JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# SEASONAL AND HABITAT VARIATION ON THE POPULATION DISTRIBUTION OF BUTTERFLIES IN KOTTUR VILLAGE , THENI DISRTRICT, TAMIL NADU, SOUTH INDIA

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Abstract

Butterflies of Kottur village, Theni district was studied by Pollard method. Four different habitats were selected for the study. Total of 3925 individuals belonging to 117 species were recorded. More number of species were recorded during November, followed by October and less in December. Natural forest supports a greater number of species than other habitats. Total of ten endemic one near threateaned species were recorded. Out of 117 species 15 were comes under wildlife protection act 1972 (Schedule species). At family level, the family Nymphalidae was dominant with 52 species followed by Lycaenidae (26), Pieridae (18). The least number of butterfly species were recorded in the families of Hesperiidae (13) and Papilionidae (8).

Key words: Butterfly, seasonal variation, habitat variation, Diversity, Richness, Evenness

## Introduction

In recent times, biological diversity is increasingly being recognized as a vital parameter to assess global and local environmental changes and the sustainability of developmental activities. Invertebrates are widely regarded as powerful monitoring tools in environmental management because of their great abundance, diversity and functional importance, their sensitivity to perturbation, and the ease with which they can be sampled (Brown 1997, McGeoch 1998). Within the class insect, lepidopterans – butterflies, in particular, are highly faunistically interesting, habitat-specific and often endemic (Spitzer et al., 1997). Butterflies play important roles in the ecosystem functions. Butterflies are important herbivores insects that have a direct trophic relationship with plants (Chew 1975, Gratton and Denno 2003). As pointed out by Daily and Erhlich (1995) butterflies appear to be potentially good indicators of forest biodiversity. They also respond to forest disturbance and this can be useful indicators of the effects of tropical forest disturbance (Hill and Hamer 1998, Kremen 1992). India possesses 1501 species of butterflies (Kunteet al., 1999). Though the tropical region contains very rich diverse butterfly fauna, the information on species found in different habitats is very poor particularly for the Indian region (Rajagopal et al., 2011). In Tamil Nadu, the systematic study of invertebrates particularly on butterflies has not been carried out in most of the areas.

The study area kottur (9°55’12.1 N 77°25’43.9 E) situated in Theni district of Western Ghats (Map 1). Kottur is situated on the way of Mullai-periyar River. It is rich in soil, vegetation and butterfly’s population.

The agricultural landscape predominantly covers coconut-based mono-cropping and mixed -cropping systems. The annual atmospheric temperatures range from a minimum of 13 °C to a maximum of 39.5 °C. In the hills the temperatures can range from as low as 18 °C to 25 °C. The month between March and May is the hottest period and cool dry winter is experienced during November-January. Though this area is rich in the butterfly population there is no published record so for. Hence this study was carried out to study the butterfly species found in this area.

Methodology

The present study was conducted between July 2018 and June 2019. A total of four habitat types namely, natural forest, pond edge, mixed crop (banana, green beans, spring onion, tomato, maize, agave spinach), coconut plantation were selected. Pollard walk method (Pollard, 1991) was adopted to record the butterfly following Moore (1975). As suggested by Swengel (1977) a transect line of one km was used as a standard method and covered fortnightly. Butterflies were counted 5m on both side and 5m in front of the observer. These surveys were done from during 07:00 to 11:00 hr and 16:00 to 19.00 hr. Gunathilagaraj et al., (1998, 2015). Kunte (2000) and Kehimkar (2008) were referred for the identification of Butterflies. Larsen (1987 a, b, c; 1988), Evans (1932) and Wynter-Blyth (1957) were also referred for the scientific nomenclature of butterflies.

Statistical analysis

The encounter rate for different species was calculated as the number of each species of butterflies per kilometer (transect) surveyed.

$$ER = \frac{\text{No. of Species}}{\text{Total number of transect}}$$

The ANOVA and Diversity index was calculated using PAST3 statistical software. The α diversity of butterfly species was calculated by the Shannon Diversity Index (H1) that combines the number of species within a range with the relative abundance of each species. The evenness of species within a range was calculated by Simpson_1-DEvenness Index to identify the variation within the community among species. β (beta) diversity of butterflies was calculated using Sorensen's Index. It is a simple method used to identify the beta (β) diversity and indicates the similarity of species distribution within the study sites.

RESULT

Totally 3925 individuals of 117 species of butterflies were recorded which includes ten endemic, two least concern, one nearly threatened butterfly. More number of species were recorded during November (53), followed by October (47), July (44), December (37) and a sizeable number of species were recorded in during summer March (23) April (23) and May (22) (Fig. 1 and Table 1). Analysis of variance of butterfly species observations indicated that there was a significant variation between the butterfly species families ($F = 4.14$, $P < 0.003$) and seasons ($F = 4.92$, $P < 0.002$)

Family, season and month-wise abundance of species results shows except Hesperidae other four families recorded in almost all seasons. The number of individuals and species recorded more in North-east monsoon than other seasons. (Table 2).

A total of three butterfly species comes under IUCN red list. Two butterfly species namely, one-spot grass yellow Eurem andersoni and common crow Euploea core were categorised under Least Concern. One species Malabar tree nymph Idea malabarica is recorded, which comes under the near threatened category. A total of 15 butterfly species were found schedule category (Forest act 1974), Of which three species were kept under schedule I, nine species were reported as schedule II, three species were reported as schedule IV. Total of ten endemic species was recorded (Table 3).

