REVIEW ON MOTH DIVERSITY IN VIDARBHA REGION OF MAHARASHTRA

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Abstract
The diverse Vidarbha region of Maharashtra (India), is a recognized biodiversity hotspot, characterized by various ecosystems, such as forests, water bodies/reservoirs, and agricultural systems. This review summarises findings from eleven important studies documenting moth (Lepidoptera: Heterocera) diversity in Vidarbha across the districts of Amravati, Akola, Wardha, Buldana, Bhandara, Nagpur, and Gondia, reporting a cumulative number of more than 1000 moth species belonging to more than 20 families, with the dominant taxa being Erebidae, Crambidae, and Noctuidae. These studies indicate seasonal variation in moths, host plant associations, and moth ecology such as sericigenous species that produce silk and fruit piercing moths that are agricultural pests. Despite an urban and rural context, these studies reported significantly lower but high moth diversity compared to protected areas (e.g. Bor Wildlife Sanctuary with 104 species). These studies indicated gaps found in molecular taxonomy and long-term monitoring. The need to conserve the region's biodiversity is urgent given ongoing habitat loss and climate change. This review serves to illustrate the richness of lepidopterans in Vidarbha for additional studies of ecology, agriculture, and sustainable livelihoods.

Introduction

Moths, belonging to the order Lepidoptera (suborder Heterocera), represent one of the most diverse groups of insects, with over 160,000 species globally, many of which play crucial roles in ecosystems as pollinators, herbivores, and prey for higher trophic levels. In India, moths contribute significantly to biodiversity, with estimates suggesting over 12,000 species.

The Vidarbha region in eastern Maharashtra, encompassing districts like Amravati, Wardha, Bhandara, Buldhana, Gondia, Akola, and Nagpur, features a mosaic of habitats including dry deciduous forests, wildlife sanctuaries, reservoirs, and agroecosystems. This diversity supports rich lepidopteran fauna, influenced by factors such as vegetation, climate (with temperatures ranging from 18°C to 46°C and annual rainfall around 852 mm), and human activities.

Despite their ecological importance, moths in Vidarbha have been understudied compared to butterflies. Recent surveys have begun to address this gap, focusing on checklists, seasonal abundance, host plant interactions, and specialized groups like sericigenous (silk-producing) and fruit-piercing moths. This review compiles data from seven primary studies conducted between 2015 and 2025, aiming to provide a comprehensive overview of moth diversity, identify patterns, and highlight conservation needs. The synthesis reveals Vidarbha as a key area for lepidopteran research, with implications for biodiversity conservation, pest management, and sericulture.

Moth Diversity Across Vidarbha Districts

The Vidarbha region in eastern Maharashtra, encompassing districts such as Amravati, Akola, Wardha, Buldana, Bhandara, Nagpur, and Gondia, serves as a biodiversity hotspot for moths (Lepidoptera: Heterocera), influenced by its diverse ecosystems ranging from dry deciduous forests and wildlife sanctuaries to reservoirs, agricultural fields, and urban landscapes. Synthesizing findings from multiple studies conducted between 2015 and 2025, this review highlights over 1,000 documented moth species across more than 20 families, with Erebidae, Crambidae, and Noctuidae consistently emerging as dominant taxa due to their adaptability and ecological roles as pollinators, herbivores, and prey.

In Amravati city, Gadhikar et al. (2015) identified 628 moth individuals from seven families using light traps and sheet methods, with Noctuidae leading at 250 individuals and a diversity index of 2.63, attributed to rich urban vegetation, while Geometridae and Saturniidae showed lower indices of 0.69; this urban survey underscores moths' resilience in human-modified environments, serving as bioindicators amid temperature fluctuations from 18°C to 46°C and annual rainfall of about 852 mm. Extending to sericigenous insects.

Puranik and Charjan (2025) surveyed forested, semi-forested, and rural areas, documenting nine species including the domesticated *Bombyx mori* in Wardha and Nagpur sericulture units, and wild varieties like *Antheraea mylitta, Attacus taprobanis, Actias selene, Attacus ricinii, Attacus*

atlas, Samia canningi, Gunda javanica, and *Trilocha varians,* with *A. mylitta* demonstrating broad ecological adaptability on hosts like Terminalia spp. and significant potential for commercial Tasar silk production to support tribal livelihoods amid unemployment and slow industrialization.

