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Status and Diversity of Butterfly Fauna in Joggers Park, Lucknow, Uttar Pradesh, India

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Abstract

Field surveys were carried out to assess the butterfly species diversity in different seasons in Joggers Park, Lucknow, Uttar Pradesh, India in 2021 using the line transect method with the aid of digital cameras and binoculars. Joggers Park is rich in floral diversity and therefore, good habitat for butterflies. Altogether, 38 species of butterflies were recorded which belonged to 27 genera and 6 families. Out of the total 38 butterfly species, 58% were common, 29% rare and 13% were the most common species respectively. Nymphalidae was the most dominant (maximum number of 7 genera and 11 species) among the six families. Maximum species richness was reported during summer (April, May and June) and minimum in the rainy season (July, August and September). The present study might be useful in creating awareness among common masses and encouraging the conservation of a wide array of indigenous species of butterfly in the study area.

Keywords: Butterfly, Diversity, Seasonality, Status

1. Introduction

The butterflies are the most tantalizing insects and are regarded as one of the finest taxonomically studied groups of insects[1]. Globally, around 19,238 species of butterfly are found[2] out of which nearly 1,504 species (8.7%) have been identified in India[3]. Furthermore, 42 species are endemic to India[4]. In ecosystems, they hold an indispensable position hence their diversity and existence indicate healthy terrestrial biota[5]. Butterflies move from plant to plant for the collection of nectar and that's why they are recognized as valuable pollinators and play vital roles in food chain components[6]. They prefer specific habitats and seasons and thus are good bio-indicators of anthropogenic disturbance[7]. Their life cycle is short and various series of lifestyles help achieve the population size quickly and make them sensitive to changing environmental conditions[8]. They offer a good opportunity to study population and community ecology[9]. However, the population of the butterfly is declining gradually due to several reasons[10] and about 100 out of 1,504 species of butterfly in India are on the verge of extinction[11]. It is primarily due to human activities and changes in environmental factors above the limit tolerated by butterflies[12]. Furthermore, they also act like keystone species and play a crucial role in protecting plant diversity[13]. Hence, recording the diversity and current population of butterflies is imperative.

Lucknow, one of the important metro cities in Uttar Pradesh, India, holds prodigious biodiversity in a few green fragmented natural and manmade habitats. Jogger's Park is one of them. Presently, this park harbours rich biodiversity but lacks scientific documentation. Such information is essential as the park serves as an important site for students, nature lovers and common masses. The present investigation was undertaken to assess the existing butterfly fauna in Joggers Parks, Lucknow, Uttar Pradesh, India.

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2. Materials and Methods

2.1 Study Area

Joggers Park (26°52'5.89" N 80°51'43.58" E) is one of the managed vital parks in Lucknow, Uttar Pradesh. The park spans an area of about 2 square kilometres. Lucknow has a humid subtropical climate with annual average temperatures of 25.1°C (77.2°F) and an average precipitation rate is 999 mm (39.3 inches) per year.

The Joggers parks are rich in floral diversity and mainly consist of *Mangifera indica, Psidium guajava, Artocarpus lacucha, Bauhinia racemosa, Bauhinia variegata, Cassia fistula, Duranta plumeri, Rosa indica, Ficus benghalensis, Ficus religiosa, Tagetes*spp., *Lantana camara, Polyalthia longifolia* and many medicinal plants.

2.2 Methodology

The surveys were conducted in 2021 to record the status and diversity of butterflies in Joggers Park in relation to different seasons. Observations were made during four seasons i.e., Spring (February and March), Summer (April, May and June), Rainy (July, August and September) and Winter (October, November, December) using the line transect method, which involved walking along the fixed paths while recording and counting the butterfly species. Capturing of butterflies was done very safely by sweep nets and released in the same area immediately after the photographs were taken by Canon EOS 1500D DSLR Cameras. Butterflies were observed from 8 AM to 10 AM and 4 PM to 6 PM following the line transect method, by travelling slowly and giving 30 minutes per transect by visual counting within a three-meter radius of the observation.

