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Butterfly diversity in Tamil Nadu agricultural university campus, Coimbatore, Tamil Nadu, India

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Abstract
This work was taken with the prime objective to make an inventory of the butterflies of Tamil Nadu Agricultural University so as to generate a baseline data for future studies. A total of 77 taxa of butterflies belonging to 5 families have been recorded in a survey carried out from August 2014 to August 2015 at Tamil Nadu Agricultural University Campus, Coimbatore, Tamil Nadu, India. For this study, the campus was mapped into three different habitats *viz.*, Garden land, Botanical Garden and Orchard. Comparison of species similarities between the habitats, revealed 56% similarity between Botanical Garden and Orchard, 46.67% similarity between Botanical Garden and Garden Land and 62% between Garden Land and Orchard. Among the three sites Botanical Garden ranks first with the record of more number of species (73) followed by Orchard (44) and Garden Land (37) being the least. The results of relative diversity (RD) index showed that Nymphalidae (RD value = 37.67) was the dominant family in the area followed by Lycaenidae (22.07%), Pieridae (16.89%) and the least being Hesperiidae and Papilionidae (11.69%).

Keywords: Butterfly, diversity, Tamil Nadu Agricultural University Campus, Coimbatore

1. Introduction
Butterflies are the important, most beautiful and the most studied insect group in the world. Besides being good pollinators, butterflies extend their role as pests, predators and weed killers too. They belong to the order Lepidoptera, coming under the phylum Arthropoda and the class Insecta. The order Lepidoptera is divided into two suborders *viz.*, Heterocera (Moths) and Rhopalocera (Butterflies). So far, about 1,57,424 species of Lepidoptera have been described globally [1]. There are about 18,000 species of butterflies in the world and India has 1,501 species of butterflies [2]. The Western Ghats harbours around 330 species of butterflies [3]. Butterflies are classified into two superfamilies *viz.*, Hesperioidea and Papilionoidea. Hesperioidea consists of a single family of Hesperiidae (Skippers), whereas Papilionoidea consists rest of the butterfly families *viz.*, Papilionidae (Swallowtails), Pieridae (Whites and Sulphurs), Nymphalidae (Brush-footed butterflies) and Lycaenidae (Blues). The book "Identification of Indian butterflies," was published by Evans [4] provides notes to identify Indian butterflies up to family and species level. Later Gunathilagaraj *et al*., [5] published a book "Some South Indian Butterflies" with description and photographs for 139 butterflies. Kehimkar [2] documented about 735 species of butterflies occurring in the Indian subcontinent. Gunathilagaraj *et al.* [6] in the book "South Indian Butterflies" described nearly 300 butterflies. Butterflies play a major ecological, economic and aesthetic role. Being pollinators, pests of various crops and also as good bio-indicators, knowing its diversity, biology and the correct identification are essential in its management and conservation. The management and research on these threatened taxa have now become the responsibility of various research Institutes dealing with biodiversity coursework. Establishment of the correct species identity is very essential in any conservation programme. Hence this work was taken with the prime objective to make an inventory of the butterflies of Tamil Nadu Agricultural University so as to generate a baseline data for future studies.

2. Materials and Methods
To study the butterflies of Tamil Nadu Agricultural University campus fortnight observations were conducted from August 2014 to August 2015.

