

Diversity of Butterflies from Different Agroecosystem with Their Host Plants in Namakkal District, Tamil Nadu, India

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Received June 23, 2020; Revised July 24, 2020; Accepted August 04, 2020

Abstract Butterflies are the most fascinating group of insects which belong to the insect order Lepidoptera, under the phylum Arthropoda. In India, 1501 butterfly species, from 5 different families, viz., Papilionidae, Pieridae, Lycaenidae, Nymphalidae and Hesperidae which include nearly 100 endemic species. The main objective of the present study is to document the butterfly species diversity in Namakkal district and also record how the agroecosystem plays a major role to complete butterflies lifecycle. The Diversity of butterflies in different agricultural field is observed during the period between October 2016 and November 2017. A total of 60 species under 40 genera and 5 families were recorded. During the course of investigation, surveys have been carried out to study the various groups of butterflies with their abundance and distribution and also to assess the preferred host-plants in agricultural lands of surrounding areas in Namakkal district, Tamil Nadu, India.

Keywords: *lepidoptera, diversity, host plants, agroecosystem, India*

Cite This Article: Kanimozhi C., V. Ramesh., P.C. Pathania, and A. Rameshkumar, "Diversity of Butterflies from Different Agroecosystem with Their Host Plants in Namakkal District, Tamil Nadu, India." *Applied Ecology and Environmental Sciences*, vol. 8, no. 5 (2020): 315-318. doi: 10.12691/aees-8-5-19.

1. Introduction

Biodiversity describes the diversity of living beings on earth recounting the number or plenty of different species living within a particular region. Butterflies are the best biological indicator. Butterflies and moths are belonging to the order Lepidoptera which means scaled-winged. Butterflies are often polymorphic and make use of camouflage, mimicry and aposematism to evade their predators. Butterflies, birds and vascular plants represent the most frequently monitored taxonomic groups [1].

The butterfly fauna of India is rich with over 1500 species because of their vivid colors, amazing shapes and elegant flight give bliss to everyone [2]. Nearly fifty economically important crops are pollinating with the help of butterflies [3]. Butterfly's lifecycle consists of four stages namely egg, larva, pupa and adult. Butterflies require specific food and habit at different stages of their life cycle. The larvae of butterflies cause only little damage to host plants. The larva as well as adults is food for many predators like lizards and birds. Monitoring the changes in the diversity of butterflies is a potential tool for assessing the environmental changes in a particular area.

Butterflies can be identified even on the wings and they show the symbiotic relationships with flowering

plants where flowers provide nectar for adult butterflies and plant tissues such as leaves and soft stems for caterpillars and also provide shelter. Biological diversity is a vital parameter for assess the global and environmental changes.

The main objective of the present study is to document the diversity of butterflies in Namakkal district and also record the seasonal changes. During the course of investigation, surveys have been carried out to study the various groups of butterflies and their abundance and distribution to assess the preferred host-food plants in agricultural lands of surrounding areas in Namakkal district.

2. Materials and Methods

2.1. Study Area

Survey for collection and population assessment of insects was carried out in different agricultural fields of Namakkal district in the state of Tamil Nadu. Namakkal district is bounded by Salem district on the north, on the east by Attur taluk of Salem district, Perambalur and Tiruchirappalli district, by Karur district on the south and on the west by Erode district. Namakkal district is situated in the north western and western agro climatic zones.

Minimum temperature is 22°C and maximum temperature is 38°C. The average rainfall is 764mm. The main occupation in the district is agriculture. The cultivation is generally depends on monsoon rains, wells and tanks. The major crops of this district are paddy, sorghum, greengram, blackgram, maize, cholam, cumbu, ragi, pulses, groundnut, castor, sugarcane, cotton and tapioca.



Map showing the study area (Namakkal district of Tamil Nadu)

2.2. Survey and Identification

Preliminary survey was carried out during the day from 7a.m to 12p.m for a period of 12 months extending from October 2016 to November 2017 with weekly intervals. Different agricultural fields of this district was surveyed

by using line transect method. In this method five permanent 300m line transects was setup in different agricultural fields. The transect walk was done once in a month as Pollard walk method [4,5] for recording the butterflies. Most of the butterfly species were identified on sight, whereas, some species could not be identified in that manner, those were collected with the help of a sweep net and identified through the handbook by Kehimkar [6] and standard references such as Evans [7] and Wynter Blyth [8]. Wherever possible, the recorded species were photographed for verification and authentication.

