Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(5): 1389-1400

Received: 15-07-2017
Accepted: 16-08-2017

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Butterfly diversity at the agricultural college campus, Killikulam, Tami Nadu, India

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Abstract
An Investigation was carried out to study the diversity of the butterfly fauna at the Agricultural College Campus, Killikulam. A total of 721 individuals of butterflies belonging to 43 genera and 60 species within five families were recorded. Nymphalidae was the dominant family contributing 325 individuals followed by Pieridae (n=226), Lycaenidae (n=118), Papilionidae (n=31) and Hesperiidae with 21 individuals being the least. Lycaenidae was the dominant family with 14 genera (32.56%), followed by Nymphalidae with 11 genera (25.58%), whereas, in case of species composition, Nymphalidae was the most dominant family with 19 species, followed by Lycaenidae (16 species). Out of 60 butterfly species recorded, 20 are common, 8 are fairly common, 18 are un common and 14 are rare to the study area. *Eurema brigitta* Cramer (Family: Pieridae) was the most dominant species with 98 individuals followed by *Eurema hecabe* Linnaeus (n=67) (Family: Pieridae) and *Danaus chrysippus* Linnaeus (n=65) (Family: Nymphalidae). The abundance of butterflies fluctuated widely over the months and November 2014 was the most active month (n=200) and the butterflies were in less proportion during February 2015 (n=53). Species diversity was found highest in the family Nymphalidae (2.50), while as it was lowest in Hesperiidae (1.50). All the values obtained from the diversity indices showed that the whole area is rich in butterfly abundance.

Keywords: Butterfly diversity, Agri. College Campus, Killikulam, Tamil Nadu

1. Introduction
Insect fauna are the extremely important component of the bio-indicators of the World [10, 18]. 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. They are valuable pollinators in the local environment and help more than 50 economically important crops in pollination [8]. Butterflies also play a vital role in the food chain components of birds, reptiles, spiders and predatory insects. They are the sensitive insects which react quickly to any kind of disturbances like changes in microclimate, temperature, solar radiation and the availability of host plants for oviposition and larval development [38]. There are number of scientific records of butterflies in various places of India [23, 17, 25, 28, 12, 41]. Western Ghats is considered as one of the most diversified areas containing a wide variety of species of butterflies. So far, about1501 butterfly species have been recorded from India [21], 350 species are from Peninsular India, 331 species from the Western Ghats and 313 species of butterflies from South India [14]. The butterfly fauna is very rich in the Southern part of Peninsular India due to the availability of diverse habitats, a wide range of altitudinal gradients and associated microclimate regimes [21].
Diversity indices are a measure of a way in which individuals in an ecological community are distributed among the species [31]. The measure of the diversity of the fauna will represent the number and the available niche present in the environment. If niche heterogeneity is great, it will support a more diverse fauna and thus will result in a higher co-efficient or index of diversity in that area or habitat [16]. Many species are becoming very rare and some are on the verge of extinction due to various reasons such as, increased urban features including roads and buildings, habitat destruction, fire, use of pesticides and illegal collection for trade. There is no report on the diversity of butterfly species at the Agricultural College Campus, Killikulam. The present study was the first attempt to study the butterfly diversity and distribution from the selected study area. Keeping this in view, the present study was conducted to study the diversity, abundance and distribution of butterfly fauna at the Agricultural College Campus, Killikulam.

2. Materials and Methods

2.1 Study Area

The study area Agricultural College Campus is located in the foothills of Vallanadu Blakbuck Sancturay about 35 km from Thoothukudi, Tamil Nadu, Southern India with an area of about 476.61 ha. It is situated at an altitude of 40 m above MSL and lies between 8^0 46' N latitude and 77^0 42' E longitude. The area receives good rainfall during the north-east monsoon (October - December). The mean annual rainfall of the area during the study period was 728 mm. The temperature ranges from minimum of 21.6 ^{0}C - 26.8 ^{0}C and maximum 30.1 ^{0}C - 37.9 ^{0}C with a relative humidity of 74 - 91 %. The study area is predominantly covered by Agricultural, Horticultural, Agri-horticultural and Silvicultural ecosystems.

2.2 Data collection

Field observations were recorded during the period between September 2014 and February 2015 at the Agricultural College Campus, Killikulam. For species identification, the adult butterflies were carefully collected, killed, preserved and stored in insect storage boxes using naphthalene as repellent. In subsequent observations, the repeated collection of same specimen was avoided to the extent possible and photographic documentations were done. The specimens were identified with the help of standard identification keys [21, 1, 19, 37, 12, 41]. The information on genera and species composition, species richness and relative abundance were tabulated. Butterflies observed were categorized into groups based on their relative numbers as, Common > 9 - 10, Fairly Common 6 - 8, Uncommon 3 - 5, Rare 0 - 2 [6].

The density pattern was calculated by the formula

$$D = \frac{1}{L} \times 100$$

Where, D is the density, I is number of specimens of each species, L is the number of all specimens [32].

