



## Butterfly species assemblages and abundance of Kurangani and Kumbakarai Falls area, Theni district, Tamilnadu, India

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### Abstract

The present study aimed to record the diversity of butterfly in two different fauna of Theni district falls. Totally four families and 19 numbers of genera have been recorded in Kumbakarai whereas four families and 17 genera have also been documented in Kurangani during the study period. The equal number of families such as Nymphalidae, Papilionidae Lycaenidae, and Pieridae have been recorded. Among the 11 genera, the highest populations have been observed *Mottled emigrant* and *Gram blue* as number as 94 and 92 respectively in Kurangani. But in Kumbakarai falls Lesser grass blue, Psyche and Dark grass blue are the dominant species.

**Keywords:** butterfly species, Kumbakarai Falls area

### Introduction

Biodiversity studies encompass the systematic assessment of the full range of different kinds of organisms collectively with the skill by which the diversity can be maintained and used for the advantage of humankind. Loss of habitat, man-made activity, eco-tourism, native people modulations which lead to loss of natural habitats over this tenure leftovers the prime anxiety of biodiversity conservation. Force on natural habitats is expected to augment in forth coming decades and hence, several species are under the pressure for their survival.

Our country is home for nearly 1977 species of butterflies and the Western Ghats alone harbours nearly 300 species. It is often said that scientist in their certitude and proof tend to reject the marvelous. And butterflies are once such as neglected marvel, in India. Though taxonomic accounts are plenty for Indian butterflies, detailed biologically investigations are to be made for many of them. Yet, this wealth is rapidly getting depleted to an alarmingly low level and this decline is usually associated with several factors. We are largely responsible for this through the destruction of their habitats and degradation of the environment. We have the knowledge and the power to halt this wanton destruction. Yet we do little and the need to save the butterfly. In India number of butterfly species reported as 1500 (Gay *et al.*, 1992) [2] and it was reported from the Indian country, which remarked around 8.33% of the 18000 documented species of the world (Larsen, 1995) [13]. Among insects, butterflies are the most studied (Larsen, 1987 a, b, c, 1988; Gunathilagaraj *et al.*, 1997; Gunathilagaraj, 1997 b; Kunte, 1997; Kunte *et al.*, 1999) [9, 3, 4, 7, 8]. Huge literatures reported about the Indian butterflies are belongs the territory of Himalayas and the Western Ghats. Larsen (1987 a, b, c, 1988) [9] made a comprehensive investigation of the butterflies of the Nilgiri hills. In Kerala studies on butterflies have been carried out in Silent valley national park (Mathew and Rahamathulla, 1993 [16] and Aralam wild life sanctuary

(Sreekumar and Balakrishnan, 2001) [21]. The species richness of butterflies indicated that to understand the condition of the horticultural ecosystem as they are good pollinator species (Kremen, 1992) [6]. However, data on the habitat preferences of butterflies and their abundant in diverse habitats of varying ecological parameters are sparse with record to any region. The main objective of this survey focus with the butterfly species assemblages in Kumbakarai and Kurangani falls of Western Ghats, Tamilnadu.

### Study area 1

GPS location of Kumbakari is located at 10°10'48"N 77°31'50"E. Kumbakari waterfalls surrounded by the deciduous forest. Since there is no route and access to travel inside the forest, one must reach Kumbakarai falls from Kodaikanal Lake via Perumal Malai, Pannaikadu and Peirya Kulam. Kumbakarai falls from the nearest village of Periyakulam for the 9KM travel distance. The entire falls come under the Kodaikanal forest range. The falls is 50 feet in height. Major horticulture crops cultivated in this territory are fruits crops like mango, banana, grapes, guava and aonla, tropical vegetables like bhendi, tomato, brinjal, onion, temperate vegetables like cauliflower, beetroot and knol-khol.

