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Diversity and seasonal occurance of Butterflies at Kisan P.G. College, Simbhaoli, Hapur, Uttar Pradesh (India)

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Abstract

Kisan P.G. College, Simbhaoli, Hapur, contains a large quantity of green spaces. Kisan P.G. College Simbhaoli with its plant diversity in the form of small grassland, scrubland and some dense green belt area provide good habitat for butterfly's species. Moving vehicles cause heavy metal toxicity, and high sulphur dioxide in the air is particular harmful to butterflies. During smog episodes, the caterpillar mortality was very high and only a few to survive to turn into full-fledged butterflies. People are happy because the brightly coloured flyers are flourishing in the lockdown period. With the pollution load dropping due to lockdown, butterflies seem to be doing extremely well. Butterflies have a shorter life, so it wasn't easy to determine the effect of lockdown in the beginning, but over the weeks, it is evident that the butterfly populations have gone up dramatically. They may have been aided by stoppage in human activity. The present study was carried out to assess the Butterfly diversity from 1 February 2019 to 31 December 2020 by applying standard technique. During the study period, a total of 53 species of butterflies belonging to 5 families were observed.

Keywords: Butterfly diversity, Abundance, lockdown

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Introduction

In recent decades the world has become increasingly urbanized, with over half of the global population now living in urban areas, a proportion which is predicted to increase to 66% by 2050 (United Nations, 2014). The effects of urbanization have been studied and reviewed for various taxa, including birds, invertebrates, mammals, reptiles and plants (Aronson et al., 2014). Urban biodiversity provides important cultural ecosystem services and may contribute towards human well-being. Depending upon the intensity of urbanization, urban structures can provide a wide and heterogeneous range of habitats. Urban forested areas in the form of parks and green belts could be good habitats for sustenance of butterfly species (Rajagopal et al. 2010, Raut and Pendharkar 2010). Kisan P.G. College, Simbhaoli, Hapur contains a large quantity of green spaces. Parks and green belt areas in the city provide natural vegetation, as well as planted seasonal flowering plants. Devoid of any developmental activities and less population, these areas may be reserve for butterflies. Butterflies respond sensitively and rapidly to changes in climate and habitat and may act as representatives for less well-monitored insect groups. Butterflies are also culturally important as demonstrated by their popularity amongst the general public and frequent appearances in art and literature (Fox et al., 2015). These attributes make butterflies potentially valuable biodiversity indicators. At present, there are around 18,000 species of butterflies in the world and India has about 1501 species of butterflies, which are further segregated into various families viz. Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, Pieridae and Riodinidae (Kunte et al. 2017). Butterflies are taxonomically well studies group, which have received a reasonable amount of attention throughout the world (Winter-Blyth, 1957; Laithwaite et al.,1975; Smart 1975; Larsen 1987; Ghazoul,2002; Uniyal, et al.,2007.The present study focuses on the status of butterfly diversity across seasons in Kisan P.G. College, Simbhaoli, Hapur and is the first ever scientific documentation hitherto unreported.

Study Area

Kisan P.G. College, Simbhaoli, Hapur (N 28° 40' 4.28", E 77° 26' 59.24") and having elevation of 184.7m is located in Hapur District of Uttar Pradesh. The College is located at the eastern part of Hapur. It is approx. 25 km from Hapur railway station. Ghaziabad is one of the largest and oldest cities in the state of Uttar Pradesh. The city which is adjacent to New Delhi also shares the boundary with the district of Meerut, is called the "Gateway of UP". Simbhaoli Is Situated near Garhmukteshwar Which Is on the banks of Holy Ganga River. The soils of the district are loam, sandy loam, alkaline & saline in nature. The area has a sub-tropical climate with hot summers (37-44 0C) from late March to early July, the humid monsoon season from late June to early October and a cool and dry winter from early November to late February (2-9.5.0 0C). Simbhaoli, Hapur gets 780 mm of rain every year, most of which is concentrated in the monsoon months from late June to late September.

Data collection

The field study was conducted during 1 February 2019 to 31 December 2020, in the selected sites during different seasons. The whole study was classified into four seasons to record the diversity upon abundance of flora in each season. Pollard walk method (Pollard 1979, Pollard and Yates 1993) was adopted for observing butterflies, i.e., walking along the fixed paths while recording and collecting the species. The observation width was limited to about 5 M. Butterflies were observed from 8:00 hrs to 12.00 hrs twice in a week .The study was restricted to spotting, digital recording, collecting and releasing the specimen as and when required for confirming the species. The observations were with the naked eye, magnifying lenses, digital camera and field microscope along with other requisite tools. The species were

identified in the field using field guides by Isaac Kehimkar (2008), internet database by Kunte et al were consulted.