2.3 tatistical analysis

To calculate the diversity of the butterflies ten indices were used namely Shannon - Wiener Diversity index (H) [33] along with its equitability component, Simpson's Index (D) [36], Simpson's Index of Diversity (1-D), Simpson's Reciprocal Index (1/D), Berger - Parker Dominance Index [5], Margalef Richness Index (d) [24], Menhinick Index [26], Buzas and Gibson's Index [9] by using the software 'Biodiversity Calculator' (http://www.alyoung.com/labs/biodiversity_calculator.html) and Fisher's alpha index (S) [13] by http://groundvegetationdb-web.com/ground_veg/home/diversity_index.

3. Results and Discussion

A total of 721 individuals of butterflies belonging to 43 genera and 60 species within five families were recorded during the study period (Table 1). The family Nymphalidae was the dominant contributing 325 individuals followed by Pieridae (n=226), Lycaenidae (n=118), Papilionidae (n=31) and Hesperiidae with 21 individuals being the least (Table 2). Members of the family Nymphalidae were always dominant in the tropical region because most of them are polyphagous in nature, consequently they were able to survive in all the habitats. Additionally, many species of this family are strong, active fliers that might help them in searching for resources in large areas [11, 20]. A high proportion of nymphalid butterfly species indicated high host plant richness [7].

Among the five families, Lycaenidae was the dominant family with 14 genera (32.56%), followed by Nymphalidae with 11 genera (25.58%), whereas, in case of species composition, Nymphalidae was the most dominant family with 19 species, followed by Lycaenidae (16 species) (Table 2) (Fig. 2). The predominance of Nymphalidae over other butterfly groups in Western Ghats has earlier been reported by many workers [22, 11, 27, 20, 29]. The attributed reasons for the increase in butterfly diversity are favourable climatic conditions, availability of more number of host plants and vegetation cover of herbs, shrubs and trees for nectaring of butterflies [40]. Out of 60 butterfly species recorded, 20 are common (33.33%), 8 are fairly common (13.33), 18 are un common (30.00%) and 14 are rare ones (23.33%) to the study area (Table 3) (Fig. 3).

The documented species and their density pattern of butterflies recorded during the study period were shown in Table 4. The relative abundance of dominant species, sub-dominant species and satellite species seems to be more or less similar. *Eurema brigitta* Cramer (Family: Pieridae) was recorded as the most abundant species which represented 13.59 per cent of the total recorded individuals (n=98) of the butterflies. *Eurema hecabe* Linnaeus (Family: Pieridae) was the second most dominant species (n=67) constituting 9.29 per cent of the total butterflies collected. *Danaus chrysippus* Linnaeus (9.02%) (Family: Nymphalidae) was the third most dominant species (n=65) of the total butterflies collected, followed by *Acraea violae* Fabricius (7.49%) (Family: Nymphalidae), *Melanitis leda* Linnaeus (6.38%) (Family: Nymphalidae), *Euchrysops cnejus* Fabricius (4.44%) (Family: Lycaenidae), *Junonia lemonias* Linnaeus (3.88%) (Family: Nymphalidae), *Leptotes plinius* Fabricius (3.19%) (Family: Lycaenidae) and *Tirumala limniace* Cramer (Family: Nymphalidae) (2.77) (Table 4).

The abundance of butterflies fluctuated widely over the months and November month was the most active month (n=200) and the butterflies were in less proportion during February 2015 (n=53) (Table 5) (Fig. 4 & 5). The highest peak in the monsoon month November was due to the high abundance of the members of Nymphalidae representing a higher number of individuals (n=100) followed by Pieridae (n=79). In the present study, more number of adult butterflies were observed during the periods of North East Monsoon (NEM). In Southern plains, the ideal breeding season for most of the butterflies is NEM. This is due to the fact that during these seasons, Tamil Nadu receives sufficient rain and prevalence of conducive temperature. These two factors are vital to both butterflies as well as larval host plants. This is in accordance with the report of [30], the rainfall condition has a greater positive influence on the butterfly numbers and species distribution in a locality. Maximum numbers of butterflies were recorded during the rainy season when the humidity and temperature were favourable for the growth and development of butterflies [4]. Butterfly population rapidly declined during the period from March to June. Usually in Southern India, these months are very hot and dry. Moreover, factors such as scarcity of water, poor nectar butterfly pasture and dry vegetation results in less butterfly abundance and lower survival ability of most species. Seasonal fluctuations are often influenced by environmental factors including temperature, photoperiod, rainfall, humidity, variation in the availability of food resources and vegetation cover such as herbs and shrubs [2, 3, 34, 39].

