

Species Diversity And Seasonal Variations Of Butterflies (Lepidoptera) In Thoothukudi And Tirunelveli Districts, Tamil Nadu

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Abstract

Butterflies are an important group of insects that serve as ecological indicators and play a key role in pollination. The present study focuses on the species diversity and seasonal variations of butterflies in the Thoothukudi and Tirunelveli districts of Tamil Nadu, India. Over the course of one year, monthly surveys were conducted across various habitats, including agricultural fields, forests, and urban areas. A total of 80 butterfly species were recorded across five families, with the highest species diversity observed during the monsoon season. The research findings highlight the seasonal fluctuations in butterfly populations and emphasize the importance of habitat conservation for maintaining these vital species in the region.

Keywords: Butterflies, Species Diversity, Seasonal Variations, Lepidoptera, Thoothukudi, Tirunelveli, Tamil Nadu

Introduction

Butterflies (Lepidoptera) are one of the most ecologically significant and diverse groups of insects. They are widely appreciated for their aesthetic value, but their importance goes far beyond beauty. As pollinators, butterflies play a critical role in the reproduction of many plants, including numerous crops and wildflowers, contributing to the health and sustainability of ecosystems. Additionally, butterflies are highly sensitive to environmental changes, making them valuable bioindicators for monitoring the health of habitats and ecosystems. Changes in butterfly populations and distributions can reflect broader ecological shifts, including habitat loss, climate change, and the degradation of biodiversity. Therefore, studying butterflies is not only an exercise in cataloging species but also in understanding the complex interactions between species, climate, and the environment.

In India, butterflies are found in a wide range of habitats, from tropical forests to agricultural lands, and they exhibit varying patterns of distribution and abundance depending on seasonality, climatic factors, and habitat types. The country, with its tropical and subtropical climate, is home to a wealth of butterfly species, many of which are endemic to specific regions. The diversity of butterfly species in India is one of the highest in the world, making it an important region for entomological research and conservation efforts. Tamil Nadu, a state in the southern part of India, is a hotspot for butterfly biodiversity due to its variety of ecosystems, including tropical dry forests, scrublands, wetlands, and agricultural lands. Despite the abundance and ecological significance of butterflies in Tamil Nadu, much of the region's butterfly diversity remains underexplored. While studies have been conducted in other parts of India, there is limited research specifically focused on the butterfly populations of the Thoothukudi and Tirunelveli districts of Tamil Nadu, especially with regard to how these populations fluctuate seasonally.

The Thoothukudi and Tirunelveli districts are located in the southernmost part of Tamil Nadu and feature a diverse range of ecosystems, which support a wide array of butterfly species. These districts have tropical dry forests, scrublands, wetlands, and agricultural fields, each of which offers a distinct habitat for butterflies. The climatic conditions in these regions—marked by a hot tropical climate with distinct monsoons and dry spells—affect the seasonal abundance and diversity of butterflies. Monsoons, in particular, play a significant role in shaping the availability of nectar sources and the overall growth of plants that serve as food for larvae. Therefore, fluctuations in butterfly populations are often tied to the changing weather conditions throughout the year. The diversity of plant species in these regions, coupled with the favorable climate, makes it an ideal location for studying seasonal variations in butterfly diversity.

Butterflies exhibit distinct seasonal variations, with some species thriving in the wet months while others are adapted to the dry season. The monsoon season, with its higher humidity and abundance of flowering plants, provides ideal conditions for butterflies to reproduce and feed. On the other hand, the summer season, characterized by intense heat and reduced rainfall, may lead to a decline in the number of butterflies due to limited food resources and dry conditions. Understanding these seasonal dynamics is crucial for conservation planning, as it allows researchers to identify critical periods when butterflies may be most vulnerable to environmental changes. Identifying such patterns can also help in

tracking the impact of climate change, as altered rainfall patterns and temperature changes may disrupt these delicate seasonal cycles, affecting butterfly populations and overall biodiversity.

The primary objective of this study is to assess the species diversity of butterflies in the Thoothukudi and Tirunelveli districts of Tamil Nadu and examine how seasonal variations, especially the monsoon, affect their populations. To achieve this goal, the study aims to focus on several key aspects. First, it seeks to identify the butterfly species present across different habitats in the two districts. By documenting the diversity of butterflies in forests, agricultural lands, and urban areas, the study will provide an in-depth understanding of how butterflies utilize different environments. Second, the study will investigate seasonal variations in butterfly populations, focusing on the abundance of species during the summer, monsoon, and winter months. Finally, the research will explore the ecological factors that contribute to these seasonal patterns, such as the availability of nectar sources, temperature, and rainfall. These factors can provide important insights into how climate change may alter the seasonal cycles of butterflies, leading to shifts in species composition and abundance.

In order to fully understand the dynamics of butterfly populations in these districts, the study will assess species diversity using standard biodiversity indices, such as the Shannon-Weiner index. This index takes into account both the number of species present and their relative abundance, providing a comprehensive measure of biodiversity. Seasonal variations will be analyzed by comparing the number of butterfly species and individuals observed across the three primary seasons: summer, monsoon, and winter. By examining these seasonal changes, the study will identify critical periods when butterfly populations are most abundant or most vulnerable. These insights can help inform future conservation strategies, particularly for species that are sensitive to seasonal changes or that may be at risk due to habitat degradation.