Habitat Wise distribution

Four habitats such as natural forest, pond edge, mixed crop, and coconut plantation were selected for this study. More number of butterfly species (74) were recorded in a natural forest with 1550 individuals, followed by pond edge (59 species of 932 individuals), coconut plantation (56 species of 800 individuals) and mixed crop (48 species from 643 individuals) (Fig. 2, Table 4). Analysis of variance of butterfly species observations indicated that there was a significant variation between the butterfly species in different habitats ($F = 1.82$, $P < 0.1$).

At the family level, the family Nymphalidae was dominant with 52 species (44%) and 1516 individuals followed by Lycaenidae with 26 (22%) species 232 individuals, Pieridae with 18 (15%) species 1915 individuals. The least number of butterfly species were recorded in the families namely Hesperiidae 13 (11%) species comprising 30 individuals and Papilionidae 8 (7%) with 232 individuals (Table 5).

Butterfly community structure

Among the 117 species Lesser Albatross Appias wardii was the dominant species with 649 individuals and also recorded in all four-seasons followed by Common emigrant Catopsilia pomona (n=453), Plain tiger Danaus chrysippus(n=383), Yellow pansy Junonia hierta (n=269). Based on the encounter rate the butterfly species were classified as uncommon (< 0.5 ER), common (< 1.0 ER), very common (< 2.0 ER) and abundant (>3.0 ER). Out of 117 butterflies species 103 were uncommon, 10 butterflies are common, 2 each recorded as very common and abundant (Appendix 1).

Diversity index

Variation of Families:

The different family wise results indicated (Table 6,7 and Fig.3) that there was a significant variation between the butterfly species and different families. The diversity indices values namely, Shannon_H (4.414) and Simpson_1-D (0.981) was high in Nymphalidae family (Table 6). Sorenson's Index was used to compare the species and families. The values indicate that little variation was found between the families (Table 7). The diversity curve showed a unique type of variation and variety in butterfly species distribution of among families (Fig. 3).

Variation of season:

The highest diversity value indices of Shannon_H (3.1) was observed north east monsoon among the seasons. Moreover, the Simpson_1-D indices revealed that the distribution of a majority of butterfly species was almost same (0.90 and 0.93) within the seasons, suggested the evenness between the four seasons (Table 8). The Sorenson's Index (ß diversity) values did not indicate many variations between the seasons with the values ranging between 0.45 and 0.56 (Table 9). The diversity curve showed all curves with a unique type of variation and diversity in butterfly species distribution at four seasons (Fig.4).

Variation of Habitat:

Highest value of diversity indices Shannon_H (3.1) was observed in pond habitat.. Moreover, the Simpson_1-D indices revealed that the distribution of a majority of butterfly species was almost the same (0.89 and 0.93) within habitats, suggested the evenness between all habitat (Table 10).The Sorenson's Index (ß diversity) values did not indicate many variations between the habitat with values ranging between 0.38 and 0.47 (Table 11). The diversity curve showed all the curves showed a unique type of variation and diversity in butterfly species distribution at four habitats (Fig.5).

Discussion

During the present study, a total of 117 butterfly species belongs to five different families were recorded in four different seasons in four habitats in Kottur Village, Theni. The diversity index among the families of butterflies indicated that the population has rich butterfly diversity in the Kottur Village, Theni. Butterflies in all habitats showed a highly seasonal trend. More number of species and individuals were recorded in North-east monsoon. However, there was no evidence of peak summer during this study. Similar results were reported in other parts of the Western Ghats by Kunte (1997). The population was low in summer may be due to heat, scarcity of water and dry ground cover Kunte (1997). From the early monsoon the population started increasing and reached its peak in late monsoon. The present study has found that, although the post-monsoon is the favourable season for butterflies in the study area, still some families were able to survive even during unfavourable seasons viz. winter and summer, was mainly due to their stress-tolerant. The present study indicates that the family Nymphalidae was the dominant family in the study area. A similar pattern of the predominance of Nymphalidae was also reported by different researchers from the different ecosystems of Western Ghats (Mathew and Rahamathulla 1993; Kunte 1997; Kunte et al., 1999; Arun 2000; Devi and Davidar 2001; Eswaran and Pramod 2005; Kumar et al., 2007; Dolia et al., 2008; Krishnakumar et al., 2008, Ramesh et al., 2010). But in the case of abundance, the most abundant butterfly family in the present study area was Pieridae. A similar pattern of abundance was also reported

from various locations in the Western Ghats (Ramesh et al., 2010; Rajagopal et al., 2011; Eswaran and Pramod 2005), Vikhroli, Mumbai (Arun 2009) and Siruvani Hills (Arun 2000, 2002). One of the reasons for the higher abundance of Pieridae butterflies in the Theni area might be the higher availability of their larval food plants such as Chinnaarag sp. around the lake.

The representation from the family Hesperiidae was very low, when compared to the proportion of other families in the study area. The same kind of low species richness was recorded in the Eastern Plains of southern India (Ramesh et al. 2010; Rajagopal et al. 2011) and in the Western Ghats (Eswaran and Pramod 2005) also. It might partly be attributed to the sampling/observer bias, and Hesperiidae are generally crepuscular in nature, and are small and cryptically coloured. The highest diversity of butter flies in all types of habitats were found in forest edges and pond edges which present vegetation as food and host plants of butterflies (Koneri, et al., 2016). Butterfly activity is higher in the relatively undisturbed areas around the banks of the lake with ample nectar and food plants.

