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A Study on the diversity and abundance of Butterfly fauna in urban green areas of Krishnagar, Nadia, West Bengal

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Abstract

A study on diversity of butterfly fauna was carried out in urban green areas of Krishnagar, Nadia, West Bengal. A total of 33 species of butterflies belonging to the five families were recorded during the survey. Among the five families Nymphalidae is the most dominant family with 15 species belonging to 11 genera and averaging 45.45% species richness of total species, followed by family Lycaenidae (8 species, 8 genera and 24.24%), Pieridae (5 species, 5 genera and 15.15%), Papilionidae (3 species, 2 genera and 9.09%) and Hesperidae (2 species, 2 genera and 6.06%). Among these species, 3 (9.09%) were very rare, 6 (18.18%) were rare, 6 (18.18%) were not rare, 10 (30.30%) were commonly occurring and 8 (24.24%) were very common. Highest number of species was seen during Post monsoon and winter. Least number of species was observed during monsoon.

Keywords: Butterflies, diversity, Krishnagar, abundance, urban area

1. Introduction

More than half of the world's identified animal species are insects^[1] in which Lepidoptera is the second largest and most diverse order of class Insecta^[2]. Butterflies belong to order Lepidoptera and are the most beautiful and colorful creatures on the earth. They are closely associated with plants, most efficient pollinators of flowers in addition to moths and bees and important ecological indicators. Butterflies help in production of food crops, seeds and fruits. They play important role in the food chain of a forest ecosystem; therefore, they are essential for the survival of man and animals^[3].

India hosts about 1,501 butterfly species^[4], from 5 different families, viz. Papilionidae, Pieridae, Lycaenidae, Nymphalidae and Hesperidae which include nearly 100 endemic species. Western Ghats is one of the most diversified areas containing a wide variety of species due to the typical eco-climatic and geographic features. Butterflies are seasonal in their occurrence. Many species show seasonal variations during the year^[5].

Butterflies being very sensitive towards any type of change in their habitat are considered as excellent Biological Indicators^[6]. They are also strongly influenced by local weather and highly sensitive to environmental changes. They react rapidly to environmental changes due to their short generation time, high mobility, and specific habitat preferences^[7]. Urbanization is usually considered to impact biodiversity^[8]. Increased urban features, including busy roads, buildings, and anthropogenic activities correspond with decreases in butterfly species richness, diversity and abundance. Few researches on butterfly fauna were carried out in the urban area of Krishnagar and its adjacent areas. Thus the present survey was conducted to prepare a checklist of the butterfly fauna found in urban areas of Krishnagar, Nadia, West Bengal.

2. Materials and Methods

2.1 Study Region

Krishnagar is located at 23°23'N & 88°30'E on the banks of the Jalangi River in Nadia District, West Bengal. The Tropic of Cancer passes through outskirts of Krishnagar. It is located at a distance of 100 Km from the Metropolis of Kolkata. The area around Krishnagar Govt. College has been selected as urban site. This area is developed and has high density of human population. The locality has a good number of houses, commercial buildings, roads. However, many gardens and larger and denser plantings are present in and around the college campus area (Figure1).

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Mean annual temperature of Krishnagar is slightly above 30 °C. But in summer the average Temperature occasionally goes often beyond 35 °C. The average temperature in winter has increased in recent past few decades and the winter spell has become shorter as recorded by Indian Meteorological Department (IMD) (Alipore, Kolkata). The annual average

rainfall has been recorded about 1500 mm. As the area belongs to the Monsoon climate, June to July is the rainiest season, September to November constitutes the Post Monsoon season, while December to middle of February is the winter season and March to May is the hot humid summer season [9]

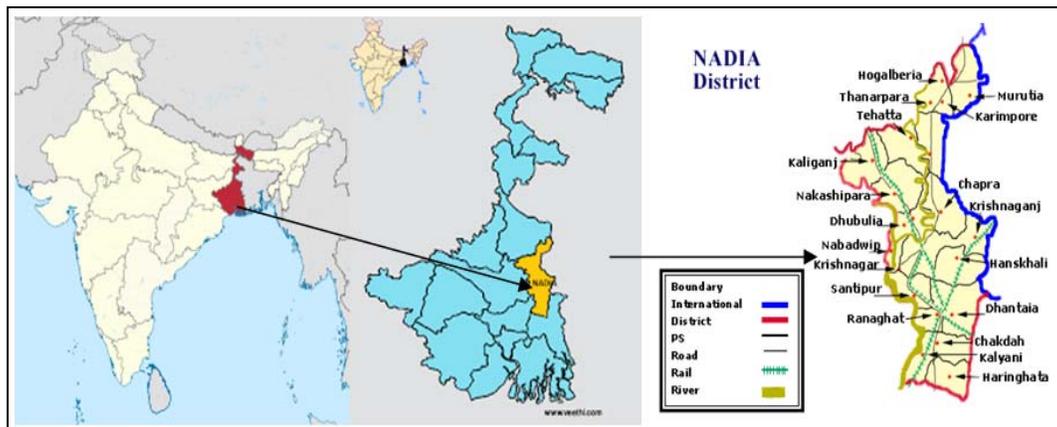


Fig 1: Location of the study Area.