Table-I

Seasons	Duration
Monsoon and post Monsoon	July to October
Winter	November-January
Spring Summer	February to March
Peak Summer	April to June

Habitat Characterization

The life cycle of a butterfly completes in four stages, and each butterfly species lays its eggs on a specific plant (or a choice of few species of plants). The larva (or caterpillars) feed on these plants and hence these plants are termed as larval host plants (LHP). For example the Common Rose butterfly lays its eggs on *Aristolochia indica*, Common Jay lays their eggs on *Polyalthia longifolia*, *Common Mormon* lays its eggs on *Murraya koenigii* (Curry Leaf) and *Citrus aurantifolia* (Lime tree). The more is the diversity of larval host plants in the butterfly garden the more number of butterfly species will start breeding in the garden. And there is more chance of the butterflies staying back in the area if they can fulfill all their requirements in the area. Some of the common plants which attract lot of butterfly species for nectaring are *Lantana* spp., Jamaican Blue *Stachytarphaeta* spp., Cockscomb Celosia spp., wild Xenia spp. and Ixora species. A small herb *Tridax indica* attracts lot of blue (lycaenid) butterflies for nectaring. The entire study area was di-vided into three major habitats on the basis of vegetation and soil type, woodland, grassland and wetland habitats. These major habitat further divided into micro-habitats; woodland includes *Phoenix sylvestris, Termina-lia arjuna, Syzigium cumini* and *Prosopis juliflora*; grassland are dominant with *Sachharum* sp., *Vetiveria zizanioides* and *Desmostachya bipinnata* species. These mosaics of habitat serve as a good host for various species of butterflies in the area.

Data analysis

Abundance categories of butterflies were assigned into five categories on the basis of species abundance recorded during sampling (Uniyal and Bhargav, 2007), abundant (A= >40), fre-quent (F= 30-40), common (C= 20-30), occasional (O= 10-20) and rare (R= <10). Conservation status of each species was assigned according to the IUCN Red List (2012) and Indian Wildlife (Protection) Act (1972).

Results

A total of 53 butterfly species belonging to 5 families were recorded. Nymphalidae represented by 23 species, was the most dominant family followed by Pieridae-12 species, Lycaenidae- 8 species, Hesperiidae- 7 species and Papilionidae- 3 species respectively (Table 1). The dominance index for various groups of butterflies in the study area is presented in Table 1. Out of 53 butterfly species, 16.98% (n=9) were recorded abundantly (A), followed by 15.09% (n=8) frequent (F), 18.87% (n=10) common (C), 26.42% (n=14) occasional (O) and 22.64% (n=12) rare (R) butterflies (Table 2). Habitat-wise com-position of butterfly species recorded maximum in wood-land (39 species) followed by grassland (24 species), wetland habitat (14 species) and 4 species recorded over-lapping in all the habitats; 12 species recorded in both woodland and grassland habitat; 4 species recorded in both woodland and