2.3. Statistical Analysis

Species diversity was calculated using Shannon diversity index ($H' = - \sum P_i \ln P_i$) and Shannon evenness was calculated using the formula; $E = H' / \ln S$, where, H' = Shannon diversity index, and P_i = Proportional abundance of the i th species, E = Shannon evenness and S = Total number of species in habitat (species richness).

3. Results & Discussion

The study revealed the presence of 60 species of butterflies from all agricultural fields belonging to five families during 2016 October to November 2017. Nymphalidae shows the maximum species richness of 17 species followed by Lycaenidae and Pieridae with 15 species, Papilionidae with 7 species, Hesperidae with 6 species (Table 1).

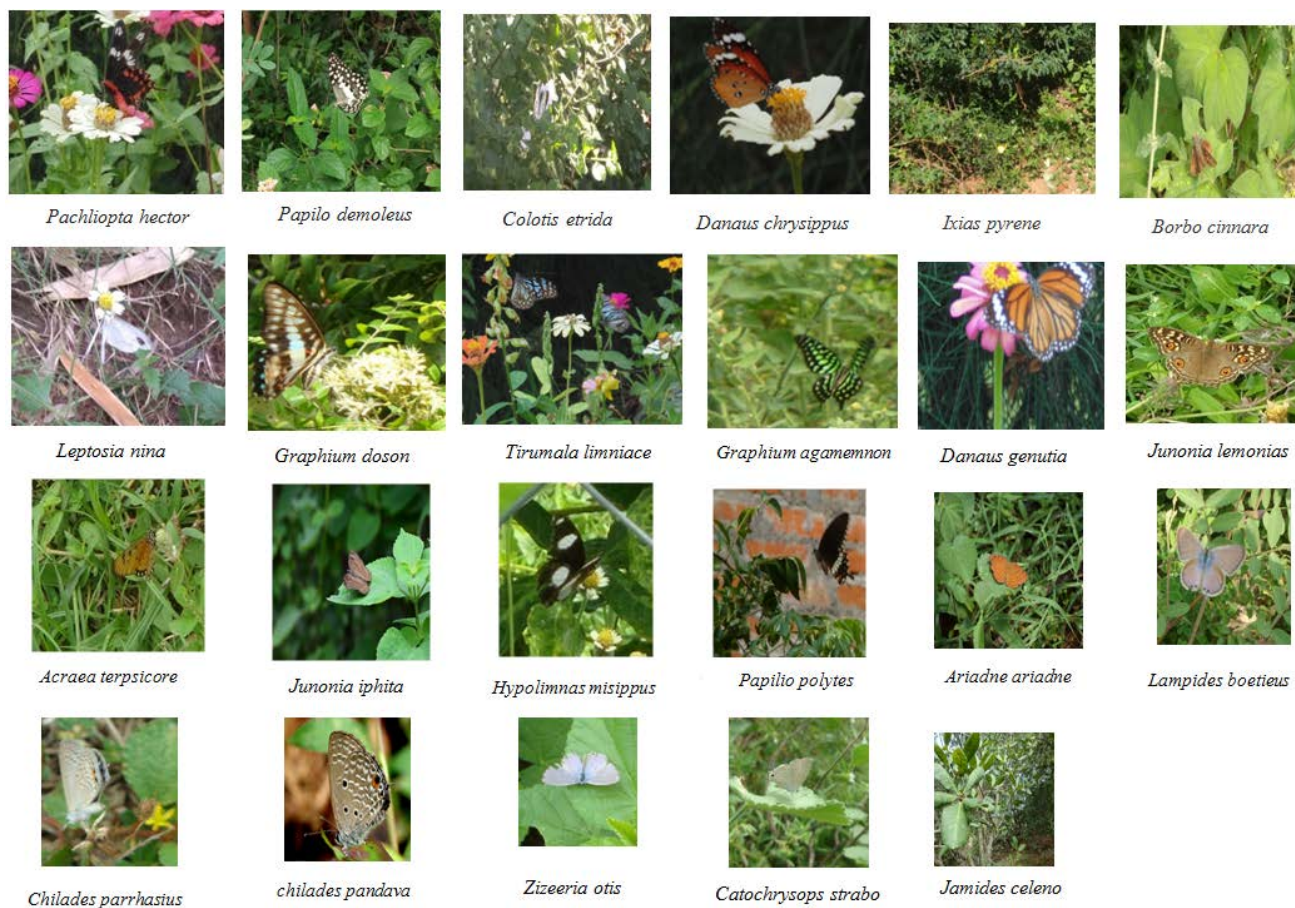


Figure 1. Butterfly fauna in agriculture fields of Namakkal district

Table 1. List of butterfly fauna in agricultural fields of Namakkal district during 2016-2017