The university is situated at and elevation of 426.72m and between 11^0 latitude and 77^0 longitude. For the purpose of the study, the campus was mapped into three types of habitats *i.e.,* Garden Land, Botanical Garden and Orchard. Garden Land is meant for crop cultivation and annual crops and weeds are its specialties. The total area is around 10.11 ha. Botanical garden is spread over 270 ha. It is more or less a wild habitat with trees and shrubs and with minimum anthropogenic disturbances. Orchard is meant for the cultivation of fruiting plants, vegetables and it is about 57 ha. Fixed radius (20 m) point count method (for the orchard), line transect method (for the Garden Land, and the botanical garden) and direct observation methods were used [7]. Monitoring of transects were done either in early morning from 6.00 to 7.00 or late evening from 17.00 to 18.00 hours. The surveys were only performed during suitable weather (*i.e.,* in the absence of rain or strong wind). Occasional sightings of butterflies were also included. Photography was done by making use of Panasonic FZ 300 camera. Butterflies were identified with the help of a field guide [5,6]. Butterflies were classified as Common (60-80% sighting), uncommon (40-60% sighting), occasional (20-40% sighting) and Rare (< 20% sighting). The following formula was used for determining percentage of occurrence of Families [8]. Percentage of occurrence is also stated as Relative diversity. Percentage occurrence = (No. of species of each family/ Total no. of different species seen) x 100. Beta diversity between the three sites were also assessed so as to compare the species similarity between the sites. The most widely used index for assessment of Beta diversity is Jaccard Index (JI) [9], which is calculated using the equation: JI (for two sites) $=j / (a+b-j)$, where j=the number of species common to both sites A and B, a=the number of species in site A and b=the number of species in site B. It is assumed that the data to be normally distributed and adopted parametric statistics for comparing the sites.

3. Results and Discussion

A total of 77 species belonging to 5 families have been identified from Tamil Nadu Agricultural University Campus. A comparative chart of the total butterfly species belonging to different families along with their abundance are provided in Table 1. The photographs of all the butterflies are depicted in Plate 1. Butterflies of Madurai city, Tamil Nadu was studied by Baskaran and Solaiappan [10] 33 species were recorded in the study. Gunasekaran and Balasubramanain [11] has done a study on the butterfly diversity and its conservation in temple premises of Tamil Nadu. The study was focused in documenting the butterflies associated with sthalavriksha (Temple tree) and nanthavana (Flower garden) of 1165 temples in the state. A total of 55 butterflies were documented. Prasad *et al.,* [12] recorded 52 species from Kerala University campus, Thiruvananthapuram. Kumar and Murugesan [13] studied the species diversity and habitat association of butterflies around 30 km radius of Kudankulam Nuclear Power Plant and reported 64 butterfly species in the area. Rajagopal *et al.,* [14] Studied diversity and community structure of butterfly of Arignar Anna Zoological Park, Chennai and a total of 56 species were recorded. Aneesh *et al.,* [15] studied the butterfly diversity at Kerala Agricultural University campus, Thrissur and reported 139 butterfly species. The present study revealed that the species richness was maximum (73) in Botanical Garden, followed by Orchard (44) and it was (37) in Garden Land. 27 species were recorded from Botanical Garden alone, 2 species were recorded from Garden Land alone and 2 species were recorded from orchard alone. 31 species of butterflies were recorded from all the three habitats. Botanical Garden and Garden Land shared only four species likewise, Botanical Garden and Orchard shared 11 species in common. But no species were shared by Garden Land and Orchard. Among the 5 families, Hesperiidae was represented by nine species, Lycaenidae was represented by 17 species, Nymphalidae was represented by 29 species, Papilionidae was represented by nine species and Pieridae was represented by 13 species *i.e.,* Nymphalidae was found to be the most dominant family in the campus with a RD Index value of = 37.67 percent followed by Lycaenidae (22.07%), Pieridae (16.89%) and the RD Index value of Papilionidae and Hesperiidae was 11.69 percent. The butterfly composition of a site depends on the vegetation structure and nectar source. Existences of trees, bushes, creepers are very important to them. More complex vegetation structure is associated with greater diversity. The horticultural and agricultural fields surrounding orchard and Garden Land probably provided shelter and suitable foraging grounds for some butterflies, plantations surrounding the botanical garden provided different food sources, rich nectar resources and variety of flowers which further added to the diversity of butterflies in Botanical Garden. This is in accordance with the study conducted by Tiple *et al.,* [16] who studied the butterfly species and their nectar host plant relationships from north central India. A total of 48 butterfly species belonging to five families were recorded. Visits of butterflies were more frequent to flowers with tubular corollas than to non tubular ones, to flowers of herbs and shrubs rather than trees, to flowers coloured red, yellow, blue and purple than those coloured white and pink, and to flower sources available for longer periods in the year. Based on the abundance (frequency of sightings), 20 species were identified as rare, nine uncommon, 32 common and 16 occasional. On comparing the species similarities using the Jaccard's index between the three habitats, taken in pairs it was found that 56 percent similarity was between Botanical Garden and Orchard and 46.67 percent similarity between Botanical Garden and Garden Land and maximum similarity (62%) was between Garden Land and Orchard.