3.1 Diversity indices of butterflies

The calculated values of different diversity indices are in Table 6. The first index used in the present study is Shannon - Wiener Diversity index (H). Species diversity was found highest in the family Nymphalidae (2.50), while as it was lowest in Hesperiidae (1.50). Shannon's Equitability component showed that the butterfly fauna were well distributed in all the families. The Simpson Index (D) and Shannon's Equitability Index (J) indices revealed that the individuals among species were not evenly distributed during the study period indicating that some species were more abundant than the others. The abundance of the individuals of a species at any given point on a temporal scale is again dependent on various biotic and abiotic environmental factors. The Simpson's Index of Diversity (1-D) was found highest in Nymphalidae (0.89) followed by Lycaenidae (0.85) and lowest in Pieridae (0.72). The calculated value of Berger - Parker Dominance Index ranged from 0.20 (Nymphalidae) to 0.43 (Pieridae and Hesperiidae). Nymphalidae and Lycaenidae had the highest species richness index of 3.10 while Papilionidae showed the lowest value with 1.50 Margalef Richness Index. The calculated value of Menhinick Index ranged from 0.86 (Pieridae) to 1.50 (Lycaenidae) and the Buzas and Gibson's Index ranged from 0.41 (Pieridae) to 0.81 (Papilionidae). The Fisher's alpha diversity indicated the following families in a decreasing order of diversity; Papilionidae (2.21), Hesperiidae (2.81), Pieridae (3.00), Nymphalidae (4.41) and Lycaenidae (4.99). All the values obtained from these indices showed that the whole area is rich in butterfly abundance.

Table 1: Species richness, composition and status of butterflies at the Agricultural College Campus, Killikulam, Tamil Nadu

Genus	Scientific Name	Common Name	Sep '14	Oct '14	Nov '14	Dec '14	Jan '15	Feb '15	Total	Status
Family: Nymphalidae										
Acraea	*Acraea violae* Fabricius	Tawny Coster	1	14	19	11	7	2	54	C
Ariadne	*Ariadne merione* Cramer	Common Castor	--	2	5	--	--	3	10	C
Byblia	*Byblia ilithyia* Drury	Joker	6	3	8	2	--	--	19	C
Danaus	*Danaus chrysippus* Linnaeus	Plain Tiger	35	11	3	1	2	13	65	C
	Danaus genutia Cramer	Striped Tiger	--	3	--	--	--	--	3	UC
Euploea	*Euploea core* Cramer	Common Indian Crow	--	3	6	--	--	1	10	C
Hypolimnas	*Hypolimnas bolina* Linnaeus	Great Eggfly	--	2	4	--	--	--	6	FC
	Hypolimnas misippus Linnaeus	Danaid Eggfly	--	4	4	1	1	--	10	C
Junonia	*Junonia almana* Linnaeus	Peacock Pansy	2	--	3	2	1	--	8	FC
	Junonia hierta Fabricius	Yellow Pansy	--	4	7	5	3	--	19	C
	Junonia iphita Cramer	Chocolate Pansy	--	--	1	1	--	--	2	R
	Junonia lemonias Linnaeus	Lemon Pansy	4	1	13	3	7	--	28	C
	Junonia orithya Linnaeus	Blue Pansy	--	1	7	1	--	--	9	C
Melanitis	*Melanitis leda* Linnaeus	Common Evening Brown	4	2	11	12	15	2	46	C
	Melanitis phedima Cramer	Dark Evening Brown	--	--	1	--	5	1	7	FC
Mycalesis	*Mycalesis perseus* Fabricius	Common Bush Brown	--	--	3	--	--	2	5	UC
Neptis	*Neptis hylas* Moore	Common Sailer	--	--	--	--	1	--	1	R
Tirumala	*Tirumala limniace* Cramer	Blue Tiger	1	13	3	--	1	2	20	C
	Tirumala septentrionis Butler	Dark Blue Tiger	--	1	2	--	--	--	3	UC
Sub Total (A)			**53**	**64**	**100**	**39**	**43**	**26**	**325**	
Family: Papilionidae										
Atrophaneura	*Atrophaneura hector* Linnaeus	Crimson Rose	1	8	1	--	--	1	11	C
	Atrophaneura aristolochiae Fabricius	Common Rose	--	--	1	--	1	--	2	R
Graphium	*Graphium agamemnon* Linnaeus	Tailed Jay	--	--	--	1	--	--	1	R
Papilio	*Papilio demoleus* Linnaeus	Lime Butterfly	1	4	2	--	--	--	7	FC
	Papilio polymnestor Cramer	Blue Mormon	--	--	--	--	5	--	5	UC
	Papilio polytes Linnaeus	Common Mormon	1	--	--	--	4	--	5	UC
Sub Total (C)			**3**	**12**	**4**	**1**	**10**	**1**	**31**	
Family: Pieridae										
Appias	*Appias libythea* Fabricius	Striped Albatross	1	--	1	--	--	--	2	R
Belenois	*Belenois aurota* Fabricius	Pioneer	--	--	1	--	--	--	1	R
Catopsilia	*Catopsilia pomona* Fabricius	Common Emigrant	1	5	--	--	--	--	6	FC
	Catopsilia pyranthe Linnaeus	Mottled Emigrant	10	6	1	--	--	--	17	C
Cepora	*Cepora nerissa* Fabricius	Common Gull	1	3	1	--	--	2	7	FC
Colotis	*Colotis danae* Fabricius	Crimson Tip	--	1	2	--	--	--	3	UC
	Colotis etrida Boisduval	Small Orange Tip	1	3	--	--	--	--	4	UC
	Colotis eucharis Fabricius	Plain Orange Tip	1	1	1	1	--	--	4	UC
Delias	*Delias eucharis* Drury	Common Jezebel	--	3	2	--	--	1	6	FC

