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A REVIEW STUDY ON BIODIVERSITY OF EASTERN HIMALAYA AND ITS CONSERVATION STRATEGIES

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ABSTRACT

The Eastern Himalaya is one of the most ecologically diverse regions on Earth, serving as a critical biodiversity hotspot with high levels of endemism. Spanning northeastern India, Bhutan, south eastern Tibet, and northern Myanmar, this region harbors thousands of plant and animal species, many of which are endangered. However, rapid environmental changes, deforestation, habitat fragmentation, climate change, and anthropogenic pressures threaten its biodiversity. This review synthesizes existing literature on the biodiversity of the Eastern Himalaya and examines conservation strategies, including protected areas, community-based initiatives, and trans boundary co-operation. Strengthening these strategies through policy implementation, local engagement, and scientific research is essential for safeguarding the region's rich ecological heritage.

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INTRODUCTION

The Eastern Himalaya is part of the broader Indo-Burma and Himalayan biodiversity hotspots (Mittermeier et al., 2011). It encompasses northeastern India (Arunachal Pradesh, Sikkim, Assam, West Bengal), Bhutan, northern Myanmar, and southeastern Tibet, covering diverse ecosystems ranging from tropical forests to alpine meadows (CEPF, 2017). This region supports over 10,000 plant species, 300 mammal species, 1,000 bird species, and numerous amphibians, reptiles, and invertebrates (WWF, 2022). However, biodiversity loss due to habitat destruction, climate change, and illegal activities necessitates urgent conservation measures (Myers et al., 2000).

2. Biodiversity of the Eastern Himalaya

2.1 Flora

The Eastern Himalaya hosts approximately 10,000 species of vascular plants, with 30–40% endemism (Singh & Singh, 2021). Notable plant families include Orchidaceae, Rhododendronaceae, and Lauraceae (Rao, 2020). The forest types include:

- **Tropical and Subtropical Forests**: Dominated by Dipterocarps, bamboos, and epiphytic orchids (Bhagwat et al., 2017).
- **Temperate Forests**: Composed of oaks (*Quercus* spp.), rhododendrons, and maples (*Acer* spp.).
- **Alpine Meadows**: Home to medicinal plants like *Aconitum*, *Saussurea*, and *Rheum* spp. (Kala, 2019).

2.2 Fauna

The Eastern Himalaya harbors numerous flagship and lesser-known species:

- **Mammals**: Snow leopard (*Panthera uncia*),

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red panda (*Ailurus fulgens*), clouded leopard (*Neofelis nebulosa*), and Himalayan black bear (*Ursus thibetanus*) (Acharya et al., 2021).

- **Birds**: Over 1,000 bird species, including the Himalayan monal (*Lophophorus impejanus*), Blyth's tragopan (*Tragopan blythii*), and the endangered black-necked crane (*Grus nigricollis*) (Inskipp et al., 2016).
- **Amphibians and Reptiles**: Unique species such as the Himalayan salamander (*Tylototriton verrucosus*) and king cobra (*Ophiophagus hannah*) (Borthakur et al., 2022).
- **Invertebrates**: High diversity of butterflies, such as Bhutan glory (*Bhutanitis lidderdalii*), and endemic insects crucial for pollination.(Yonzon, P. 2005)

3. Threats to Biodiversity

3.1 Habitat Loss and Deforestation
Deforestation due to agriculture, logging, and infrastructure development has led to severe habitat fragmentation (WWF, 2022). Between 2000 and 2020, forest cover declined by approximately 10% in some areas (Reddy et al., 2021).

3.2 Climate Change
Rising temperatures, glacial retreat, and shifting monsoon patterns affect species distributions (Thakur et al., 2020). Alpine species are particularly vulnerable due to limited migration options (Sharma et al., 2019).

3.3 Illegal Wildlife Trade and Poaching
Targeted species include pangolins (*Manis spp.*), red pandas, and rare orchids (Nijman, 2020). Poaching networks exploit weak law enforcement and porous international borders (TRAFFIC, 2022).

3.4 Human-Wildlife Conflict
Increasing encounters with elephants, leopards, and bears have led to retaliatory killings and habitat degradation (Choudhury, 2021).

3.5 Infrastructure Development
Hydropower projects, road construction, and urbanization disrupt migration corridors and fragment ecosystems (Chettri et al., 2019).

4. Conservation Strategies

4.1 Protected Areas and Biosphere Reserves
Several national parks and reserves have been established:

- **Namdapha National Park (India)**: A biodiversity hotspot with multiple habitat types .
- **Jigme Dorji National Park (Bhutan)**: Protects alpine, temperate, and subtropical ecosystems (WWF Bhutan, 2021).
- **Makalu Barun National Park (Nepal)**: Home to snow leopards and red pandas (Acharya et al., 2021).

4.2 Community-Based Conservation
- **Eco-tourism**: Programs in Sikkim and Bhutan generate revenue while promoting conservation (Chettri et al., 2020).
- **Traditional Knowledge Integration**: Indigenous communities contribute to sustainable forest management (Rai & Sundriyal, 2019).

4.3 Trans boundary Conservation Initiatives
- **Kanchenjunga Landscape Initiative (India, Nepal, Bhutan)**: Focuses on ecological connectivity (CEPF, 2017). (Allen et al., 2020)
- **Himalayan Conservation Program (WWF)**: Supports habitat restoration across national borders (WWF, 2022).

4.4 Climate Change Adaptation
- **Afforestation and reforestation programs**: Mitigating carbon emissions (Thakur et al., 2020).
- **Wildlife corridors**: Facilitating species movement (Choudhury, 2021).

4.5 Policy Strengthening and Law Enforcement
- **Stricter anti-poaching measures** (TRAFFIC, 2022).
- **Integration of biodiversity conservation into national policies** (Singh & Singh, 2021).

CONCLUSION
The Eastern Himalaya remains a crucial biodiversity hotspot with immense ecological significance. However, deforestation, climate change, poaching, and human-wildlife conflict pose significant threats. Conservation strategies—including protected areas, community participation, transboundary cooperation, and climate resilience initiatives—are vital for sustaining biodiversity. Strengthening policy frameworks, promoting indigenous conservation practices, and improving enforcement mechanisms will be key to ensuring the long-term ecological health of the region.

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