Table 1: Different species of butterflies from the study site with their abundance and places of sighting

No	Common Name	Scientific Name	Places of sighting	Abundance
Family: Hesperiidae, Skippers - RD = 11.69%				
1	Bush Hopper	*Ampittia dioscorides* (Fabricius, 1793)	GL, BG	U
2	Rice Swift	*Borbo cinnara* (Wallace, 1866)	GL, BG	O
3	Giant Redeye	*Gangara thyrsis* (Fabricius, 1775)	GL, BG, OR	U
4	African Marbled Skipper	*Gomalia elma* Trimen, 1862	BG, OR	R
5	Grass Dart	*Taractrocera maevius* (Fabricius, 1793)	BG, OR	O
6	Chestnut Bob	*Iambrix salsala* (Moore, 1866)	BG	R
7	Smaller Dartlet	*Oriens goloides* (Moore, 1881)	BG	O
8	Small Branded Swift	*Pelopidas mathias* Fabricius, 1798	GL, BG, OR	U
9	Oriental Palm Bob	*Suastus gremius* (Fabricius, 1798)	GL, BG, OR	R
Family: Lycaenidae, Blues- Rd = 22.07%				
10	Centaur Oak Blue	*Arhopala centaurus* Fabricius, 1775	BG	U
11	African Babul Blue	*Azanus jesous* Guérin-Méneville, 1847	BG	R
12	Common Pierrot	*Castalius rosimon* (Fabricius, 1775)	GL, BG, OR	C
13	Forget-Me-Not	*Catochrysops strabo* (Fabricius, 1793)	GL, BG, OR	U
14	Gram Blue	*Euchrysops cnejus* (Fabricius, 1798)	GL, BG	C
15	Common Cerulean	*Jamides celeno* Cramer, 1775	GL, BG, OR	C
16	Pea Blue	*Lampides boeticus* (Linnaeus, 1767)	GL, BG	C
17	Zebra Blue	*Leptotes plinius* (Fabricius, 1793)	BG	U
18	Pale Grass Blue	*Pseudozizeeria maha* Kollar, 1844	GL, BG, OR	U
19	Monkey Puzzle	*Rathinda amor* Fabricius, 1775	BG	R
20	Apefly	*Spalgis epeus* Westwood,1851	BG, OR	O
21	Silverline	*Spindasis schistacea* (Moore,1881)	BG	R
22	Common Silverline	*Spindasis vulcanus* (Fabricius, 1775)	GL, BG, OR	C
23	Peacock Royal	*Tajuria cippus* Fabricius, 1798	OR	R
24	Red Pierrot	*Talicada nyseus* (Guérin-Méneville, 1843)	BG, OR	C
25	Guava Blue	*Deudorix isocrates* (Fabricius, 1793)	OR	U
26	Tiny Grass Blue	*Zizula hylax* (Fabricius, 1775)	GL, BG, OR	C
Family: Nymphalidae, Brush Footed Butterflies- RD = 37.67%				
27	Tawny Coster	*Acraea Terpsicore* (Fabricius, 1775)	GL, BG, OR	C
28	Angled Castor	*Ariadne ariadne* Linnaeus, 1763	GL, BG, OR	C
29	Joker	*Byblia ilithyia* (Drury, 1773)	GL	R
30	Black Raja	*Charaxes solon* Fabricius, 1793	BG	R
31	Painted Lady	*Vaenessa cardui* (Linnaeus, 1758)	BG	R
32	Plain Tiger	*Danaus chrysippus* Linnaeus, 1758	GL, BG, OR	C
33	Striped Tiger	*Danaus genutia* Cramer, 1779	GL, BG, OR	C
34	King Crow	*Euploea klugii* (Moore, 1858)	GL, BG, OR	C
35	Tailed Palmfly	*Elymnias Caudata* (Butler, 1871)	BG, OR	O
36	Common Crow	*Euploea core* Cramer, 1780	GL, BG, OR	C
37	Common Baron	*Euthalia aconthea* Cramer, 1779	GL, BG, OR	C
38	Great Egg Fly	*Hypolimnas bolina* (linnaeus, 1758)	BG	U
39	Danaid Eggfly	*Hypolimnas misippus* Linnaeus, 1764	BG	C
40	Peacock Pansy	*Junonia almana* (Linnaeus, 1758)	GL, BG, OR	C
41	Yellow Pansy	*Junonia hierta* (Fabricius, 1798)	GL, BG, OR	C
42	Chocolate Pansy	*Junonia iphita* Cramer, 1779	BG	C
43	Lemon Pansy	*Junonia lemonias* (Linnaeus, 1758)	GL, BG, OR	C
44	Blue Pansy	*Junonia orithya* Linnaeus, 1758	BG	U
45	Commander	*Moduza procris* Cramer, 1779	BG	R
46	Common Evening Brown	*Melanitis leda* Linnaeus, 1758	GL, BG, OR	C
47	Common Sailer	*Neptis hylas* Linnaeus, 1758	GL, BG, OR	C
48	Chestnut-Streaked Sailer	*Neptis jumbah* Moore, 1857	BG	R
49	Medus Brown	*Orsotriaena medus* Fabricius, 1775	BG	R
50	Glassy Tiger	*Parantica aglea* Stoll, 1782	GL, BG, OR	C
51	Common Leopard	*Phalanta phalantha* (Drury, 1773)	GL, BG, OR	C
52	Dark Blue Tiger	*Tirumala septentrionis* (Butler, 1874)	BG	R
53	Common Five Ring	*Ypthima baldus* Fabricius, 1775	GL, BG, OR	O
54	White Four Ring	*Ypthima ceylonica* Hewitson, 1864	BG	R
55	Common Four Ring	*Ypthima huebneri* Kirby, 1871	GL, BG, OR	C
Family: Papilionidae, Swallowtails- Rd = 11.69%				
56	Tailed Jay	*Graphium agamemnon* Linnaeus, 1758	BG, OR	O
57	Spot Swordtail	*Graphium nomius* Esper, 1799	BG	R
58	Common Bluebottle	*Graphium sarpedon* Linnaeus, 1758	BG, OR	O
59	Common Rose	*Pachliopta aristolochiae* Fabricius, 1775	GL, BG, OR	C
60	Crimson Rose	*Pachliopta hector* Linnaeus, 1758	GL, BG, OR	C
61	Common Lime	*Papilio demoleus* Linnaeus, 1758	GL, BG, OR	C
62	Blue Mormon	*Papilio polymnestor* Cramer, 1775	BG	R
63	Common Mormon	*Papilio polytes* Linnaeus, 1758	BG	C
64	Southern Birdwing	*Troides minos* Cramer, 1779	BG	R
Family: Pieridae, Yellows- Rd = 16.89%				