S.No	Family	Genus	Species	Common name	Larval host plant	Distribution	
1	Papilionidae	Graphium	<i>doson</i> C. & R. Felder	Common Jay	<i>Polyalthia longifoliya pendula</i>	Rf, Pf, Sf	
2			<i>Agamemnon</i> Linnaeus	Tailed Jay	<i>Murraya koenigii</i>	Vf, Rf	
3		Pachliopta	<i>aristolochiae</i> Fabricius	Common Rose	<i>Aristolochia indica</i>	Gf, Pf, Sf, Vf, Rf	
4			<i>hectar</i> Linnaeus	Crimson Rose	<i>Aristolochia indica</i>	Gf, Pf, Sf, Vf, Rf	
5		Papilio	<i>polytes</i> Linnaeus	Common Mormon	<i>Murraya koenigii</i>	Gf, Pf, Sf, Vf, Rf	
6			<i>demolus</i> Linnaeus	Lime Butterfly	<i>Murraya koenigii</i>	Gf, Pf, Sf, Vf, Rf	
7			<i>polymnestor</i> Cramer	Blue mormon	<i>Citrus limon</i>	Gf, Pf, Rf	
8	Nymphalidae	<i>Neptis</i>	<i>hylas</i> Linnaeus	Common Sailor	<i>Salix tetrasperma</i>	Vf, Rf	
9		Hypolimnas	<i>misippus</i> Linnaeus	Danaid Eggfly	<i>Barlaria cristata</i>	Rf, Pf, Sf	
10			<i>bolina</i> Linnaeus	Great Fly	<i>Laportea interrupta</i>	Rf, Vf, Sf	
11			<i>orithya</i> Linnaeus	Blue Pansy	<i>Barlaria cristata</i>	Vf, Rf	
12		Junonia	<i>lemonias</i> Linnaeus	Lemon Pansy	<i>Barlaria cristata</i>	Rf, Pf, Sf	
13			<i>almanac</i> Linnaeus	Peacock Pansy	<i>Barlaria cristata</i>	Rf, Vf, Sf	
14			<i>hierta</i> Fabricius	Yellow Pansy	<i>Barlaria cristata</i>	Vf, Rf	
15			<i>iphita</i> Cramer	Chocolate Pansy	<i>Barlaria cristata</i>	Rf, Pf, Sf	
16			<i>atlites</i> Linnaeus	Grey Pansy	<i>Barlaria cristata</i>	Rf, Pf, Sf	
17			<i>Tirumala</i>	<i>limniace</i> Cramer	Blue tiger	<i>Calotropis procera</i>	Vf, Rf
18		Danaus	<i>chrysippus</i> Linnaeus	Plain Tiger	<i>Calotropis gigantea</i>	Gf, Pf, Sf, Vf, Rf	
19			<i>genutia</i> Cramer	Striped tiger	<i>Holostemma annulare</i>	Vf, Rf	
20		<i>Melanitis</i>	<i>idea</i> Linnaeus	Common Evening Brown	<i>Sorghum halepense. Oryza sativa.</i>	Pf, Gf	
21		<i>Phalanta</i>	<i>phalanta</i> Drury	Common Leopard	<i>Salix tetrasperma</i>	Rf, Vf, Sf	
22		<i>Acraea</i>	<i>terpsicore</i> Linnaeus	Tawny Coster	<i>Turnera subulata</i>	Rf, Pf, Sf	
23		<i>Ariadne</i>	<i>merione</i> Cramer	Common Castor	<i>Ricinus communis</i>	Pf, Gf	
24		<i>Euploea</i>	<i>core</i> Cramer	Common Crow	<i>Nerium oleander</i>	Rf, Pf, Sf	
25		Pieridae	<i>Cepora</i>	<i>nerissa</i> Fabricius	Common Gull	<i>Maerua oblongifolia</i>	Pf, Gf
26			Ixias	<i>marianne</i> Cramer	White Orange Tip	<i>Capparis decidua</i>	Rf, Vf, Sf
27	<i>pyrene</i> Linnaeus			Yellow Orange Tip	<i>Capparis separia</i>	Rf, Pf, Sf	
28	<i>Delias</i>		<i>eucharis</i> Drury	Common Jezebel	<i>Azadirachta indica</i>	Vf, Rf	
29	<i>Hebomoia</i>		<i>glaucippe</i> Linnaeus	Great Orange Tip	<i>Capparis separia</i>	Pf, Gf	
30	Colotis		<i>amata</i> Fabricius	Small Salmon Arab	<i>Salvadora persica</i>	Vf, Rf	
