



BUTTERFLY (LEPIDOPTERA: RHOPALOCERA) DIVERSITY OF FOREST CAMPUS, COIMBATORE, TAMILNADU

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between all authors. Author KRS was involved in identification of butterflies, literature collection, analysis and preparation of manuscript. Author RR performed the survey and collection of field data and photography. Author CK was involved in identification of plant species. All authors read and approved the final manuscript.

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ABSTRACT

The Forest Campus is situated in the urban environs of Coimbatore. It has an extent of 165 acres. Studies on butterfly diversity in the Forest campus was carried out from January 2013 to January 2014 by line transect method. Altogether 59 species of butterflies coming under 42 genera and five families were recorded during the study. Occurrence of certain butterflies viz. Crimson Rose (*Pachliopta hector* Linnaeus), Common Pierrot (*Castalius rosimon* Fabricius) and Danaid eggfly (*Hypolimnas misippus* Linnaeus) listed in the Schedule-I and Common Gull (*Cepora nerissa* Fabricius) included in the Schedule-II of the Indian Wildlife (Protection) Act 1972, in the campus is interesting. The study highlights the potential of such vegetated areas in the urban surroundings to serve as 'refugia' for the fast dwindling butterfly fauna.

Keywords: Forest Campus; butterfly diversity; urban environs; conservation.

1. INTRODUCTION

Butterflies are one of the most beautiful and colourful creatures on earth and they have high aesthetic value. They also perform the very important ecosystem function of pollination and act as a key component of food chain. They are highly sensitive to changes in environment and are considered as 'bioindicators'. India has around 1,500 species of butterflies, of which

334 species are reported from the Western Ghats. Among them, 37 species are endemic to the Western Ghats [1,2]. Butterflies are threatened by many factors like the habitat destruction, disappearance of host plants, pollution, pesticide application and climate change. Coimbatore city, known as the "Manchester of South India" is a fast expanding industrial area and recently declared as one of the "Smart Cities" in the country. Due to rapid urbanization, much of the

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natural vegetation has disappeared during the past few decades and “Concrete Jungles” have come up in the city and suburban areas. Therefore, it is imperative to take concerted efforts to protect and preserve the butterflies - a sensitive group of organisms in all possible ways and means to maintain the dynamics of the ecosystem and aesthetic beauty of surroundings.

The Western Ghats is considered as one of the hotspots of butterfly diversity. Several studies have been made on the butterfly diversity of this important mountain system of Peninsular India [3-7]. Arun [8] reported 53 species of butterflies from the forests of Siruvani (Coimbatore), located in the Western Ghats. Easwaran and Promod [9] recorded 75 species of butterflies from Anaikatti hills (Coimbatore) of the Western Ghats. Alagumurugan et al. [10] studied the seasonal and relative abundance of butterflies in a scrub jungle habitat of Peraiyur Taluk in Madurai District and recorded 65 species from the study area. Parandhaman et al. [11] assessed butterfly diversity in the Southern Western Ghats of Tamil Nadu and reported 92 species belonging to 65 genera and five families. A few studies have also been conducted on butterfly diversity in other parts of Tamil Nadu, including the forests of the Eastern Ghats. Prabakaran et al. [12] surveyed butterflies of Tiruvallur District of Tamil Nadu and reported a total of 97 species coming under 63 genera and five families. Anbalagan et al. [13] assessed diversity of butterflies in north-eastern Tamil Nadu and recorded 101 species. Kalaivani and Gunasekaran [14] studied butterfly diversity in Kolli Hills of the Eastern Ghats and reported 46 species belonging to 22 genera and four families.

There have been some studies on the butterfly fauna of institutional campuses, wherein the local vegetation though modified to a great extent, supporting good number of butterfly species. The School of Environmental Sciences, Mahatma Gandhi University, Kottayam published a photographic guide of 106 species of butterflies from university campus [15]. Aneesh et al. [16] recorded 139 species of butterflies belonging to six families from Kerala Agricultural University Campus, Thrissur, Kerala.

