

## Diversity of butterflies (Lepidoptera: Rhopalocera) in and around Chennai, Tamil Nadu, India

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### Abstract

Urbanization is a growing threat to biodiversity, particularly in tropical regions where habitat fragmentation and environmental degradation can lead to significant losses in species richness. This study assesses the diversity and abundance of butterfly species in urban and peri-urban landscapes in and around Chennai, Tamil Nadu, India. A total of 107 butterfly species were recorded across six distinct locations over a year survey period. Species were distributed across five major families: Lycaenidae (22.19%), Nymphalidae (21.39%), Hesperidae (19.25%), Papilionidae (18.72%), and Pieridae (18.45%) and 71 genera. Despite the pressures of urbanization, the results indicate that a diverse butterfly community persists in Chennai, supported by pockets of green spaces, wetlands, and gardens within the urban matrix.

**Keywords:** Urban biodiversity, butterfly diversity, conservation, Chennai, habitat fragmentation, tropical ecosystems

### Introduction

Butterflies, belonging to the order Lepidoptera, are among the most vibrant and well-studied insects, renowned for their ecological and aesthetic value (Merckx *et al.*, 2013; Ramírez-Restrepo & MacGregor-Fors, 2017) [13, 19]. As essential pollinators, butterflies contribute significantly to the functioning of various ecosystems, facilitating plant reproduction and the transfer of genetic material across floral species (Ollerton, 2017; Torezan-Silingardi *et al.*, 2021) [16, 23]. Butterflies are also bioindicators of environmental health since their populations are susceptible to variations in habitat quality, climate, and levels of pollution (Gerlach *et al.*, 2013; Chowdhury *et al.*, 2023) [2, 6]. Researchers have described about 18,000 species of butterflies worldwide, their diversity spanning multiple biogeographic zones from tropical rainforests to temperate regions (van Nieukerken *et al.*, 2011; Anonymous, 2022) [1, 24]. The wide distribution and diverse habitats that butterflies occupy represent the required importance for biodiversity and indicate the value of this faunal group.

With as many as 1379 species described so far, India supports a rich diversity of butterfly species. The varied climates and topographies that India hosts, from the Himalayas in the north to tropical forests in the south, are responsible for this. Tamil Nadu, being a part of southern India, is no exception to this richness—a host of varied species in the diverse landscapes of coastal ecosystems, forests, and urban environments. The surroundings of Chennai City—the capital of the Indian state of Tamil Nadu—present a mosaic of urban and peri-urban habitats, which determine the composition and abundance of butterfly communities.

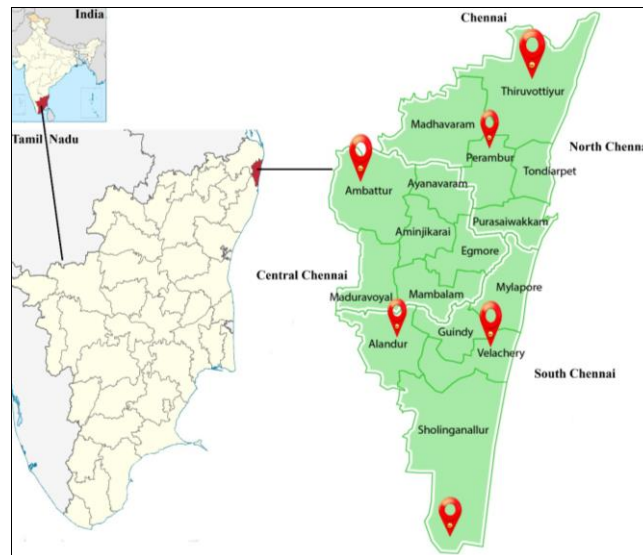
Large-scale urbanization during recent decades has still left several patches of natural and semi-natural habitats in and around the city, which continue to harbor butterfly populations and hence render it particularly useful for studying the impact of urbanization on biodiversity. We are undertaking the present study to highlight the diversity and

abundance of butterfly species in and around Chennai, Tamil Nadu, India. Specifically, this study will determine the composition of species in various habitats, assess the effects of urbanization on butterfly communities, and provide a baseline for further conservation in the region. Furthermore, we propose the research to enhance our understanding of Lepidoptera, not only in urban and peri-urban areas, but also to aid in the development of a biodiversity conservation strategy for rapidly urbanizing landscape territories.