Eurema	*Eurema brigitta* Cramer	Small Grass Yellow	10	14	51	19	2	2	98	C
	Eurema hecabe Linnaeus	Common Grass Yellow	25	3	17	7	13	2	67	C
Ixias	*Ixias marianne* Cramer	White Orange Tip	--	5	2	--	--	--	7	FC
Leptosia	*Leptosia nina* Fabricius	Psyche	--	--	--	2	--	2	4	UC
Sub Total (B)			50	44	79	29	15	9	226	
Family: Lycaenidae										
Azanus	*Azanus ubaldus* Stoll	Bright Babul Blue	1	1	--	--	--	--	2	R
Castalius	*Castalius rosimon* Fabricius	Common Pierrot	1	3	--	--	--	--	4	UC
Catochrysops	*Catochrysops strabo* Fabricius	Forget-Me-Not	1	--	--	3	1	--	5	UC
Chilades	*Chilades laius* Stoll	Lime Blue	--	--	2	1	--	--	3	UC
	Chilades pandava Horsfield	Plains Cupid	2	2	--	--	--	--	4	UC
Curetis	*Curetis thetis* Drury	Indian Sunbeam	--	--	1	--	--	--	1	R
Euchrysops	*Euchrysops cnejus* Fabricius	Gram Blue	18	8	3	2	--	1	32	C
Lampides	*Lampides boeticus* Linnaeus	Pea Blue	1	--	--	--	3	--	4	UC
Freyeria	*Freyeria trochylus* Freyer	Grass Jewel	--	1	5	3	--	4	13	C
Leptotes	*Leptotes plinius* Fabricius	Zebra Blue	1	1	--	6	3	12	23	C
Tarucus	*Tarucus indica* Evans	Pointed Pierrot	--	1	--	--	--	--	1	R
	Tarucus nara Kollar	Rounded Pierrot	--	1	--	2	--	--	3	UC
Pseudozizeeria	*Pseudozizeeria maha* Kollar	Pale Grass Blue	9	7	1	1	--	--	18	C
Zizeeria	*Zizeeria karsandra* Moore	Dark Grass Blue	--	--	--	1	--	--	1	R
Zizina	*Zizina otis* Fabricius	Lesser Grass Blue	--	1	1	--	1	--	3	UC
Zizula	*Zizula hylax* Fabricius	Tiny Grass Blue	--	--	1	--	--	--	1	R
Sub Total (D)			34	26	14	19	8	17	118	
Family: Hesperiidae										
Baoris	*Baoris farri* Moore	Paint Brush Swift	--	--	--	1	--	--	1	R
Erionota	*Erionota thrax* Linnaeus	Palm Redeye	--	--	--	1	3	--	4	UC
Pelopidas	*Pelopidas mathias* Fabricius	Small Branded Swift	7	1	--	--	1	--	9	C
Spialia	*Spialia galba* Fabricius	Indian Skipper	1	2	2	--	--	--	5	UC
Suastus	*Suastus gremius* Fabricius	Indian Palm Bob	--	--	1	--	--	--	1	R
Udaspes	*Udaspes folus* Cramer	Grass Demon	--	--	--	1	--	--	1	R
Sub Total (E)			8	3	3	3	4	--	21	
Sub Total (A+B+C+D+E) = Total			148	149	200	91	80	53	721	

C - Common; FC - Fairly Common; UC - Un Common; R – Rare

Table 2: Relative abundance of butterflies at the Agricultural College Campus, Killikulam

Family	Number of Genus	Number of Species	No. of individuals
Nymphalidae	11 (25.58%)	19 (31.66%)	325 (45.08%)
Papilionidae	3 (6.98%)	6 (10.00%)	31 (4.30%)
Pieridae	9 (20.93%)	13 (21.67%)	226 (31.35%)
Lycaenidae	14 (32.56%)	16 (26.67%)	118 (16.37%)
Hesperiidae	6 (13.95%)	6 (10.00%)	21 (2.91%)
Total	43 (100%)	60 (100%)	721 (100%)

Table 3: Species Composition, abundance and status of butterflies at the Agricultural College Campus, Killikulam

S. No.	Family	No. of species	Occurrence			
			Common	Fairly Common	Un Common	Rare
1.	Nymphalidae	19	11	3	3	2
2.	Papilionidae	6	1	1	2	2
3.	Pieridae	13	3	4	4	2
4.	Lycaenidae	16	4	0	7	5
5.	Hesperiidae	6	1	0	2	3
		60	20	8	18	14

Table 4: Density pattern of butterflies at the Agricultural College Campus, Killikulam