2. METHODOLOGY

The Forest Campus is situated in the middle of Coimbatore city (Lat. 11°13.05'N & Long. 76°57'4.26'E) and has a total extent of 165 acres. The sylvan surroundings of the campus have been a nerve centre for forestry research and education in India over a century. The Forest Campus houses the Gass Forest Museum, established in 1902, which shelters a number of unique exhibits of forestry and natural history importance. Apart from this, there are three major forestry research and educational

institutions functioning in Forest Campus viz. Institute of Forest Genetics and Tree Breeding (IFGTB), Tamil Nadu Forest Academy (TNFA) and Central Academy for State Forest Service (CASFOS) as well as many other offices of the Tamil Nadu Forest Department.

2.1 Vegetation

The Forest Campus is perhaps one of the unique campuses situated in the urban environs of Coimbatore, with lush greenery. The original vegetation of the area is dry deciduous type, with tree species like *Acacia leucophloea*, *Acacia nilotica*, ssp. *indica*, *Balanites aegyptiaca*, *Azadirachta indica*, *Santalum album*, *Dichrostachys cinerea*, *Commiphora caudata*, *Commiphora wightii*, *Morinda coreia*, *Zizyphus mauritiana*, *Crataeva magna* and *Capparis divaricata*. The invasive tree species, *Prosopis chilensis* (*Prosopis juliflora*) has colonized in the Forest Campus, which almost suppressed the establishment and growth of other native species.

The common climbers found in the Forest Campus are *Aristolochia bracteolata*, *Vallisneria spiralis*, *Sarcostemma acidum*, *Tinospora cordifolia*, *Ceropegia juncea*, *Pentatropis capensis* (*P. microphylla*), *Pergularia daemia*, *Tylophora indica*, *Wattakaka volubilis*, *Corallocarpus epigeus*, *Coccinia grandis*, *Capparis oblongifolia* (*Maerua oblongifolia*), *Ipomoea biflora* (*I. calycina*), *Ipomoea hederifolia*, *Solanum trilobatum*, *Passiflora foetida*, *Cissus quadrangularis* and *Gloriosa superba*.

The common shrubs occur here are *Calotropis gigantea*, *Abutilon hirtum*, *A. indicum*, *Commiphora berryi*, *Capparis grandiflora*, *Opuntia striata* var. *dillenii*, *Aloe vera*, *Kalanchoe pinnata*, *Jatropha gossypifolia*, *Hibiscus micranthus*, *Pavonia coxii*, *Datura metel*, *Crotalaria verrucosa*, *C. laburnifolia*, *C. retusa*, *Indigofera trita*, *Grewia betulifolia*, *Ecbolium viride*, *Capparis sepiaria*, *Cadaba fruticosa*, *Cassia auriculata*, *C. occidentalis* and *Indigofera articulata*.

Some of the common herbs found are *Trichodesma indicum*, *Commelina forskalaei*, *Gomphrena celosioides*, *G. decumbens*, *Aerva lanata*, *Acalypha indica*, *Ocimum basilicum*, *Trianthema portulacastrum*, *Blepharis maderaspatensis*, *Vicoa indica*, *Pulicaria wightiana*, *Xanthium strumarium*, *Justicia tranquebarensis*, *Eclipta alba*, *Blainvillea acmella*, *Polygonum glabrum*, *Dipteracanthus patulus*, *Blumea obliqua*, *Mimosa pudica*, *Tephrosia hirta*, *T. procumbens*, *T. spinosa*, *Tribulus terrestris*, *Vernonia cinerea*, *Evolvulus alsinoides*, *Alternanthera sessilis*, *Rungia repens*, *Leucas aspera*, *Croton bonplandianum*, *Achyranthes aspera*, *Boerhavia diffusa*, *B. verticillata*, *Leucas urticifolia*, *Barleria*

prionitis, *Tridax procumbens*, *Lactuca runcinata*, *Acanthospermum hispidum*, *Martynia annua*, *Gynandropsis pentaphylla*, and *Polycarpha corymbosa*.