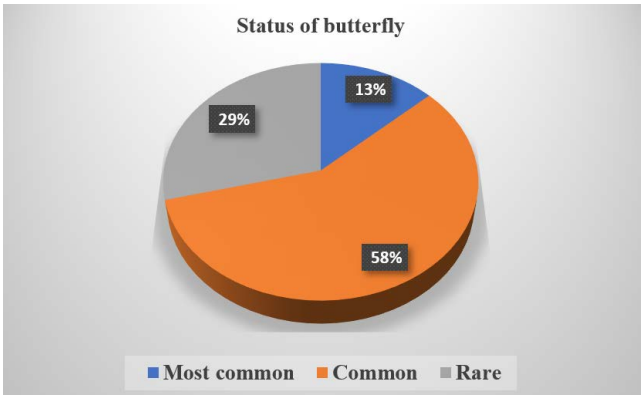

Figure 1. Status of butterflies in Joggers park.

Based on the presence or absence scoring method seasonality was determined[14]. Furthermore, the percentage of occurrence was also calculated to determine the status. The status of butterflies was categorized into three categories based on their abundance in Joggers Park: MC - Most Common (>90 sightings), C - Common (45-90 sightings), and R – Rare (2-10 sightings)[15]. Butterfly species identification was done following field guides[16,17].

3. Results

A total of 38 butterfly species were documented in different seasons during the study period 2021 (Table 1). The richest family, Nymphalidae, constituted 31.57% (12 species) of the total species followed by Pieridae 23.68% (9 species), Danaidae, Lycaenidaeand Papilionidae contributed 13.15% each (5 species) and Hesperiidae 5.26% (2 species) (Table 1, Figure 2). These 6 families

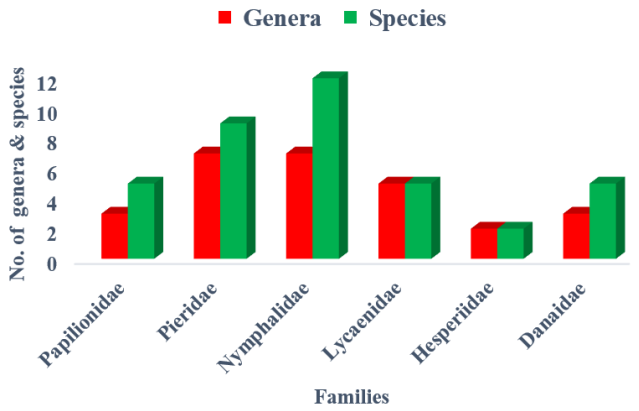

Figure 2. Distribution of genera and species of butterflies in respective families.

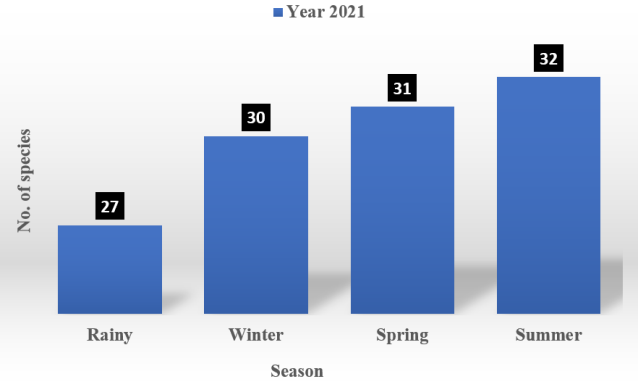

Figure 3. Distribution of species of butterflies in different seasons.

A

B

C

D

E

F

Figure 4. Photographs of the butterflies observed in Joggers Park, **A.** Common jay (*Graphium doson*); **B.** Lime butterfly (*Papilio demoleus*) **C.** Common crow (*Euploea core*) **D.** Common emigrant (*Catopsilia pomona*) **E.** Plain tiger (*Danaus chrysippus*) **F.** Peacock pansy (*Junonia almana*).