Species status	Family	Name of the species	Distribution of density pattern (%)
Dominant (> 5%)	Nymphalidae	*Acraea violae* Fabricius	7.49
		Danaus chrysippus Linnaeus	9.02
		Melanitis leda Linnaeus	6.38
	Pieridae	*Eurema brigitta* Cramer	13.59
		Eurema hecabe Linnaeus	9.29
Subdominant (1 - < 5%)	Nymphalidae	*Ariadne merione* Cramer	1.40
		Byblia ilithyia Drury	2.64
		Euploea core Cramer	1.40
		Hypolimnas misippus Linnaeus	1.40
		Junonia almana Linnaeus	1.11
		Junonia hierta Fabricius	2.64
		Junonia lemonias Linnaeus	3.88
		Junonia orithya Linnaeus	1.25
		Tirumala limniace Cramer	2.77
	Papilionidae	*Atrophaneura hector* Linnaeus	1.53
	Pieridae	*Catopsilia pyranthe* Linnaeus	2.36
	Lycaenidae	*Euchrysops cnejus* Fabricius	4.44
		Freyeria trochylus Freyer	1.80
		Leptotes plinius Fabricius	3.19
		Pseudozizeeria maha Kollar	2.50
	Hesperiidae	*Pelopidas mathias* Fabricius	1.25
Satellite (< 1%)	Nymphalidae	*Danaus genutia* Cramer	0.42
		Hypolimnas bolina Linnaeus	0.83
		Junonia iphita Cramer	0.28
		Melanitis phedima Cramer	0.97
		Mycalesis perseus Fabricius	0.69
		Neptis hylas Moore	0.14
		Tirumala septentrionis Butler	0.42
	Papilionidae	*Atrophaneura aristolochiae* Fabricius	0.28
		Graphium agamemnon Linnaeus	0.14
		Papilio demoleus Linnaeus	0.97
		Papilio polymnestor Cramer	0.69
		Papilio polytes Linnaeus	0.69
	Pieridae	*Appias libythea* Fabricius	0.28
		Belenois aurota Fabricius	0.14
		Catopsilia pomona Fabricius	0.83
		Cepora nerissa Fabricius	0.97
		Colotis danae Fabricius	0.83
		Colotis etrida Boisduval	0.42
		Colotis eucharis Fabricius	0.55
		Delias eucharis Drury	0.55
		Ixias marianne Cramer	0.97
		Leptosia nina Fabricius	0.55
	Lycaenidae	*Azanus ubaldus* Stoll	0.28
		Castalius rosimon Fabricius	0.55
		Catochrysops strabo Fabricius	0.69
		Chilades laius Stoll	0.42
		Chilades pandava Horsfield	0.55
		Curetis thetis Drury	0.14
		Lampides boeticus Linnaeus	0.55
		Tarucus indica Evans	0.14
		Tarucus nara Kollar	0.42
Satellite (< 1%)	Lycaenidae	*Zizeeria karsandra* Moore	0.14
		Zizina otis Fabricius	0.42
		Zizula hylax Fabricius	0.14
	Hesperridae	*Baoris farri* Moore	0.14
		Erionota thrax Linnaeus	0.55
		Spialia galba Fabricius	0.69
		Suastus gremius Fabricius	0.14
		Udaspes folus Cramer	0.14

Table 5: Month wise abundance of butterflies at the Agricultural College Campus, Killikulam

Family	Sep '14	Oct '14	Nov '14	Dec '14	Jan '15	Feb '15	Total
Nymphalidae	53	64	100	39	43	26	325
Papilionidae	03	12	04	01	10	01	31
Pieridae	50	44	79	29	15	09	226
Lycaenidae	34	26	14	19	08	17	118
Hesperiidae	08	03	03	03	04	00	21
Total	148	149	200	91	80	53	721

Table 6: Family wise diversity indices of different butterfly species at Agricultural College Campus, Killikulam

S. No.	Family	No. of Genus	No. of species	No. of individuals	Shannon - Wiener Diversity index (H)	Shannon's Equitability Index (J)	Simpson's Index (D)	Simpson's Index of Diversity (1-D)	Simpson's Reciprocal Index (1/D)	Berger - Parker Dominance Index	Margalef Richness Index (d)	Menhinick Index	Buzas and Gibson's Index	Fisher's Alpha Index (S)
1.	Nymphalidae	11	19	325	2.50	0.84	0.11	0.89	9.20	0.20	3.10	1.10	0.63	4.40
2.	Papilionidae	3	6	31	1.60	0.88	0.21	0.79	4.80	0.35	1.50	1.10	0.81	2.21
3.	Pieridae	9	13	226	1.70	0.65	0.28	0.72	3.50	0.43	2.20	0.86	0.41	3.00
4.	Lycaenidae	14	16	118	2.20	0.79	0.15	0.85	6.80	0.27	3.10	1.50	0.56	4.99
5.	Hesperiidae	6	6	21	1.50	0.81	0.25	0.75	4.00	0.43	1.60	1.30	0.71	2.81

Fig 1: Study Area - Map showing Agricultural College campus, Killikulam, Tamil Nadu