### Materials and Methods

#### Study Area

The study was conducted at six different sites in and around Chennai, Tamil Nadu, India, over a transitional zone of urban and peri-urban landscapes. As Chennai belongs to the southeastern coasts of India, due to its tropical climate in nature, it contains a diverse set of different species of flora and fauna. Selected locations for the study were Sholinganallur (12°52'45.18"N, 80°12'0.73"E), a rapidly developing urban area with mixed residential, commercial, and wetland environments; Thiruvottiyur (13°9'26.08"N, 80°17'28.51"E), a coastal neighborhood in northern Chennai near industrial zones; Ambattur (13°6'31.16"N, 80°7'38.56"E), an important industrial and residential zone with green spaces in western Chennai; Alandur (13°0'0.41"N, 80°11'35.56"E), a suburban zone with a balance of urban infrastructure and green zones in central Chennai; Velachery (12°57'8.60"N, 80°13'1.63"E), a rapidly urbanizing residential area in southern Chennai, flanked by wetlands and marshes; and Perambur (13°6'19.79"N, 80°14'18.90"E), a densely populated residential area in north-central Chennai with parks and railway corridors providing green spaces (Figure 1). These sites have been selected to capture the variability in species richness and abundance of butterflies across different environmental settings within Chennai, thereby providing insight into the impact of urbanization on butterfly communities.



**Fig 1:** Map of the study area showing sampling sites

**Sampling Method**

Butterfly sampling was conducted using the line transect method, a widely accepted technique for monitoring butterfly populations. Transects of 500 meters in length and 5 meters in width were established across different locations. Each transect was walked at a steady pace, and all butterflies observed within the transect boundary were recorded. Sampling was conducted between 8:00 AM and 11:00 AM, when butterflies are most active. Sampling was carried out monthly over a period of one year, from January to December 2023. Each site was sampled once a month, resulting in six sampling events per site.

**Species Identification**

Butterflies observed during the transect walks were identified to the species level using standard field guides and available literature (Varshney & Smetacek, 2015; Kehimkar, 2016) [10, 25]. When necessary, photographs were taken for later verification. In cases where species identification was difficult, specimens were captured using a butterfly net, closely examined, and released immediately after identification.

**Data Collection and Analysis**

**Species Richness**

Species richness (S) was calculated as the total number of different butterfly species recorded across all study sites. This provided a basic understanding of the diversity of species present in the region.

**Diversity Indices**

To quantify butterfly diversity, the Shannon-Wiener Diversity Index (H') was calculated. This index accounts for both species richness and evenness, offering a more comprehensive measure of diversity. The Shannon-Wiener Diversity Index was calculated using the formula:

$$H' = -\sum(pi \times \ln(pi))$$

Where:

pi is the proportion of individuals belonging to species ii relative to the total number of individuals observed.

**Species Evenness**

Species evenness (E) was calculated using Pielou's Evenness Index, which evaluates how evenly individuals are distributed among the recorded species. Evenness was calculated using the formula:

$$E = \frac{H'}{\ln(S)}$$

Where:

H' is the Shannon-Wiener Diversity Index.

S is the total number of species (species richness).

**Ethical Considerations**

This study adhered to all ethical guidelines for wildlife research. No butterflies were harmed during the sampling process, and all individuals were released immediately after identification. Necessary permissions were obtained from relevant authorities for conducting research in public and protected areas.

**Results**

**Species Richness**

A total of 107 butterfly species were recorded in the study area over the one year survey period. This high species richness highlights the diverse butterfly fauna present in and around Chennai, despite the ongoing urbanization. The recorded species were distributed across 71 genera and five families, with some species being more dominant in terms of their population size than others (Table 1). The butterfly species recorded in the study were categorized into five main families: Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, and Pieridae.