The common grass species recorded are *Andropogon pumilus*, *Brachiaria distachya*, *B. ramosa*, *Dactyloctenium aegyptium*, *Dichanthium annulatum*, *Cenchrus ciliaris*, *Aristida adscensionis*, *Echinochloa colonum*, *Panicum maximum* and *Enneapogon persicus* (*E. elegans*) [17].

Many of these plant species serve either as nectar and / or larval food plants of butterflies available in the campus.

A Botanical Garden having 3.40 ha area, established in the Forest Campus in 1976 has a large number of plants of forestry importance. It contains 166 species of trees 82 species of shrubs / woody climbers and 47 species of herbs. A number of plant species of conservation concern are also grown in the Botanical Garden and it serves as an *ex-situ* conservation and education centre.

2.2 Survey

The butterfly species occurring in the Forest Campus were surveyed during January 2013 to January 2014, covering monsoon, winter and summer seasons, following line transect method. Butterflies

encountered along the line and five meters on either side were recorded while walking at a constant pace. Digital images of butterflies were taken in the field for identification. Some specimens were also collected with the help of butterfly collection nets for confirming identity and subsequently released. Most of the species were identified in the field itself. Further confirmation of identity was made by comparing with the descriptions given by Kunte [2] and Kehimkar [6] and finally matching with the reference collections available in IFGTB. Data was also collected on the larval and nectar host plants of butterflies occurring in this area.

3. RESULTS AND DISCUSSION

Even though the study was conducted for a short period of one year, altogether, 59 species of butterflies coming under 42 genera and five families viz. Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae were recorded from the Forest Campus (Table 1). Among them, the family Nymphalidae was found to be the most specious having 23 species. The number of species recorded under different families is given in Table 2. The Forest Campus also shelters four species of butterflies which enjoy protection under the Wildlife (Protection) Act, 1972 and the details of these species are given in Table 3.

Table 1. Butterfly species recorded from Forest Campus, Coimbatore

S. no.	Scientific name	Common name	Larval host plants recorded
Family: Papilionidae (Swallowtails)			
1	<i>Graphium agamemnon</i> Linnaeus	Tailed jay	<i>Annona squamosa</i> , <i>Polyalthia longifolia</i> , <i>Michelia champaca</i>
2	<i>Graphium sarpedon</i> Linnaeus	Common blue bottle	Annonaceae and Lauraceae members
3	<i>Pachliopta aristolochiae</i> Fabricius	Common Rose	<i>Aristolochia</i> spp.
4	<i>Pachliopta hector</i> Linnaeus	Crimson rose	<i>Aristolochia</i> spp.
5	<i>Papilio demoleus</i> Linnaeus	Lime butterfly	<i>Aegle marmelos</i> , <i>Murraya koenigii</i>
6	<i>Papilio helenus</i> Linnaeus	Red helen	Rutaceae members
7	<i>Papilio polytes</i> Linnaeus	Common mormon	<i>Aegle marmelos</i> , <i>Murraya koenigii</i>
Family: Pieridae (Whites & Yellows)			
8	<i>Belenois aurota</i> Fabricius	Pioneer	<i>Cadaba fruticosa</i> , <i>Capparis oblongifolia</i>
9	<i>Catopsilia pomona</i> Fabricius	Common emigrant	<i>Bauhinia racemosa</i> , <i>Cassia fistula</i> , <i>C. siamea</i> , <i>C. tora</i>
10	<i>Catopsilia pyranthe</i> Linnaeus	Mottled emigrant	<i>Cassia fistula</i> , <i>C. auriculata</i> , <i>C. occidentalis</i> , <i>C. tora</i>
11	<i>Cepora nerissa</i> Fabricius	Common gull	<i>Cadaba fruticosa</i> , <i>Capparis</i> spp., <i>Crataeva</i> spp.
12	<i>Colotis danae</i> Fabricius	Crimson tip	<i>Cadaba fruticosa</i> , <i>Capparis oblongifolia</i>
13	<i>Colotis etrida</i> Boisduval	Small orange tip	<i>Cadaba fruticosa</i> , <i>Capparis oblongifolia</i>

