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Diversity of Butterfly Species in Selected Sites of Dindigul, Tamil Nadu

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ABSTRACT

Butterflies are the most beautiful insects on the earth and are recognized for their splendour, attractiveness and graceful flight. They are good pollinators impacting good amount of benefits to humankind and ecosystem. Considering the importance of this species, the diversity of butterfly fauna in Dindigul, Tamil Nadu was documented. The study was carried out in three different study areas of different ecosystems at Dindigul. Field observation was carried out between September 2020 to March 2021. The study revealed a total of 40 species of butterflies belonging to 29 genera, grouped under four families and 9 sub families were recorded. Some species namely *Danaus chrysippus*, *Acraea violae*, *Catopsilia pomona*, *Euploea core*, *Pachliopta aristolochiae*, *Papilio polymnestor*, *Appias albino* and *Zizula hylax* were observed regularly and very common (VC) in occurrence. Likewise, 6 species *Euploea klugii*, *Phalanta phalantha*, *Vaenessa cardui*, *Colotis danae*, *Chilades lajus* and *Spindasis vulvanus* were observed as rare occurrence species (RO). The percentage of occurrence was found to be high in the month of November, December and January on par with plant productivity and flowers bloom. The distribution might also be associated with specialties in the floral composition of plants in a particular habitat. Many of the butterfly species are strictly seasonal with less population and they are good indicators in terms of anthropogenic disturbance, poor vegetation and habitat degradation.

Key words: Butterflies, Species, diversity, Occurrence, Habitat, Vegetation

Biodiversity is the variety of life describing the number and variability in relation to ecosystem in which they occur. Insects comprise more than the world's known animal species [1] of which the second largest and more diverse order is the Lepidoptera of class Insecta [2]. Butterflies are one of the most amazing and magnificent elements of bio-diversity. They are most beautiful and attractive than most other insects and have fascinated human imagination and creativity. Their landing with graceful take off give pleasure to everyone [3]. Compared to other groups of insects, their appealing-coloured body with beautiful wings and eyespots have attracted biologists and scientists to carry on research and study on its diversity. In India there are about 1500 butterfly species which is about 9% of the total butterfly species of the world. Out of these about 500 species are reported from the western Himalayan region. They are taxonomically well studied group, which have received a reasonable amount of attention throughout the world [4].

Butterflies can be used as surrogate to assess the conservation threat to the biodiversity. The population of butterflies in a particular area reflects the luxuriant plant growth with healthy environment. A number of flowering plants and fruits depend on this species for reproduction and propagation. Besides being good pollinators, butterflies extend their role as pests, predators and weed killers too. These species are highly sensitive to habitat disturbances which are used as an indicator of environmental quality [5]. Butterfly community assembly and the factors which influence it, have long been a topic of interest to ecologists and conservationists [6]. In Tamil Nadu, the butterfly fauna have been studied in few areas. Since no biodiversity study was carried out in Dindigul adjoining areas, I preferred to carry out a survey on butterfly in Dindigul. The present investigation reveals the abundance of butterfly, its diversity, taxonomy and seasonal richness in the study areas of varied vegetative growth.

MATERIALS AND METHODS

The Dindigul district consists of 7 blocks and two blocks are noticed as driest parts. The average annual rainfall over the district varies from about 700 mm to about 1600 mm. The location is situated at 10.35°N latitude and 77.95°E longitude with an average elevation of 265m (869

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ft). The majority of the villages in the district are rain fed with less than 40 percent of net sown area. It spreads through the biologically diverse and productive habitat of native flora, fauna and aesthetically blended with introduced vegetation. The study area is predominantly covered by agriculture land, crop land, grass land, home garden, orchards, farms, hills, floral garden and vegetable garden etc.

The study on the biodiversity of butterflies was carried out in three different study areas of Kuttiyapatty, Ponnimandurai, Kambiliampatty of different ecosystems at Dindigul, Tamil Nadu. The area under study includes cultivated crops viz., rice, black gram, cotton, sugarcane, vegetables, flowers and fruiting trees besides weeds. Field observation was recorded during the periods between September 2020 to March 2021 in the various sampling areas. Photographic documentation was done.

Monitoring and recording

In order to evaluate diversity and species richness, regular monitoring of the butterflies was carried out by making transect counts and recorded their number for the entire study period. Modification of the line transect count as per [7] was used to determine butterfly richness and abundance. The transect in each habitat was slowly traversed at a uniform pace for 30 min at each habitats from 6:00 to 10:30am during good weather period free of heavy rain or strong winds. This timing was found ideal in the area based on preliminary counts done in different times of the day revealed that the maximum butterfly activity was noticed during that time. Butterfly species were recorded around a radius of five meter from the observer covering either side, above and front. A visual survey was done during each sampling period and photographic documentation was done using canon camera. Some species which were difficult to identify were caught by hand net and released after identification.