**Table 1:** List of butterfly species recorded in this study

S. No.	Family	Binomial Name	Common Name
1	Papilionidae	<i>Graphium doson</i> C & R Felder, 1864	Common Jay
2		<i>Graphium sarpedon</i> (Linnaeus, 1758)	Common Bluebottle
3		<i>Graphium chironides</i> (Honrath, 1884)	Tailed jay

4		<i>Graphium terebon</i> (Felder & Felder, 1864)	Narrow banded blue bottle
5		<i>Graphium nomius</i> (Esper, 1798)	Spot sword tail
6		<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	Common Rose
7		<i>Pachliopta hector</i> (Linnaeus, 1758)	Crimson Rose
8		<i>Papilio polytes</i> (Linnaeus, 1758)	Common Mormon
9		<i>Papilio dravidarum</i> Wood-Mason, 1880	Malabar Raven
10		<i>Papilio demoleus</i> (Linnaeus, 1758)	Lime Butterfly
11		<i>Chilias aclytia</i> (Linnaeus, 1758)	Common Mime
12	Hesperiidae	<i>Badamia exclamatoris</i> Fabricius, 1775	Brown Awl
13		<i>Hasora badra</i> (Moore, 1857)	Common Awl
14		<i>Celaenorrhinus ruficornis</i> (Mabille, 1878)	Tamil Spotted Flat
15		<i>Gerosis bhagava</i> (Moore, [1866])	Common Yellow-breasted Flat
16		<i>Hasora chromus</i> (Cramer, [1780])	Common Banded Awl
17		<i>Aeromachus dubius</i> Elwes & Edwards, 1897	Dingy Scrub-Hopper
18		<i>Aeromachus pygmaeus</i> (Fabricius, 1775)	Pygmy Grass, Scrub Hopper
19		<i>Ampittia dioscorides</i> (Fabricius, 1793)	Bush Hopper
20		<i>Pseudoborbo bevani</i> (Moore, 1878)	Beavan's Swift
21		<i>Caltoris canaraica</i> (Moore, [1884])	Kanara Swift
22		<i>Caltoris kumara</i> (Moore, 1878)	Blank Swift
23		<i>Halpe homolea</i> (Hewitson, 1868)	Indian Ace, Ceylon Ace
24		<i>Halpe porus</i> (Mabille, [1877])	Moore's Ace
25		<i>Iambrix salsala</i> (Moore, [1866])	Chestnut Bob
26		<i>Notocrypta curvifascia</i> (C. & R. Felder, 1862)	Restricted Demon
27		<i>Pelopidas agna</i> (Moore, [1866])	Dark Branded Swift
28		<i>Pelopidas conjuncta</i> (Herrich-Schäffer, 1869)	Conjoined Swift
29		<i>Pelopidas mathias</i> (Fabricius, 1798)	Dark Small-Branded Swift
30		<i>Potanthus pava</i> (Fruhstorfer, 1911)	Pava Dart
31		<i>Potanthus pseudomaesa</i> Moore, 1881	Pseudomaesa, Common Dart
32		<i>Psolos fuligo</i> (Mabille, 1876)	Coon or dusky partwing
33		<i>Suastus gremius</i> (Fabricius, 1798)	Indian Palm Bob
34		<i>Taractrocera ceramas</i> (Hewitson, 1868)	Tamil Grass Dart
35		<i>Thoressa honorei</i> (de Nicéville, 1887)	Madras Ace
36	Nymphalidae	<i>Libythea myrrha</i> Godart, 1819	Club Beak
37		<i>Parantica aglea</i> (Stoll, [1782])	Glassy Tiger
38		<i>Tirumala septentrionis</i> (Butler, 1874)	Dark Blue Tiger
39		<i>Tirumala limniace</i> (Cramer, [1775])	Blue Tiger
40		<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger
41		<i>Danaus genutia</i> (Cramer, [1779])	Common or Striped Tiger
42		<i>Euploea core</i> (Cramer, [1780])	Common Indian Crow
43		<i>Euploea klugii</i> Moore, [1858]	Blue King Crow
44		<i>Mycalasis subdita</i> (Moore, [1890])	Tamil Bushbrown
45		<i>Mycalasis mineus</i> (Linnaeus, 1758)	Dark Branded Bushbrown
46		<i>Ypthima baldus</i> (Fabricius, 1775)	Common Fivering
47		<i>Ypthima huebneri</i> Kirby, 1871	Common Fourring
48		<i>Orsotriaena medus</i> (Fabricius, 1775)	Nigger
49		<i>Melanitis leda</i> (Linnaeus, 1758)	Common Evening Brown
50		<i>Cirrochroa thais</i> (Fabricius, 1787)	Tamil Yeoman
51		<i>Cupha erymanthis</i> (Drury, [1773])	The Rustic
52		<i>Phalanta phalantha</i> (Drury, [1773])	Common Leopard
53		<i>Cethosia nietneri</i> C. & R. Felder, [1867]	Tamil Lacewing
54		<i>Acraea terpsicore</i> (Linnaeus, 1758)	Tawny Coster
55		<i>Neptis hylas</i> (Linnaeus, 1758)	Common Sailer
56		<i>Neptis soma</i> Moore, 1858	Sullied Sailer
57		<i>Ariadne merione</i> (Cramer, [1777])	Common Castor
58		<i>Rohana parisatis</i> (Westwood, [1851])	Black Prince
59		<i>Junonia atlites</i> (Linnaeus, 1763)	Gray Pansy
60		<i>Junonia almana</i> (Linnaeus, 1758)	Peacock Pansy
61		<i>Junonia hierta</i> (Fabricius, 1798)	Yellow Pansy
62		<i>Junonia iphita</i> (Cramer, [1779])	Chocolate Pansy
63		<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy
64		<i>Junonia orithya</i> (Linnaeus, 1758)	Blue Pansy
65		<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Great Eggfly
66		<i>Hypolimnas misippus</i> (Linnaeus, 1764)	Danaid Eggfly
67		Lycaenidae	<i>Spalgis epius</i> (Westwood, [1851])
68	<i>Azanus ubaldus</i> (Stoll, [1782])		Bright Babul Blue
69	<i>Azanus jesous</i> (Guérin-Ménéville, 1849)		African Babul Blue
70	<i>Acytolepis pusa</i> (Horsfield, [1828])		Common Hedge Blue
71	<i>Chilades contracta</i> (Butler, 1880)		Small Cupid