65	Common Albatorss	*Appias albina* Boisduval, 1836	BG	R
66	Chocolate Albatross	*Appias lyncida* Cramer, 1777	BG	R
67	Pioneer	*Belenois aurota* Fabricius, 1793	GL, BG, OR	C
68	Lemon Emigrant	*Catopsilia pomona* Fabricius, 1775	GL, BG, OR	C
69	Mottled Emigrant	*Catopsilia pyranthe* Linnaeus, 1758	BG, OR	C
70	Common Gull	*Cepora nerissa* Fabricius, 1775	GL	O
71	Crimson Tip	*Colotis danae* Fabricius, 1775	BG,OR	O
72	Little Orange Tip	*Colotis etrida* Boisduval, 1836	BG, OR	O
73	Three Spot Grass Yellow	*Eurema blanda* Boisduval, 1836	BG, OR	O
74	Great Orange-Tip	*Hebomoia glaucippe* Linnaeus, 1758	BG	O
75	White Orange Tip	*Ixias marianne* Cramer, 1779	GL, BG, OR	O
76	Psyche	*Leptosia nina* Fabricius, 1793	BG	O
77	Indian Wanderer	*Pareronia hippia* Fabricius, 1787	BG	O

GL- Garden Land, BG- Botanical Garden, OR- Orchard; RD- Relative Diversity; C-common, U-uncommon, O-ocassional, R-rare