### Study area 2

Kurangani (77°.50"E longitudes and 11°.00"N latitudes), the survey area is located 31Km from Theni. It lies at an altitude of 650 above Mean Sea Level (M.S.L). This area is showing to the southwest monsoon, northeast monsoon and summer. Average annual rainfall is the location is 1050mm. The highest average daily temperature during extreme summer month (May and June) is 36°C and least during winter season (December and January) is 16°C. Dominant vegetation types are moist deciduous and dry deciduous forest with under growth of grasses. These habitats differed with record to disturbance levels. Canopy was open in moist

deciduous with undergrowth of grasses. Canopy is not covered in dry deciduous forest covered with herbs, shrubs and invasive species of the weeds, *Lantana camera*, *Acalypha paniculata* and *Chromolaena odorata* and ground vegetation is found of heavy undergrowth of grasses and sedges such as *Cymbopogon citratus*, *Heteropogon sp.*, *Themaea sp.*, *Eragrostis unioloitus*, *Pennisetum polystachyom*, *Pycreus puncticulatus*, *Fimbristylis sp.*, and *Mariscus puncticulatus*.

**Materials and Methods**

Butterflies were captured with the assistance of sweep net on herbs, shrubs, small tree species and grasses randomly for 2 hours in Kumbakarai falls and undisturbed semi dry deciduous forest in Kurangani falls in Theni district. The collected insects were pinned and they were taxonomically identified. The identified butterflies were used for the analysis of diversity indices like richness, evenness and abundance.

**Table 1:** Shows the diversity of butterflies in Southern Western Ghats of Kumbakarai (K1) and Kurangani (K2) stream areas in the period of JFM 2016

S.NO	Family	Name	January	February	March	K 1 total	January	February	March	K 2 total	Grand total
1	Papilionidae	Common rose	3	2	2	7	4	5	2	11	18
2	Papilionidae	Common mormon	1	1	1	3	1	1	0	2	5
3	Papilionidae	Lime Butterfly	1	0	0	1	0	0	0	0	1
4	Papilionidae	Blue mormon	3	4	1	8	2	2	4	8	16
5	Papilionidae	Common emigrant	11	8	12	31	14	16	13	43	74
6	Papilionidae	Mottled emigrant	16	12	8	36	24	32	43	99	135
7	Pieridae	Spotted glass yellow	5	4	2	11	3	3	5	11	22
8	Pieridae	Common jezebel	4	2	1	7	6	8	6	20	27
9	Pieridae	Psyche	12	19	11	42	8	13	15	36	78
10	Pieridae	Common gull	10	8	16	34	5	8	11	24	58
11	Pieridae	Yellow orange tip	1	0	0	1	2	2	2	6	7
12	Pieridae	Crimson tip	1	1	2	4	0	0	0	0	4
13	Nymphalidae	common evening brown	0	1	1	2	0	0	0	0	2
14	Nymphalidae	Common castor	0	0	0	0	0	1	0	1	1
15	Nymphalidae	peacock pansy	0	2	0	2	1	2	5	8	10
16	Nymphalidae	Plain tiger	8	10	3	21	0	0	0	0	21
17	Nymphalidae	Striped tiger	0	0	0	0	6	4	12	22	22
18	Lycaenidae	Lesser grass blue	15	12	21	48	20	24	26	70	118
19	Lycaenidae	Dark grass blue	13	17	12	42	22	29	21	72	114
20	Lycaenidae	Gram blue	11	8	5	24	24	29	41	94	118
21	Lycaenidae	Red pierrot	5	4	9	18	7	12	20	39	57
		Total	120	115	107	342	149	191	226	566	908

Note: JFM (January, February and March)