72		<i>Chilades lajus</i> (Stoll, 1780)	Lime blue
73		<i>Chilades pandava</i> (Horsfield, 1829)	Plains cupid
74		<i>Chilades parrhasius</i> (Fabricius, 1793)	Small cupid
75		<i>Zizeeria otis</i> (Fabricius, 1787)	Lesser Grass Blue
76		<i>Euchrysops cnejus</i> (Fabricius, 1798)	Gram Blue
77		<i>Catochrysops strabo</i> (Fabricius, 1793)	Forget-me-not
78		<i>Tajuria cippus</i> (Fabricius, 1798)	Peacock Royal
79		<i>Horaga onyx</i> (Moore, [1858])	Common Onyx
80		<i>Virachola isocrates</i> (Fabricius, 1793)	Common Guava Blue
81		<i>Virachola perse</i> (Hewitson, [1863])	Large Guava Blue
82		<i>Rapala varuna</i> (Horsfield, [1829])	Indigo Flash
83		<i>Spindasis ictis</i> (Hewitson, 1865)	Common Shot silverline
84		<i>Jamides bochus</i> (Stoll, 1782)	Dark Cerulean
85		<i>Jamides celeno</i> (Cramer, 1775)	Common cerulean
86		<i>Prosotas dubiosa indica</i> (Evans, 1925)	Indian Tailless line blue
87		<i>Prosotas nora</i> (C. Felder, 1860)	Indian Common line blue
88	Pieridae	<i>Pieris canidia</i> (Linnaeus, 1768)	Indian Cabbage White
89		<i>Cepora nerissa</i> (Fabricius, 1775)	Common Gull
90		<i>Ixias marianne</i> (Cramer, [1779])	White Orange Tip
91		<i>Ixias pyrene</i> (Linnaeus, 1764)	Yellow Orange Tip
92		<i>Delias eucharis</i> (Drury, 1773)	Common Jezebel
93		<i>Prioneris sita</i> (Felder & Felder, 1865)	Painted Sawtooth
94		<i>Appias albina</i> (Boisduval, 1836)	Common Albatross
95		<i>Hebomoia glaucippe</i> (Linnaeus, 1758)	Great Orange-Tip
96		<i>Colotis fausta</i> (Olivier, 1804)	Large Salmon Arab
97		<i>Colotis eucharis</i> (Fabricius, 1775)	Plain Orange-Tip
98		<i>Colotis danae</i> (Fabricius, 1775)	Crimson-Tip
99		<i>Pareronia valeria</i> (Fabricius, 1787)	Common Wanderer
100		<i>Catopsilia pomona</i> (Fabricius, 1775)	Common Emigrant
101		<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Mottled Emigrant
102		<i>Eurema brigitta</i> (Stoll, [1780])	Small Grass Yellow
103		<i>Eurema andersonii</i> (Moore, 1886)	One-Spot Grass Yellow
104		<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow
105		<i>Eurema blanda</i> (Boisduval, 1836)	Three-Spot Grass Yellow
106		<i>Eurema nilgiriensis</i> Yata, 1990	Nilgiri Grass Yellow
107			<i>Colias nilagiriensis</i> C. & R. Felder, 1859

