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Local landscape effects on butterfly community: A Case study

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Abstract

Butterflies being highly diversified and require specific ecological conditions for their survival. However, due to various reasons, the habitats of many butterflies have been altered. The main objective of this study was to determine the diversity and dynamics of Swallowtail butterflies in the landscaped sites. The total abundance and seasonal index of Swallowtail butterflies observed in different seasons were computed and graphically plotted. The correlation co-efficient between number of sightings per month and each of the above weather parameters were computed for each species by using SPSS. A total of 2,466 sightings of 13 species of Papilionid butterflies were recorded during the study period. Of these, sightings of 1,185 individuals were recorded during the first half of the study and 1,281 individuals in the second half. Of the various species recorded, *Atrophaneura hector, A. pandiyana, P. paris, P. dravidarum, P. demoleus*, *P. liomedon* and *Graphiumsarpedon* were present in the garden only during certain seasons. With regard to species abundance, except for *Atrophaneura aristolochiae* and *Papiliopolymnestor* which enjoyed relatively higher abundance and wider distribution within the study area.

1. Introduction

The most exhilarating aspect of life is its diversity and the uniqueness of its components. Among the invertebrates, butterflies are sufficiently well studied since their populations respond more rapidly to adverse environmental changes than longer lived organisms. Many species of butterflies that were once very common in our locality and country sides have vanished. It has been stated that extinction of a single species would eventually lead to extinction of about a dozen or more species that are linked with it. Biological diversity is increasingly recognized as a vital parameter to assess global and local environmental changes and sustainability of developmental activities (Rajagopal *et al,* 2011). Butterflies are potentially useful ecological indicators of urbanization because they are sensitive to changes in microclimate, temperature, solar radiation, and the availability of host plants for ovipositing and larval development (Thomas *et al,* 1998; Fordyce and Nice, 2003). The four main aspects that threaten Swallowtails are habitat alteration and destruction, pollution, introduction of exotic species and commercial exploitation. In general, these threats are either the direct result of increasing human population

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pressure or else are enhanced by it (Collins, 1984). Various attempts have been made to conserve butterflies in different parts of the world. Since public communication is an important element of environmental education, habitat recreations and site ameliorations are ideal means by which visitors can observe and study butterflies in a recreated environment. Butterfly population size, vulnerability and structure together constitute perhaps the most urgent information required for any possible conservation target. In this context, the role of landscaped sites in conserving the diversity and dynamics of Swallowtail butterflies were studied during the study.

2. Materials and Methods

An area of 0.5 ha of degraded moist deciduous forest patch in the Kerala Forest Research Institute (KFRI) sub-centre campus at Nilambur (11° 17.958′ N 76° 15.054′ E) was selected. This study plot included both landscaped areas containing streams, waterfalls, rock gardens, bushes, lianas, hedges and creepers as well as natural forest patch which offer appropriate conditions for a variety of Papilionid butterflies. Data pertaining to butterfly population, seasonal patterns and habitat associations was generated by making regular observations in the field along a transect. The transect was laid out as per the method suggested by Ishii (1993) and Pollard (1977). Transects of 175 m long and 1.2 m wide traversing differing habitats such as landscaped area, natural vegetation, and forest areas was monitored regularly at 15 days interval during the two year period. Observations were made for a period of 28 months from September 2010 to December 2012. Weather data from weather stations in the study area was collected for correlating the seasonal abundances of butterflies to the weather parameters particularly temperature, rainfall and humidity. The total abundance of Swallowtail butterflies observed in different seasons in the study site over the study period were computed and graphically plotted.

3. Results and Discussion

A total of 2,466 sightings of 13 species of Papilionid butterflies were recorded during the study period (Table-1&2). Of these, sightings of 1,185 individuals were recorded during the first half of the study and 1,281 individuals in the second half. Of the various species recorded, six species, *viz.,Troidesminos, Atrophaneura aristolochiae, Papiliopolytes, P. polymnestor*, *Chilasaclytia* and *G. Agamemnon* were commonly observed in the area during most of the seasons while species such as *Atrophaneura hector, A. pandiyana, P. paris, P. dravidarum, P. demoleus*, *P. liomedon* and *Graphium sarpedon* were present in the garden only during certain seasons. With regard to species abundance, except for *Atrophaneura aristolochiae* and *Papiliopolymnestor* which enjoyed relatively higher abundance and wider distribution within the study area. It is interesting to note that 6 species recorded from the garden *viz.*, *Troidesminos, Atrophaneura pandiyana*, *A. hector, Papiliodravidarum, P. liomedon* and *P. polymnestor* were endemic to the Western Ghats; two species *viz.,P. liomedon* and *Atrophaneura hector* were having protected status, while another