**Table 2**

Dataset Totals for Kumbakarai (K1)			
Total Number of Organisms:	342	Total Number of Species:	19
Average population size:	18	Decimal Accuracy:	4
Total Number of Regions:	1	Total Number of Region Sets:	1
Alpha Biodiversity			
Simpson Index $\frac{\sum_i n_i(n_i - 1)}{N(N - 1)}$	0.09057	Simpson Index Approximation $\frac{\sum_i n_i^2}{N^2}$	0.09323
Dominance Index $1 - \left(\frac{\sum_i n_i(n_i - 1)}{N(N - 1)}\right)$	0.9094	Dominance Index Approximation $1 - \left(\frac{\sum_i n_i^2}{N^2}\right)$	0.9068
Reciprocal Simpson Index $\frac{1}{\left(\frac{\sum_i n_i^2}{N^2}\right)}$	11.04	Alternate Reciprocal Simpson Index $\frac{1}{\left(\frac{\sum_i n_i(n_i - 1)}{N(N - 1)}\right)}$	10.73
Shannon Index $-\sum_i \left(\frac{n_i}{N} \cdot \log_2 \left(\frac{n_i}{N}\right)\right)$	3.654	Berger-Parker Dominance Index $\frac{n_{max}}{N}$	0.1404
Shannon Index $-\sum_i \left(\frac{n_i}{N} \cdot \ln \left(\frac{n_i}{N}\right)\right)$	2.533	Inverted Berger-Parker Dominance Index $\frac{N}{n_{max}}$	7.125
Shannon Index $\sum_i \left(\frac{n_i}{N} \cdot \log_{10} \left(\frac{n_i}{N}\right)\right)$	-1.1	Margalef Richness Index $\frac{S - 1}{\ln N}$	3.085
Menhinick Index $\frac{S}{\sqrt{\sum_i n_i}}$	1.027	Rényi Entropy/Hill Numbers (r=0,1,2, $\infty$ ) $\frac{1}{1-r} \cdot \ln \left(\sum_i p_i^r\right)$	19, 12.61, 10.73, $\approx \infty$
Buzas and Gibson's	0.6627	Gini Coefficient	7.266

Index $\frac{e^{-\sum_i (\frac{n_i}{N} \cdot \ln(\frac{n_i}{N}))}}{S}$			
Equitability Index $\frac{\sum_i (\frac{n_i}{N} \cdot \ln(\frac{n_i}{N}))}{\ln N}$	0.8602	Ln () of Hill Numbers (0,1,2, ∞):	2.944, 2.534, 2.373, ∞
<b>Beta Biodiversity</b>			
Absolute beta Value ((S <sub>0-c</sub> )-(S <sub>1-c</sub> )...):	18	Whittaker's Index (S/alpha):	1
Sørensen's similarity index:	1	Alternate Whittaker's Index (S/alpha-1):	0
Sørensen's similarity index (%):	100%	Jaccard Index:	-1
Routledge beta-R Index:	6.333	Jaccard Index (%):	-100%
Mountford Index:	-0.1176	Number of Common Species:	19
Mountford Index (%):	-11.76%	Bray Curtis dissimilarity	0