Lycaenidae contributed the highest proportion, comprising 22.19% of the total species recorded. This family, commonly known as the "blues," includes small and vibrant species that thrive in various habitats, including urban environments. Nymphalidae followed closely, accounting for 21.39% of the total species, and includes larger, more conspicuous butterflies like the common crow and monarch, which are often seen in a variety of ecosystems. Hesperidae, or skippers, made up 19.25% of the total

species; these fast-flying butterflies are typically small and commonly found in grassy and shrubby areas. Papilionidae, or swallowtails, represented 18.72% of the species, known for their large, colorful butterflies that are indicators of good environmental health. Lastly, Pieridae, often referred to as the whites and yellows, contributed 18.45% of the total species, with several well-known species frequently seen in both rural and urban settings (Figure 2).

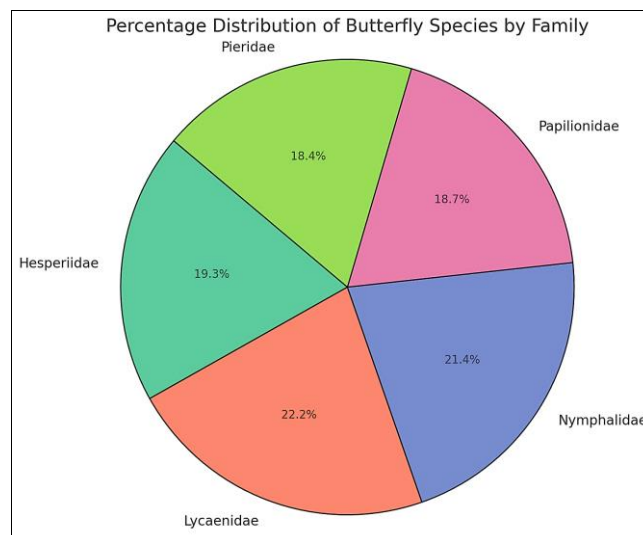


Fig 2: Percentage distribution of butterflies across families

Across all transects and sampling events, a total of 7,458 butterfly individuals were recorded. This substantial number of individuals provides a robust dataset for analyzing species composition and abundance patterns in the study area. The large sample size strengthens the reliability of the diversity and evenness indices calculated (Figure 3).

