent and sustained conservation efforts. Despite existing initiatives orchids continue to face severe threats from habitat loss overexploitation and climate change. Conservation challenges are compounded by limited research inadequate policy implementation and socioeconomic pressures.

A holistic approach integrating scientific research community participation policy support and sustainable livelihood options is essential for conserving native orchids. Protecting these species will not only preserve ecological integrity but also safeguard traditional knowledge and economic opportunities for local communities. Long term conservation of indigenous orchids in Northeastern India is therefore both an ecological necessity and a socio-cultural responsibility.

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