

# DIVERSITY OF BUTTERFLIES FROM THE ST.XAVIER'S COLLEGE (AUTONOMOUS), PALAYAMKOTTAI, TIRUNELVELI, TAMILNADU.

T. Elizabeth Thangamani Sunitha ,Andrew Shelton Babu.A , Balagangatharan.P, Rohini.R , Jeslin.J

St. Xavier's college (Autonomous), Palayamkottai, Tirunelveli, Tamilnadu, South India

**Abstract:** Butterflies are the most tantalizing, beautiful creatures and are suitable for diversity studies as the taxonomy, geographic distribution and status of many species are relatively known. Besides being good pollinators, butterflies extend their role as pests, predators and weed killers. In the present study, the butterfly diversity of St. Xavier's college (Autonomous), Palayamkottai was studied. The atlas of the butterflies, the diversity indices, Shannon Weiner index, Simpsons dominance, Species evenness and species richness were calculated. 37 species of butterflies belongs to 5 family were observed during the present study. Butterflies belongs to the order Nymphalidae were predominantly distributed in the study area during the study period from December to March. The present study shows the species dominance of butterflies belongs to Nymphalidae. Variation in the diversity indices, Shannon-Weiner and Evenness index may be due to the loss of habitat in the study area due to habitat alteration and anthropogenic disturbance by the people in the study area.

**Keywords:** Tantalizing, Habitat, Species richness, Dominance, Diversity indices.

## **Introduction:**

Butterflies (Lepidoptera: Rhopalocera) are one of the most plant dependent group of insects when compared to the other megadiverse insect groups. (Kristensen *et al.*, 1999) Butterflies are beneficial as they serve as pollinators and indicators of environmental quality and are appreciated for their aesthetic value (Chakravarthy *et al.*, 1997).

The holometabolous life history of butterflies reveals that Lepidoptera are exposed to a wide range of environmental influences and are highly sensitive to the climatic changes in temperature, humidity and light levels (Erhardt 1985; Warren *et al.*, 2001). Nearly 1500 butterflies (Smetacek 1992; Gay 1992) are identified from the Indian sub-continent, constituting 8.33% of the 18,000 known species of the world; most of the Indian butterflies are reported from the Himalayas and from the Western Ghats (Larsen 1987a; 1988). The population status of butterflies in any area would help us to understand the status of ecosystem as they are good indicator species (Karemen 1992). Nearly 300 species of butterflies were recorded in a detailed survey of Nilgiri Biosphere (Larsen 1987a; 1988). At present Nilgiri Biosphere is one among the 18 hot-spots of the World. Scientific study and documentation of Indian butterflies has been started in southern India, as early as in 1767. Then on many studies were carried out to evaluate the diversity of butterflies in different parts of India.

## **OBJECTIVES:**

The Objectives of the present study are

1. To make a checklist of the butterflies found in St. Xavier's (autonomous) college, Palayamkottai, Tirunelveli.
2. To record the richness of order and family of butterflies available in the St. Xavier's (autonomous) college, Palayamkottai, Tirunelveli.
3. To assess the population fluctuation across the months and season of the

Year December 2018 to early March 2019.

4. To provide general information of this area and its butterfly diversity for Future studies, and makes a simple atlas for butterflies in St. Xavier's (autonomous) college, Palayamkottai, Tirunelveli.

#### METHODOLOGY:

The butterflies were observed and recorded directly in the field following "Pollard Walk" method (Pollard, 1977; Pollard and Yates, 1993) with necessary modifications. For each site, there were three transect paths (1000m each) in 500mgap. Individuals were counted on either side of the path (at a distance of 1.5m) Thus there were a total of 2 kms (1000 x2) transect tracts for each month.

Collection of specimen was avoided to the extent possible. Mostly photographic documentation was done. Butterflies were broadly sampled in a random manner along the lush green well nurtured gardens, bushy shrubs and trees area. Species were noted along with the date, location of capture. The specific host plants were identified and recorded (Mukherjee, 1981; Kehimkar, 2000) in each transect and also from the adjoining areas Butterflies observed were categorized into five groups based on their abundance during the period of study.

Accordingly, those species observed 80-100% of the survey days were categorized as very common (VC), 60-80 % as common (C), below 60 % are occasional (O).

