

A preliminary assessment of butterfly diversity in Suti, Murshidabad, West Bengal, India

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Abstract

To assess the diversity and abundance of butterfly community in Suti Block II, Murshidabad district, West Bengal, a study was conducted in twelve points namely Bhabki, Parulia, Khidirpur, Hassanpur, Arungabad, Bajitpur, Kayadanga, Mahendrapur, Hafania, Dafahat, Suti and Mahesail, using line transect method, from February, 2024 to January, 2025. A total number of 67 butterfly species, belonging to six different families and 51 genera were recorded from the selected study sites in which family Nymphalidae was dominant with 38.03% followed by family Lycaenidae (27.48%), Pieridae (23.51%), Papilionidae (7.76%), Hesperidae (2.97%), Riodinidae (0.25%). Based on sightings of butterflies at the study sites, it was found that 40.09% belonged to very common category, 33.33% to common category, 22.60% to not rare category, 3.82% to rare category and 0.16% to very rare category. Among the recorded butterfly species, 8 of them were found to be protected under various Schedules of the Wildlife Protection Act, 1972. Values of various diversity indices such as Shannon diversity index ($H' = 3.84$) indicated the high species richness of the butterfly community. Pielou's evenness index ($j = 0.91$) depicted the evenly distributed nature of the butterflies in the studied butterfly community while, Simpson's index of diversity ($D = 0.97$) signified the persistence of high abundance of species in the sampled sites. Therefore, the information from this preliminary survey will prove to be beneficial for implementing necessary conservation strategies required for the persistence of butterfly fauna in the rural landscape as well as for the maintenance of ecosystem integrity.

Keywords: Butterfly community, diversity indices, nymphalidae, species richness, suti block II

Introduction

Butterflies are fascinating insects belonging to order Lepidoptera and possess brightly coloured wings. They are considered as one of the most competent bioindicators which represent the overall health condition of an ecosystem (Pollard, 1991) [25]. Therefore butterflies have been considered as an important aspect of ecology and conservation studies (Watt and Boggs, 2003; Ehrlich and Hanski, 2004) [33, 12]. They are extremely sensitive to any change in climatic conditions such as temperature, moisture or light levels and are swiftly affected by any minor disturbances or fluctuation in habitat health (Anu *et al.*, 2009; Tiple *et al.*, 2011) [1, 31]. Butterflies constitute the taxonomically analyzed group of insects which have caught much attention among entomologists worldwide (Ghazoul, 2002) [13]. In tropical regions, butterflies greatly contribute towards the maintenance of floral community structure (Bonebrake *et al.*, 2010; Samanta *et al.*, 2017) [4, 26]. Studies on butterfly diversity and abundance is essential, as it helps us in determining the overall status of an ecosystem thereby adopting necessary conservation strategies whenever an ecological imbalance is being assessed.

An approximate of more than 19,000 butterfly species have been documented worldwide (Kunte, 2000) [18], while 1379 butterfly species have been recorded from India (Das *et al.*, 2023) [7]. Over the past few decades, anthropogenic activities and climatic changes have led to various modifications in the overall habitat structure and function, thereby having a negative impact on butterfly diversity (Clark *et al.*, 2007; Di Mauro *et al.*, 2007) [6, 10]. Prior documentation on butterfly community has been conducted in various regions of West Bengal that include studies on diversity and abundance of

butterfly fauna in Rampurhat by Pandit *et al.* (2018) [22], in Howrah district by Dwari and Mondal (2015) [11], in Nadia district by Dey and Ghosh (2016) [8], in Bolpur Shantiniketan urban area by Kamar (2022) [16], in Midnapore urban area by Biswas *et al.* (2019) [3], in heterogeneous habitat of Bankura by Mukherjee and Mondal (2020) [20] etc.

