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RESEARCH ARTICLE

DIVERSITY AND ABUNDANCE OF BUTTERFLIES IN VILLUPURAM DISTRICT, TAMIL NADU, SOUTH INDIA

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ABSTRACT

Butterflies are fascinating creatures of order Lepidoptera have special place in the insect world. The present study was carried out to document the species diversity and abundance from January to December 2010 in the Villupuram District, using the transect counting method. All the butterflies recorded at a distance of 5m from the observer during the counts. Species diversity and abundance is calculated by Shannon –Weiner index. A total of 2844 individuals belonging to 56 species of butterflies were recorded during the period and highest number of species was recorded from the family Nymphalidae, Pieridae and Papilionidae were recorded. Butterflies are sensitive to the changes in the habitat and climate, which influences their distribution and abundance. It is suggest that butterfly species diversity generally increase with increase in vegetation.

INTRODUCTION

Biodiversity is the variety of life describing the number and variability in relation to ecosystem in which they occur. Arthropods are good indicators of habitat biodiversity because they respond quickly to environmental changes, and are a highly diverse taxon. Lepidoptera (butterflies and moths) are the second largest order of arthropods and making them particularly useful for biodiversity surveys. The butterflies are the best indicator of these changes and can be used as surrogate to assess the conservation threat to the biodiversity. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programmes (Gadgil 1996). Many of butterfly species are strictly seasonal and prefer only a particular set of habitats (Kunte, 1997) and they are good indicators in terms of anthropogenic disturbance and habitat quality (Kocher and Williams, 2000). These were highly adapted to particular habitats and it is neglected by many ecologists. Being good indicators of climatic conditions as well as seasonal and ecological changes, they can serve in formulating strategies for conservation. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programmes (Gadgil 1996). Increases in human population combined with advances in technology have directly subjected in the ecosystems of the world to many changes and leads to decline in the habitats of many species. The different urban landscapes showed variations in the family and species abundance, richness and percent frequency of species. The purpose of present investigation is to understand the butterfly diversity, seasonal variations and to analyse changes in abundance of butterflies diversity and species richness in Villupuram District.

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MATERIALS AND METHODS

Study Area

The Villupuram district are located at a latitudes and longitudes of (79° 32' E and 11° 57' N) which is situated at the foothills of the eastern slope of the Western Ghats. The study area concentrating only in Kallakurichi area, it is the largest taluk in Tamil Nadu comprising around 268 villages, giving you the reason for its large growth than Villupuram. The study area is divided into three sites which include undisturbed area, Agricultural area and Urban Area. Agriculture is the backbone of this study area. Sugarcane cultivation is prevalent in this area. Kallakurichi is also known as "Sugar City" .The temperature is moderate; the maximum and minimum temperatures being 38°C and 21°C respectively. The town gets its rainfall from the northeast monsoon in winter and the southwest monsoon in summer. The average annual rainfall is 1070 mm.

Methodology

Butterfly transects are a way of measuring the number and variety of butterflies present at a site from year to year, and require a weekly to two-weekly recording. Mostly photographic documentation was done. Modifications of the line transect count as per. Kunte; (1997) was used to determine butterfly richness and abundance. In this method permanent 300m line transects was setup in each habitat. The transect in each habitat was slowly traversed at a uniform pace for 30min at each habitats from 8.30 to 11.30 h during good weather period (no heavy rain or strong winds). This timing was found ideal in the area based on preliminary counts done in different times of the day revealed that the maximum butterfly activity was during that time. Butterfly species were

recorded around a radius of five meter from the observer covering his either sides, above and front. All individuals were identified in the field using standard guides (Gunathilagaraj et al., 1998; Kunte, 2000; Jahir et al., 2008). And data were analysed by using Shannon's diversity index (H'). Diversity and evenness values for litter and soil arthropods were estimated using Shannon's diversity index (H') (ludwing and reynolds 1988).