S. no.	Scientific name	Common name	Larval host plants recorded
14	<i>Delias eucharis</i> Drury	Common jezebel	Loranthaceae (Parasite) members
15	<i>Eurema hecabe</i> Linnaeus	Common grass yellow	<i>Caesalpinia</i> spp., <i>Cassia</i> spp., <i>Acacia</i> spp., <i>Albizia</i> spp., <i>Pithecellobium dulce</i>
16	<i>Hebomoia glaucippe</i> Linnaeus	Great orange tip	<i>Capparis</i> spp.
17	<i>Ixias pyrene</i> Linnaeus	Yellow orange tip	<i>Capparis</i> spp.
18	<i>Ixias marianne</i> Cramer	White orange tip	<i>Capparis</i> spp., <i>Cadaba fruticosa</i>
19	<i>Leptosia nina</i> Fabricius	Psyche	<i>Cleome viscosa</i> , <i>Capparis</i> spp., <i>Crataeva</i> spp.
20	<i>Pareronia hippia</i> Fabricius	Indian wanderer	<i>Capparis</i> spp.
Family: Lycaenidae (Blues)			
21	<i>Azonus ubaldus</i> Stoll	Bright babul blue	<i>Acacia nilotica</i> , ssp. <i>indica</i>
22	<i>Castalius rosimon</i> Fabricius	Common pierrot	<i>Zizyphus mauritiana</i>
23	<i>Chilades lajus</i> Stoll	Lime blue	Rutaceae members
24	<i>Jamides celeno</i> Cramer	Common cerulean	<i>Pongamia pinnata</i> and Caesalpiniaceae members
25	<i>Leptotes plinius</i> Fabricius	Zebra blue	<i>Indigofera</i> spp., <i>Mimosa</i> spp., <i>Albizia lebbek</i>
26	<i>Nacaduba kurava</i> Moore	Transparent 6-line blue	Myrsinaceae and Sterculiaceae members
27	<i>Spalgis epius</i> Westwood	Apefly	Feed on scale insects and mealy bugs
28	<i>Spindasis vulcanus</i> Fabricius	Common Silverline	<i>Zizyphus mauritiana</i>
29	<i>Talicauda nyseus</i> Guérin-Ménéville	Red pierrot	<i>Kalanchoe pinnata</i>
30	<i>Zizula hylax</i> Fabricius	Tiny grass blue	Acanthaceae, Fabaceae and Verbenaceae members
Family: Nymphalidae (Brush-footed butterflies)			
31	<i>Acraea violae</i> Fabricius	Tawny coster	<i>Passiflora</i> spp., Euphorbiaceae members.
32	<i>Ariadne ariadne</i> Linnaeus	Angled castor	<i>Ricinus communis</i> , <i>Tragia</i> spp.
33	<i>Ariadne merione</i> Cramer	Common castor	<i>Ricinus communis</i> , <i>Tragia</i> spp.
34	<i>Byblia ilithyia</i> Drury	Joker	<i>Tragia</i> spp.
35	<i>Danaus chrysippus</i> Linnaeus	Plain tiger	<i>Asclepias curassavica</i> , <i>Calotropis gigantea</i> , <i>Cryptolepis buehneri</i> , <i>Caralluma adscendens</i>
36	<i>Danaus genutia</i> Cramer	Striped tiger	<i>Asclepias curassavica</i> , <i>Ceropegia</i> sp., <i>Tylophora</i> spp., <i>Trichodesma indicum</i> , <i>Tridax procumbens</i>
37	<i>Euploea core</i> Cramer	Common crow	<i>Cryptolepis buehneri</i> , <i>Hemidesmus indicus</i> , <i>Tylophora indica</i> , <i>Streblus asper</i> , <i>Heliotropium indicum</i>
38	<i>Euploea klugii</i> Moore	Brown king crow	<i>Streblus asper</i> , <i>Ficus</i> spp.
39	<i>Euploea sylvestris</i> Fabricius	Double branded crow	<i>Ficus</i> spp., <i>Ichnocarpus frutescens</i>
40	<i>Euthalia aconthea</i> Cramer	Common baron	<i>Streblus asper</i> , Anacardiaceae and Cucurbitaceae members
41	<i>Hypolimnas bolina</i> Linnaeus	Great eggfly	<i>Abutilon</i> sp., <i>Hibiscus</i> sp., <i>Sida rhombifolia</i> , <i>Portulaca oleracea</i> .
42	<i>Hypolimnas misippus</i> Linnaeus	Danaid eggfly	<i>Barleria</i> spp., <i>Abutilon</i> sp., <i>Hibiscus</i> sp., <i>Portulaca oleracea</i>
43	<i>Junonia hierta</i> Fabricius	Yellow pansy	<i>Barleria</i> spp., <i>Ruellia prostrata</i>
44	<i>Junonia iphita</i> Cramer	Chocolate pansy	<i>Justicia</i> spp., <i>Lepidagathis prostrata</i>
45	<i>Junonia lemonias</i> Linnaeus	Lemon pansy	<i>Barleria prionitis</i> , <i>Justicia</i> spp., <i>Lepidagathis</i> spp., <i>Sida rhombifolia</i> , <i>Corchorus capsularis</i>