31			<i>danae</i> Fabricius	Crimson Tip	<i>Maerua oblongifolia</i>	Rf, Pf, Sf	
32			<i>aurora</i> Cramer	Plain orange tip	<i>Cadaba fruticosa</i>	Vf, Rf	
33			<i>etrida</i> Boisduval	Little orange tip	<i>Maerua oblongifolia</i>	Pf, Gf	
34	Catopsilia		<i>pomona</i> Fabricius	Common Emigrant	<i>Cassia fistula</i>	Vf, Rf	
35			<i>pyranthe</i> Linnaeus	Mottled Emigrant	<i>Senna occidentalis</i>	Rf, Pf, Sf	
36	Eurema		<i>brigitia</i> Stoll	Small Grass Yellow	<i>Cassia kleinii</i>	Gf, Pf, Sf, Vf, Rf	
37			<i>hecabe</i> Linnaeus	Common Grass Yellow	<i>Senna alata</i>	Rf, Vf, Sf	
38	<i>Pareronia</i>		<i>valeria</i> Fabricius	Common wanderer	<i>Capparis zeylanica</i>	Pf, Gf	
39	<i>Belenois</i>		<i>aurota</i> Fabricius	Indian Pioneer	<i>Maerua oblongifolia</i>	Gf, Pf, Sf, Vf, Rf	
40	<i>Leptosia</i>	<i>nina</i> Fabricius	Psyche butterfly	<i>Capparis zeylanica</i>	Rf, Pf, Sf		
41	Lycaenidae	<i>Zizeeria</i>	<i>karsandra</i> Moore	Dark Grass Blue	<i>Amaranthus spinosus</i>	Rf, Pf, Sf	
42		<i>Zizula</i>	<i>hylax</i> Fabricius	Tiny Grass Blue	<i>Lantana camara</i>	Pf, Gf	
43		<i>Leptotus</i>	<i>plinius</i> Fabricius	Zebra Blue	<i>Indigofera suffruticosa</i>	Rf, Vf, Sf	
44		<i>Catochrysops</i>	<i>strabo</i> Fabricius	Forget- me- not	<i>Pongamia pinnata</i>	Gf, Pf, Sf, Vf, Rf	
45		Chilades	<i>putli</i> Freyer	Small Grass Jewel	<i>Heliotropium indicum</i>	Vf, Rf	
46			<i>lajus</i> Stoll	Lime Blue	<i>Citrus limetta</i>	Pf, Gf	
47			<i>pandava</i> Horsfield	Plains Cupid	<i>Cycas circinalis</i>	Gf, Pf, Sf, Vf, Rf	
48		<i>Celastrina</i>	<i>lavendularis</i> Moore	Plain Hedge Blue	<i>Ziziphus jujuba</i>	Vf, Rf	
49		<i>Prosotas</i>	<i>dubiosa</i> Semper	Tailless Line Blue	<i>Mimosa pudica</i>	Pf, Gf	
50		<i>Euchrysops</i>	<i>cnejus</i> Fabricius	Gram Blue	Leguminous plants	Pf, Gf	
51		<i>Pseudozizeeria</i>	<i>maha</i> Kollar	Pale Grass Blue	Leguminous plants	Pf, Gf	
52	<i>Zizina</i>	<i>indica</i> Fabricius	Lesser Grass Blue	<i>Mimosa pudica</i>	Rf, Pf, Sf		
53	<i>Lampides</i>	<i>boeticus</i> Linnaeus	Pea blue	<i>Pisum sativa</i>	Vf, Rf		
54	<i>Castalius</i>	<i>rosimon</i> Fabricius	Common Pierrot	<i>Ziziphus jujuba</i>	Pf, Gf		
55	Hesperiidae	<i>Suastrus</i>	<i>gremius</i> Fabricius	Oriental Palm Bob	Leguminous plants	Pf, Gf	
56		<i>Hasora</i>	<i>chromus</i> Cramer	Common Banded Awl	Leguminous plants	Pf, Gf	
57		<i>Parnara</i>	<i>bada</i> Moore	Ceylon Swift	Leguminous plants	Vf, Rf	
58		<i>Borbo</i>	<i>cinnara</i> Wallace	Rice Swift	<i>Oryza sativa</i>	Gf, Pf, Sf, Vf, Rf	
59		<i>Potanthus</i>	<i>pseudomaesa</i> Moore	Common Dart	Leguminous plants	Pf, Gf	
60		<i>Udaspes</i>	<i>folus</i> Cramer	Grass Demon	<i>Pisum sativa</i>	Pf, Gf	