In subsequent observation, the repeated collection of same specimen was avoided. The butterflies were identified based on the wing structure, antenna, eyespot, colouration

with the help of standard identification keys [8]. The information of genera and species composition species richness and relative abundance were tabulated under different categories such as Very Common (VC), Common Occurrence (CO), Less Common (LC), and Rare Occurrence (RO). Simpson's indices [9] measure the diversity of the species recorded. It has been measured by the formula:

$$D = 1 - (\sum n(n-1) / N(N-1))$$

Where, n = the total number of butterflies of a particular species

N= the total number of butterflies of all species

From D value, 1-D and 1/D values were calculated

RESULTS AND DISCUSSION

Butterflies are the excellent choice in terms of indicator organisms for biodiversity studies. They can be used as surrogate to assess the conservation threat to the biodiversity and they are amongst the better studied groups of Lepidoptera. (Table 1) depicted the recorded butterfly diversity in the various sampling spots observed. The survey revealed the recorded data information on rarity and commonness of species in a community. A total of 40 species of butterfly belonging to 4 families were registered. Out of the 40 species recorded 16 species *Acraea violae*, *Danaus chrysippus*, *Euploea core*, *Hypolimnas misippus*, *Junonia almana*, *Junonia iphita*, *Melanitis leda*, *Pachliopta aristolochiae*, *Papilio polymnestor*, *Papilio polytes*, *Appias albino*, *Eurema blanda*, *Belenois aurota*, *Colotis etrida*, *Zizula hylax* and *Jamides celeno* (Plate 1-2) were found to occur frequently and they were grouped under the category very common (VC). They are almost everywhere, attractive frequently observed and easily identified in the field with the help of field guides [10]. Likewise, 6 species *Euploea klugii*, *Phalanta phalantha*, *Vaenessa cardui*, *Colotis danae*, *Chilades lajus* and *Spindasis vulvanus* were recorded as rare occurrence (RO) individuals. Diversity index provides more information about community composition of species within their ecological niches [11].



Euploea klugii



Danaus chrysippus



Euploea core



Neptis hylax



Junonia lemonias



Melanitis leda



Junonia iphita



Danaus plexippus

*Orsotriaena medus**Phalanta phalantha**Junonia almanac**Cethosia nietneri**Acraea violae**Tirumala septentrionis**Hypolimnas bolina**Parantica aglea*

Plate 1 Butterfly species of Nymphalidae Family observed in the study areas

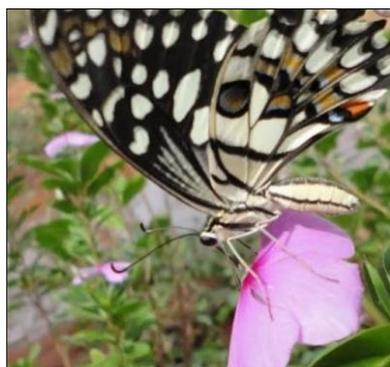
*Pachliopta aristolochiae**Papilio polymnestor**Pachliopta hector**Papilio demoleus**Graphium gamemnen**Papilio polytes*

Plate 2 Butterfly species of Papilionidae family observed in the study areas

Butterflies together with birds and vascular plants represent the most frequently monitored taxonomic groups [12] which are mostly due to their extreme popularity among amateur naturalists. (Table 2) revealed the diversity and taxonomy of the species observed during the course of investigation. A total of 40 butterfly species belonging to 28 genera classified under four families Nymphalidae (18), Papilionidae (6), Pieridae (10), and Lycaenidae (6) were recorded. The observed species were grouped in nine

subfamilies Coliadinae, Danaina, Heliconiinae, Nymphalinae, Papilioninae, Pierinae, Polymmatinae, Satyrinae and Theclinae.

Nymphalidae was the dominant family and Nymphalinae, Papilioninae were the species rich subfamilies in the present study (Table 3) and their predominance had been reported by earlier workers from Western Ghats [13]. The species of Nymphalidae are polyphagous strong active fliers which help them to search their food for survival. The

observations proved that diverse plant community will also create more heterogenous microhabitat conditions forming a suitable niche for species richness [14].