#### STUDY AREA:

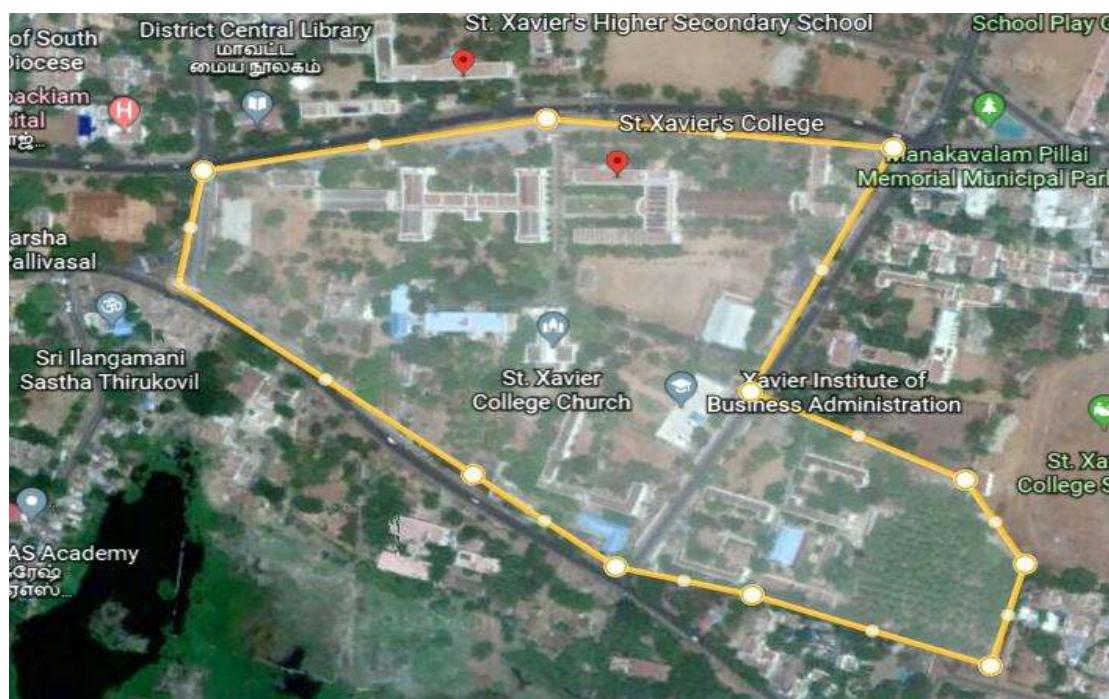
The Campus is spread over an area of 58 acres with lawns, lush green well nurtured gardens, bushy shrubs and trees which serve as a good shelter and source of nectar, open atmosphere and reduced use of pesticide has resulted in variety of butterfly showing an excellent diversity.

#### STUDY PERIOD:

The butterflies were collected using sweep net and the collection was done every month from late December to early March 4.00 AM to 4 PM under appropriate weather conditions (temperature 25°C, (always >18°C) cloudless or just a few clouds and wind speed\5 Beaufort (only leaves and thin branches moved by the wind)).

Hence an attempt was carried out to study the diversity of butterflies in St.Xavier's Autonomous College, Palayamkottai, Tirunelveli, and Tamilnadu, India.

## Satellite view:



### Data Analysis:

Season and habitat wise variation in the number of species sampled during the study period is represented graphically.

The diversity indices of the butterfly abundance of each study site were analyzed separately.

**A. Shannon-Weiner Index( $H^+$ ):** Species diversity was calculated using the Shannon-Weiner Index (Shannon-Weiner, 1948; Magurran 1988, 2004) across seasons and habitats.

$$H' = - \sum p_i \ln p_i.$$

Where,  $p_i$  is the proportion of the  $i$ th species in the total sample. The number of species (species richness) in the community and their evenness in abundance (or equitability) are the two parameters that define  $H^+$ .

**B. Pielou's Evenness Index ( $J^+$ ):** The species evenness is the proportion of individuals among the species. Evenness of species indicates their relative abundance on site (Pielou 1969; Magurran 1988, 2004)

$$J^+ = H^+ / \ln S$$

Where,  $S$  is the number of species present in the site.

**C. Simpson's Dominance Index (D):** Species dominance across habitats was estimated by Simpson's dominance index (Simpson, 1949). This index was used to determine the proportion of more common species in a community or an area by the following formula

$$D = \frac{\sum n_i(n-1)}{N(N-1)}$$

Where,  $n_i$  is the population density of the  $i$ th species, and  $N$  is the total population density of all component species in the study site.

**D. Margalef's Species Richness (R):** used to compare the species richness across seasons and habitats.

$$R = (S-1) / \ln M$$

Where S is the number of species and N is the number of individuals (Magurran 1988,2004).