Murshidabad district which lies on the left bank of River Ganges, is situated in the state of West Bengal, India. The Bhagirathi River separates the district into two distinct regions: Rarh which lies in the western part and Bagri which is the eastern portion. Suti block II is a community development block that lies mainly in the Rarh region, which is a high undulating continuation of the Chota Nagpur plateau. It falls under Jangipur subdivision, one of the five subdivisions of Murshidabad district and covers an area of 111.13 sq.km. This undulating region is comprised of mostly clay and lateritic clay-based soil. Land utilization pattern in Suti block II is much diversified, the north eastern portion is occupied by various industrial settlements along with extensive mango and litchi gardens whereas the south western portion is typically comprised of agricultural fields (Hasan, 2022) [14].

The current study was conducted to assess the diversity and abundance of butterfly fauna of twelve selected study sites situated in Suti block II, Murshidabad district, namely Bhabki, Parulia, Khidirpur, Hassanpur, Arungabad, Bajitpur, Kayadanga, Mahendrapur, Hafania, Dafahat, Suti and Mahesail. Since no prior studies have been conducted at the chosen study site, the data obtained from this preliminary study will prove to be beneficial for all upcoming studies and will be helpful for adopting conservation strategies if necessary.

Materials and Methods

Study area

The study was conducted in Suti Block II of Murshidabad district, West Bengal, India. The main points of the study area were Bhabki (P1; 24.59753°N, 88.01888°E), Parulia (P2; 24.58622°N, 88.02888°E), Khidirpur (P3; 24.59047°N, 88.03411°E), Hassanpur (P4; 24.58214°N, 88.05931°E), Arungabad (P5; 24.59804°N, 88.03373°E), Bajitpur (P6; 24.60971°N, 88.03986°E), Kayadanga (P7; 24.60635°N, 88.02729°E), Mahendrapur (P8; 24.61150°N, 88.02077°E), Hafania (P9; 24.61416°N, 88.01304°E), Dafahat (P10; 24.62126°N, 88.00519°E), Suti (P11; 24.61868°N, 88.02399°E) and Mahesail (P12; 24.58825°N, 88.01167°E). The study area experiences a tropical monsoon climate with an average temperature of 30° C. The time span from December to February is quite pleasant, while the temperature starts rising from March and reaches its maximum in May. Rainfall is brought about by South –West Monsoon winds. A total annual precipitation of about 1070 mm is experienced by this region.

Survey Technique

For conducting the butterfly survey, Pollard Walk method was used (Pollard *et al.*, 1975; Pollard 1977) [23, 24] for a time period of one year, from February, 2024 to January, 2025 mostly on sunny days (08:00 h to 12:00 h and 16:00 h to 17:30 h), in the designated twelve areas. Observations were primarily made via naked eyes or with the help of photographs and binocular. The line transect method was implemented for the purpose of butterfly sampling (Hossain and Aditya, 2016) [15]. The butterfly species that were

observed during the sampling period were recorded along with their number. Identification of maximum butterfly species were done via direct observation in the field or in few cases, photographs were clicked for the same purpose. Identification was carried out by following the keys of Kunte *et al.* (2014) [19], Kehimkar (2016) [17] and Dey *et al.* (2017) [9]. During the survey period, neither of the butterflies were collected nor captured. The common English names and scientific names followed in the study are in accordance with Varshney and Smetacek (2015) [32].

Statistical data Analysis

To understand the community structure of the butterfly species in the sampled site, all the recorded data were used to estimate the diversity indices with the help of Microsoft Excel 2019 software. Species richness, abundance and evenness were determined through Shannon index (Shannon and Weaver, 1963) [27], Simpson index (Simpson, 1964) [29] and Pielou’s index (Mulder *et al.*, 2004) [21] respectively. To explain species richness and evenness a rank abundance curve was prepared (Whittaker, 1965) [34].

Shannon diversity index (H') = $-\sum pi \ln pi$

Shannon H_{max} = $\text{Log}_1(N)$

Dominance index (D_{BP}) = ni/N (Berger and Parker, 1970) [2].

