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"STUDIES ON THE LEPIDOPTERAN FAUNA OF THE REWA REGION WITH SPECIAL REFERENCE TO THEIR ECOLOGY"

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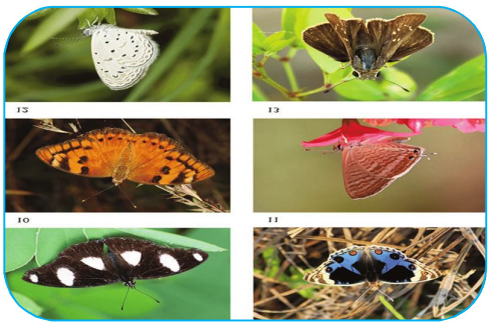
ABSTRACT



Lepidoptera, comprising butterflies and moths, represent one of the most diverse and ecologically significant insect orders. They play vital roles as pollinators, herbivores, prey organisms, and bioindicators of environmental health. The present study investigates the diversity, distribution, seasonal abundance, and ecological associations of lepidopteran fauna in the Rewa region of Madhya Pradesh, India. Extensive field surveys were conducted across different habitats including forests, agricultural landscapes, wetlands, and urban green spaces over a period of two years. The study highlights the influence of vegetation structure, climate, host plant availability, and anthropogenic disturbances on lepidopteran diversity. The findings emphasize the ecological importance of Lepidoptera and underline the need for habitat conservation and biodiversity-friendly land-use practices in the Rewa region.

KEYWORDS: *Lepidoptera, butterflies, ecology, biodiversity Rewa region*.

INTRODUCTION

Lepidoptera is the second largest order of insects, comprising more than 1,60,000 described species worldwide. This order includes butterflies and moths, which are widely distributed across terrestrial ecosystems. Lepidopterans are highly sensitive to environmental changes and are therefore considered excellent indicators of ecosystem health and biodiversity. In tropical countries like India, lepidopteran diversity is remarkably high due to varied climatic conditions, diverse vegetation types, and heterogeneous landscapes. India hosts more than 15,000 species of Lepidoptera, many of which are endemic. Despite this richness, several regions remain poorly explored, especially in central India.

The Rewa region of Madhya Pradesh forms part of the Vindhyan plateau and exhibits a mosaic of forests, agricultural lands, grasslands, wetlands, and urban habitats. These varied ecosystems provide suitable niches for a wide range of lepidopteran species. However, increasing anthropogenic pressures such as deforestation, agricultural intensification, pesticide use, urbanization, and climate variability pose significant threats to lepidopteran populations. The present study aims to document the lepidopteran fauna of the Rewa region and analyze their ecological relationships, habitat preferences, and seasonal dynamics, contributing valuable baseline data for biodiversity conservation and ecological research. The Rewa region is located in the northeastern part of Madhya Pradesh between approximately 24°18′–25°12′ N latitude and 81°02′–82°18′ E longitude. The region lies within the Vindhyan range and is characterized by undulating terrain, plateaus, and river valleys.

OBJECTIVES OF THE STUDY:

1. To document the diversity of lepidopteran fauna in the Rewa region.
2. To study habitat-wise distribution and abundance of butterflies and moths.
3. To analyze seasonal variations in lepidopteran populations.
4. To assess ecological roles such as pollination and herbivory.
5. To evaluate the impact of environmental and anthropogenic factors on lepidopteran ecology.

REVIEW OF LITERATURE:

Lepidoptera, comprising butterflies and moths, have long attracted scientific attention due to their ecological significance, taxonomic diversity, and sensitivity to environmental changes. Numerous studies across the world have highlighted their importance as pollinators, herbivores, prey species, and bioindicators of ecosystem health. Early systematic documentation of Indian Lepidoptera was undertaken by Wynter-Blyth (1957), whose comprehensive work *Butterflies of the Indian Region* remains a classical reference for species identification, distribution, and taxonomy. This pioneering study laid the foundation for subsequent ecological and faunal investigations in the Indian subcontinent. Later, Kehimkar (2008) provided an updated and richly illustrated account of Indian butterflies, incorporating ecological notes, habitat preferences, and behavioral aspects. His work significantly contributed to popularizing butterfly research and conservation awareness in India, while also serving as an essential guide for field-based ecological studies.