S. no.	Scientific name	Common name	Larval host plants recorded
46	<i>Junonia orithya</i> Linnaeus	Blue pansy	<i>Justicia</i> spp., <i>Lepidagathis prostrata</i> , <i>Sida rhombifolia</i> , <i>Mimosa pudica</i>
47	<i>Melanitis leda</i> Linnaeus	Common evening brown	Poaceae (grasses) members
48	<i>Mycalesis mineus</i> Linnaeus	Dark- brand bush brown	Poaceae (grasses) members
49	<i>Mycalesis perseus</i> Fabricius	Common bush brown	Poaceae (grasses) members
50	<i>Phalanta phalantha</i> Drury	Common leopard	Flacourtiaceae members
51	<i>Tirumala limniace</i> Cramer	Blue tiger	<i>Asclepias curassavica</i> , <i>Calotropis gigantea</i> , <i>Tylophora indica</i> , <i>Wattakaka volubilis</i> , <i>Crotalaria retusa</i>
52	<i>Tirumala septentrionis</i> Butler	Dark blue tiger	<i>Ageratum conyzoides</i> , <i>Wattakaka volubilis</i>
53	<i>Ypthima ceylonica</i> Hewitson	White fourring	Poaceae (grasses) members
Family: Hesperidae (Skippers)			
54	<i>Badamia exclamationis</i> Fabricius	Brown awl	Combretum spp., <i>Ficus</i> spp., <i>Terminalia bellirica</i>
55	<i>Iambrix salsala</i> Moore	Chestnut bob	Grasses and bamboos
56	<i>Matapa aria</i> Moore	Common redeye	Bamboos
57	<i>Pelopidas mathias</i> Fabricius	Small-branded swift	Poaceae (grasses) members
58	<i>Spialia galba</i> Fabricius	Indian Grizzled Skipper	<i>Hibiscus</i> spp., <i>Sida rhombifolia</i> , <i>Waltheria indica</i>
59	<i>Hasora chromus</i> Cramer	Common banded awl	<i>Pongamia pinnata</i> , <i>Ricinus communis</i>

Table 2. Number of butterfly species recorded under different families

S. no.	Family	No. of species
1.	Papilionidae (Swallowtails)	7
2.	Pieridae (Whites & Yellows)	13
3.	Lycaenidae (Blues)	10
4.	Nymphalidae (Brush-footed butterflies)	23
5.	Hesperidae (Skippers)	6
	Total	59