## RESULTS:

A total 750 individuals of butterflies belonging to 37 species and 5 families were recorded during the study period. Butterflies recorded in this study belongs to five families with Nymphalidae and lycanidea containing maximum number of species followed by Papilionidae, Pieridae and Hesperiidae. Altogether 37 species have been recorded from St.Xavier's College campus.

The Shannon Wiener index value is high at the month of December (3.13233) and it is followed by February (3.04721), the species diversity is at the month of March (2.83982) with only 23 species out of 37 species recorded from the study area during the study period of December 2018 March 2019.

The Margalef's species index value is high during the month of December (6.2724) with 37 species it is followed by January (5.6915), February (5.4091) and the lowest species richness is during the month of March (5.035) . The evenness value is high during the month of March (0.9057) with 23 species out of 37 species of the total species recorded during the study period.

The family Nymphalidae contains maximum of 35% of the total species recorded it is followed by Lycaenidae 22%, Papilionidae 18%, Pieridae 16%, and the remaining 8% is Hesperiidae.

Common emigrant occupies the dominant portion in the Pieridae family with 92 individuals observed during the study period. In the Nymphalidae family Plain tiger 85 is the most dominant species followed by Tawny coster 42, Lemon pansy and Chocolate pansy. Zebra blue is the most dominating species in the Lycaenidae family, in the hesperiidae family the most dominating species is Rice swift.

The species abundance is high for Nymphalidae with 37% of the total butterflies observed it is followed by Pieridae, Lycaenidae, Papilionidae and Hesperiidae of 29%, 22%, 11%, 1% respectively during the study period.

**Table 1: Checklist of Butterflies recorded during the study period:**

SI.NO	Family	Common Name	Scientific Name	Status
1	Papilionidae	Commonrose	<i>Pachliopta aristolochiae</i>	Common
2		Southernbird wing	<i>Troides minos</i>	Common
3		Tailed jay	<i>Graphium agamemnon</i>	Common
4		Blue mormon	<i>Papilio polymnestor</i>	Common
5		Lime butterfly	<i>Papilio demoleus</i>	Common
6		Crimson rose	<i>Pachliopta hector</i>	Common
7		Common moremon	<i>Papilio polytes</i>	Common
8	Pieridae	Common grass yellow	<i>Eurema hecabe</i>	Common

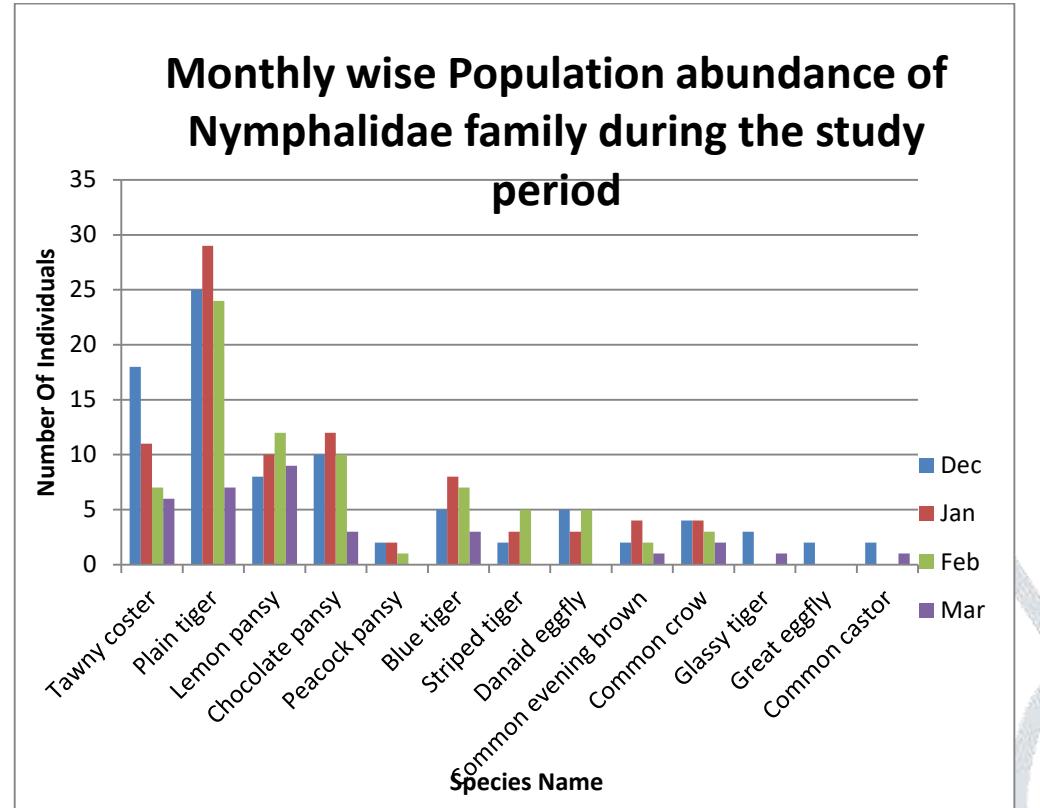
9		Common jezebel	<i>Delias eucharis</i>	Common
10		Common Emigrant	<i>Catopsilia pomona</i>	Common
11		Psyche	<i>Leptosia nina</i>	Common
12		Pioneer	<i>Belenois aurota</i>	Common
13		Great orange tip	<i>Hebomoia glaucippe</i>	Common
14	Nymphalidae	Tawny coster	<i>Acraea terpsicore</i>	Common
15		Plaintiger	<i>Danaus chrysippus</i>	Common
16		Lemon pansy	<i>Junonia lemonias</i>	Common
17		Chocolate pansy	<i>Junonia iphita</i>	Common
18		Peacock pansy	<i>Junonia almana</i>	Common
19		Blue tiger	<i>Tirumala limniace</i>	Common
20		Striped tiger	<i>Danaus genutia</i>	Common
21		Danaid egg fly	<i>Hypolimnas misippus</i>	Common
22		Common evening brown	<i>Melanitis leda</i>	Common
23		Common crow	<i>Euploea core</i>	Common
24		Glossy tiger	<i>Parantica aglea</i>	Common
25		Great egg fly	<i>Hypolimnas bolina</i>	Common
26		Common castor	<i>Ariadne merione</i>	Common
27	Lycaenidae	Pale grass blue	<i>Pseudozizeeria maha</i>	Common
28		Zebra blue	<i>Tarucus plinius</i>	Common
29		Grass jewel	<i>Chilades trochylus</i>	Common
30		Forget me not	<i>Catocbrysops strabo</i>	Common
31		Indian sunbeam	<i>Curetis thetis</i>	Common
32		Common pierrot	<i>Castalius rosimon</i>	Common
33		Common cerulean	<i>Jamides celeno</i>	Common