The diversity index of season and habitat result reveals that there was a significant variation among seasons and habitats. More, number of species and individuals were recorded in north east monsoon season and in Pond habitat. Because butterflies prefer specific habitats (Sreekumar and Balakrishna, 2001), to avail themselves of available resources for survival in the forest ecosystem. They show diverse feeding habits, and varied forest habitats offer suitable sites for breeding, foraging and resting during different stages in their life cycle (Santhosh and Basavarajappa, 2017). Further, Sorenson's Index (ß diversity) did not indicate many variations between the seasons and habitat. Thus, the biodiversity profile showed a typical decreasing trend and displayed a good diversity profile of butterflies amidst the study area.

Therefore, our research revealed that Kottur, Theni possess a fine ecosystem by the evidence of 117 species occurrence belong to five familes (Hesperiidea, Lycaenidae, Nymphalidae, Papilionidae, Pieridae), and the dominance of family Pieridae and Nymphalidae. This place is the perfect landscape sites for the host plants and butterfly interaction, fresh water and less pollution were established with the result of several butterfly species occurrence. The present study also found that the butterfly diversity, abundance and endemics are in considerable numbers when compare to the other parts of the eastern plains and the Western Ghats. Therefore, the present study suggests that the Kottur area of the Theni District may be considered for butterfly conservation in the future.

Table 1: Seasonal and monthly occurrence of butterflies in study area during the study period 2018 and 2019

| Season | Month | No. of Species | No. of Individuals |
|---|---|---|---|
| SWM | June | 23 | 177 |
| | July | 44 | 229 |
| | Aug | 32 | 195 |
| NEM | Sept | 36 | 344 |
| | Oct | 47 | 685 |
| | Nov | 53 | 928 |
| Winter | Dec | 37 | 439 |
| | Jan | 27 | 176 |
| | Feb | 35 | 284 |
| Summer | Ma r | 23 | 118 |
| | April | 23 | 155 |
| | May | 22 | 195 |

SWM: south west monsoon, NEM: northe east monsoon,

Table 2: Family, season and month wise frequency of butterflies in the study area.

| SEASON | MONTH | CATOGERY | HESPERIIDAE | LYCAENIDAE | NYMPHALIDAE | PAPILIONIDAE | PIERIDAE |
|---|---|---|---|---|---|---|---|
| SWM | June | Species | 0 | 1 | 7 | 4 | 9 |
| | | Individuals | 0 | 1 | 44 | 10 | 122 |
| | July | Species | 3 | 9 | 13 | 4 | 13 |
| | | Individuals | 5 | 28 | 69 | 12 | 115 |
| | Aug | Species | 2 | 3 | 13 | 3 | 9 |
| | | Individuals | 3 | 4 | 52 | 16 | 120 |
| NEM | Sept | Species | 2 | 3 | 17 | 1 | 8 |
| | | Individuals | 7 | 13 | 129 | 16 | 179 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Oct | Species | 3 | 8 | 22 | 5 | 8 |
| | | Individuals | 8 | 40 | 261 | 29 | 347 |
| | Nov | Species | 0 | 8 | 28 | 4 | 12 |
| | | Individuals | 0 | 98 | 336 | 37 | 457 |
| WINTER | Dec | Species | 4 | 3 | 16 | 3 | 9 |
| | | Individuals | 5 | 7 | 234 | 42 | 151 |
| | Jan | Species | 2 | 2 | 11 | 2 | 8 |
| | | Individuals | 2 | 2 | 95 | 17 | 60 |
| | Feb | Species | 0 | 6 | 17 | 2 | 9 |
| | | Individuals | 0 | 7 | 135 | 26 | 116 |
| SUMMER | March | Species | 0 | 2 | 9 | 3 | 8 |
| | | Individuals | 0 | 4 | 55 | 7 | 52 |
| | April | Species | 0 | 6 | 6 | 2 | 8 |
| | | Individuals | 0 | 12 | 53 | 6 | 84 |
| | May | Species | 0 | 5 | 6 | 2 | 8 |
| | | Individuals | 0 | 16 | 53 | 14 | 112 |

Table 3: List of Endemic, Threatened and Schedule species of butterflies recorded during the study period.

| Family | Common name | Scientific name | Resident Status | IUCN status | Schedule |
|---|---|---|---|---|---|
| HESPERIIDAE | Kanara swift | Caltoriscanaraica | Endemic | -- | -- |
| LYCAENIDAE | Gram blue | Euchrysops | -- | -- | S2 |
| | Peacock royal | Tajura cippus | -- | -- | S2 |
| | White tipped lineblue | Prosotasnoreia | -- | -- | S1 |
| | Pea blue | Lampidesboeticus | | | S2 |
| NYMPHALIDAE | Painted courtesan | Euripus consimilis | -- | -- | S2 |
| | Glad-eye Bushbrown | Mycalesispatnia | Endemic | -- | -- |
| | Clipper | Parthenos Sylvia | -- | -- | S2 |
| | Small leopard | P.alcippe | -- | -- | S2 |