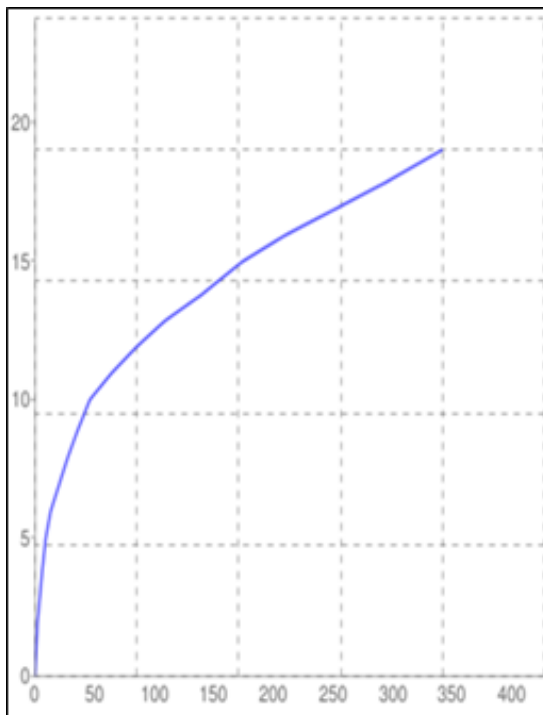


Fig 1: Refraction curve

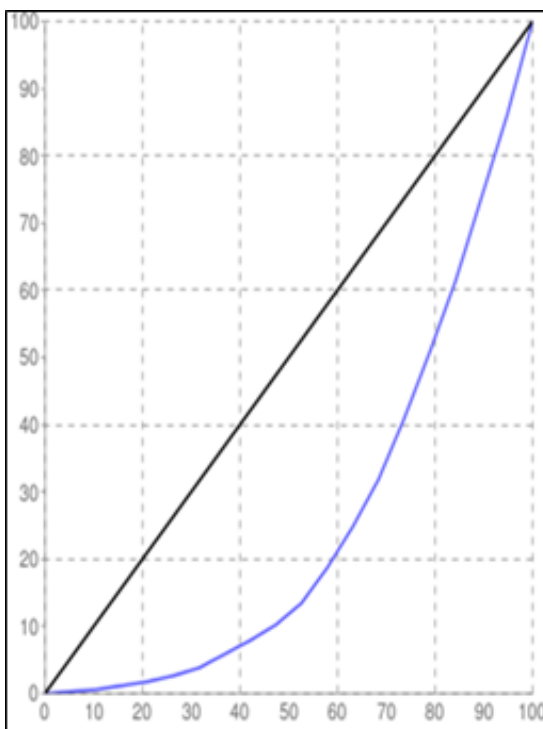


Fig 2: Lorenz graph

**Results & Discussion**

Butterflies diversity was recorded in Kumbakarai falls and Kurangani falls in Theni district. Table 1 represents four families and 19 numbers of genera have been recorded in Kumbakarai whereas four families and 17 genera have also been documented in Kurangani (Table.1). The equal number of families such as Nymphalidae, Papilionidae Lycaenidae, and Pieridae have been recorded. Among the 11 genera, the highest populations have been observed *Mottled emigrant* and *Gram blue* as number as 94 and 92 respectively in Kurangani. But in Kumbakarai falls Lesser grass blue, Psyche and Dark grass blue are the dominant species.

The species richness and abundance was calculated by the online software programme [www.alyounglabs.com](http://www.alyounglabs.com). The results are interpreted in annexure.

Zoogeographically, India is part of Oriental realm and virtually the entire fauna is in Oriental origin (Larsen 1998). The Oriental butterfly fauna of this region is mostly closed to that of Agrotropical region, with which its share all butterfly families, most subfamilies and about 40 genera (Larsen 1995) [13]. Larsen 1995 [13] suggested that both these regions once constitute a joint evolutionary unit which later split into two. The family nymphalidae is the chief family with almost 1/3<sup>rd</sup> of the identified butterflies of the earth. This is one of the prime butterfly families in the Western Ghats. Similar findings have also been reported by Mathew and Rahmathulla (1993) in Silent Valley.

Due to the broad range of factors the particular habitat belong to the existence specific butterfly fauna, it was depending upon the food resources and climatic conditions which is suitable for egg laying at suitable flowers for adults and preside over the distribution of butterflies. Further, the abundance natural enemies and prevalence of diseases also determine the populations (Pollard and Yates, 1993). The existence of Dark variety and white bar bush brown in ever green habitat recommend that they are shade loving. Sathyamurti (1994) reported that Satyrides have first choices for dimness and frequent in grassland, bushy area and opaque undergrowths. However, out of 16 species recorded, 4 species are distributed in disturbed place in Madurai.

In the present study, Mottled emigrant more affinity to the cattle urine in Kurangani. This habit helps them to satisfy their salt requirements. Dark grass blue is common in shrubby vegetation and requires flowering herbaceous and shrub flowering plants. Plant diversity and composition influence the variability of many species of land non-chordate populations (Warren et al., 1997; Launer and Murphy, 1994). Vegetation structure is decisive to butterflies as it undergone pressure on reproduction and thermoregulation of their normal physiological conditions

(Holl, 1995, 1996). The butterflies can be regarded as a sensible environmental indicator (Karemen, 1992) [6]. Our findings also indicated that the diversity and abundance was maximum found in undisturbed and high Vegetation patterns. This can be indicates that a good bio-markers of the specific regions. So, from the overall findings indicated that butterflies are highly sensitive to turbulence of man-made activity and the prevalent species are most probably territory specialist.