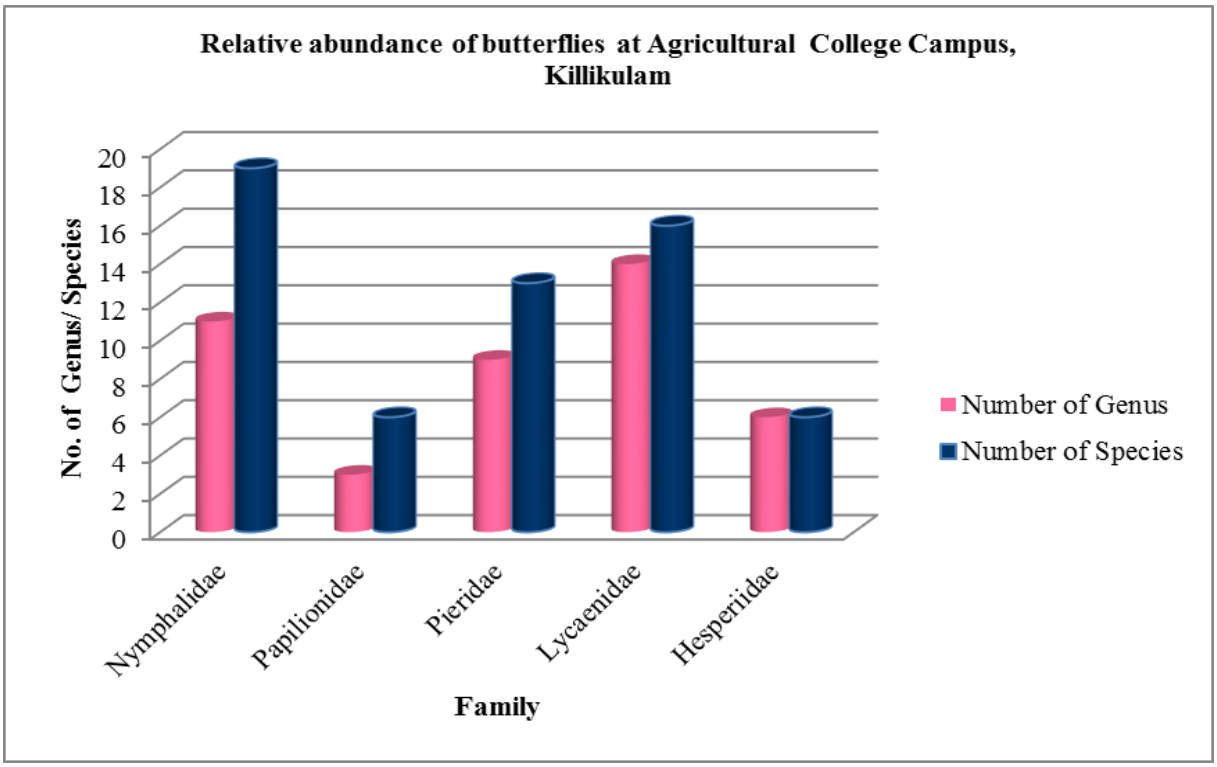


Fig 2: Relative abundance of butterflies at the Agricultural College Campus, Killikulam