34		Indian cupid	<i>Everes lacturnus</i>	Common
35	Hesperiidae	Rice swift	<i>Borbo cinnara</i>	Common
36		Grass demon	<i>Udaspes folus</i>	Common
37		Brown awl	<i>Badamia exclamationis</i>	Common

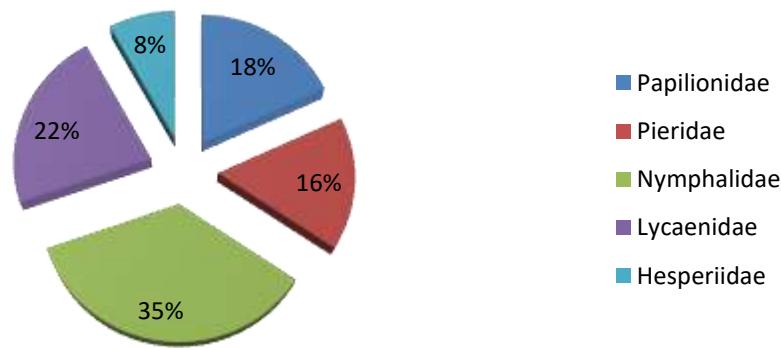
**Table 2: Monthlywise diversity indices during the study period:**

Diversity indices	December	January	February	March
Species Richness	35	32	30	23
Total Abundance	226	232	213	79
Shannon- Wiener Index ( $H'$ )	3.13233	3.0021	3.04721	2.83982
Simpson's Dominance Index (D)	18.37066	15.47113	17.61154	16.56452
Margalef's Species Index ®	6.2724	5.6915	5.4091	5.035
Pielou's Evenness Index ( $J'$ )	0.8810	0.8662	0.8959	0.9057

## Monthly wise Population abundance of Nymphalidae family during the study period



## Family wise abundance in the study area



### DISCUSSION:

In the present study it is clearly noticed that the distribution of Lepidopterans is related to the floral diversity as mentioned by Wynter Blyth, (1956) and Kunte (1997).

Migratory species are common during the monsoon season so hence 6 migratory species namely *Euploea core*, *Danaus chrysippus*, *Tirumala limniace*, *Catopsilia pyranthe*, *Catopsilia pomona*, have been recorded in this study period.

The study preferred in the study area was almost along the river bed and nearby forest fringes and so the Nymphalidae and Lycaenidae family occupy a major portion in this area during the study period. The collected data reveals the most dominating family is Nymphalidae this is due to the availability of enormous numbers of host plant in the study area.