| | | | | | |
|---|---|---|---|---|---|
| | Common crow | Euploea core | -- | LC | S4 |
| | Red disc bushbrown | Mycalesis oculus | Endemic | -- | -- |
| | Tamil yeoman | Cirrochorathais | Endemic | -- | -- |
| | Grey count | Tanaecialepidea | -- | -- | S2 |
| | Malabar tree nymph | Idea malabarica | Endemic | NT | -- |
| PAPILIONIDAE | Malabar banded peacock | papilio Buddha | Endemic | -- | S2 |
| | Common mime | Papilioclytia | -- | -- | S1 |
| | Crimson rose | Pachliopta hector | -- | -- | S1 |
| | Malabar rose | Pachlioptapandiyana | Endemic | -- | -- |
| PIERIDAE | Painted sawtooth | Prionerissita | Endemic | -- | S4 |
| | Lesser albatross | Appiaswardii | Endemic | -- | S2 |
| | One spot grass yellow | Euremaandersonii | -- | LC | -- |
| | Nilgiri clouded yellow | Colisnilagiriensis | Endemic | -- | -- |
| | Striped albatross | Appiaslibythea | -- | -- | S4 |

Table 4: Number of individuals and species recorded in different habitats of the study area

| Habitat | No. of Individuals | % | Species | % |
|---|---|---|---|---|
| Natural Forest | 1550 | 39 | 74 | 63 |
| Pond Edge | 932 | 24 | 59 | 50 |
| Mixed Crop | 643 | 16 | 48 | 41 |
| Coconut Plantation | 800 | 20 | 56 | 48 |

Table 5: Details of butterfly families and species recorded in the study area

| Family | Species | % | Individuals | % |
|---|---|---|---|---|
| Hesperiidae | 13 | 11 | 30 | 1 |
| Lycaenidae | 26 | 22 | 232 | 6 |

| | | | | |
|---|---|---|---|---|
| Nymphalidae | 52 | 44 | 1516 | 39 |
| Papilionidae | 8 | 7 | 232 | 6 |
| Pieridae | 18 | 15 | 1915 | 49 |
| Total | 117 | 100 | 3925 | 100 |

Table 6:Butterflies diversity with respect to families in Kottur Village, Theni

| Diversity Index | Families | | | | |
|---|---|---|---|---|---|
| | Hesperiidae | Lycaenidae | Nymphalidae | Papilionidae | Pieridae |
| Species | 13 | 26 | 52 | 8 | 18 |
| Individuals | 30 | 232 | 1516 | 232 | 1915 |
| Shannon_H | 2.563 | 3.261 | 4.414 | 3.307 | 3.927 |
| Simpson_1-D | 0.9044 | 0.9165 | 0.981 | 0.955 | 0.9704 |

Table 7: Beta diversity of butterflies with respect to their families (Sorenson's Index) in Kottur Village, Theni

| Families | Families | | | | |
|---|---|---|---|---|---|
| | Hesperiidae | Lycaenidae | Nymphalidae | Papilionidae | Pieridae |
| Hesperiidae | - | 0.94203 | 0.9337 | 0.88889 | 0.81967 |
| Lycaenidae | - | | 0.82569 | 0.89011 | 0.81132 |
| Nymphalidae | - | - | - | 0.94089 | 0.79336 |
| Papilionidae | - | - | - | - | 0.75 |
| Pieridae | - | - | - | - | - |

Table 8: Seasonal wise butterfly species diversity in Kottur Village, Theni

| Diversity Index | Seasons | | | |
|---|---|---|---|---|
| | SWM | NEM | Winter | Summer |
| Species | | | | |

| | | | | |
|---|---|---|---|---|
| Individuals | | | | |
| Shannon_H | 2.977 | 3.1 | 3.082 | 2.627 |
| Simpson_1-D | 0.9049 | 0.9206 | 0.9362 | 0.9018 |

SWM: south west monsoon, NEM: northe east monsoon,

Table 9: Seasonal wise Beta diversity of butterflies (Sorenson's Index) in Kottur Village, Theni

| Seasons | Seasons | | | |
|---|---|---|---|---|
| | SWM | NEM | Winter | Summer |
| SWM | - | 0.43885 | 0.45946 | 0.45882 |
| NEM | - | - | 0.5 | 0.56364 |
| Winter | - | - | - | 0.5122 |
| Summer | - | - | - | - |

SWM: south west monsoon, NEM: northe east monsoon,

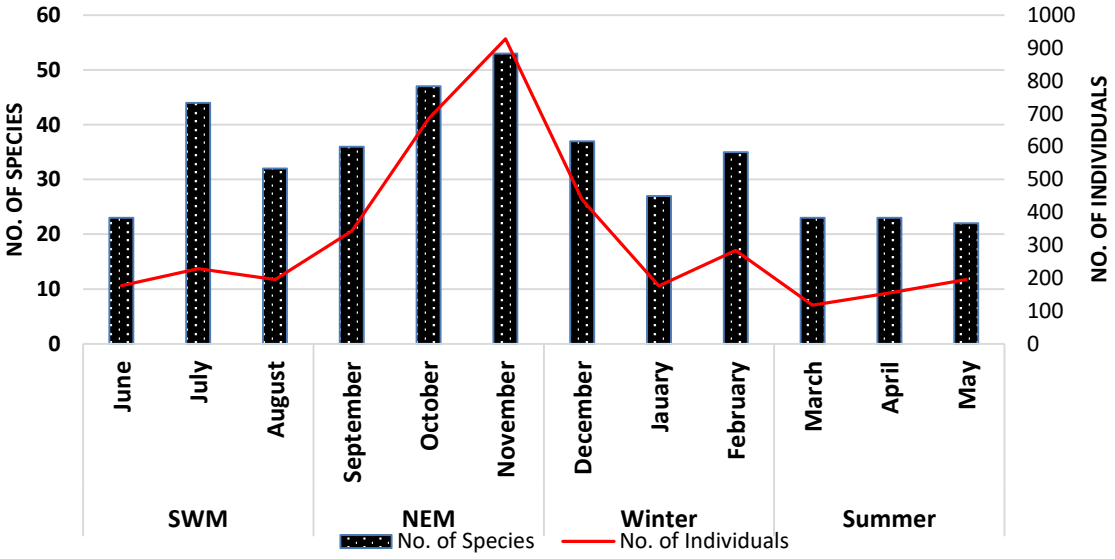
Table 10: Habitat wise butterfly species diversity in Kottur Village, Theni