Simpson’s diversity index (D_s) = $\sum_{i=1}^S [ni(ni-1)/N(N-1)]$

Simpson’s index of diversity (D) = $1/\sum_{i=1}^S [ni(ni-1)/N(N-1)]$

Simpson’s reciprocal index (Dr) = $1/\sum_{i=1}^S pi^2$

Pielou’s evenness index (J') = $H'/\ln N$

Here, pi is the proportion of the i^{th} species in the butterfly community. N is the number of species present in a butterfly fauna. ni is the number of individuals of i^{th} species.

Table 1: Checklist of butterfly species along with their family, relative abundance, status and WPA Schedule recorded in the study area

Sl. No.	Family	Common Name	Scientific name	Relative Abundance	Status	WPA schedule
1	Nymphalidae	Peacock Pansy	<i>Junonia almana</i>	3.85	VC	
2		Lemon Pansy	<i>Junonia lemonias</i>	1.50	NR	
3		Chocolate Pansy	<i>Junonia iphita</i>	1.16	NR	
4		Grey Pansy	<i>Junonia atlites</i>	3.19	VC	
5		Common Palmfly	<i>Elymnias hypermnestra</i>	1.60	C	
6		Blue Tiger	<i>Tirumala limniace</i>	1.00	NR	
7		Common Evening Brown	<i>Melanitis leda</i>	4.01	C	
8		Common Bushbrown	<i>Mycalesis perseus</i>	1.75	C	
9		Plain Tiger	<i>Danaus chrysippus</i>	3.35	VC	
10		Striped Tiger	<i>Danaus genutia</i>	0.88	NR	
11		Common Crow	<i>Euploea core</i>	0.75	NR	
12		Great Eggfly	<i>Hypolimnas bolina</i>	0.59	NR	
13		Danaid Eggfly	<i>Hypolimnas misippus</i>	0.44	R	Schedule I & II
14		Tawny Coster	<i>Acraea terpsicore</i>	1.85	C	
15		Common Castor	<i>Ariadne merione</i>	1.66	C	
16		Angled Castor	<i>Ariadne ariadne</i>	0.47	R	
17		Common Fivering	<i>Ypthima baldus</i>	1.35	NR	
18		Common Furring	<i>Ypthima huebneri</i>	4.16	VC	
19		Glassy Tiger	<i>Parantica aglea</i>	1.10	NR	
20		Short Banded Sailer	<i>Phaedyma columella</i>	0.13	R	
21		Blue Spotted Crow	<i>Euploea midamus</i>	0.06	VR	Schedule II
22		Common Sailer	<i>Neptis hylas</i>	0.50	NR	
23		Common Baron	<i>Euthalia aconthea</i>	1.06	NR	Schedule II
24		Medus Brown	<i>Orsotriaena medus</i>	0.13	R	
25		Common Leopard	<i>Phalanta phalantha</i>	0.72	NR	
26		Common Sergeant	<i>Athyma perius</i>	0.78	NR	
27	Papilionidae	Common Mormon	<i>Papilio polytes</i>	1.69	C	
28		Lime Butterfly	<i>Papilio demoleus</i>	1.91	C	
29		Common Jay	<i>Graphium doson</i>	2.66	C	
30		Tailed Jay	<i>Graphium agamemnon</i>	0.50	NR	
31		Blue Mormon	<i>Papilio polymnestor</i>	0.03	VR	