Table 1. List of butterflies recorded from Joggers park with status and seasons M.C. - Most Common, C - Common, R – Rare, +: Present; -: Absent

Families (genera/species)	S.N.	Scientific Name	Common Name	Status	Season			
					Rainy	Winter	Spring	Summer
Nymphalidae (7/12)	1	*Atellaphalanta* (Drury)	Common Leopard	R	+	+	+	+
	2	*Danaus chrysippus* (Linnaeus)	Plain Tiger	M.C.	+	+	+	+
	3	*Precislemonias* (Linnaeus)	Lemonpansy	R	+	+	+	+
	4	*Junonia almana* (Linnaeus)	Peacockpansy	C	+	+	+	+
	5	*Precishierta* (Fabricius)	Yellow pansy	R	+	+	+	+
	6	*Hypolimnasmissipus* (Linnaeus)	Danaideggfly	C	+	+	+	+
	7	*Hypolimnasbolina* (Linnaeus)	Greateggfly	C	+	+	+	+
	8	*Bybliailithyia* (Drury)	Joker	C	+	_	_	+
	9	*ErgolisAriadne* (Linnaeus)	AngledCaster	C	+	+	+	+
	10	*Ergolismerione* (Cramer)	Commoncastor	R	+	+	+	+
	11	*Argynnischildren* (Robert Gray)	Large silver stripe	C	_	_	_	+
	12	*Argynnishyperbius* (Linnaeus)	Indianfritillary	C	+	+	+	+
Pieridae (7/9)	1	*IxiasMarianne* (Cramer)	Whiteorangetip	M.C.	_	_	_	+
	2	*Deliaseucharis* (Drury)	Common Jezebel	M.C.	_	+	+	+
	3	*Catopsiliapyranthe* (Linnaeus)	Mottledemigrant	C	+	+	+	+
	4	*Euremabrigitta* (Cramer)	Smallgrassyellow	M.C.	+	+	+	+
	5	*Appias libythea* (Fabricius)	Striped albatross	C	+	+	+	+
	6	*Catopsiliacrocale* (Fabricius)	Common emigrant	C	+	+	+	+
	7	*Teriashecabe* (Linnaeus)	Common grass yellow	C	+	+	+	+
	8	*Pierisbrassicae* (Linnaeus)	Large cabbage white	C	_	+	+	_
	9	*Colotisfausta* (Olivier)	Largesalmonarab	C	+	+	+	+

Table 1 to be continued...								
Lycaenidae (5/5)	1	*Chiladescontracta* (Fabricius)	Smallcupid	C	_	_	_	+
	2	*ZizeeriaOtis* (Fabricius)	Lesser grassblue	R	+	+	+	+
	3	*Catochrysopsstrabo* (Fabricius)	Forgetme not	R	+	_	_	_
	4	*Lampidesboeticus* (Cramer)	Peablue	R	+	+	+	+
	5	*Azanusjesous* (Guerin–Meneville)	AfricanBabulblue	C	+	+	+	+
Danaidae (3/5)	1	*Danaislimniace* (Cramer)	Blue tiger	C	_	+	+	_
	2	*Danaismelissa* (Melissa Stoll)	Darkblue tiger	C	+	+	+	+
	3	*Euploeacore* (Cramer)	Commonindiancrow	C	_	+	+	_
	4	*Euploeaalcathoe* (Godart)	Stripedblackcrow	C	_	_	_	+
	5	*Hestialynceus* (Drury)	Tree nymphs	R	+	+	+	+
Hespiridae (2/2)	1	*Udaspesfolus* (Cramer)	GrassDemon	R	_	_	_	+
	2	*Taractroceramaevius* (Fabricius)	CommonGrassdart	R	+	_	+	_
Papilionidae (3/5)	1	*Papiliodemoleus* (Linnaeus)	Limebutterfly	C	+	+	+	+
	2	*Papilio demodocus* (Linnaeus)	Christmas butterfly	C	_	+	+	+
	3	*Graphium doson* (Felder)	Common Jay	M.C	_	+	+	+
	4	*ZetidesAgamemnon* (Linnaeus)	Tailed Jay	R	+	+	+	_
	5	*Trosaristolochiae* (Fabricius)	Commonrose	C	+	+	+	+