Table 3. Butterfly species protected under Wildlife (Protection) Act, 1972 recorded from Forest Campus

S. no.	Common name	Scientific name	Protection status
1.	Crimson Rose	<i>Pachliopta hector</i> Linnaeus	Schedule-I
2.	Common Gull	<i>Cepora nerissa</i> Fabricius	Schedule-II
3.	Common Pierrot	<i>Castalius rosimon</i> Fabricius	Schedule-I
4.	Danaid Eggfly	<i>Hypolimnas misippus</i> Linnaeus	Schedule-I

A few studies have already been made on the butterfly diversity of certain locations in Coimbatore earlier. Arun [8] reported 53 species of butterflies from the forests of Siruvani (Coimbatore) and observed that, Nymphalids have the maximum species diversity in this area. Easwaran and Promod [9] recorded 75 species of butterflies from Anaikatti hills (Coimbatore) of the Western Ghats, in which also Nymphalids was found to have the maximum species diversity. Studies made by Alagumurugan et al. [10],

Parandhaman et al. [11], Prabakaran et al. [12], Anbalagan et al. [13] as well as Kalaivani and Gunasekaran [14] have shown that Nymphalids were dominant in other parts of Tamil Nadu too. In the present study, we have noticed that, in Forest Campus, Coimbatore, the Nymphalids stand first in terms of species diversity, which is in consonance with the studies on butterfly fauna conducted in other areas of the State.

Many researchers have also recorded endemic as well as species of conservation concern from natural vegetation and planted areas within institutional campuses. Prasad et al. [18] recorded 52 species from Kerala University Campus, Thiruvananthapuram. Toms et al. [19] reported 109 species from Mahatma Gandhi University Campus, Kottayam. Paunikar [20] listed 39 species of butterflies, including two species protected under Wildlife (Protection) Act, 1972, from Rani Durgawati University Campus, Jabalpur (MP). Aneesh et al. [16] recorded 139 species of butterflies belonging to six families, including four species that are endemic to the Western Ghats and nine species protected under various schedules of the Wildlife (Protection) Act, 1972, from Kerala Agricultural University (KAU) main campus located at Vellanikkara, Thrissur. Though we could not record any endemic butterfly species from the Forest Campus during the present study, occurrence of four species of butterflies, protected under Wildlife (Protection) Act, 1972, in the campus is very interesting. According to Prabakaran et al. [12] the most important threat to butterfly diversity is urbanization, since complete eradication of greenery in an area drives butterfly population away due to lack of food and reduced chances to increase progeny.

4. CONCLUSION

The studies have shown that, vegetation existing in urban environs similar to that of Forest Campus can act as 'refugia' for many species of butterflies. Their population could also be maintained / further enhanced by planting selected butterfly host plants. While adding aesthetic beauty, this will support conservation of a group of highly sensitive and fascinating group of organisms, which is facing threats from various angles.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX



Picture code	Caption
a	Plain Tiger on flowers of <i>Justicia adhatoda</i>
b	White Orange Tip on <i>Justicia adhatoda</i>
c	Tiny Grass Blue on <i>Justicia tranquebariensis</i>
d	Indian Grizzled Skipper on <i>Justicia tranquebariensis</i>
e	Small branded swift on flowers of <i>Kleinia grandiflora</i> (<i>Notonia grandiflora</i>)
f	Brown Awl on Dividivi (<i>Caesalpinia coriaria</i>) flowers
g	Red Pierrot on flowers of <i>Kleinia grandiflora</i> (<i>Notonia grandiflora</i>)
h	Red Pierrot caterpillar on <i>Bryophyllum pinnatum</i> (<i>Kalanchoe pinnata</i>)
i	Lime Butterfly caterpillar on <i>Ruta graveolens</i>
j	Common Crow caterpillar on <i>Holarrhena antidysenterica</i>
k	Common Emigrant caterpillar on <i>Cassia fistula</i>
l	Crimson Rose - Caterpillar

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