Kunte (2000) emphasized the strong relationship between butterfly diversity and habitat quality, demonstrating that species richness and abundance are higher in undisturbed and structurally complex habitats. His studies highlighted the role of vegetation diversity, host plant availability, and microclimatic conditions in shaping lepidopteran communities. Several researchers have explored the use of Lepidoptera as ecological indicators. Pollard (1991) introduced standardized monitoring techniques for butterfly populations, demonstrating their effectiveness in assessing habitat changes and environmental disturbances. Thomas (2005) further established butterflies as sensitive indicators of climate change, reporting range shifts and phenological changes in response to rising temperatures.

In the Indian context, studies by Singh and Bhandari (2010) and Tiple et al. (2011) documented lepidopteran diversity across different habitats, including forests, agricultural landscapes, and urban ecosystems. These studies reported a decline in specialist species in disturbed habitats, with a corresponding increase in generalist species, indicating habitat degradation. Research conducted in central India has shown that tropical dry deciduous forests support relatively high lepidopteran diversity due to the availability of diverse larval host plants and nectar sources. Sharma and Joshi (2015) reported significant seasonal variation in lepidopteran abundance, with peak populations during monsoon and post-monsoon periods.

Despite the growing body of literature on Lepidoptera in India, region-specific ecological studies in the Rewa region of Madhya Pradesh remain limited. Most available works focus either on taxonomic checklists or short-term surveys, with insufficient emphasis on ecological interactions, habitat associations, and anthropogenic impacts. Therefore, a comprehensive ecological assessment of lepidopteran fauna in the Rewa region is essential to fill existing knowledge gaps and to support biodiversity conservation and sustainable ecosystem management.

MATERIALS AND METHODS:

The present study was conducted in the Rewa region of Madhya Pradesh, India, covering diverse habitats such as tropical dry deciduous forests, agricultural fields, wetlands, grasslands, and urban green areas. Field surveys were carried out over a two-year period covering all major seasons to record seasonal and habitat-wise variation in lepidopteran fauna. Butterflies were surveyed using visual encounter methods and transect walks during peak activity hours (0800–1100 h), while moths were sampled using light traps and bait traps during nocturnal hours. Specimens were photographed in the field, and minimal collection was carried out where necessary, following ethical and conservation guidelines.

Species identification was performed using standard taxonomic keys, field guides, and reference literature, including works by Wynter-Blyth and Kehimkar. Habitat characteristics, vegetation type, and host plant associations were recorded simultaneously during surveys. Data were analyzed to assess species richness, relative abundance, habitat preference, and seasonal variation. Comparative analysis across different habitats was used to evaluate ecological patterns and the influence of environmental factors on lepidopteran distribution in the Rewa region.

RESULTS:

The present investigation revealed a considerable diversity of lepidopteran fauna in the Rewa region, reflecting the heterogeneity of habitats and vegetation types present in the study area. Both butterflies and moths were well represented, with butterflies showing higher visibility and abundance during daytime surveys, while moths dominated nocturnal collections. The recorded species included common, occasional, and rare taxa, indicating varying degrees of habitat specificity and ecological adaptability.

Among the recorded families, Nymphalidae emerged as the most dominant butterfly family in terms of species richness, followed by Pieridae, Lycaenidae, and Papilionidae. In the moth assemblage, Noctuidae, Erebidae, and Geometridae were the most frequently encountered families. Family-wise analysis showed that species richness was strongly associated with vegetation complexity and availability of larval host plants. Forested habitats supported the maximum number of families and species, whereas urban and semi-urban areas showed comparatively lower diversity but higher dominance of a few adaptable species.