Moderate to higher level of canopy coverage is available with wild vegetation pattern and their natural distribution is being affected and fragmented due to various urbanization processes .Grossly the landscape heterogeneity and climatic changes in local and regional scale have impact on the observed butterfly diversity Ghosh and Saha (2016) the same phenomena is observed in our study during the study period.

At monsoon, coincidence of their developmental stages with the climatic parameters may detain the visitors from spotting the adult individuals. The lower environmental temperature during winter restricts the normal distribution range of these poikilothermic creatures. Though butterflies are found during winter in their unique behavioural mode of dorsal and lateral basking to keep their body temperatures up to the ambient temperature (kehimkar, 2008).

On anthropogenic part, daily increment in human settlement, grazing, pesticidal effluents, increased abundance of decorative plants in the study area and this also one of the major reason for decline of the population.

A previous study (Wynter-Blyth 1957) had identified two seasons as peaks, March-April (summer) and October (post monsoon) for butterfly abundance in India. In this study the October and November month is the peak season for Butterflies.

The Shannon-Weiner ( $H'$ ) and Pielou's Evenness ( $J$ ) indices revealed that in some months the individuals among species are more abundant than the others.

This reflects the uniqueness of the butterfly species in their own habitat.

Butterflies bear a long term co evolutionary relationship with plants. The life span of adult butterflies, consisting of a complex life cycle, Ranges between one week and eight months, and averages two to three weeks in length (Kunte, 2000). They usually implies on more vascular plant species for egg laying by females. Leaves branches of trees and shrubs, climbers, and grasses serve as substrate for butterfly eggs. The developmental stages rely on specific larval host plant for foliage and shelter, whereas adults are dependent on nectar and pollen as their primary nutritional resources.

Herbs and shrubs begin their life cycles in the beginning of the monsoon and complete it by the end of post monsoon, though some shrubs like *Lantana camara* shows flowering throughout the year. They provide consistent power fuel to these flighting creatures Ghosh and Saha (2016).

Some typical behavioural attributes of the butterflies, like basking, resting, courtship, etc are noted to be performed on ground or around some shrubs or herbs or trees.

The present documentation leaves further scope of detailed study of local butterflies regarding the ethological attributes, behavioural, ecological and character displacement at the population level distributions utilizing the varied microhabitat arrays by continuing minute, thorough observations, which ultimately would be helpful for preparing suitable conversation scheme. Long term diversity study may throw light on ecological succession process along the gradient of habitat parameters.

**REFERENCES:**

1. Ambrose, D.P. 2004. The Insects: Structure, Function and Biodiversity. Kalyani Publishers, Delhi, 521-640.
2. Arya, M.K, Dayakrishna and Chaudhary, R. 2014. Species richness and diversity of butterflies in and around Kumaun University, Mainital, Uttarkhand, India. Journal of Entomology and Zoology Studies, 2(3): 153-159.
3. Blair R. B., "Birds and butterflies along an urban gradient: surrogate taxa for assessing biodiversity?" Ecological Applications, vol. 9, no. 1, pp. 164–170, 1999.
4. Brereton T., D. B. Roy, I. Middlebrook, M. Botham, and M. Warren, "The development of butterfly indicators in the United Kingdom and assessments in 2010," Journal of Insect Conservation, vol. 15, no. 1, pp. 139–151, 2011.
5. Gunathilagaraj, K. Berumal, T.N.A, Jayaram, K. and Ganeshkumar, M. 1998. Butterflies of Coimbatore. Zoo's Print Journal, 12: 26-27.
6. Gupta, M.B, Rao, P.V.C, Reddy, D.S, Maddala, S.R.S.C.S and Babu, P.M. 2012. A preliminary observation of butterflies: Sesachalam Biosphere Reserve, Eastern Ghats Andra Pradesh, India, And Journal of Zoology, 7(1): 83-89.
7. Gutierrez D, Mendez R. Phenology of butterflies in a mountain area in northern Iberian Peninsula. Ecography. 1995;(18): 209–219.
8. Janzen DH, Schoener TW. Difference in insect abundance and diversity between wetter and drier sites during a tropical dry season. Ecology. 1968;(49): 96–110.
9. Jiggins CD, McMillan WO, Neukirchen W, Mallet J. What can hybrid zones tell us about speciation? Biol. J. Linn. society.1996;(59):221-242.
10. Johnson and Steiner. Long-proboscis fly pollination of two orchids in the Cape Drakensberg Mountains South Africa. J. S. African Bot. Suppl. 1995;( 195): 169-175.