species, *viz., Papilioparis* has been ranked as Rare. The total number of species recorded from the present study represented 68.8% of the total Papilionid species documented from the Kerala part of the Western Ghats.Compared to the first year, species richnessof*A. pandiyana*, *P. polymnestor* and *C. clytia* was higher during the second year. However, sightings of *A. hector, P. dravidarum, P. liomedon*, *P. paris*, *P. demoleus* and *G. agamemnon* were less during the second year (Fig. 1). This maybe due to the unfavourable climatic conditions or due to the scarcity of water, nectar or fresh foliage. The pooled data from two years transect count showed a remarkable difference in the proportional abundance of different species of Papilionids during different seasons. The population was present throughout the year, with maximum number of sightings in September 2012. The population had lowest sightings during the summer months (March- April) probably due to high temperature characteristic of these months. From June onwards, the population registered an increase and reached its peak in September 2012. The population showed a sharp decline during April (Fig. 2). The number of total sightings was considerably high during the second year compared to the first year, which may be due to the better performance of larval and nectar plants inroduced in the Safari.

Table-1 Sightings of butterflies at Nilambur (Sep. 2010 – Dec. 2012)

Sl. No	Species	No. of Sightings (In percentage, %)		Total sightings
		Ist Half	II nd Half	
1	*Troidesminos* (Southern Birdwing)	178	180	358
2	*Atrophaneura hector* (Crimson Rose)	79	57	136
3	*A. aristolochiae* (Common Rose)	233	325	558
4	*A. pandiyana* (Malabar Rose)	143	169	312
5	*Chilasaclytia* (Common Mime)	70	86	156
6	*Papilioparis* (Paris Peacock)	18	12	30
7	*P. polytes* (Common Mormon)	241	188	429
8	*P. polymnestor* (Blue Mormon)	60	150	210
9	*P. demoleus* (Lime Butterfly)	24	17	41
10	*P. dravidarum* (Malabar Raven)	34	15	49
11	*P. liomedon* (Malabar Banded	47	42	89

	Swallowtail)			
12	*Graphium sarpedon* (Common Bluebottle)	15	15	30
13	*G. agamemnon* (Tailed Jay)	43	25	68
	Total sightings	1,185	1,281	2,466

Table-2 Correlation coefficient of butterfly abundance versus weather parameters

Sl. No.	Species	Correlation Coefficient (R) Rainfall
1	*T. minos*	0.386*
2	*A. hector*	-0.458*
3	*A. pandiyana*	0.349
4	*A. aristolochiae*	0.058
5	*P. liomedon*	0.382*
6	*P. polymnestor*	0-.015
7	*P. paris*	0.531**
8	*C. clytia*	0.096
9	*P. polytes*	0.149
10	*P. dravidarum*	0.661**
11	*P. demoleus*	-0.211
12	*G. agamemnon*	-0.334
13	*G. sarpedon*	0.537**