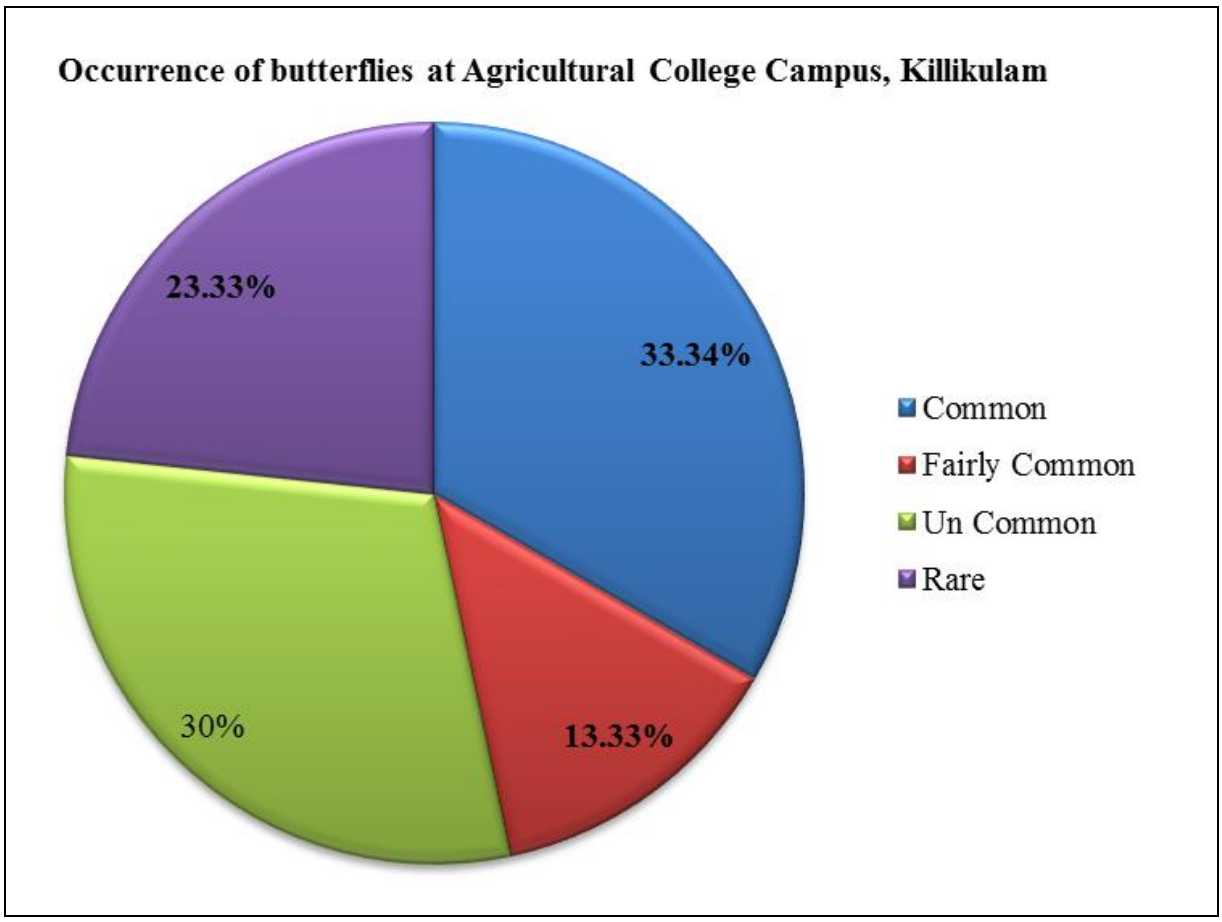


Fig 3: Occurrence of butterflies at the Agricultural College Campus, Killikulam

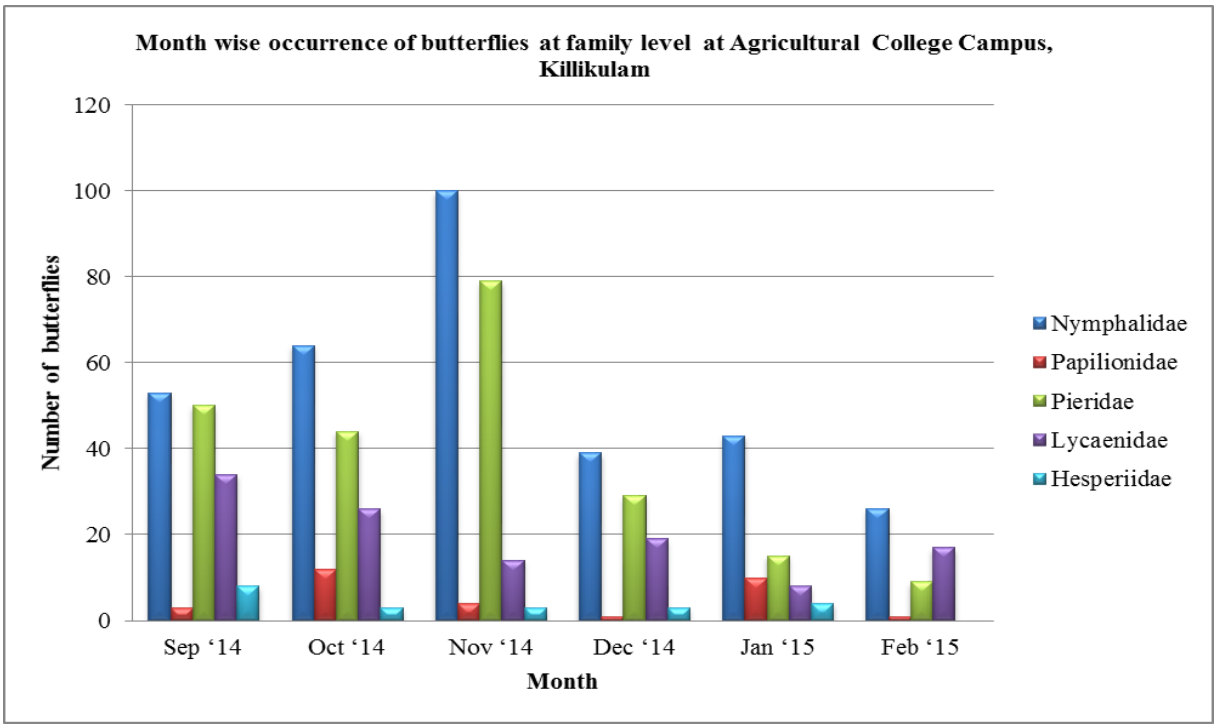


Fig 4: Month wise occurrence of butterflies at the Agricultural College Campus, Killikulam