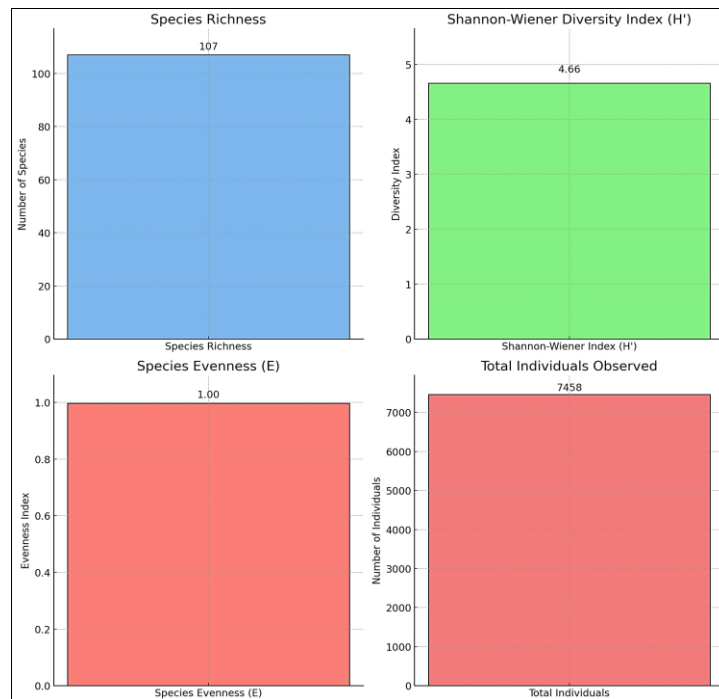
### Shannon-Wiener Diversity Index (H')

The Shannon-Wiener Diversity Index (H'), which accounts for both species richness and the relative abundance of each species, was calculated as 4.66. This relatively high value reflects a diverse butterfly community with many species

contributing to the overall population. A higher diversity index generally indicates a healthy ecosystem with a variety of ecological niches that support different species.

### Species Evenness (E)

The species evenness (E) was calculated to be 0.997, indicating that the individuals observed were distributed very evenly across the recorded species. A high evenness value suggests that no single species is overly dominant in the community, further supporting the idea of a balanced and diverse ecosystem.



**Fig 3:** Species evenness, species richness, Shanno-wiener Index and total number of butterfly species recorded in this study

### Month-wise distribution of butterfly species

The annual butterfly survey in Chennai reflects a dynamic monthly change in species richness and abundance, coupled with a season of climatic variation and the availability of different habitats. Representatives of all the butterfly families were more active during these monsoon months. June to September recorded the highest number of species, with August and September recognized as peak months. This can be explained by the fact that continual rainfall brings a lot of vegetation and many water bodies where a variety of host plants and nectar sources are supported, which create ideal feeding and breeding conditions, thus encouraging the dispersal of many varied families, such as Lycaenidae and Nymphalidae, in these moist, green areas. The counter, however, took place during the summer months, from March to May.

While the onset of summer in March and April increases this activity, species such as Papilionidae and Pieridae showed resistance to higher temperatures when the flowers provided the necessary resources. In May, a very hot month, no doubt due to the increase in temperature and a reduction in water quantities, the abundance has shown a low count, especially in places where the vegetation cover was low. Butterflies at this time adapted by becoming more active during the cooler hours of the day and seeking shelter in more shaded or irrigated habitats.

Another pattern shift occurred during the winter period between December and February, as temperatures became cooler and daylight hours shorter. With this, metabolic rates slowed down, reflecting a reasonable drop in the overall butterfly flight activity and species richness. However, the presence of evergreen and well-planned urban green spaces helped hardy species, such as those in the Pieridae and Hesperidae families, which are commonly adapted to disturbed regimes, sustain their population counts during this seasonal drop in activity. This month-wise distribution indicates strong seasonal climatic variables related to temperature, rainfall, and vegetation cycles, which are important for the assessment of the diversity and abundance of butterflies (Figure 4). It reflects how different families of butterflies are adapted to sets of various environmental variables, and, hence, it is of prime importance to conserve various types of habitats.

Wetlands, urban green zones, and well-vegetated areas are critically important because they can provide all-year-round resources for butterflies; this, in turn, dampens the negative effects of seasonal extremities and urbanization. The broad knowledge of temporal patterns in butterfly activity will be very useful in drawing up policies for the conservation of butterflies in view of climate change and urbanization.