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

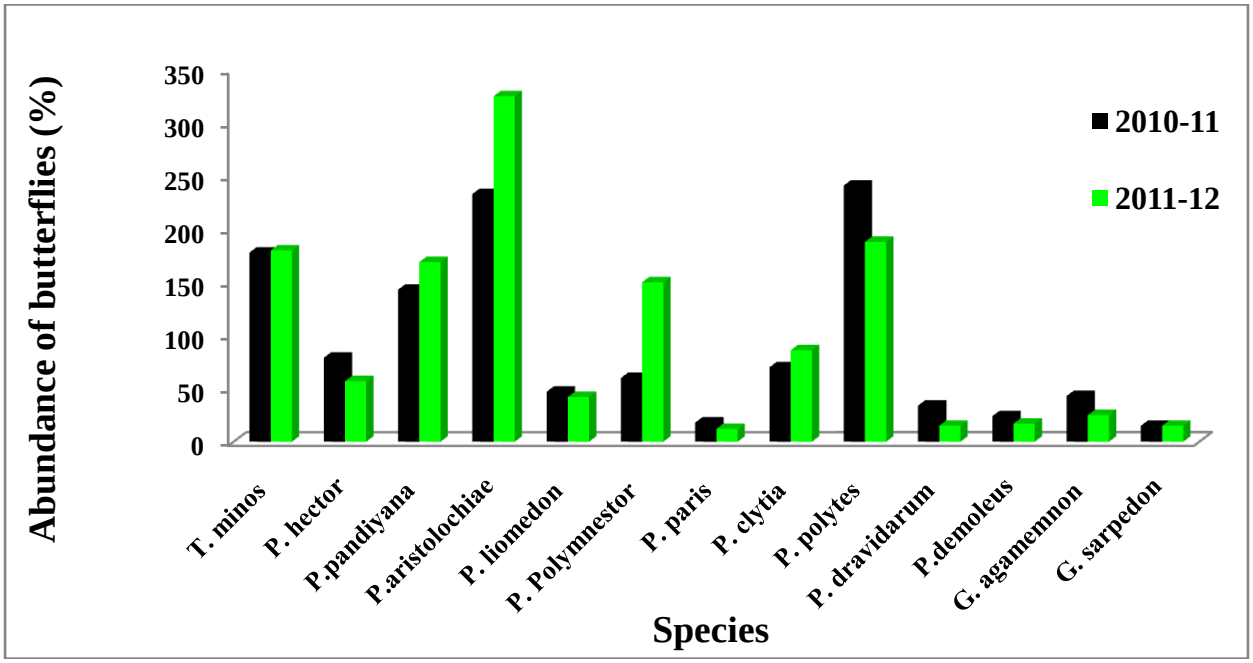

Fig. 1. Species-wise population trends of Papilionids in the Nilambur region

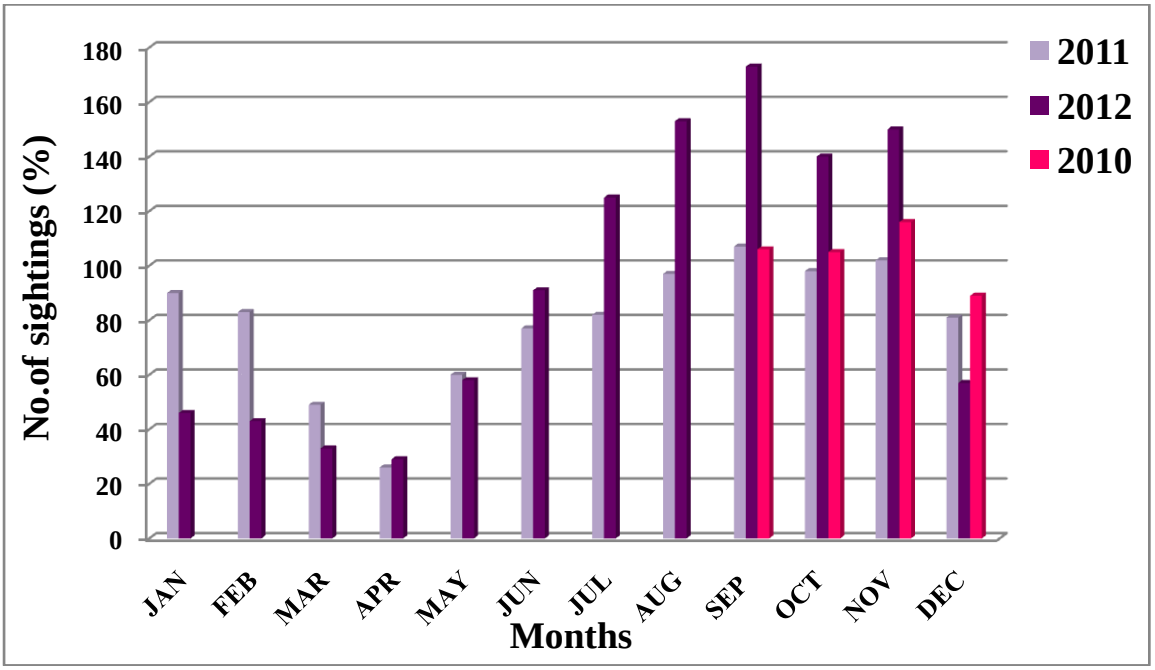

Fig. 2. Seasonal abundance pattern of Papilionids in the Nilambur region.

4. Conclusion

As regards to the Papilionid fauna, 13 species belonging to 5 genera were recorded from Nilambur area. The faunal elements comprised of protected and endemic species. The abundance in butterfly population is attributed mainly due to the availability of a relatively large stretch of natural vegetation, offers ample opportunities for the survival of a wide spectrum of butterflies compared to the other locations which are situated in the outskirts of natural forests. As regards to the seasonal abundance of butterflies the highest abundance was noted during the post monsoon seasons in 2012 and lowest in the pre monsoon season of 2012. The highest seasonal index was observed during June to November and lowest in January to May. From June onwards the population showed a gradual increase reaching its peak during the months August to November. It indicates that weather parameters play a major role in regulating butterfly populations. Correlation analysis has shown that different butterfly species respond differently to the environmental/weather parameters, thus highlighting the importance of maintaining the environmental heterogeneity for the conservation of different butterfly species. Information related to the community structure, composition and seasonal fluctuations of the butterfly fauna are very important and form a baseline data for the future conservation programmes.

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