2.2 Methods

Sampling of butterflies was conducted once a week from January 2015 to December 2015 and all species encountered during the survey was recorded. Butterflies were primarily photographed directly in the field by using Canon Power Shot SX520 HS camera. Species identity was confirmed with the help of the field guides Evans (1932), Kunte (2000) and Kehimkar (2008) [10-12]. The collection of butterflies was carried out in the early hours of the day because most butterflies being diurnal prefer the warmth of the sun for basking and feeding. Different characters like size, wing colour and pattern, wing span, flight period, were observed and used for correct identification of the species. When identifying species by sight was difficult, the butterflies were caught using a net, identified, and released. Those species observed 80–100% of the survey days were categorized as very common (VC), 60–80% as common (C), 40–60% as occasional (O), 20–40% as rare (R) and below 20% as very rare (VR).

3. Results

The butterfly fauna of Krishnagar urban green area is moderately rich. During the present study total 33 species belonging to 28 genera were recorded (Table 1). Among the

five families Nymphalidae is the most dominant family with 15 species belonging to 11 genera and averaging 45.45% species richness of total species, followed by family Lycaenidae (8 species, 8 genera and 24.24%), Pieridae (5 species, 5 genera and 15.15%), Papilionidae (3 species, 2 genera and 9.09%) and Hesperidae (2 species, 2 genera and 6.06%)(Figure 2).The photographs of the recorded species of the butterflies from the area are given in Plate 1.

Among these species, 3 (9.09%) were very rare, 6 (18.18%) were rare, 6(18.18%) were not rare, 10 (30.30%) were commonly occurring and 8 (24.24%) were very common (Figure 3).

It was also noted that only four species were present in all seasons. Highest number (19) of species was seen during winter and Post monsoon.13 species were observed during summer. Least number of species (7) was observed during monsoon (Figure 4). Among these 33 recorded species, Common crow, Plain tiger, Angled Castor, Common pierrot, Common ciliate blue, Common grass yellow and Rice swift were found in high frequencies in the campus. Two species, Common pierrot and Chestnut-streaked sailer and Danaid egg fly belong to Schedule I, Common baron belong to Schedule II of the Indian Wildlife (Protection) Act, 1972.

Table 1: Check List of butterflies recorded from urban green areas of Krishnagar, Nadia, and West Bengal along with their status and flight period

Sl. No.	Common Name	Scientific Name	Relative Abundance	Flight period
<i>Papilionidae</i>				
1.	Common mormon	<i>Papilio polytes</i> (Linnaeus,1758)	VR	S,W
2.	Lime butterfly	<i>Papilio demoleus</i> (Linnaeus,1758)	NR	PM
3.	Common rose	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	C	PM,W
<i>Nymphalidae</i>				
4.	Grey pansy	<i>Junonia atlites</i> (Linnaeus, 1763)	R	W
5.	Chestnut-streaked sailer	<i>Neptis jumbah</i> (Moore, 1857)	VR	W
6.	Common palmfly	<i>Elymnias hypermnestra</i> (Linnaeus,1763)	C	PM,W
7.	Tawny Coster	<i>Acraea violae</i> (Fabricius, 1775)	R	W
8.	Great eggfly	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	R	S,PM
9.	Common crow	<i>Euploea core</i> (Cramer,1780)	VC	S, M, PM,W
10.	Plain tiger	<i>Danaus chrysippus</i> (Linnaeus,1758)	VC	S, M, PM,W
11.	Striped tiger	<i>Danaus genutia</i> (Cramer,1779)	VC	S,W
12.	Peacock pansy	<i>Junonia almana</i> (Linnaeus,1758)	C	M,PM