32		Common Mime	<i>Papilio clytia</i>	0.53	NR	Schedule I
33		Common Rose	<i>Pachliopta aristolochiae</i>	0.44	R	
34	Pieridae	Mottled Emigrant	<i>Catopsilia pyranthe</i>	3.32	VC	
35		Common Emigrant	<i>Catopsilia pomona</i>	2.16	C	
36		Striped Albatross	<i>Appias libythea</i>	1.85	C	Schedule IV
37		Common Gull	<i>Cepora nerissa</i>	1.28	NR	Schedule II
38		Common Grass Yellow	<i>Eurema hecabe</i>	3.91	VC	
39		Small Grass Yellow	<i>Eurema brigitta</i>	1.72	C	
40		Pioneer	<i>Belenois aurota</i>	1.44	NR	
41		Cabbage Butterfly	<i>Pieris rapae</i>	3.35	VC	
42		Asian Cabbage White	<i>Pieris canidia</i>	0.88	NR	
43		Yellow Orange Tip	<i>Ixias pyrene</i>	0.06	VR	
44		White Orange Tip	<i>Ixias marianne</i>	0.22	R	
45		Common Jezebel	<i>Delias eucharis</i>	1.19	NR	
46		Common Wanderer	<i>Pareronia valeria</i>	0.34	R	
47		Psyche	<i>Leptosia nina</i>	1.78	C	
48	Lycaenidae	Redspot	<i>Zesius chrysomallus</i>	0.16	R	Schedule II
49		Bengal State Flash	<i>Rapala manea schistacea</i>	0.38	R	
50		Dark Grass Blue	<i>Zizeeria karsandra</i>	4.41	VC	
51		Plains Cupid	<i>Chilades pandava</i>	3.04	C	
52		Tiny Grass Blue	<i>Zizula hylax</i>	5.88	VC	
53		Monkey Puzzle	<i>Rathinda amor</i>	0.16	R	
54		Common Pierrot	<i>Castalius rosimon</i>	1.22	NR	
55		Angled Pierrot	<i>Caleta decidia</i>	0.25	R	Schedule II
56		Rounded Pierrot	<i>Tarucus nara</i>	0.19	R	
57		Pale Grass Blue	<i>Pseudozizeeria maha</i>	4.66	VC	
58		Common Lineblue	<i>Prosoias nora</i>	1.19	NR	
59		Common Acacia Blue	<i>Surendra quercetorum</i>	0.28	R	
60		Common ciliate blue	<i>Anthene emolus</i>	1.97	C	
61		Common Cerulean	<i>Jamides celeno</i>	1.78	C	
62		Forget-me-not	<i>Catochrysops strabo</i>	1.91	C	
63	Riodinidae	Plum Judy	<i>Abisara echerius</i>	0.25	R	
64	Hesperiidae	Rice Swift	<i>Borbo cinnara</i>	1.16	NR	
65		Chestnut Bob	<i>Iambrix salsala</i>	0.59	NR	
66		Small Branded Swift	<i>Pelopidas mathias</i>	0.69	NR	
67		Indian Palm Bob	<i>Suastrus gremius</i>	0.53	NR	

VC - very common (>100 sightings), C – common (51 to 100 sightings), NR – nor rare (16 to 50 sightings), R – rare (3 to 15 sightings), VR – very rare (1 to 2) to indicate the rarest to the most common butterfly species (Tiple *et al.*, 2006) ^[30]. WPA- Species enlisted in Indian Wildlife Protection Act, 1972