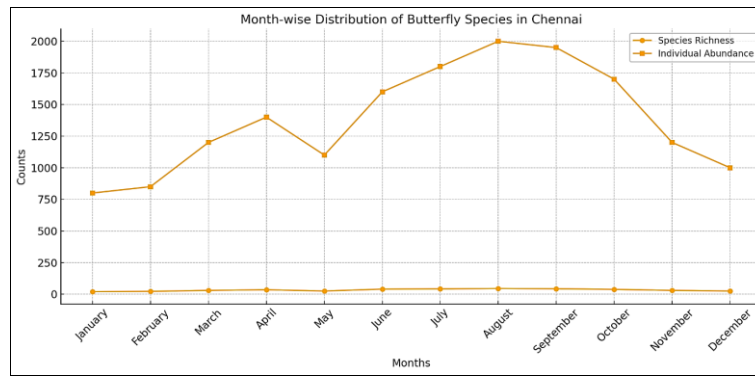


Fig 4: Month-wise distribution of butterfly species in selected locations

**Area-wise distribution of butterfly species**

The study of six different sites around and within Chennai gave a clear view of how the distribution pattern changes on an area-wise basis, bringing forward the dynamics in urbanization and biodiversity. Species richness and abundance proved to be very high in Sholinganallur due to diversified habitats, which accommodated wetlands and various rich genera like Lycaenidae and Papilionidae. The Velachery site, with marshy and wet areas, similarly recorded high counts dominated by Lycaenidae, which are more adaptable to a high level of moisture. The moderate richness found in Ambattur and Alandur, which are both industrial and suburban landscapes, shows that species like Nymphalidae and Papilionidae are able to survive the

stresses of urban development. Adjacent to coastal and industrial areas, Thiruvottiyur also recorded a moderate level of species richness of Pieridae, indicating their adaptation to higher levels of disturbed environments. Despite Perambur's high population density, it still boasted a significant number of 'green' areas in the form of parks, which contributed to its relatively low diversity. This suggests that even narrow stretches of urban greenery can significantly contribute to the survival of these butterflies. Bar graph shows how the study areas differ in terms of the number of species and the patterns of individual abundance (Figure 5). Velachery and Sholinganallur stand out as clear hotspots, which makes it clear why we need to protect wetland and peri-urban habitats from rapid urbanization.

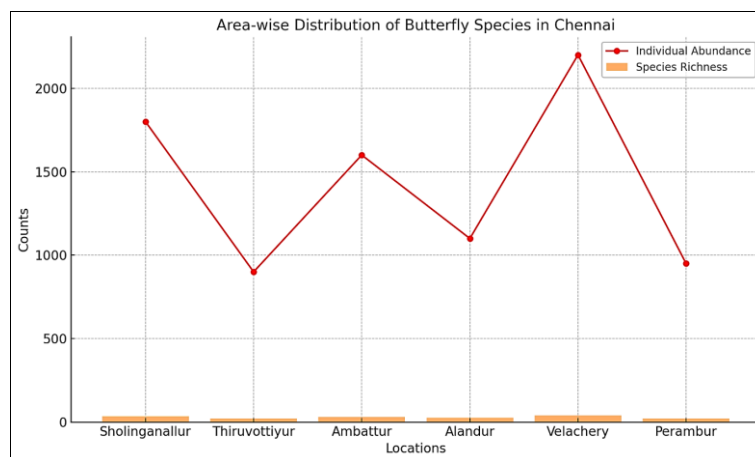


Fig 5: Area-wise Distribution of Butterfly Species in Chennai

**Discussions and Conclusion**

The current survey identified 107 species of butterflies across six distinct locations in Chennai, representing a diverse range of butterfly communities, despite the area's significant urbanization. This finding is in congruence with the previous studies done in other urban regions in India, such as Bengaluru and Pune, where the species richness continued to stay high in urban green spaces (Kunte, 2001; Jaganmohan *et al.*, 2013; Swamy *et al.*, 2019; Sushmita *et al.*, 2022) [8, 11, 21, 22]. Different families in Chennai city contribute their species almost equally: Lycaenidae has the highest contribution, accounting for 22.19% of the total species, followed by Nymphalidae (21.39%), Hesperidae (19.25%), Papilionidae (18.72%), and Pieridae (18.45%). These results are consistent with other studies in various tropical parts of India, where these families dominated the urban butterfly assemblages (Raut & Pendharkar 2010, Dey