| Diversity Index | Habitat | | | |
|---|---|---|---|---|
| | Natural Forest | Pond Edge | Mixed Crop | Coconut Plantation |
| Taxa_S | 74 | 59 | 48 | 56 |
| Individuals | 1550 | 932 | 643 | 800 |
| Shannon_H | 2.96 | 3.086 | 2.764 | 2.938 |
| Simpson_1-D | 0.912 | 0.9257 | 0.8943 | 0.9069 |

Table 11: Habitat wise beta diversity of butterflies (Sorenson's Index) in Kottur Village, Theni

| Habitat | Habitat | | | |
|---|---|---|---|---|
| | Natural Forest | Pond Edge | Mixed Crop | Coconut Plantation |
| Natural Forest | - | 0.42857 | 0.44262 | 0.38462 |
| Pond | - | - | 0.42056 | 0.47826 |
| Mixed forest | - | - | - | 0.44231 |

| | | | | |
|---|---|---|---|---|
| Coconut Plantation | - | - | - | - |




SWM: south west monsoon, NEM: northe east monsoon,

Figure 1: Seasonal and monthly variation of butterflies recorded in study area during the study period 2018 and 2019.

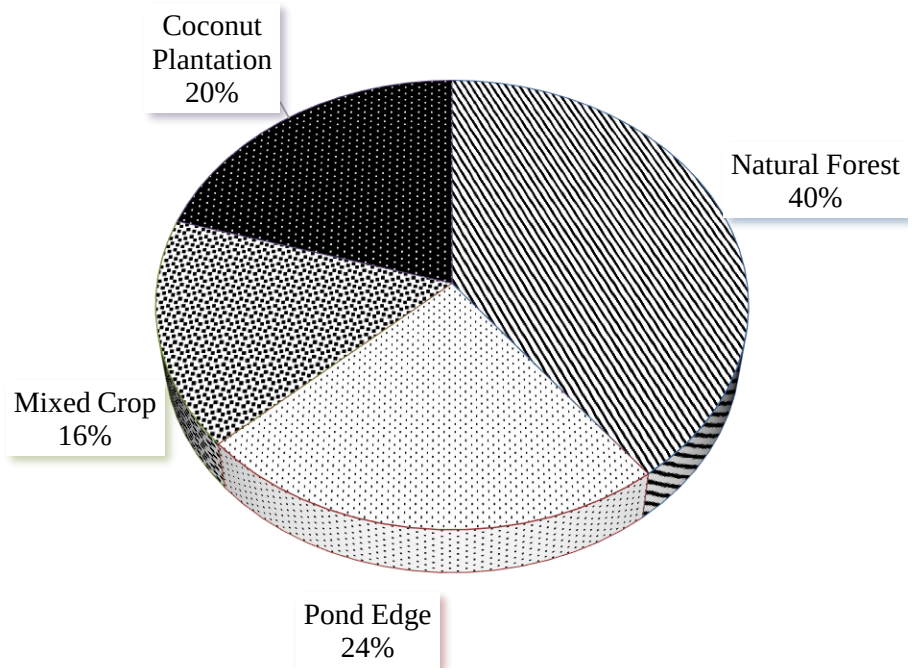
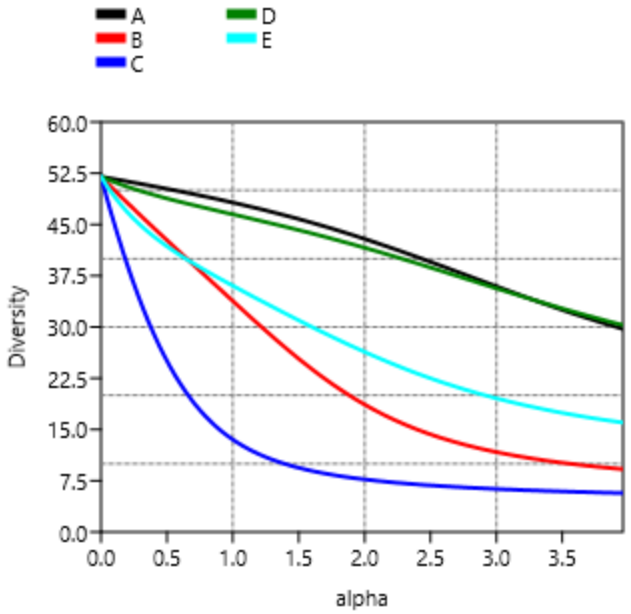
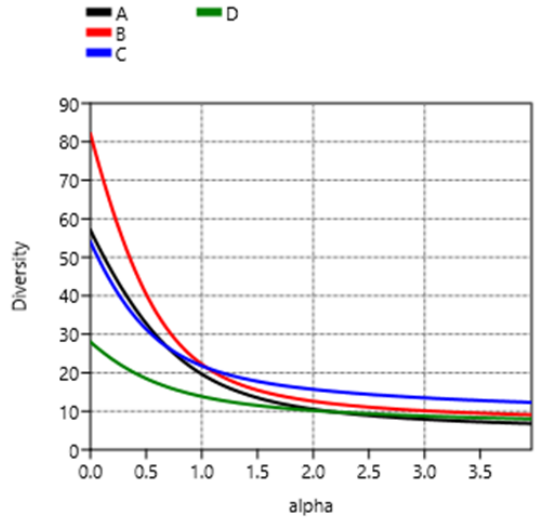