COMMON SILVERLINE


PEACOCK ROYAL


RED PIERROT


GUAVA BLUE


TINY GRASS BLUE

NYMPHALIDAE


TAWNY COSTER


ANGLED CASTOR


JOKER


BLACK RAJA


PAINTED LADY


PLAIN TIGER


STRIPED TIGER


KING CROW


COMMON PALMFLY


COMMON CROW


COMMON BARON


GREAT EGG FLY


DANAID EGGFLY


PEACOCK PANSY


YELLOW PANSY


CHOCOLATE PANSY


LEMON PANSY


BLUE PANSY


COMMANDER


COMMON EVENING BROWN


COMMON SAILER


CHESTNUT-STREAKED SAILER


MEDUS BROWN


GLASSY TIGER


COMMON LEOPARD


DARK BLUE TIGER


COMMON FIVE RING


WHITE FOUR RING


COMMON FOUR RING

PAPILIONIDAE


TAILED JAY


SPOT SWORDTAIL


COMMON BLUEBOTTLE


COMMON ROSE


CRIMSON ROSE


COMMON LIME


BLUE MORMON


COMMON MORMON


SOUTHERN BIRDWING

PIERIDAE


COMMON ALBATORSS


CHOCOLATE ALBATROSS


PIONEER

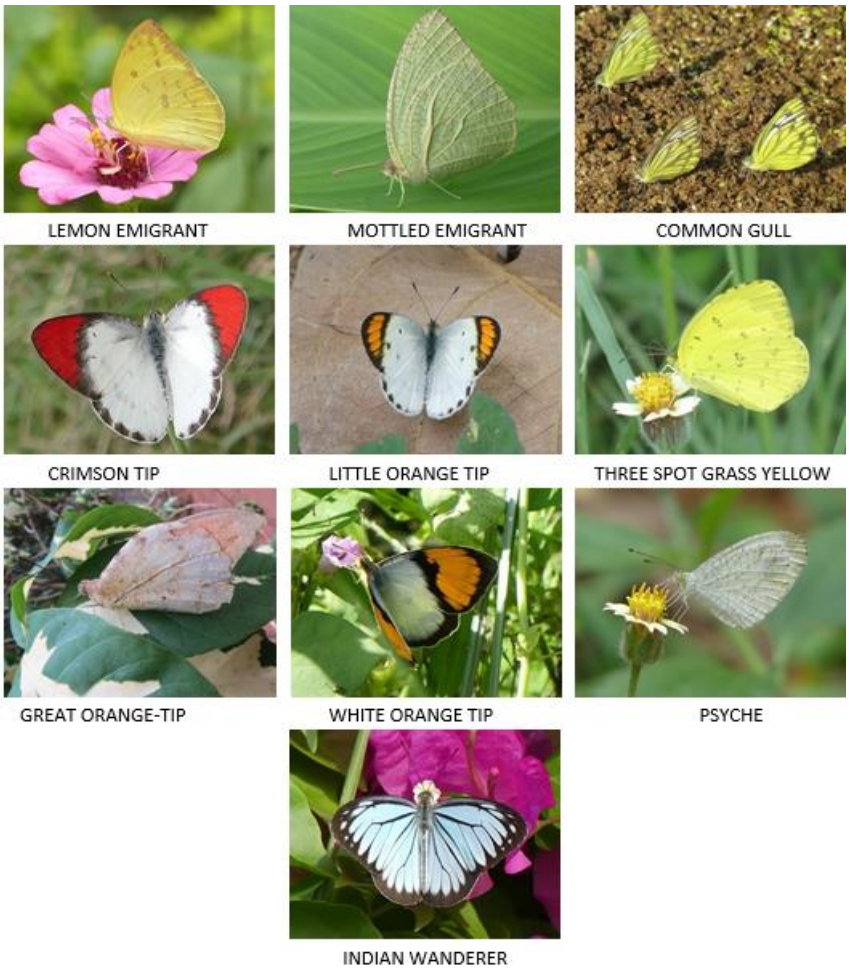

Plate 1: Photographs of commonly found butterflies of Tamil Nadu Agricultural University campus

4. Conclusion

This study increased the information and knowledge available on the butterflies of Coimbatore Tamil Nadu Agricultural University campus. This information will be help in future for species specific work on butterflies and for launching conservation strategies.

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6. References

1. Kristensen NP, Scoble MJ, Karsholt O. Lepidoptera phylogeny and systematics: the state of inventorying moth and butterfly diversity. Zootaxa. 2007; 1668:699-747.
2. Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, 2008, 497.
3. Gaonker H. Butterflies of Western Ghats, India including Sri Lanka. A biodiversity assessment of threatened mountain system. Report to the center for ecological science, Bangalore, 1996, 86.
4. Evans WH. Identification of Indian butterflies. The Bombay Natural History Society, Bombay, 1927, 32.
5. Gunathilagaraj K, Perumal TNA, Jayaram K, Kumar MG. Some south Indian butterflies. Nilgiri Wildlife and Environment Association, 1998, 253.