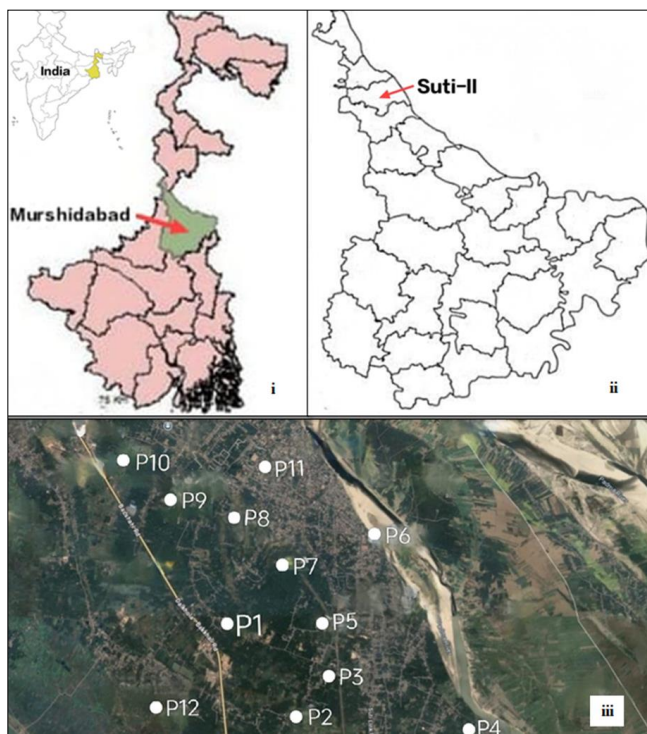


Fig 1: Map of West Bengal (i), Murshidabad (ii) and satellite image of study area (iii).

Results

The map of West Bengal, Murshidabad district, satellite image of the study sites was represented in figure 1. Table 1 illustrates a checklist of the butterfly species that were recorded during the survey period, along with their scientific name, the family to which they belong, their relative abundance and WPA Schedule (Wildlife Protection Act, 1972). A total number of 67 butterfly species, belonging to 51 genera and six different families were documented from the selected study sites. Out of the total number of butterflies that were recorded from the study area, family Nymphalidae was comprised of 26 species belonging to 18 genera, followed by family Lycaenidae comprised of 15 species belonging to 15 genera, family Pieridae comprised of 14 species belonging to 10 genera, family Papilionidae comprised of 7 species belonging to 3 genera, family Hesperidae comprised of 4 species belonging to 4 genera and the family Riodinidae was comprised of only 1 butterfly species. On analysing the relative abundance of the butterflies that were observed at the study sites, it was found that Tiny Grass blue (*Zizula hylax*; RA= 5.88) was the most abundant butterfly at the study sites, followed by Pale Grass Blue (*Pseudozizeeria maha*; RA=4.66), Dark Grass Blue (*Zizeeria karsandra*; RA=4.41), Common Fourring

(*Ypthima huebneri*; RA=4.16), Common Evening Brown (*Melanitis leda*; RA=4.01), Common Grass Yellow (*Eurema hecabe*; RA=3.91), Peacock Pansy (*Junonia almana*; RA=3.85), Plain Tiger (*Danaus chrysippus*; RA=3.35), Cabbage butterfly (*Pieris rapae*; RA=3.35), Mottled Emigrant (*Catopsilia pyranthe*; RA=3.32), Grey Pansy (*Junonia atlites*; RA=3.19), Plains Cupid (*Chilades pandava*; RA=3.04). Relative Abundance of 26 butterfly species ranged from 3 to 1. The remaining butterfly species had relative abundance less than 1.

While considering family Nymphalidae, Common Fourring (*Ypthima huebneri*) was found to be the most abundant species, followed by Common Evening Brown (*Melanitis leda*), while Blue Spotted Crow (*Euploe amidamus*) was counted with least number. Upon considering family

Papilionidae, Common Jay (*Graphium doson*) was counted in maximum number whereas Blue Mormon (*Papilio polymnestor*) was counted in minimum number. Common Grass Yellow (*Eurema hecabe*) of the Pieridae family was found to be the most abundant species whereas Yellow Orange Tip (*Ixias pyrene*) was counted with the least number. Under Lycaenidae family Tiny Grass Blue (*Zizula hylax*) was recorded with the highest number, while Redspot (*Zesius chrysomallus*) and Monkey Puzzle (*Rathinda amor*) were both counted with the least numbers. When the family Hesperidae was taken under consideration, Rice Swift (*Borbocinnara*) was found to be the most abundant species whereas Indian Palm Bob (*Suastusgremius*) was counted in minimum numbers. Only one species was observed under the family Riodinidae.