### Conclusion

The butterfly species assemblages investigation navigate to the agricultural and horticultural production of the entire study area indirectly. Our findings give a clear explanation regarding the frequent survey of butterfly communities can be conducted in peat-swamp forests in order to gain an knowledge of the impacts of forest disturbance in a relatively short fall-out. We make a preliminary survey to study the species assemblages of butterflies in both Kumbakarai and Kurangani hill area of Theni district. Moreover, it requires a detailed study to find out the endemic species and the economically important pests in future.

### References

- Gadagkar R, Chandrasekhra K, Nair P. Insect species diversity in the tropics sampling methods and a case study. *J.Bombay. Nat. His.Soc*,1990;87(3):337-353.
- Gay T, Kehimkar D, Punetha JC. Common butterflies of India, Oxford University Press: Madras, 1992, 67.
- Gunathilagaraj K, Ganeshkumar M, Ramesh PT. Butterflies of Coimbatore, Zoos' print,1977a:12:26-27.
- Gunathilagaraj K, Ganeshkumar M, Ramesh PT. Addition to the Butterflies of Coimbatore, Zoos' print,1977b:12:27.
- Hill MO. Diversity and Evenness: a unifying notation and its consequences. *Ecology*,1973;54:427-431.
- Kremen C. Assessing the indicator properties of species assemblages for natural area monitoring, *Ecol. Appl*,1992;2:203-217.
- Kunte JK. seasonal patterns in butterfly abundance and species diversity in four tropical habitats in the northern western ghats, *J. Biosci*,1997;22:593-603.
- Kunte JK, Joglekar A, Utkarsh G, Padmanabhan P. Patterns of butterfly, bird and tree diversity in the western Ghats, *Curr.Sci*,1999;77:577-586.
- Larsen TB. The butterflies of the Nilgiri mountains of south India (Lepidoptera: Rhopalocera), *J.Bombay nat. Hist. Soc*,1987a:84:26-43.
- Larsen TB. The butterflies of the Nilgiri mountains of south India (Lepidoptera: Rhopalocera), *J.Bombay nat. Hist. Soc*,1987b:84:291-316.
- Larsen TB. The butterflies of the Nilgiri mountains of south India (Lepidoptera: Rhopalocera),*J.Bombay nat. Hist. Soc*,1987c:84:560-584.
- Larsen TB. The butterflies of the Nilgiri mountains of south India (Lepidoptera: Rhopalocera),*J.Bombay nat. Hist. Soc*,1988:85:26-43.
- Larsen TB. Butterfly biodiversity and conservation in the Afrotropical region, In: *Ecology and Conservation of butterflies*, Pullin, A.S.:(Editor). Chapman and Hall: Madras, 1995, 290-303.
- Ludwig JA, Reynolds TF. *Statistical Ecology*. John Wiley and Sons Inc., New York, 1988, 37-39.
- Margalef R. Information theory in ecology. *General systematics*,1958;3:36-71.
- Mathew G, Rahamathulla VK. Studies on the butterflies of silent valley National park, *Entomon*,1993;18:185-192.
- Menhinick EF. A comparison of some species individual diversity indices applied to samples of field insects. *Ecology*,1964;45:859-861.
- Pielou EC. *Ecological diversity* Wiley, New York, 1975.
- Shannon CE, Weaver W. *The mathematical theory of communication*, Univ. Illinois press: Urbana, 1963, 117.
- Simpson EH. Measurement of diversity. *Nature*, 1949, 163-188.
- Sreekumar PG, Balakrishnan M. Diversity and Habitat Preference of Butterflies in Neyyar Wildlife Sanctuary, South India. *Entomon*,2001;26:11-22.