wetland habitat and only one species in both grassland and wetland habitat, respectively (Table 2). Jaccard and Sorenson similarity index showed the shared species statistics between pairs of the three habitats (Table 4). The woodland and grassland habitat showed highest number of shared species (16 species). The Fisher alpha diversity indicated the following habitats in a decreasing order of diversity; grassland (5.97), woodland (3.31), wetland (3.11). The Shannon's diversity index showed the same pattern with minor variations from 1.55 to 2.05. The equitability or evenness index and Margalef's richness index recorded maximum in grass-land habitat. Species wise abundance of butterfly species recorded by frequency of sightings across the study pe-riod. Plain Tiger butterfly *Danaus chrysippus* (42 sightings) recorded maximum sighting frequency followed by Peacock Pansy *Junonia almana* (34 sightings) and Common Grass Yellow *Eurema hecabe* (32 sightings), whereas least frequency of sightings recorded by 5 species Forget-Me-Not *Catochrysops strabo*, Grass Demon *Udaspes folus*, Great Swift *Pelopidas assamensis*, Pale Grass Blue *Pseudozizeeria maha* and Tawny Coster Acraea violae (only one sighting). Daily (morning-evening) sighting frequencies of selected butterfly species were also recorded. Out of 20 selected butterfly species, 16 species recorded in morning hours and 14 species recorded in evening hours, whereas 9 species re-corded in both morning and evening hours. Monthly sighting frequencies of butterfly individuals vary across the months during the study period. Out of total 444 sightings of butterfly individuals, November recorded maximum number of individuals 17.34% (n=77) and May recorded least number of individuals 4.05% (n=18) (Fig. 5). Seasonal variation of butterfly species recorded over the study period, monsoon re-corded maximum number of species (37%) followed by summer (32%) and winter (31%); whereas 16 species recorded in all the seasons, 5 species recorded in both monsoon and winter, 4 species recorded in both summer and monsoon; 6 species recorded in both summer and winter respectively. Host preferences of the 12 selected butterfly species belong to 3 families were also recorded during the study period. Eleven different larval food plants are fed by Nymphalids butterflies, whereas Lycanids feed on five food plant species and Pierids feed on six food plant species. Plain Tiger recorded the maxi-mum host species as bare ground and *Evolvulus* sp., *Des-mostachya bipinnata, Prosopis juliflora, Tribulus ter-restris, Eragrostis* sp., *Achyranthus aspera, Sida* sp., *Saccharum* sp. plant species. Common Cerulean preferred in bare ground and *Cynodon dactylon, Setaria verticillata, Sida* sp., *Desmostachya bipinnata, Saccha-rum* sp. plant species. Peacock Pansy showed preference in bare ground and *Setaria verticillata, Cynodon dacty-lon, Desmostachya bipinnata* and other grass species. Host preference of other species are as: Blue Pansy- bare ground and *Achyranthes aspera* plant species; Common Emigrant- *Achyranthus aspera*; Common Evening Brown- *Desmostachya bipinnata, Prosopis juliflora*; Common Grass Yellow- *Prosopis juliflora*, *Sida* sp., *Se-taria verticillata, Cynodon dactylon*; Common Leopard- bare ground, *Sida* sp., *Desmostachya bipinnata* and other grasses; Great *Eggfly- Prosopis juliflora*; Lemon pansy- *Achyranthus aspera*; Mottled Emigrant- *Setaria verticil-lata, Desmostachya bipinnata* and Striped Tiger- mixed grasses, *Phyllanthus reticulates* and *Sida* sp. According to the IUCN Red List, 5 species listed as Least Concern (LC) while the rest 47 species as Not Evaluated (NE). With respect to the Indian Wildlife (Protection) Act (1972), one species each was listed in Schedule I (Danied Eggfly *Hypolimnas misippus*) and IV (Great Swift *Pelopidas assamensis*) 3 species were listed in Schedule II (Indian Ace *Halpe homolea*, Common Gull *Cepora nerissa* and One Spot Grass Yellow *Eurema andersoni*) while the rest 47 species was not listed in any schedule.

Discussion

The diversity and abundance of butterfly species is highly correlated with the availability of food plants and varied assemblage of floral species in the surroundings (Kunte, 2000). Occurrence of maximum number of species in the family Nymphalidae could be the result of high availability of food plants in the study area. Habitat association of butterflies can be directly related to the availability of food plants (Thomas, 1995). Woodland showed maximum butterfly species richness due to rich floral assemblage in the study area. The woodland and grassland showed highest number of shared species, because these areas had comparatively similar plant composition and provide

perennial nectars sources for adult butterflies. The species abundance rose from the beginning of the monsoon, from the months June to July and reached a peak in the months from September to November. A decline in species abundance was observed from the months December to January and continued up to the end of May. Bhusal and Khanal (2008) reported that there is a significant correlation between species diversity and spring season, indicating the abundances of diverse species was positively affected by approaching warmer days, high relative humidity and more rainfall. These factors help to flourish diverse vegetations, which are vital food sources for many butterfly species. Butterflies indicate change in environmental variation and also are affected by plant diversity since they are directly dependent on them (Elrich et al., 1972). The association between butterflies and plants is highly specific. A large proportion of species of Papilionidae and Pieridae were found to be engaged in mud-puddling behavior in many locations (Uniyal and Bhargav, 2007).

Conclusion

In the present study, the maximum number of species and individuals were observed in woodland and grassland, where availability of diverse plants and access to host plants viz., *Achyranthes aspera, Desmostachya bipinnata, Pro-sopis juliflora, Sida* sp., *Setaria verticillata, Cynodon dactylon, Evolvulus* sp., *Tribulus terrestris, Eragrostis sp*., *Saccharum sp., Phyllanthus reticulatus* and orna-mental flowering plants promoted the butterfly richness and density. Most of these plants provide rich nectar sources to adult butterflies.

Kisan P.G. College, Simbhaoli, Hapur provides an opportunity to protect biodiversity and set an example of how wildlife can be protected and preserved close to urban areas, without hindering the development of the same. It will not only provide urban people an opportunity to experience the uniqueness of the wetland area and the species it attracts, but also make them more environmentally conscious.

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