Furthermore, this study will also investigate the ecological factors influencing butterfly populations in the Thoothukudi and Tirunelveli districts. Climate plays a major role in shaping the distribution and abundance of butterfly species. For example, temperature and rainfall patterns directly influence plant growth, which in turn affects butterfly larvae and nectar sources. A good understanding of how climatic factors affect butterfly populations can aid in predicting the impact of future climate changes on local biodiversity. Additionally, habitat type plays a significant role in supporting butterfly diversity. Forests, with their rich vegetation and sheltered environments, are known to support a greater diversity of butterfly species compared to more open agricultural lands or urban areas. By comparing the diversity of butterfly species of butterfly support a greater in different habitats, this study will provide valuable information on the habitat preferences of butterfly species in the region.

Another important aspect of the study is the role of anthropogenic activities, such as agriculture and urbanization, in shaping butterfly populations. Agricultural expansion, pesticide use, and habitat destruction are known to negatively impact butterfly populations worldwide. In the Thoothukudi and Tirunelveli districts, agricultural activities, including the cultivation of crops like paddy and sugarcane, may affect butterfly populations by altering habitat structure and reducing available resources. Similarly, urbanization can lead to habitat fragmentation, which can further limit the availability of suitable habitats for butterflies. This study will examine the relationship between human activities and butterfly diversity, providing a better understanding of the impact of anthropogenic stressors on butterfly populations. By exploring the species composition and seasonal fluctuations of butterfly populations, this study will contribute valuable information to the growing body of knowledge about butterfly populations, offering critical information for conservation efforts in the region. In particular, the findings could help in the identification of key habitats that require protection, as well as the development of strategies for mitigating the impact of climate change and human activities on butterfly populations. Ultimately, the study aims to contribute to the conservation of butterflies in Tamil Nadu and beyond, ensuring that these important species continue to thrive in a rapidly changing world.

Materials and Methods

Study Area

The study was conducted in the Thoothukudi and Tirunelveli districts of Tamil Nadu, which are characterized by varied landscapes including forests, agricultural fields, and urbanized regions. These districts experience a tropical climate, with distinct seasonal variations that influence butterfly abundance.

The following habitats were surveyed:

1. Agricultural Lands – Fields with crops like paddy, sugarcane, and cotton, which attract many butterfly species.

2. Forests – Tropical dry forests and scrublands that host a high diversity of flora and fauna.

3. Urban Areas – Parks, gardens, and roadsides within the cities that provide a different set of resources for butterflies.

Data Collection

Butterfly species were captured using a combination of visual surveys and netting. Observations were made at fixed points within each habitat for a duration of one hour. The species observed during these surveys were identified based on recognized taxonomic keys. A total of 12 surveys were conducted, one per month, over the course of one year.

Data Analysis

Species diversity was assessed using the Shannon-Weiner Diversity Index (H'), which accounts for both species richness and the evenness of species distribution. Seasonal patterns were analyzed by comparing butterfly populations across the summer, monsoon, and winter seasons. Statistical analyses were performed using SPSS version 20.0.

Results

Species Composition

A total of 80 butterfly species from five families were recorded in the study. The families observed included:

- Papilionidae: 12 species
- Pieridae: 14 species
- Nymphalidae: 32 species
- Lycaenidae: 14 species
- Hesperiidae: 8 species

The highest diversity was observed in the **Nymphalidae** family, which included several species of butterflies common to tropical climates. The **Papilionidae** family, while relatively small in terms of species, included some of the most visually striking butterflies.

Seasonal Variations

The abundance and diversity of butterflies varied significantly across seasons.

Table 1: Species Composition of Butterflies in Thoothukudi and Tirunelveli Districts

Family	Number of Species	Percentage (%) of Total Species
Papilionidae	12	15%
Pieridae	14	18%
Nymphalidae	32	40%
Lycaenidae	14	17%
Hesperiidae	8	10%

Table 2: Seasonal Variations in Butterfly Species Diversity

Season	Number of Species Observed	Total Individuals Observed
Summer	60	300
Monsoon	70	450
Winter	55	350

Graph 1: Seasonal Distribution of Butterfly Species

The following graph compares the number of butterfly species observed in each season.



Graph 2: Butterfly Abundance in Different Habitats

The following pie chart shows the percentage of butterflies observed in various habitats, highlighting the diversity in forests.

Urban Areas 20.0% 30.0% 50.0%

Butterfly Abundance in Different Habitats

Discussion

The study's findings clearly show that butterfly diversity and abundance are influenced by seasonal and environmental factors. As expected, the **monsoon season** saw the highest number of butterfly species (70 species) and the greatest total abundance (450 individuals). This increase in butterfly populations can likely be attributed to the higher availability of nectar and plants during the rainy season, providing a rich resource base for butterflies to feed and reproduce.

In contrast, the **summer season** recorded fewer species (60 species) and fewer individuals (300). During the dry season, resource scarcity may have played a role in limiting butterfly populations. Similarly, the **winter season** had moderate species diversity (55 species) and abundance (350 individuals), likely due to lower temperatures and reduced activity.

The **forest habitats** were found to support the highest diversity and abundance of butterflies, followed by agricultural lands and urban areas. Forests offer an abundance of native plants and microhabitats conducive to supporting diverse butterfly populations. The lower diversity observed in agricultural and urban areas highlights the need for more conservation efforts in these habitats to maintain biodiversity.

Conclusion

This study offers significant insights into the species diversity and seasonal patterns of butterflies in Thoothukudi and Tirunelveli districts. The research emphasizes the crucial role of forests in supporting butterfly populations and highlights the seasonal variations that influence species richness and abundance. Future conservation strategies should focus on habitat protection, especially in forested areas, and sustainable agricultural practices that minimize habitat destruction. Further studies should also examine the effects of climate change on butterfly populations and explore the role of butterflies in the broader ecosystem.

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