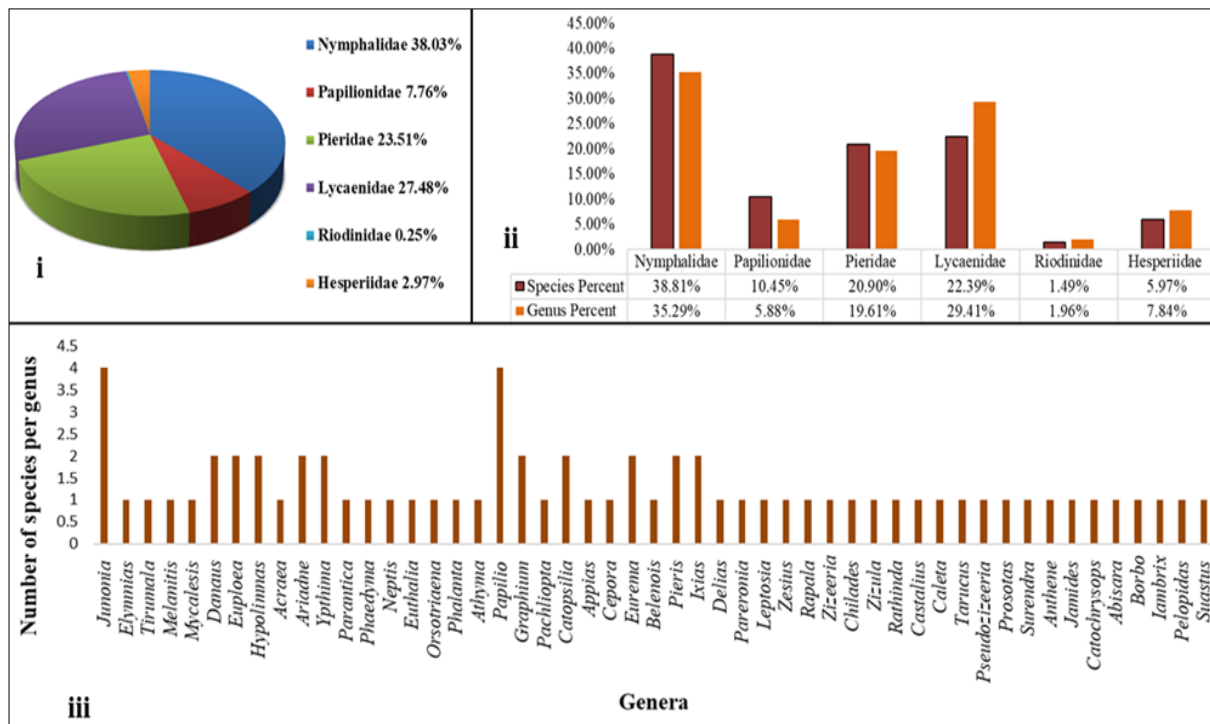


Fig 2: Percentage composition (i), genus to species proportion of butterflies of six families (ii), and genus wise species richness of the recorded butterfly genera (iii) of the study sites

Figure 2(i) illustrates the percentage composition of the six butterfly families that were observed at the study sites. On analysing the percentage composition, it was found that the family Nymphalidae had the maximum value constituting 38.03% of the total counted butterflies, followed by the family Lycaenidae (27.48%), Pieridae (23.51%), Papilionidae (7.76%), Hesperidae (2.97%), Riodinidae (0.25%).

Analysis of Genus proportion composition of the studied butterfly community illustrated that the maximum number of genera were recorded under the family Nymphalidae (35.29%), followed by the family Lycaenidae (29.41%), Pieridae (19.61%), Hesperidae (7.84%), Papilionidae (5.88%), Riodinidae (1.96%). Results of species proportion analysis revealed that the highest number of butterfly species were observed from the family Nymphalidae (38.81%), followed by the family Lycaenidae (22.39%), Pieridae (20.90%), Papilionidae (10.45%), Hesperidae (5.97%), Riodinidae (1.49%) (figure 2ii).