13.	Common bushbrown	<i>Mycalesis perseus</i> (Fabricius,1775)	R	S, PM, W
14.	Common evening brown	<i>Melanitis leda</i> (Linnaeus,1758)	C	S, PM
15.	Angled Castor	<i>Ariadne ariadne</i> (Linnaeus,1763)	VC	S, M, PM,W
16.	Danaid Eggfly	<i>Hypolimnas misippus</i> (Linnaeus,1764)	NR	S
17.	Lemon pansy	<i>Junonia lemonias</i> (Linnaeus, 1758)	VR	S, M, PM, W
18.	Common baron	<i>Euthalia aconthea</i> (Cramer,1777)	R	PM,W
Pieridae				
19.	Indian Pioneer	<i>Belenois aurota</i> (Fabricius,1793)	C	S
20.	Common gull	<i>Cepora nerissa</i> (Fabricius, 1775)	NR	S
21.	Common jezebel	<i>Delias eucharis</i> (Drury,1773)	NR	W
22.	Common emigrant	<i>Catopsilia pomona</i> (Fabricius,1775)	NR	M,PM
23.	Common grass yellow	<i>Eurema hecabe</i> (Linnaeus,1758)	VC	M,W
Lycaenidae				
24.	Common-Silverline	<i>Spindasis vulcanus</i> (Fabricius,1775)	NR	PM
25.	Common pierrot	<i>Castalius rosimon</i> (Fabricius,1775)	VC	PM,W
26.	Common ciliate blue	<i>Anthene emolus</i> (Godart,1823)	VC	PM
27.	Forget-me-not	<i>Catochrysops strabo</i> (Fabricius,1793)	C	W
28.	Rounded pierrot	<i>Tarucus extricates</i> (Butler,1886)	C	PM
29.	Common Quaker	<i>Neopitheops zalmora</i> (Butler,1870)	R	W
30.	Pale grass blue	<i>Pseudozizeeria maha</i> (Kollar,1848)	C	S
31.	Dark grass blue	<i>Zizeeria karsandra</i> (Moore,1865)	C	PM
Hesperiidae				
32.	Rice swift	<i>Borbo cinnara</i> (Wallace,1866)	VC	PM
33.	Dark Palm dart	<i>Telicota bambusae</i> (Moore,1878)	C	W

VC-Very Common (> 100 sightings), C-Common (50-100 sightings), NR-Not Rare (15-50 sightings), R-Rare (2-15 sightings), VR-Very Rare (1-2 sightings) S-Summer, M-Monsoon, PM-Post Monsoon, W-Winter

The study area has mixed vegetation comprising fruit plants, trees, few shrubs and herbs and grasses. Following is a list of butterfly species along with their preferred food plants found in the study area. Trees like *Butea monosperma*, *Ficus racemosa*, *Agle marmelos*, *Zizyphus* spp., *Mimusops elengi*, *Acacia* spp., *Cocos nucifera*, *Shorea robusta* are common in

the area. *Calotropis gigantea* are found in large numbers within the campus of the college and also along the side of the roads in the surrounding area. The butterfly species along with their preferred host plant identified in the area are listed in Table 2.

Table 2: List of food plants of the study area

Sl. No	Plant species	Family of Plant species	Butterfly species
1.	<i>Hygrophila spinosa</i>	Acanthaceae	Peacock pansy, Grey pansy
2.	<i>Acacia</i> spp.	Fabaceae	Common grass yellow
3.	<i>Calotropis gigantea</i>	Asclepiadeacea	Plain Tiger
4.	<i>Butea monosperma</i>	Fabaceae	Common emigrant
5.	<i>Ficus racemosa</i>	Moraceae	Common Crow
6.	<i>Hibiscus</i> spp.	Malvaceae	Danaid egg fly, Great egg fly
7.	<i>Rosa</i> spp.	Rosaceae	Common Baron
8.	<i>Cocos nucifera</i>	Palmae	Common Palmfly, Dark palm dart
9.	<i>Sida</i> spp.	Malvaceae	Lemon Pansy
10.	<i>Agle marmelos</i>	Rutaceae	Common mormon, Lime butterfly
11.	<i>Mimusops elengi</i>	Sapotaceae	Grey pansy
12.	<i>Zizyphus</i> spp.	Rhamnaceae	Common Pierrot
13.	<i>Ixora coccinea</i>	Rubiaceae	Lime butterfly

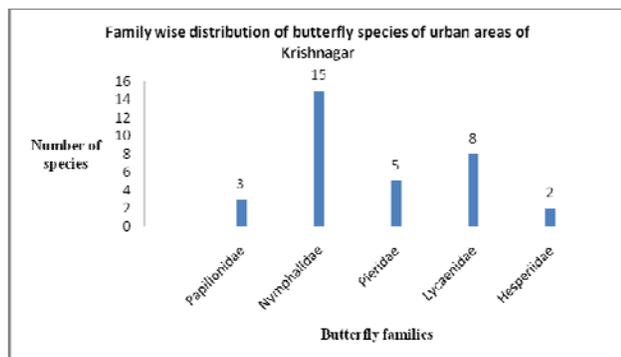


Fig 2: Family wise distribution of butterfly species of urban areas of Krishnagar, Nadia