Figure 2: Percentage of butterfly individuals recorded in different habitat of the study area



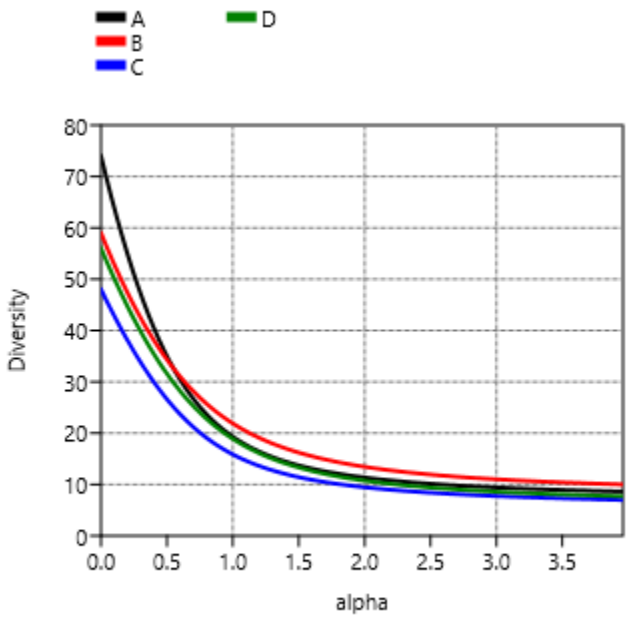

Hesperiida, B-Lycaenidae, C- Nymphalidae, D-Papilionidae, E- Pieridae

Figure 3: Family wise butterfly species diversity profile at Kottur Village, Theni




A-SWM, B-NEM, C-Winter, D-Summer

Figure 4: Seasonal wise butterfly species diversity profile at Kottur Village, Theni




A-Natural forest, B-Pond Edge, C-Mixed Crop, D- Coconut Plantation

Figure 5: Habitat wise butterfly species diversity profile at Kottur Village, Theni

Appendix 1: Encounter Rate of butterflies recorded in the study area from July 2019 to June 2020

| S.No | Family | Common name | Scientific name | Total number of Butterflies sighted | Individuals/KM |
|---|---|---|---|---|---|
| 1 | HESPERIIDAE | Brown awl | Badamia exclamationis | 1 | 0.01 |
| 2 | HESPERIIDAE | Common grass dart | Taractrocera maevius | 1 | 0.01 |
| 3 | HESPERIIDAE | Kanara swift ## | Caltoris canaraica | 2 | 0.02 |
| 4 | HESPERIIDAE | Common banded awl | Hasora chromus | 1 | 0.01 |
| 5 | HESPERIIDAE | Dark branded swift | Pelopidas mathias | 2 | 0.02 |
| 6 | HESPERIIDAE | Brush flitter | Hyarotis microstictum | 1 | 0.01 |
| 7 | HESPERIIDAE | Suffused snow flat | Tagiades gana | 4 | 0.04 |
| 8 | HESPERIIDAE | African marbled skipper | Gomalia elma | 2 | 0.02 |