Table 1 Diversity of butterfly species recorded in different sampling spots

S. No.	Common Name	Scientific name	Biodiversity of species occurrence
Nymphalidae			
1	Tawny Coster	<i>Acraea violae</i>	VC
2	Plain Tiger	<i>Danaus chrysippus</i>	VC
3	Common Crow	<i>Euploea core</i>	VC
4	Danaid Eggfly	<i>Hypolimnas misippus</i>	VC
5	Peacock Pansy	<i>Junonia almana</i>	VC
6	Chocolate Pansy	<i>Junonia iphita</i>	VC
7	Common Evening Brown	<i>Melanitis leda</i>	VC
8	Striped Tiger	<i>Danaus plexippus</i>	CO
9	Lemon Pansy	<i>Junonia lemonias</i>	CO
10	Common Sailer	<i>Neptis hylas</i>	CO
11	Tamil Lacewing	<i>Cethosia nietneri</i>	CO
12	Medus Brown	<i>Orsotriaena medus</i>	LC
13	Glassy Tiger	<i>Parantica aglea</i>	LC
14	Great Eggfly	<i>Hypolimnas bolina</i>	LC
15	Dark Blue Tiger	<i>Tirumalaa septentrionis</i>	LC
16	King Crow	<i>Euploea klugii</i>	RO
17	Painted Lady	<i>Vaenessa cardui</i>	RO
18	Common Leopard	<i>Phalanta phalantha</i>	RO
Papilionidae			
1	Common Rose	<i>Pachliopta aristolochiae</i>	VC
2	Blue Mormon	<i>Papilio polymnestor</i>	VC
3	Common Mormon	<i>Papilio polytes</i>	VC
4	Crimson Rose	<i>Pachliopta hector</i>	CO
5	Common Mormon	<i>Papilio romulus</i>	CO
6	Tailed Joy	<i>Graphium agamemnon</i>	CO
Pieridae			
1	Common Albatross	<i>Appias albino</i>	VC
2	Three Spot Yellow Grass	<i>Eurema blanda</i>	VC
3	Pioneer	<i>Belenois aurota</i>	VC
4	Little Orange Tip	<i>Colotis etrida</i>	VC
5	Chocolate Albatross	<i>Appias lycinda</i>	LC
6	Lemon Emigrant	<i>Catopsilian pomona</i>	LC
7	Psyche	<i>Leptosia nina</i>	CO
8	Mottled Emigrant	<i>Catopsilian pyranthe</i>	CO
9	Common Gull	<i>Cepora nerissa</i>	CO
10	Crimson Tip	<i>Colotis danae</i>	RO
Lycaenidae			
1	Tiny Grass Blue	<i>Zizula hylax</i>	VC
2	Common Cerulean	<i>Jamides celeno</i>	VC
3	Tailess Line Blue	<i>Prosotas dubiosa</i>	CO
4	Pale Grass Blue	<i>Pseudozizeeria maha</i>	CO
5	Lime Blue	<i>Chilades lajus</i>	RO
6	Common Silverline	<i>Spindasis vulcanus</i>	RO

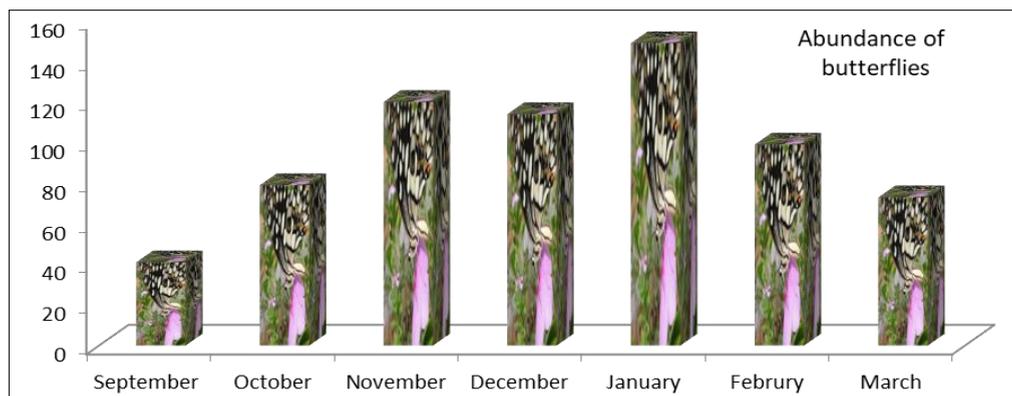


Fig 1 Total number of butterfly population registered during the sampling periods