RESULTS AND DISCUSSION

During the transect sampling, we recorded a total of 2844 individuals belonging to 56 species of butterflies were observed during the study. Nymphalidae found to be the dominant family during all seasons. The figure-1 shows the species abundance graph shows uneven distribution of butterfly species with few family species being abundant and many species are rare. The Nymphalidae was the most specious family in the all sites. Eighteen species belonged to this family, which accounted for around 42% of the species richness. And the abundance species richness more in Nymphalidae**,** Papilionidae and Pieridae families during the study period which may be due to the availability of host plants.

Table 1 Diversity and richness of different families collected from the study sites

Family	SITE- I Undisturbed area			SITE –II Agricultural area			SITE –III Urban area		
Taxonomic group	Diversity (Shannon–Wiener)	Evenness	Richness	Diversity (Shannon–Wiener)	Evenness	Richness	Diversity (Shannon–Wiener)	Evenness	Richness
Nymphalidae	1.98	0.9992	9	1.77	0.9888	6	1.09	0.9889	3
Papilionidae	1.92	0.9877	7	1.37	0.9761	4	1.07	0.976	3
Pieridae	1.58	0.9737	5	1.09	0.9877	3	1.05	0.9684	2
Lycaenidae	1.35	0.9737	4	1.09	0.9872	3	0.97	0.9553	2
Hesperiidae	1	0.9123	3	0.66	0.9456	1	0.67	0.8868	1

And the abundance is more in Papilionidae and Pieridae families and species richness is more in Nymphalidae during the study period which may be due to the availability of host plants. Plant diversity and structure affect the viability of many terrestrial invertebrates' populations. And the study reveals increase in richness and abundance during winter.

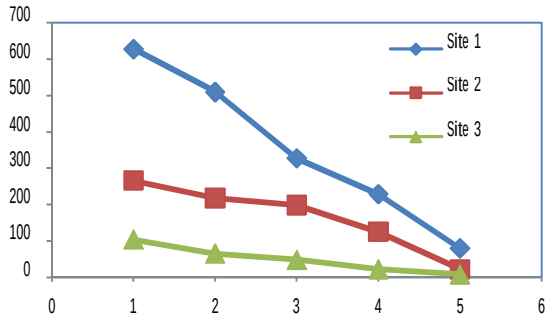

Fig.1 Shows the abundance of butterflies in different study sites

Occurrence patterns of a few butterfly species showed interesting trends. The rings (*Ypthima* spp., family Nymphalidae) are grass-feeders in their larval stage. Some butterfly species have environmentally induced an alternative seasonal form, which is known as seasonal polyphenism. However, dry season forms were more abundant during winter than during summer. Seasonal changes faced by different generations may include changes in ambient temperature and day-length, differential availability of secure resting places, nectar plants for adults and larval host plants, and a different set of predators and predation risk. Many researchers have reported that butterflies are good responders to changes in the environment (Kunte 1997; Arun 2002; Borkar & Komarpant 2004; Kunte Padhye et al. 2006; Tiple et al. 2006; 2007; Joshi 2007; Mathew & Anto 2007; Krishnakumar et al. 2008).

The relationships between butterflies and climate are complex, involving all four stages of the life cycle. Food habits among species (Gilbert & Singer 1975; Kitahara et al. 2000) also influence the relationships between climate and butterfly diversity and abundance (South wood 1975). And habitat type also plays a major role in distribution of species. The butterfly distribution are expected to cover with the distribution of their host plants even at small scales and type of vegetation may reflect difference in the composition of butterfly communities among habitats at the generic and family level (Beccaloni; 1997). Agricultural sites had significantly more butterflies than non-agricultural sites (Erica Fleishman 1999). Butterflies have traditionally been viewed as an excellent group of bioindicators, mainly due to complexity of ecological management required by many species(Thomas 1995, New et al., 1995) and more recently to their great ability to act as indicators of climate changes (Parmesan, 2003). This indicated that the butterflies at southern plains of India prefer these seasons to rest of the year for breeding and emergence. Moreover, butterfly richness and density was negatively correlated with temperature. The present information is useful for planning and implementation of conservation measures in urban ecosystem. Hence the study on diversity of butterflies contributes to take conservation measures.

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