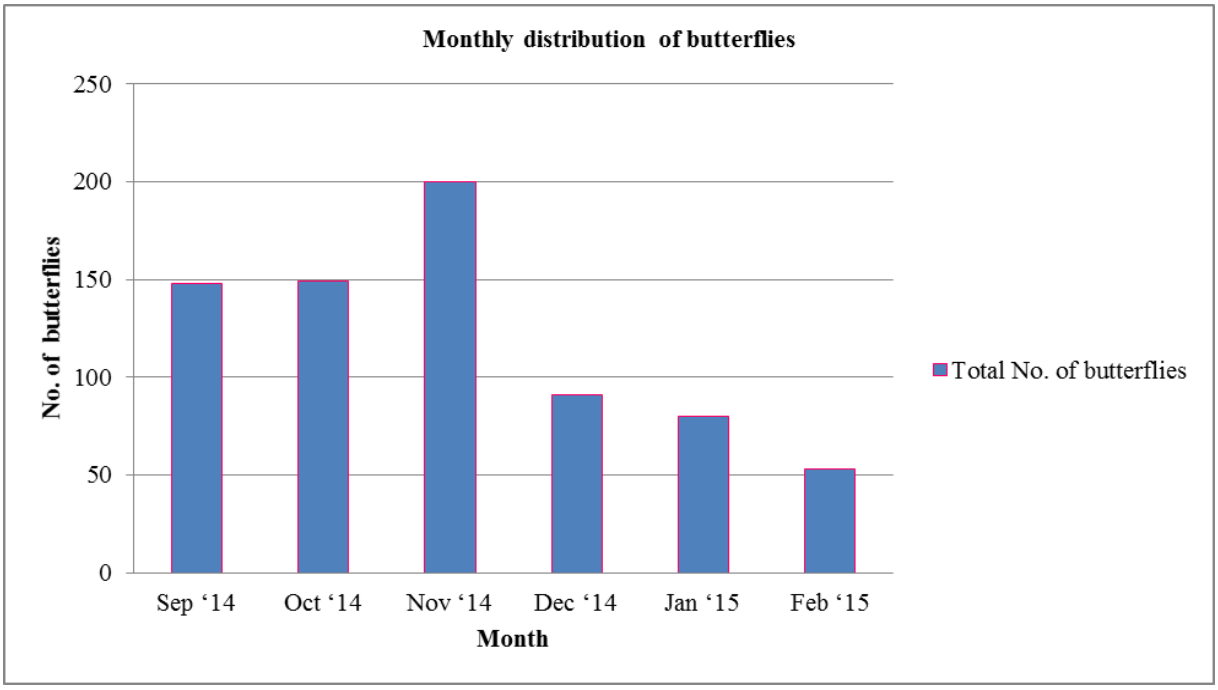
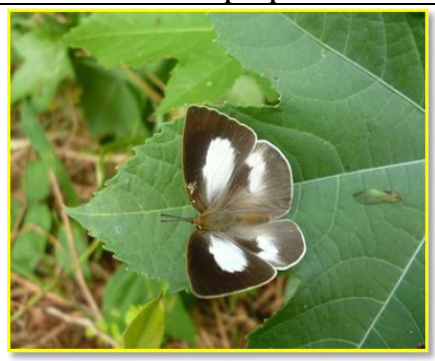


Fig 5: Monthly distribution of butterflies at the Agricultural College Campus, Killikulam

Family: Nymphalidae		**Order: Lepidoptera**
		
Peacock Pansy	Chocolate Pansy	Yellow Pansy

		
Lemon Pansy	Blue Pansy	Tawny Coster
		
Blue Tiger	Plain Tiger	Striped Tiger
		
Danaid Eggfly	Common Crow	Common Castor
		
Joker Butterfly	Bush Brown	Common Evening Brown
Family: Papilionidae		**Order: Lepidoptera**
		
Common Mormon	Citrus Butterfly	Common Rose

Family: Pieridae		**Order: Lepidoptera**
		
Mottled Emigrant	Small Grass Yellow	Common Gull
		
Plain Orange Tip	White Orange Tip	Psyche Butterfly
Family: Lycaenidae		**Order: Lepidoptera**
		
Common Pierrot	Rounded Pierrot	Indian Sun Beam
		
Common Silverline	Common Four Ring	Zebra Blue
		
Tiny Grass Blue	Lesser Grass Blue	Gram Blue

Family: Hesperiidae		Order: Lepidoptera
		
Small Branded Swift	Indian Skipper	Bright Orange Darter

4. Conclusion

The present study demonstrated that 43 genera and 60 species within five families were recorded. Nymphalidae was the most dominant family with 19 species, followed by Lycaenidae, Pieridae and least in both Papilionidae and Hesperiidae. Maximum butterfly species observed in the month of November 2014 and least in February 2015. All the values obtained from the diversity indices showed that the whole area is rich in butterfly abundance. The present study reveals that the study area provides favourable ecological conditions and habitat for butterflies. Although, the study area supports a good number of butterfly species but much has still to be explored. In addition, it is necessary to identify the rare butterfly species and conserve them by establishing butterfly parks and by creating awareness among school and college students. Establishment of butterfly gardens will help to maximize butterfly diversity and abundance in conserving species that might otherwise become rare or even disappear. This suggestion was made by several workers in different study areas [15, 35].

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