Note: Rf- Rice field, Vf- Vegetable field, Sf- Sugarcane field, Gf- Groundnut field, Pf- Pulse field.

Table 2. Number of species in different agricultural fields.

Family	Number of Species				
	Pulses Field	Rice Field	Vegetable Field	Groundnut Field	Sugarcane Field
Papilionidae	5	7	6	5	7
Nymphalidae	11	17	18	16	15
Lycaenidae	14	15	13	15	12
Hesperiidae	5	6	6	5	4
Pieridae	14	15	13	11	15
Total	49	60	59	52	53

Table 3. Diversity indices of butterflies in different agricultural fields

Indices	Pulses Field	Rice Field	Vegetable Field	Groundnut Field	Sugarcane Field
Species richness S	49	60	59	52	53
Species diversity H'	1.51	1.53	1.5	1.5	1.51
Species evenness E	0.38	0.37	0.36	0.37	0.38

The diversity index and evenness was calculated and furnished in the Table 3. The Shannon Wiener diversity index indicated the maximum in rice field (1.53) followed by pulses field and sugarcane field with 1.51, vegetable field and groundnut field with 1.50. The highest species evenness was shown in pulses field, sugarcane field with 0.38, followed by rice field and groundnut field with 0.37. The least evenness was shown in vegetable field with 0.36. The maximum number of species and individuals were found in rice field where the available of host plant is more and weeding also occur in less than other fields, whereas groundnut field and sugarcane field show less butterfly diversity because of less structural complexity and flowering plants. Each habitat has specific set of microhabitat for a species. Butterflies are depends on the different agricultural fields, due to the urbanization, these animals are under risk. Their diversity signs a good health of agricultural fields. Besides host plants, butterflies also requires specific eco- climatic conditions. Temperature ranging from 24-26°C and 85-95% relative humidity are suited for most butterflies. The maximum temperature was one of the most critical factors for insect's development and activities. The development of insect also stops at a definite low temperature.

Acknowledgements

The first and second authors are grateful to The

Principal, Nehru Memorial College and Head, Department of Zoology, Nehru Memorial College for their encouragement and support. Third and fourth authors are thankful to Dr Kailash Chandra, Director, Zoological Survey of India, Kolkata for providing facilities.

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