encompass 27 genera. The largest number of genera was reported in families Nymphalidae (7) and Pieridae (7) followed by Lycaenidae (5); Papilionidae (3); Danaidae (3); and the minimum number of genera was reported in the family Hesperiidae (2) (Table 1, Figure 2). In the present study out of a total of 38 butterfly species, 22 (58%) were common, 11 (29%) were rare and 5 (13%) were the most common species (Table 1, Figure 1). Maximum species richness was reported during summer (April, May and June) and minimum in the rainy season (July, August and September) (Table 1, Figure 3). About 23 (61%) species of butterfly were found in all the seasons around the year.

4. Discussion

In this study, we recorded a total of 38 species of butterflies belonging to 6 families and 27 genera during the study period. The richest family, Nymphalidae, constituted 31.57% of the total species followed by Pieridae 23.68%, Danaidae, Lycaenidae and Papilionidae contributed 13.15% each and Hesperiidae 5.26% respectively. (Table 1, Figure 2). The study on butterfly status based on the frequency of sightings showed that 22 (58%) were common, 11 (29%) were rare and 5 (13%) were most common in the study area (Table 1, Figure 1). The

Nymphalidae family is a large group of strong-bodied butterflies that come in almost every colour and shape. It outnumbered the rest of the families in terms of the number of butterfly species (12 sp.). This family contains 7 common species and 4 rare species and 1 most common species. Among 12 species, 10 species were present throughout the year. The family Pieridae has some of the most familiar butterflies, which including 9 species with 6 common and 3 most common in the study area. Among 9 species 6 species were present throughout the year. Lycaenidae included 5 butterfly species, 2 common species and 3 rare species. Furthermore, 3 species were present throughout the year. The Danaidae family was represented by 5 species with 4 common species and 1 rare species in our study area. 2 species of this family were found throughout the area. Papilionidae was represented by 5 species and among them, 3 were common species, 1 rare and 1 the most common species in our study area. 2 species of this family were present throughout the area. The family Hesperidae is the third-largest family of butterflies in the world. Only 2 species belonging to this family were reported from the area during our study period and both are rare. The largest number of genera were reported in the family Nymphalidae (7) and Pieridae (7) followed by Lycaenidae (5) and Papilionidae (3) as well as Danaidae (3) and the minimum number of genera were reported in the family Hesperiidae (2) (Table 1, Figure 2). A total of 23 (61%) species of butterfly were found in all the seasons of the study period.

Butterfly species richness depends on a number of factors such as seasonality, flowering plants, altitude, precipitation, temperature and anthropogenic activities. In India, two seasons have been identified as peaks, March-April and October for butterfly abundance[18]. In the present study, the highest diversity of butterflies was encountered during the warmer period (summer) of the year and lowest during the rainy season (Table 1, Figure 3), other studies also found that heavy rain and less sunny days, resulted in fewer numbers of butterflies on their wings[19]. Some researchers have reported that species diversity and abundance are highly associated with the availability of food plants in the study area[20]. Our study area has a rich diversity of flowering plants which encourages the butterfly population. Butterflies are also very sensitive to habitat and climate changes, which influence their distribution and abundance. In our study area, no significant anthropogenic disturbance was observed.

5. Conclusion and Recommendations

The occurrence of 38 species in the study area is a vital sign of healthy biodiversity. Species diversity was highest during summer and the status of maximum butterflies was of common category. In order to increase it, our study recommends planting of more flowering plants, maintenance of water bodies in the park and most importantly to create awareness among visitors, students and common masses.

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