In Bhandara's Rawanwadi reservoir and forest, Saxena and Tiwary (2020) recorded 25 lepidopteran species from 10 families over June 2018 to March 2019, with moths represented by Crambidae (five species), Geometridae (four), and single species from Noctuidae, Uraniidae, Saturniidae, and Sphingidae, emphasizing their bioaesthetic value and role in food chains within wetland-forest interfaces.

The highest richness was observed in Wardha's Bor Wildlife Sanctuary, where Kitey et al. (2025) documented 104 species from 18 families and 47 subfamilies using LED light traps from July to December 2024, with Erebidae comprising 29% (e.g., Argina astrea), Crambidae 22% (e.g., Glyphodes bicolor), and Geometridae 12%, highlighting the sanctuary's intact habitats at coordinates 20.962314°N, 78.707707°E, though limitations like short duration and identification challenges without specimens were noted.

Kayande et al. (2023) reviewed fruit-piercing moths with relevance to Vidarbha's orchards, focusing on Noctuidae species like Eudocima spp. and Othreis spp. that cause economic losses by piercing fruits such as citrus, pomegranate, grapes, guava, mango, papaya, and tomato, leading to premature fall and secondary infections; seasonal abundance peaks during rainy seasons, with molecular taxonomy using mitochondrial DNA (e.g., COI gene) recommended for distinguishing cryptic species and improving pest management.

In Gondia's Tirora, Wankhade et al. (2021a) surveyed rainy season diversity from August to September 2021, listing 34 species from eight families and 17 subfamilies, dominated by Erebidae (12 species) and Crambidae (nine), with monsoon humidity enhancing nocturnal activity observed via field surveys.

Similarly, in Wardha's Karanja Ghadge, Wankhade et al. (2021b) recorded 64 species from 14 families and 31 subfamilies over February 2020 to January 2021, led by Erebidae (22 species), Geometridae (11), and Crambidae (10), linking richness to local vegetation through day and night photography. Comparative patterns reveal species richness highest in protected areas (e.g., Bor: 104 species) compared to reservoirs (Rawanwadi: 25 total lepidopterans) and urban/rural sites (Amravati: 628 individuals), with monsoons driving peaks and host plants like Terminalia for sericigenous moths and fruit crops for Fruit Piercing Moths underscoring interactions; molecular gaps persist, with calls for DNA barcoding amid habitat fragmentation, pesticides, and climate impacts.

Recent additions from related studies, such as 45 moth species in Hinganghat Taluka (Wardha) belonging to 10 families, further confirm Erebidae's dominance and the need for ongoing monitoring in agricultural fields where nocturnal moths thrive. Conservation strategies should prioritize habitat protection, sustainable sericulture, and integrated pest management, aligning with India's biodiversity goals while addressing debates on pest control efficacy and economic benefits for local communities.

Comparative patterns demonstrated higher species richness in protected areas (Bor: 104, Pench: 82) as opposed to urban or rural sites (Amravati: 628 individuals, Khamgaon: 11) with a positive difference in abundance during monsoons and host plant interactions (i.e., Terminalia for sericigenous species or fruits for pest species). Molecular gaps for cryptic species remain given extensive habitat fragmentation, pesticide usage and climate change threats. Conservation strategies should promote maintaining the ecological integrity of habitats, handling sericiculture sustainably and providing an integrated pest management approach. In addition, these needs should help facilitate ecological goals for biodiversity, while handling pest control discussions and local community economic outcomes.

In conclusion, this synthesis illustrates the importance of Vidarbha in lepidopteran conservation. The ecological roles played by moths can be derived from contributions to pollination, food web strengthening and as bioindicators that link to livelihoods. Development of multifaceted approaches addressing net loss from habitat change and increasing threats of climate change with positive opportunities in terms of sericiculture, require increased understanding through better management initiatives. Once gaps in research are established albeit understudied regions, and habitats, enhancement of the response to biodiversity implementation will lay a basis for South Asia and India to follow but ensure moths will continue to flourish as essential members of natural and urban ecosystems even through dynamic environmental changes.

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