6. Gunathilagaraj K, Perumal TNA, Jayaram K, Kumar MG. South Indian butterflies. Krab media and Marketing, 2015, 1-358.
7. Datta M. Status, guild and diversity of avian fauna from a wetland site and surroundings, in Krishnagar, a City beside tropic of cancer, West Bengal, India. International Journal of Fauna and Biologial Studies. 2016; 3(4):68-75.
8. Wells DR. The birds of the Thai-Malay Peninsula. Passerines. London: Christopher Helm, 2007, II.
9. Jaccard P. The distribution of the flora in the alpine zone. New Phytologist. 1912; 11:37-50.
10. Baskaran S, Solaiappan A. Butterflies of Madurai City, Tamil Nadu. Zoos' Print Journal 2002; 17(10):913-914.
11. Gunasekaran M, Balasubramanian P. Taxonomic enumeration and economic values of sthalavrikshas (temple trees) in Tamil Nadu & Puducherry, southern India. Journal of Economic Taxonomy and Botany. 2010; 34(4):769-776.
12. Prasad G, Prathibakumari PV, Lizby AM. Butterflies of Kerala University Campus, Thiruvananthapuram, Kerala. Abstract volume 3rd Asian Lepidoptera Conservation Symposium and Training Programme, 25– 29 October Coimbatore, India, 2010, 20-21.
13. Kumar P, Murugesan AG. Species diversity and habitat association of butterflies around 30 km radius of Kudankulam Nuclear Power Plant area of Tamil Nadu, India. Int. J Biodiversity Conservation. 2014; 6:608-615.
14. Rajagopal T, Sekar M, Manimozhi A, Baskar N,

Archunan G. Diversity and community structure of butterfly of Arignar Anna Zoological Park, Chennai, Tamil Nadu. Journal of Environmental Biolology 2011; 32:20-32.
15. Aneesh KS, Adarsh CK, Nameer PO. Butterflies of Kerala Agricultural University (KAU) campus, Thrissur, Kerala, India. Journal of Threatened Taxa. 2013; 5(9):4422-4440.
16. Tiple AD, Deshmukh VP, Dennis RLH. Factors influencing nectar plant resource visits by butterflies in a university campus: implications for conservation. Nota Lepidopterologica. 2006; 28:213-224.