URBAN BUTTERFLY ECOLOGY: DIVERSITY AND ABUNDANCE IN THE GREEN SPACE OF GSG COLLEGE, UMARKHED USING AI-ASSISTED IMAGE ANALYSIS

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Abstract
This study investigates the diversity and abundance of butterfly species within the GSG College campus, Umarkhed, Maharashtra, India, over a three-month period (November 2024 to January 2025) by using AI assisted image analysis. The campus, characterized by a diverse flora including flowering shrubs, herbs, and mature trees, provides a rich habitat for lepidopteran species. Several butterfly species were observed, with notable presence of common Indian butterflies. Observations included species identification, frequency of visits, and general behavior. This study highlights the importance of urban green spaces in supporting butterfly biodiversity and provides baseline data for future ecological monitoring.
***Keywords**: Ecology, Habitat, Flora, Umarkhed*

Introduction:
Urban green spaces are increasingly recognized as critical refuges for insect biodiversity, particularly butterflies, which are vital pollinators and indicators of ecosystem health. In India, with its rapidly expanding urban landscapes, the preservation of such green spaces is crucial for maintaining biodiversity (Kunte, 2000). Butterflies, known for their sensitivity to environmental changes, serve as valuable bioindicators, reflecting the health and biodiversity of urban ecosystems (Arora, 1983; Varshney & Smetacek, 2015). Their role in pollination is pivotal for maintaining plant diversity and ecosystem functions, a factor of significant importance in the Indian subcontinent's diverse flora.

The GSG College campus, located in Umarkhed, Maharashtra, provides a diverse habitat due to its rich flora, including flowering plants, shrubs, and mature trees, creating a mosaic of habitats suitable for various butterfly species. Maharashtra, with its diverse climatic zones, supports a rich diversity of butterflies (Wynter-Blyth, 1957; Evans, 1932). Indian researchers have extensively documented the butterfly fauna of the region, emphasizing the importance of local habitats (Kunte, 2000; Gaonkar, 1996). This study aimed to document the diversity and abundance of butterfly species within the campus, contributing to our understanding of urban butterfly ecology in this region. Observations conducted from November 2024 to January 2025 revealed the presence of several butterfly species, including common varieties known to thrive in urban environments. This research provides baseline data on the butterfly diversity within this urban green space and contributes to understanding the ecological role of such habitats. The study will also help in understanding the effects of urbanization on local butterfly populations, building upon the foundations laid by Indian lepidopterists.

2. Materials and Methods:

Study Area:
The study was conducted within the GSG College campus, located in Umarkhed (19.53°N, 77.70°E), Yavatmal district, Maharashtra, India. The campus, encompassing approximately 14 hectares, features a diverse green space with a variety of plant species. Dominant plant groups include: Flowering shrubs (e.g., *Lantana camara*, *Hibiscus* spp.), Herbs (e.g., *Tridax procumbens*, various Asteraceae), Mature trees (*Cocos nucifera*, *Borassus flabellifer*, *Azadirachta indica*, *Mangifera indica*, *Eucalyptus* spp., *Tectona grandis*, *Ficus religiosa*) and Patches of grassland. These plants provide nectar sources, larval host plants, and shelter for butterflies.

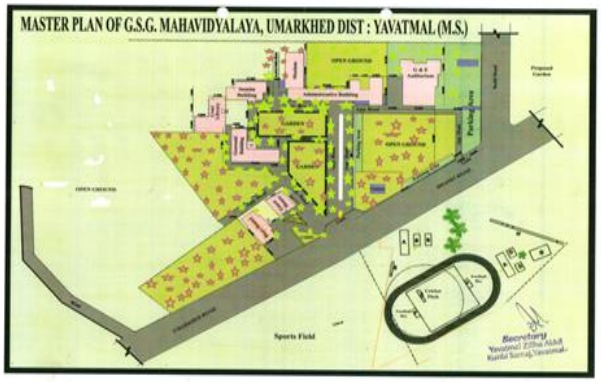

Fig.: Map of GSG college campus showing the green spaces

Study Period:
The study was conducted from November 1st, 2024, to January 31st, 2025, coinciding with the post-monsoon and early winter seasons, when butterfly activity is expected to be relatively high.

Data Collection:
Observations were conducted using direct visual observation methods. Fixed transects were established within the campus to systematically record butterfly sightings. Observations were carried out three times per week (Mondays, Wednesdays, and Fridays) during the study period. Each observation session lasted for two hours, conducted during the morning hours (09:00 to 11:00) and afternoon hours (14:00 to 16:00) to capture peak butterfly activity.

Euploea core

Danaus chrysippus

Catopsilia Pomona

Catopsilia Scylla

Eurema hecabe

Species Identification:
Species identification was based on visual characteristics, including wing patterns, colors, and size. Field guides specific to Indian butterflies (Kunte, 2000; Wynter-Blyth, 1957; Evans, 1932) were used to confirm species identification. Photographs were taken for later verification. An AI model trained on a vast database of Indian butterflies used to automatically identify the species in each photograph.

Data Analysis:
The number of observations for each butterfly species was recorded. Total frequency counts were calculated for each species over the entire study period. Relative abundance was determined by calculating the percentage of observations for each species relative to the total number of butterfly observations.

3. Results and Discussion:
Several butterfly species were identified within the GSG College campus during the study period. The following types of butterflies were observed:

S.N.	Scientific name	Common name
1	*Euploea core*	Common Crow
2	*Danaus chrysippus*	Plain Tiger
3	*Catopsilia pomona*	Common Emigrant
4	*Catopsilia scylla*	Lemon Emigrant
5	*Eurema hecabe*	Common Grass Yellow

Table: Butterfly species with their common names

The frequency of visits for each butterfly species was recorded. Relative abundance was calculated.