| | | | | | |
|---|---|---|---|---|---|
| 9 | HESPERIIDAE | Common spotted flat | Celaenorrhinus leucocera | 9 | 0.09 |
| 10 | HESPERIIDAE | Tamil grass dart | Taractrocera ceramas | 1 | 0.01 |
| 11 | HESPERIIDAE | Rice swift | Borbo cinnara | 3 | 0.03 |
| 12 | HESPERIIDAE | Vindhyan bob | Arnetta vindhiana | 2 | 0.02 |
| 13 | HESPERIIDAE | wax dart | Cupitha purreea | 1 | 0.01 |
| 14 | LYCAENIDAE | Eastern grass jewel | Freyeria putli | 11 | 0.11 |
| 15 | LYCAENIDAE | Grass jewel | Chilades trochylus | 2 | 0.02 |
| 16 | LYCAENIDAE | Tailless lineblue | Prosotas dubiosa | 3 | 0.03 |
| 17 | LYCAENIDAE | Gram blue* | Euchrysops | 10 | 0.10 |
| 18 | LYCAENIDAE | Peacock royal* | Tajura cippus | 2 | 0.02 |
| 19 | LYCAENIDAE | Indian oakblue | Arthopala atrx | 2 | 0.02 |
| 20 | LYCAENIDAE | Dark cerulean | Jamides bochus | 1 | 0.01 |
| 21 | LYCAENIDAE | Bright babul blue | Azanus ubaldus | 9 | 0.09 |
| 22 | LYCAENIDAE | Tiny grass blue | Zizula hylax | 4 | 0.04 |
| 23 | LYCAENIDAE | White hedge blue | Udara akasa | 4 | 0.04 |
| 24 | LYCAENIDAE | Yellow pancy | Loxura atymnus | 1 | 0.01 |
| 25 | LYCAENIDAE | Quaker | Neopithecops zalmora | 24 | 0.25 |
| 26 | LYCAENIDAE | Common cerulean | Jamides celeno | 3 | 0.03 |
| 27 | LYCAENIDAE | Indian cupid | Everes lacturnus | 6 | 0.06 |
| 28 | LYCAENIDAE | Dark grass blue | Zizeeria karsandra | 2 | 0.02 |
| 29 | LYCAENIDAE | plain hedge blue | Celastrina lavendularis | 2 | 0.02 |
| 30 | LYCAENIDAE | Large guava blue | Virachola perse | 5 | 0.05 |
| 31 | LYCAENIDAE | Silver forget me not | Catochrysops panormus | 88 | 0.92 |
| 32 | LYCAENIDAE | Common silverline | Cigaritis vulcanus | 3 | 0.03 |
| 33 | LYCAENIDAE | Zebra blue | Tarucus plinius | 1 | 0.01 |

| | | | | | |
|---|---|---|---|---|---|
| 34 | LYCAENIDAE | Lime blue | Chilades lajus | 14 | 0.15 |
| 35 | LYCAENIDAE | Pea blue* | Lampides boeticus | 4 | 0.04 |
| 36 | LYCAENIDAE | Large oakblue | Arhopala amantes | 1 | 0.01 |
| 37 | LYCAENIDAE | White tipped lineblue* | Prosotas noreia | 7 | 0.07 |
| 38 | LYCAENIDAE | Common hedge blue | Acytoleppis puspa | 21 | 0.22 |
| 39 | LYCAENIDAE | Plains cupid | Chilades pandava | 2 | 0.02 |
| 40 | NYMPHALIDAE | Common baron | Euthalia aconthea | 13 | 0.14 |
| 41 | NYMPHALIDAE | Painted courtesan* | Euripus consimilis | 5 | 0.05 |
| 42 | NYMPHALIDAE | Yellow jack sailer | Lasippa viraja | 13 | 0.14 |
| 43 | NYMPHALIDAE | Painted lady | Vanessa cardui | 6 | 0.06 |
| 44 | NYMPHALIDAE | Angled castor | Ariadne ariadne | 149 | 1.55 |
| 45 | NYMPHALIDAE | Blue admiral | Kaniska canace | 14 | 0.15 |
| 46 | NYMPHALIDAE | Blue pansy | Junonia orithya | 1 | 0.01 |
| 47 | NYMPHALIDAE | Dark brand bush | Mycalesis mineus | 6 | 0.06 |
| 48 | NYMPHALIDAE | Blue tiger | Tirumala limniace | 16 | 0.17 |
| 49 | NYMPHALIDAE | Chocolate pansy | Junonia iphita | 10 | 0.10 |
| 50 | NYMPHALIDAE | Common leopard | Atella phalantha | 37 | 0.39 |
| 51 | NYMPHALIDAE | Common five ring | Ypthima baldus | 2 | 0.02 |
| 52 | NYMPHALIDAE | Common sailor | Neptis hylas | 11 | 0.11 |
| 53 | NYMPHALIDAE | Dark blue tiger | Tirumala septentrionis | 4 | 0.04 |
| 54 | NYMPHALIDAE | Gladeye Bushbrown## | Mycalesis patnia | 2 | 0.02 |
| 55 | NYMPHALIDAE | Great egg fly | Hypolimnas bolina | 18 | 0.19 |
| 56 | NYMPHALIDAE | Grey pansy | Junonia atlites | 7 | 0.07 |
| 57 | NYMPHALIDAE | Lemon pansy | Junonia lemonias | 96 | 1.00 |
| 58 | NYMPHALIDAE | Clipper* | Parthenos sylvia | 1 | 0.01 |
| 59 | NYMPHALIDAE | Nigger | Orsotrioena medus | 4 | 0.04 |
| 60 | NYMPHALIDAE | Small leopard* | Phalanta alcippe | 1 | 0.01 |