Habitat-wise distribution analysis indicated clear variations in lepidopteran diversity across different ecosystems. Agricultural fields supported moderate diversity, particularly during crop flowering periods, when nectar availability was high. Wetlands and riverine habitats supported a distinct assemblage of species adapted to moist conditions. Grasslands showed seasonal fluctuations, with higher abundance during the monsoon period. Urban habitats exhibited the lowest species richness, dominated mainly by generalist species capable of surviving in disturbed environments.

Seasonal variation played a significant role in determining lepidopteran abundance and species composition. The highest number of species and individuals was recorded during the monsoon and post-monsoon seasons, coinciding with increased vegetation growth, availability of host plants, and favorable climatic conditions. During summer months, species richness and abundance declined markedly due to high temperatures and reduced floral resources. Winter surveys showed moderate diversity, with several species remaining active during cooler temperatures.

Relative abundance analysis revealed that a small number of species were highly abundant across multiple habitats, while a larger proportion of species were represented by fewer individuals. Several species exhibited strong habitat specificity, being restricted to forest interiors or wetland margins. Migratory species were observed mainly during the monsoon season, indicating seasonal movement patterns influenced by climatic conditions and resource availability.

Observations on ecological associations indicated that most butterfly species showed close relationships with specific nectar plants, while larval stages were dependent on particular host plant species. Moth species were found to be strongly influenced by artificial light sources, especially in urban and semi-urban areas. Anthropogenic disturbances such as habitat fragmentation, pesticide use in agricultural fields, and urban expansion were observed to influence species composition, leading to reduced abundance of sensitive species in disturbed habitats.

Overall, the results demonstrate that the Rewa region supports a rich and varied lepidopteran fauna, with species distribution and abundance closely linked to habitat type, seasonality, and ecological conditions. The documented patterns provide important baseline data for understanding lepidopteran ecology and for developing future conservation and management strategies in the region.

ECOLOGICAL ASPECTS OF LEPIDOPTERAN FAUNA:

Lepidopteran insects play a vital role in maintaining ecological balance in terrestrial ecosystems. Their life cycle, feeding behavior, and interactions with plants and other organisms make

them integral components of natural and managed habitats. In the Rewa region, the ecological roles of butterflies and moths were observed to be closely linked with vegetation diversity, climatic conditions, and habitat structure.

Role in Pollination : Adult butterflies and certain moth species act as important pollinators of both wild and cultivated flowering plants. While feeding on nectar, they facilitate cross-pollination by transferring pollen grains between flowers. In the study area, several butterfly species were frequently observed visiting flowering plants such as *Lantana camara*, *Tridax procumbens*, *Calotropis gigantea*, and *Cassia* species. Pollination activity was highest during the monsoon and post-monsoon seasons when floral resources were abundant. Nocturnal moths contributed significantly to the pollination of night-blooming plants, thereby enhancing plant reproductive success and ecosystem stability.

Herbivory and Host Plant Relationships : The larval stages of Lepidoptera exhibit herbivorous feeding behavior and are often highly specific to particular host plants. This host plant specificity determines species distribution and abundance. In forest habitats of the Rewa region, larvae were commonly associated with native tree and shrub species, whereas in agricultural landscapes, several moth species utilized crop plants as larval hosts. The dependence of larvae on specific host plants makes lepidopteran populations sensitive to changes in vegetation composition, deforestation, and agricultural practices.

Role in Food Webs: Lepidopterans constitute a crucial link in food webs, serving as a major food source for a variety of predators, including birds, reptiles, amphibians, small mammals, and arthropods. Eggs, larvae, pupae, and adults are all consumed by different predators at various trophic levels. In the Rewa region, insectivorous birds were frequently observed feeding on caterpillars, while bats and nocturnal birds preyed upon moths. This trophic interaction contributes to energy transfer and nutrient cycling within ecosystems.

Lepidoptera as Bioindicators : Due to their sensitivity to environmental changes, Lepidoptera are widely regarded as effective bioindicators of habitat quality and ecological health. Changes in species composition, abundance, and behavior often reflect alterations in climate, vegetation, pollution levels, and land-use patterns. In the present study, higher lepidopteran diversity was recorded in less disturbed forest habitats, while reduced diversity and dominance of generalist species were observed in urban and intensively cultivated areas. Such patterns indicate habitat degradation and ecological imbalance.