S.No.	Scientific Name	Common Name	Number of Observations	Relative Abundance (%)	Remark (Behavior, Host Plants)
1	Euploea core	Common Crow	**85**	**28.33**	Nectar feeding on Lantana camara
2	Danaus chrysippus	Plain Tiger	**72**	**24**	Observed on Calotropis procera
3	Catopsilia pomona	Common Emigrant	**58**	**19.33**	Flying around Cassia species
4	Catopsilia Scylla	Lemon Emigrant	**45**	**15**	Observed near citrus plants
5	Eurema hecabe	Common Grass Yellow	**30**	**10**	Found in grassy areas
6	Pieris brassicae	Large White	**10**	**3.33**	Observed on Brassica plants
7	Cynthia cardui	Painted Lady	**5**	**1.67**	Moving through the campus
	Total Observations		**305**	**100**	

Table: Observation table showing frequency of visits for each butterfly species and their relative abundance

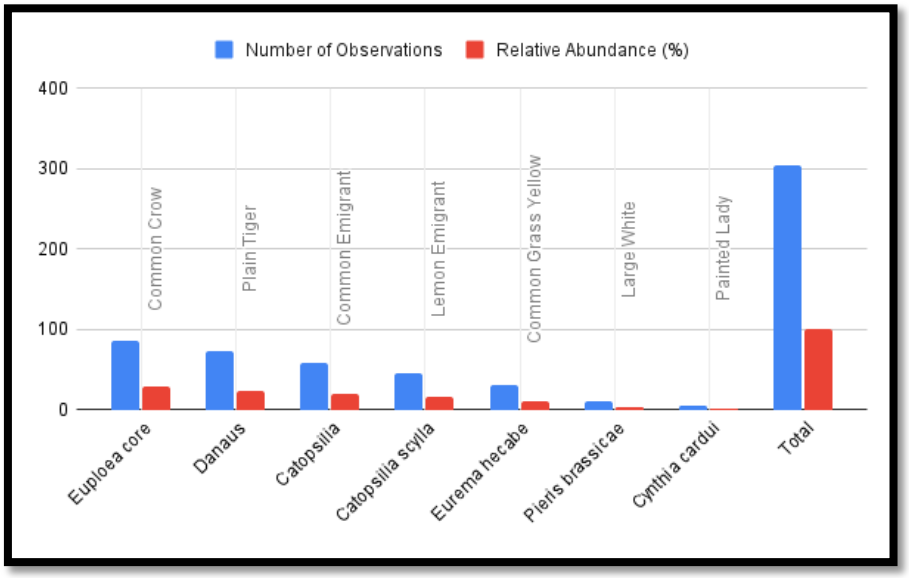

Fig: Graph showing relative abundance by using AI

Behavioral observations:
Observations included feeding on nectar from flowering plants, basking in sunlight, and mating behaviors. Host plant utilization was noted for some species. Flowering shrubs and herbs were frequently visited by butterflies for nectar. Mature trees provided shelter and resting sites.

4. Discussion:
The study revealed a notable diversity of butterfly species within the GSG College campus, highlighting the importance of urban green spaces for insect conservation. The presence of various butterfly species underscores the campus's role as a valuable habitat in an urban environment. The diverse flora of the campus provides essential resources for feeding and breeding. The presence of

specific butterfly species indicates the availability of suitable host plants within the campus.

The recorded butterfly diversity aligns with observations made by Indian researchers in similar urban and semi-urban environments. For instance, studies by Kunte (2000) on the butterflies of Peninsular India emphasize the role of diverse floral compositions in supporting butterfly populations, a feature prominently observed in the GSG College campus. The presence of species like *Danaus chrysippus* and *Euploea core*, which are commonly observed across India, reflects their adaptability to various habitats, as documented by Varshney and Smetacek (2015).

The behavioral observations, such as nectar feeding and basking, are consistent with the ecological requirements of these species. The utilization of specific host plants, where recorded, highlights the importance of maintaining native plant species within urban green spaces. The research conducted by Gaonkar (1996) in the Western Ghats underscores the importance of regional flora in supporting local butterfly diversity, a principle that can be extrapolated to the study area.

The findings are consistent with other studies that indicate that even small urban green spaces can provide vital habitats for insect populations. The work of Arora (1983) on Indian moths also highlights the importance of detailed habitat assessments, which are crucial for understanding the distribution and abundance of lepidopteran species.

5. Conclusion:

The study conducted at GSG College campus, Umarkhed, revealed a notable diversity of butterfly species, with Euploea core (Common Crow) and Danaus chrysippus (Plain Tiger) exhibiting the highest relative abundance, indicating their adaptability to the campus environment. These findings underscore the campus's role as a valuable urban green space supporting lepidopteran biodiversity. The observed species exhibited specific behaviors and associations with host plants, highlighting the importance of diverse flora for butterfly conservation. The data provides a baseline for future ecological monitoring and reinforces the need to preserve and enhance urban green spaces for insect biodiversity in the region. This study documented diverse butterfly species within GSG College campus, Umarkhed, highlighting its ecological importance as an urban green space. The campus's varied flora supports vital butterfly populations, contributing to pollination and local biodiversity. This research underscores the role of urban green spaces in insect conservation, particularly in developing regions of India. The findings emphasize the need for preserving native plant diversity in urban settings and provide a baseline for future ecological monitoring.

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