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| 61 | NYMPHALIDAE | Baronet | Euthalia nais | 6 | 0.06 |
| 62 | NYMPHALIDAE | Short banded sailor | Neptis columella | 6 | 0.06 |
| 63 | NYMPHALIDAE | Lepcha bushbrown | Mycalesis lepcha | 3 | 0.03 |
| 64 | NYMPHALIDAE | Common castor | Ariadne merione | 50 | 0.52 |
| 65 | NYMPHALIDAE | Striped tiger | Danaus genutia | 196 | 2.04 |
| 66 | NYMPHALIDAE | Common crow$* | Euploea core | 1 | 0.01 |
| 67 | NYMPHALIDAE | Red disk bushbrown## | Mycalesis oculus | 2 | 0.02 |
| 68 | NYMPHALIDAE | Tamil yeoman## | Cirrochora thais | 33 | 0.34 |
| 69 | NYMPHALIDAE | Tawny coster | Acraea violae | 45 | 0.47 |
| 70 | NYMPHALIDAE | White/ceylon four ring | Ypthima ceylonica | 5 | 0.05 |
| 71 | NYMPHALIDAE | Common lascar | Pantoporia hordonia | 1 | 0.01 |
| 72 | NYMPHALIDAE | Yellow pansy | Junonia hierta | 269 | 2.80 |
| 73 | NYMPHALIDAE | blackvein sergent | Athyma ranga | 5 | 0.05 |
| 74 | NYMPHALIDAE | Chestnut streaked sailer | Neptis jumbah | 2 | 0.02 |
| 75 | NYMPHALIDAE | Anomalous nawab | Charaxes agrarius | 3 | 0.03 |
| 76 | NYMPHALIDAE | Staff sergeant | Athyma selenophora | 3 | 0.03 |
| 77 | NYMPHALIDAE | Joker | Byblia ilithyia | 14 | 0.15 |
| 78 | NYMPHALIDAE | Indian fritillary | Argynnis hyperbius | 8 | 0.08 |
| 79 | NYMPHALIDAE | Common treebrown | Lethe rohria | 3 | 0.03 |
| 80 | NYMPHALIDAE | Indian red admiral | Cynthia indica | 1 | 0.01 |
| 81 | NYMPHALIDAE | Common three ring | Ypthima asterope | 15 | 0.16 |
| 82 | NYMPHALIDAE | Common sergeant | Athyma perius | 12 | 0.13 |
| 83 | NYMPHALIDAE | Double branded crow | Euploea sylvester | 6 | 0.06 |
| 84 | NYMPHALIDAE | Rustic | Cupha erymanthis | 1 | 0.01 |

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| 85 | NYMPHALIDAE | Cruiser | Vagrantini vindula | 5 | 0.05 |
| 86 | NYMPHALIDAE | Orange oakleaf | Kallima iinachus | 3 | 0.03 |
| 87 | NYMPHALIDAE | Black prince | Rohana parisatis | 4 | 0.04 |
| 88 | NYMPHALIDAE | Bamboo treebrown | Lethe europa | 2 | 0.02 |
| 89 | NYMPHALIDAE | Grey count* | Tanaecia lepidea | 7 | 0.07 |
| 90 | NYMPHALIDAE | Malabar tree nymph##and | Idea malabarica | 6 | 0.06 |
| 91 | NYMPHALIDAE | plain tiger | Danaus chrysippus | 383 | 3.99 |
| 92 | NYMPHALIDAE | Malabar banded peacock##* | papilio buddha | 3 | 0.03 |
| 93 | NYMPHALIDAE | Blue Mormon | Papilio polymnestor | 3 | 0.03 |
| 94 | NYMPHALIDAE | Common mime* | Papilio clytia | 5 | 0.05 |
| 95 | NYMPHALIDAE | Common Mormon | Papilio polytes | 12 | 0.13 |
| 96 | NYMPHALIDAE | Red helen | Papilio helenus | 1 | 0.01 |
| 97 | NYMPHALIDAE | Common rose | Pachliopta aristolochiae | 29 | 0.30 |
| 98 | NYMPHALIDAE | Crimson rose* | Pachliopta hector | 107 | 1.11 |
| 99 | NYMPHALIDAE | Malabar rose## | Pachliopta pandiyana | 72 | 0.75 |
| 100 | PIERIDAE | Common jezebel | Delias eucharis | 1 | 0.01 |
| 101 | PIERIDAE | Common albatross | Appias albina | 9 | 0.09 |
| 102 | PIERIDAE | Common grass yellow | Eurema hecabe | 250 | 2.60 |
| 103 | PIERIDAE | Common wanderer | Pareronia valeria | 38 | 0.40 |
| 104 | PIERIDAE | Painted sawtooth##* | Prioneris sita | 1 | 0.01 |
| 105 | PIERIDAE | Psyche | Leptosia nina | 4 | 0.04 |
| 106 | PIERIDAE | Yellow orange tip | Ixias pyrene | 35 | 0.36 |
| 107 | PIERIDAE | Chocolate albatross | Appias lyncida | 1 | 0.01 |
| 108 | PIERIDAE | white orange tip | Lxias marianne | 262 | 2.73 |

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| 109 | PIERIDAE | Lesser albatross##* | Appias wardii | 649 | 6.76 |
| 110 | PIERIDAE | Pioneer | Belenois aurota | 105 | 1.09 |
| 111 | PIERIDAE | One spot grass yellow$ | Eurema andersonii | 4 | 0.04 |
| 112 | PIERIDAE | Small salmon arab | Colotis amata | 67 | 0.70 |
| 113 | PIERIDAE | Small orange tip | Colotis etrida | 17 | 0.18 |
| 114 | PIERIDAE | Nilgiri clouded yellow## | Colias nilagiriensis | 2 | 0.02 |
| 115 | PIERIDAE | Striped albatross* | Appias libythea | 14 | 0.15 |
| 116 | PIERIDAE | Common emigrant | Catopsilia pomona | 453 | 4.72 |
| 117 | PIERIDAE | Crimson tip | Colotis danae | 3 | 0.03 |

Note: ## - endemic, $ - Least Concern, and - Near threatened, *-Schedule species

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Map 1. Study area of Kottur Village in Theni District