Influence of Environmental Factors : Environmental variables such as temperature, rainfall, humidity, and photoperiod strongly influence lepidopteran life cycles and population dynamics. Seasonal fluctuations in the Rewa region were closely associated with monsoon rainfall, which promotes host plant growth and larval survival. Extreme summer temperatures negatively affected adult activity and larval development. Anthropogenic factors, including pesticide use, habitat fragmentation, and urbanization, were observed to adversely impact sensitive species, leading to reduced diversity and altered ecological interactions.

IMPACT OF ENVIRONMENTAL FACTORS :

Environmental factors play a crucial role in shaping the diversity, distribution, and population dynamics of lepidopteran fauna. The present study reveals that both natural and anthropogenic environmental variables significantly influence the occurrence and ecological behavior of butterflies and moths in the Rewa region.

Climatic Factors : Climate is one of the most important determinants of lepidopteran ecology. Temperature, rainfall, and humidity directly affect breeding cycles, larval development, adult activity, and survival rates. In the Rewa region, lepidopteran diversity and abundance were observed to be

highest during the monsoon and post-monsoon seasons, when moderate temperatures and increased rainfall promote the growth of larval host plants and nectar sources. Conversely, extreme summer temperatures resulted in reduced adult activity and larval mortality. Prolonged dry periods negatively affected egg hatching and larval survival, leading to seasonal declines in population density.

Vegetation and Habitat Structure : Vegetation composition and habitat complexity strongly influence lepidopteran distribution. Forest habitats with diverse native plant species supported higher species richness compared to monoculture agricultural fields and urban landscapes. The availability of specific larval host plants was a key factor determining species presence. Habitat fragmentation due to deforestation and land-use change reduced connectivity between populations, particularly affecting habitat-specialist species. Loss of understory vegetation further limited breeding and shelter opportunities for many lepidopteran species.

Anthropogenic Activities : Human-induced environmental changes have had a pronounced impact on lepidopteran fauna in the study area. Intensive agricultural practices, especially the use of chemical pesticides and fertilizers, were associated with reduced larval survival and declining species diversity. Urbanization led to habitat loss and increased light pollution, which altered the behavior and distribution of nocturnal moth species. Road construction and expansion of settlements contributed to habitat fragmentation and mortality due to vehicle collisions.

Pollution and Light Disturbance : Air, water, and soil pollution indirectly affected lepidopteran populations by degrading vegetation quality and reducing floral resources. Artificial lighting in urban and semi-urban areas significantly influenced moth assemblages by disrupting natural activity patterns, mating behavior, and predator-prey interactions. Such disturbances were observed to favor a few tolerant species while negatively affecting sensitive and specialized taxa.

Climate Change Implications : Long-term changes in climate patterns pose additional threats to lepidopteran fauna. Shifts in temperature and rainfall regimes can lead to altered phenology, mismatches between larval emergence and host plant availability, and changes in species distribution ranges. The increasing frequency of extreme weather events may further exacerbate population declines, particularly among narrowly adapted species.

DISCUSSION :

The present study provides a comprehensive account of the diversity and ecological characteristics of lepidopteran fauna in the Rewa region, highlighting the influence of habitat heterogeneity, seasonal variation, and environmental factors on species distribution and abundance. The recorded richness of Lepidoptera reflects the ecological complexity of the region, which encompasses forests, agricultural landscapes, wetlands, grasslands, and urban habitats. Similar patterns of high lepidopteran diversity in heterogeneous landscapes have been reported by earlier workers in different parts of India, supporting the findings of the present investigation.

The dominance of families such as Nymphalidae, Pieridae, and Lycaenidae among butterflies, and Noctuidae among moths, is consistent with studies conducted in tropical and subtropical regions. These families are known for their ecological adaptability and wide host plant range, enabling them to thrive across varied habitats. Forest ecosystems supported the highest species richness, which can be attributed to the availability of diverse larval host plants, nectar resources, and favorable microclimatic conditions. In contrast, urban and semi-urban areas exhibited reduced diversity, dominated mainly by generalist species capable of tolerating habitat disturbance and environmental stress.