& Ghosh 2016, Ramamurty *et al.* 2021, Kathirvelu & Gopianand 2023, and Menon *et al.* 2024) [4, 9, 12, 18, 20]. The high incidence of such common species underlines the ability of certain butterfly species to proliferate even in disturbed or fragmented habitats. More fragmented urban panoramas are likely to represent less specialized species, while more specialized species may require specific host plants or undisturbed habitats. The presence of species from families like Papilionidae, which contributed about 18.72% in urban and peri-urban locations, may suggest that urban areas are capable of supporting butterfly biodiversity. Ongoing urban development, habitat fragmentation, and pollution constantly exert pressure on these areas. The observed pattern in butterfly distribution suggests that certain species may be able to withstand the fragmented nature of urban landscapes, while others may be vulnerable.

Therefore, it is crucial to continue and consolidate the parks, gardens, and wet areas that make up the urban landscape's green spaces, in order to ensure butterfly conservation. This butterfly distribution research in Chennai helps explain how spatial and temporal variables drive biodiversity in urban-peri-urban areas. Habitats in transitional zones with different environmental conditions supported numerous wetlands, greenspaces, and urban greenery with greater species richness and abundance. Most Lycaenidae and Papilionidae families lived in wetland environments in biodiversity hotspots like Sholinganallur and Velachery. The habitat had larval host plants, nectar supplies, and microclimates needed for species diversity and abundance. Urbanized or industrialized regions like Thiruvottiyur and Perambur have minimal diversity. Butterfly colonies suffer from urbanization because habitat fragmentation and decreasing green cover hinder access to key supplies. Again, parks and rail corridors in Perambur have supported decent populations, illustrating the necessity of keeping modest green spaces amid urban jungles.

Butterfly activity varied per month due to seasonal weather variations. Monsoon months have the most species richness and abundance, suggesting vegetation renewal and greater water for breeding and feeding. Lycaenidae and Nymphalidae families adapted well to harsh environmental circumstances and grew large populations in three months. Most blooming plants, especially nectar-feeding Papilionidae and Pieridae, bloomed between February and March. Due to high heat, activity dropped after May. Butterfly behavior shows that temperature stress and water deprivation affect them. Colder winter temperatures—December, January, and February—reduced variety and abundance, which lowered metabolic activity. Some hardy Pieridae and Hesperidae species survived in predominantly evergreen settings.

Area-wise and month-wise analysis shows how habitat characteristics and climate affect butterfly diversity. Wetlands and peri-urban green areas became significant habitats because they provided year-round resources to mitigate seasonal extremes and urban stresses. These results suggest concerted conservation planning to maintain and improve butterfly habitats, especially in urban centers and rapidly urbanizing regions. Creating and maintaining green corridors, wetlands, and native plants increases butterfly diversity and protects against environmental changes.

This research concluded that safeguarding the local flora that sustains butterfly feeding and reproduction is crucial for preserving their variety. Initiatives must be undertaken to preserve the Sholinganallur and Velachery wetlands, which sustain many species, including some that are threatened. Public knowledge and community involvement may promote butterfly-friendly practices such as planting native blooming species and minimizing pesticide use. Local communities, environmental groups, and urban planners may save urban butterflies and foster more sustainable cities. The tropical environment of Chennai, characterized by rainy and dry seasons, influences butterfly activity throughout the study. Following substantial rainfall, butterfly activity diminishes; hence, the year-long study may have undervalued species richness and abundance.

The urban and peri-urban research sites exhibit habitat fragmentation and challenges in accessibility. The urban development and infrastructure of Perambur and Ambattur hinder access to contiguous natural spaces, potentially

limiting the sampling of species that need expansive habitats. Structures, thoroughfares, and other impediments obstructed butterfly habitats in heavily populated regions, skewing the sample. More adaptable species may have prevailed, whereas habitat-specific species were underrepresented.

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