Figure 2(iii) depicts the species richness of various butterfly genera that were recorded from the study sites. It was found that genus *Junonia* of the Nymphalidae family and genus *Papilio* of the Papilionidae family were the dominant genera comprised of 4 species each namely *Junonia almana*, *Junonia lemonias*, *Junonia iphita*, *Junonia atlites*, *Papilio polytes*, *Papilio demoleus*, *Papilio polymnestor*, *Papilio clytia*. Under the family Nymphalidae, genera *Danaus*, *Euploeia*, *Hypolimnas*, *Ariadne* and *Ypthima*, under the family Papilionidae, genus *Graphium*, under the family Pieridae, genera *Catopsilia*, *Eurema*, *Pieris* and *Ixias* comprised of 2 species. The remaining 39 genera were found with only one species each. Species Genus ratio was 1.314.

The butterflies that were recorded from the survey sites were categorized into five different classes on the basis of their prevalence, namely very common (VC), common (C), not rare (NR), rare (R) and very rare (VR). The study revealed that 40.09% of the total counted butterflies belonged to VC category, followed by 33.33% belonged to

C category, 22.60% belonged to NR category, 3.82% belonged to R category, 0.16% belonged to VR category. Most of the butterfly species sampled at the study area were 'common' and 'generalist species' and none of them were universally threatened according to IUCN Red List (Ver. 3.1). Only 8 butterfly species observed at the study site, were found to be protected under various Schedules of the Wildlife Protection Act, 1972. Among these butterfly species, one of them is protected under Schedule I namely

Common Mime (*Papilio clytia*), five of them are protected under Schedule II namely, Blue Spotted Crow (*Euploea midamus*), Common Baron (*Euthalia aconthea*), Common Gull (*Cepora nerissa*), Redspot (*Zesius chrysomallus*) and Angled Pierrot (*Caleta decidia*). Danaid Eggfly (*Hypolimnas misippus*) is protected under both Schedule I and II. Lastly Striped Albatross (*Appias libythea*) is protected under Schedule IV.

Table 2: Values of different biodiversity indices of butterfly population of the study area

Shannon diversity index (H')	Pielou's evenness index (j)	Simpson's diversity index (Ds)	Simpson's index of diversity (D)
3.84	0.91	0.03	0.97

Table 2 elucidates the species diversity and evenness of the butterfly community of the study sites which were expressed by means of diversity indices such as Shannon diversity index (H'), Pielou's evenness index (j), Simpson's diversity index (Ds) and Simpson's index of diversity (D). The Shannon diversity index (H') value (3.84) signified that the species richness and diversity of the butterfly fauna at the sampled sites was very high. The abundance of the butterfly community was evaluated by the Simpson's diversity index (Ds) whose value was more inclined towards 0 indicating the prevalence of high species abundance

within the butterfly community. Again, the value of Simpson's index of diversity (D=0.97) illustrated that the surveyed butterfly community had high abundance. The value of Pielou's evenness index (j=0.91) was close to 1 which depicted the persistence of more evenness among the butterfly species of the studied butterfly community. All these values expressed the butterfly community was highly diverse with high abundance and high evenness, thus implying the community was in the direction of an ideal natural community.

Table 3: Values of different biodiversity indices of six butterfly families of the study area

Family	Shannon diversity index (H')	Shannon H _{max}	Pielou's evenness index (j)	Simpson's diversity index (Ds)	Simpson's index of diversity (D)	Simpson's reciprocal index (Dr)
Nymphalidae	2.94	3.08	0.90	0.06	0.94	15.44
Papilionidae	1.59	2.39	0.82	0.23	0.77	4.21
Pieridae	2.38	2.88	0.90	0.10	0.90	9.56
Lycaenidae	2.24	2.94	0.83	0.13	0.87	7.62
Riodinidae	0.00	0.90	0.00	1.00	0.00	1.00
Hesperiidae	1.34	1.98	0.96	0.27	0.73	3.61