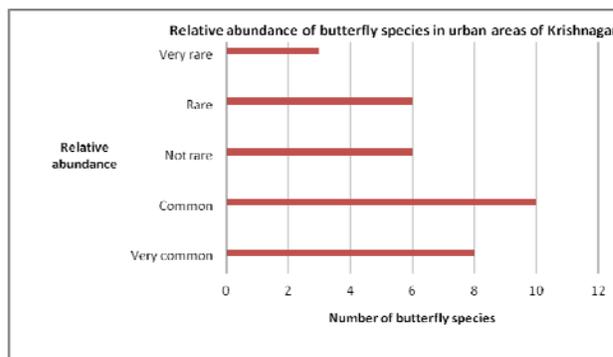


Fig 3: Relative abundance of butterfly species in urban areas of Krishnagar, Nadia

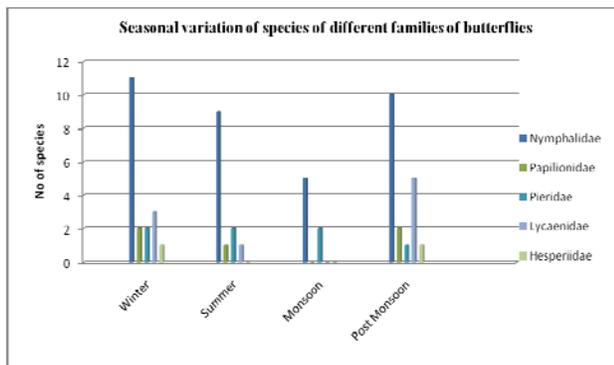


Fig 4: Seasonal variation of species of different families of butterflies

4. Discussion

The seasonal distribution shows that Nymphalidae is the dominant family in all season with highest number of species [13]. The dominance of Nymphalidae is related with their polyphagous nature, availability of food plants found and also due to their strong, active flying habit assist in searching varied food resources. Wynter-Blyth (1957) [14] had identified two seasons as peaks, March-April and October for butterfly abundance in India. In our study we did not get peak in

summer but most of the species of all five butterfly families are found in post monsoon and in winter [13] whereas monsoon shows least species variation. In winter, flowering occurs in man-made flower garden and other wild flowering plants can attract adult butterfly. In the present study butterfly density started increasing from the beginning of post monsoon till the early summer and declined from summer up to the end of monsoon. The rich diversity of butterflies, especially the Nymphalids and Lycaenids indicates a varied assemblage of floral species and shrubs and bushes in the area. But at the same time lack of preferred nectar source, larval host plants in several patches may be responsible for low species number of Papilionidae, Pieridae and Hesperidae. Urban expansion leading to habitat destruction, loss of larval food plant is the main issues of concern. Species able to survive in such urban area depends on their special adaptation in the modified habitat.

5. Conclusion

It can be concluded that despite the ill effects of urbanization, the study areas still maintaining a good diversity of butterflies. Therefore, we should try to reduce the decline of butterflies and conserve these most beautiful and colourful creatures.



Common Mormon



Lime butterfly



Common rose



Grey pansy



Chestnut-streaked sailer



Common Palmfly



Tawny Coster



Great Egg fly



Common crow



Plain tiger



Striped Tiger



Peacock pansy



Common bush brown



Common Evening brown



Angled Castor



Danaid Egg fly



Lemon pansy



Common Baron



Indian Pioneer



Common gull



Common jezebel



Common emigrant



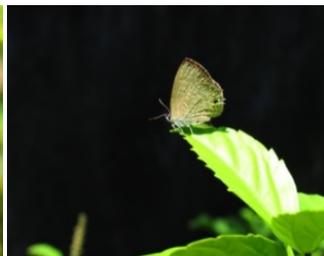
Common grass yellow



Common Silverline



Common Pierrot



Common ciliate blue



Forget-me-not



Rounded Pierrot



Common Quaker



Pale grass blue



Dark grass blue



Rice swift



Dark Palm dart

Plate 1: Photograph of the Butterflies of different families in urban green area of Krishnagar, Nadia.

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7. Conflict of interest

The authors declare that they have no conflict of interest.

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