Table 2 Taxonomy of the butterfly species recorded during observation

S. No.	Family	Sub Family	Genus	Species
1	Pieridae	Coliadinae	Catopsilian	Catopsilian Pomona
2		Coliadinae	Eurema	Eurema blanda
3		Coliadinae	Catopsilian	Catopsilia pyranthe
4	Nymphalidae	Danainae	Danaus	Danaus chrysippus
5		Danainae	Danaus	Danaus plexippus
6		Danainae	Euploea	Euploea core
7		Danainae	Euploea	Euploea klugii
8		Danainae	Parantica	Parantica aglea
9		Danainae	Tirumala	Tirumala septentrionis
10	Nymphalidae	Heliconiinae	Acraea	Acraea violae
11		Heliconiinae	Phalanta	Phalanta phalantha
12		Heliconiinae	Cethosia	Cethosia nietneri
13	Nymphalidae	Nymphalinae	Hypolimnas	Hypolimnas misippus
14		Nymphalinae	Hypolimnas	Hypolimnas bolina
15		Nymphalinae	Junonia	Junonia almanac
16		Nymphalinae	Junonia	Junonia iphita
17		Nymphalinae	Junonia	Junonia lemonias
18		Nymphalinae	Neptis	Neptis hylas
19		Nymphalinae	Vaenessa	Vaenessa cardui
20	Papilionidae	Papilioninae	Pachliopta	Pachliopta aristolochiae
21		Papilioninae	Pachliopta	Pachliopta hector
22		Papilioninae	Papilio	Papilio demoleus
23		Papilioninae	Papilio	Papilio polymnestor
24		Papilioninae	Papilio	Papilio polytes romulus
25		Papilioninae	Graphium	Graphium agamemnen
26	Pieridae	Pierinae	Appias	Appias albina
27		Pierinae	Appias	Appias lycida
28		Pierinae	Colotis	Colotis danae
29		Pierinae	Leptosia	Leptosia nina
30		Pierinae	Belenois	Belenois aurota
31		Pierinae	Cepora	Cepora nerissa
32		Pierinae	Colotis	Colotis etrida
33	Lycaenidae	Polymmatinae	Zizula	Zizula hylax
34		Polymmatinae	Prosotas	Prosotas dubiosa
35		Polymmatinae	Chilades	Chilades lajus
36		Polymmatinae	Jamides	Jamides celerio
37		Polymmatinae	Pseudozize	Pseudozizeeria maha
38	Nymphalidae	Satyrinae	Melanitis	Melanitis leda
39		Satyrinae	Orsotriaena	Orsotriaena medus
40	Lycaenidae	Theclinae	Spinndasis	Spindasis valcanus

Table 3 Abundance of butterfly occurrence during the study period

Family	Total No. of genus	Abundance of genus (%)	Total No. of species	Abundance of species (%)	Species occurrence in composition			
					Very common	Common occurrence	Less occurrence	Rare occurrence
Nymphalidae	13	45	18	45	7	4	4	3
Papilionidae	3	10	6	15	3	2	1	0
Pieridae	7	24	10	25	4	3	2	1
Lycaenidae	6	21	6	15	2	2	1	1
Total	29	100	40	100	16	11	8	5

Table 4 Simpson biodiversity index calculated for abundance of butterfly species

Family	$D = 1 - \frac{(\sum n(n-1))}{N(N-1)}$	Simpson's index (1-D)	Simpson's index (1/D)
Nymphalidae	0.708	0.292	1.412
Papilionidae	0.912	0.088	1.096
Pieridae	0.826	0.174	1.210
Lycaenidae	0.937	0.063	1.067

D = Diversity index

Butterflies are sensitive to the changes in the habitat and climate, which influence their distribution and abundance. Diversity and richness of butterfly population recorded in different months from September 2020 to March 2021 (Fig 1). The richness was found to be maximum during the months of January, November followed by December 2021. During the present study, the numbers of the butterflies were peaked during post monsoon season of January [15]. However, our findings showed a peak density in November, December and January in line with findings of [16]. Our result showed that the study area was supportive to a number of varied diverse butterfly population. Urban development and loss of prime habitat was the major threat to all wildlife, including butterflies and is expected to have a deleterious impact on butterfly populations.

Simpson's index of diversity (1-D) was maximum for Nymphalidae and minimum for Lycaenidae (Table 4). With reference to Simpson's reciprocal index (1/D), the results followed the same pattern. The higher the value, the greater would be the diversity. Simpson's index is of limited value in conservation biology if an area has rare species. The survival of a large number of endemic species in a habitat warrants for adoption of appropriate conservation strategies in order to safeguard its rich genetic diversity.

CONCLUSION

From the afore mentioned investigation it could be concluded that the diversity study revealed a total of 40 species of butterflies belonging to 29 genera categorized under 9 sub families which further grouped under four families showed their distribution. Species belonging to the family Nymphalidae were the most dominant (45%) followed by Pieridae (25%), Papilionidae (15%) and Lycaenidae (15%). Nearly 50% of species were found very common with frequent sightings and about 30% were found to be abundant while 20% of species were found rare with infrequent sighting. The percentage of occurrence was found to be high in the month of December, January on par with productivity and blossom due to rainfall. The distributions of butterflies are exclusively dependent upon the availability of their food plants. There is a direct relationship between vegetation diversity and butterfly diversity as butterflies are good pollinators. Sudden occurrence of a biotic stress may lead to substantial decline in species population and changes in butterfly diversity can be used as an indicator of environmental degradation. We need to support pollinators by planting native gardens and plants that attract butterflies thereby protecting them from extinction.

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