Seasonal variation played a significant role in shaping lepidopteran populations. The peak abundance observed during monsoon and post-monsoon seasons corresponds with increased vegetation growth and resource availability. Similar seasonal trends have been documented by several researchers, who reported enhanced breeding success and larval survival during periods of high humidity and moderate temperature. The decline in abundance during summer months may be

attributed to extreme temperatures, reduced floral resources, and increased desiccation stress affecting both larvae and adults.

Ecological interactions such as pollination, herbivory, and trophic relationships further emphasize the functional importance of Lepidoptera in the Rewa region. Butterflies and moths contribute significantly to pollination of wild and cultivated plants, thereby supporting plant reproduction and ecosystem stability. Larval host plant specificity observed in several species highlights the strong dependence of lepidopteran populations on vegetation composition. Any alteration in plant diversity due to deforestation, agricultural intensification, or invasive species is likely to have direct consequences on lepidopteran diversity.

The impact of anthropogenic activities was evident in altered species composition and reduced abundance in disturbed habitats. Intensive pesticide use in agricultural fields negatively affected larval survival and reduced species richness, particularly among sensitive taxa. Urbanization and habitat fragmentation disrupted natural movement patterns and breeding habitats, leading to population decline of habitat-specialist species. Artificial light pollution significantly influenced nocturnal moth assemblages, favoring light-tolerant species while suppressing others.

Lepidopterans proved to be effective bioindicators of environmental quality in the study area. Higher diversity and presence of specialist species in less disturbed forest habitats indicate better ecological conditions, whereas simplified assemblages in urban landscapes reflect ecological degradation. These findings reinforce the role of Lepidoptera as reliable indicators for monitoring habitat health and environmental change.

Overall, the study underscores the ecological significance of lepidopteran fauna and highlights the urgent need for habitat conservation and sustainable land-use practices in the Rewa region. Protecting forest patches, maintaining native vegetation, reducing chemical inputs in agriculture, and promoting biodiversity-friendly urban planning are essential measures for conserving lepidopteran diversity and the ecological services they provide.

CONCLUSION :

The study provides comprehensive baseline data on the lepidopteran fauna of the Rewa region with special emphasis on their ecology. Lepidoptera play vital ecological roles and reflect the health of ecosystems. Conservation-oriented planning and sustainable land management practices are essential to protect these ecologically important insects for future generations.

REFERENCES:

1. Kehimkar, I. (2008). *The Book of Indian Butterflies*. Bombay Natural History Society and Oxford University Press, Mumbai.
2. Kremen, C. (1992). Assessing the indicator properties of species assemblages for natural areas monitoring. *Ecological Applications*, **2**, 203–217.
3. Kunte, K. (2000). *Butterflies of Peninsular India*. Universities Press (India) Pvt. Ltd., Hyderabad.
4. New, T. R. (1997). *Butterfly Conservation*. Oxford University Press, Oxford.
5. Pollard, E. (1991). Monitoring butterfly numbers. *Ecological Entomology*, **16**, 87–95.
6. Sharma, G., & Joshi, P. C. (2015). Diversity of Lepidoptera in forest and agricultural ecosystems of central India. *International Journal of Biodiversity and Conservation*, **7**(6), 345–356.
7. Singh, A. P. (2011). Butterfly diversity of central India. *Journal of Entomology*, **8**(2), 1–12.
8. Thomas, J. A. (2005). Monitoring change in the abundance and distribution of insects using butterflies and other indicator groups. *Philosophical Transactions of the Royal Society B*, **360**, 339–357.
9. Tiple, A. D., Khurad, A. M., & Dennis, R. L. H. (2011). Butterfly diversity in relation to habitat heterogeneity in central India. *Journal of Insect Science*, **11**(1), 1–13.
10. Wynter-Blyth, M. A. (1957). *Butterflies of the Indian Region*. Bombay Natural History Society, Bombay.

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