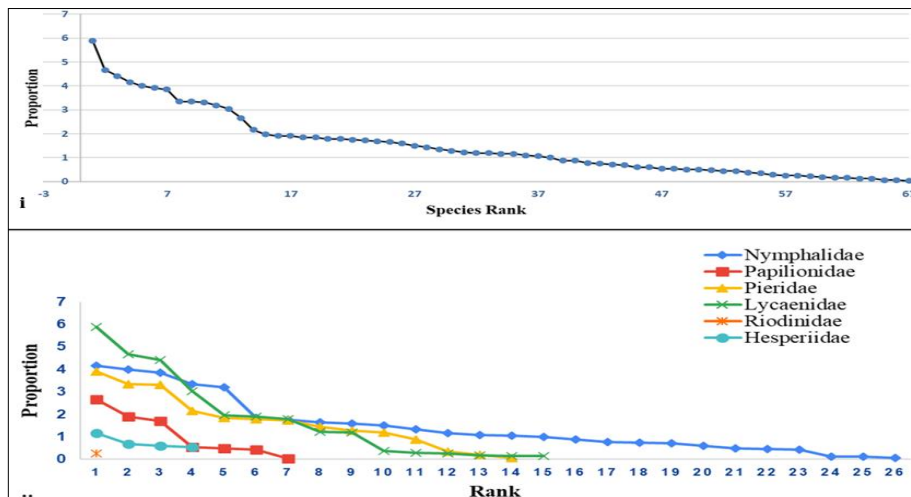


Fig 3: Rank abundance curve of 67 species of butterfly (i) and rank abundance curve of six families of butterfly community (ii) in the study area

Table 3 illustrates the family-wise values of various biodiversity indices, such as Shannon diversity index (H'), Shannon H_{max}, Pielou's evenness index (j), Simpson's diversity index (Ds), Simpson's index of diversity (D) and Simpson's reciprocal index (Dr). The Shannon diversity index (H') value of the recorded six butterfly families ranged from 2.94 to 0. In this case, the family Nymphalidae was noted with the highest value as the maximum number

of species were recorded from this family, followed by Pieridae (2.38), Lycaenidae (2.24), Papilionidae (1.59), Hesperiidae (1.34) whereas, the least value was observed from the Riodinidae family. Moreover, the highest value of Shannon H_{max} was obtained from the family Nymphalidae (3.08), followed by Lycaenidae (2.94), Pieridae (2.88), Papilionidae (2.39), Hesperiidae (1.98) and Riodinidae (0.90). The values of Pielou's evenness index (j) determine

whether the species in a community is evenly distributed or not. This value was highest in case of Hesperidae (0.96), followed by the family Pieridae (0.90) and Nymphalidae (0.90), Lycaenidae (0.83), Papilionidae (0.82). Simpson's index of diversity (D) that revealed the abundance of species in a community. Its value was recorded higher for the family Nymphalidae (0.94), Pieridae (0.90), Lycaenidae (0.87), Papilionidae (0.77), Hesperidae (0.73). Again, the value of Simpson's reciprocal index (Dr) indicated a higher diversity of butterfly from the family Nymphalidae (15.44).

Figure 4 (i and ii) showed the Whittaker plot i.e., species-wise rank abundance curve that explains the species abundance with evenness and the family-wise rank abundance curve that illustrates the species abundance and

evenness among the six families. The Whittaker plot's curve showed a steep inclination up to the first twelve butterfly species that were recorded in the surveyed area. This twelve-butterfly species occurred in high abundance and with less evenness in comparison to the remaining species. Species rank fifteen onwards the abundance of the observed butterfly species were found to decrease accordingly with increased evenness among the sampled species of the study area.

While considering the family-wise rank abundance curve, it was clearly observed that more evenness was in family Hesperidae, followed by the family Nymphalidae, Pieridae, whereas, the family Papilionidae and Lycaenidae showed relatively less evenness (figure 4ii.).

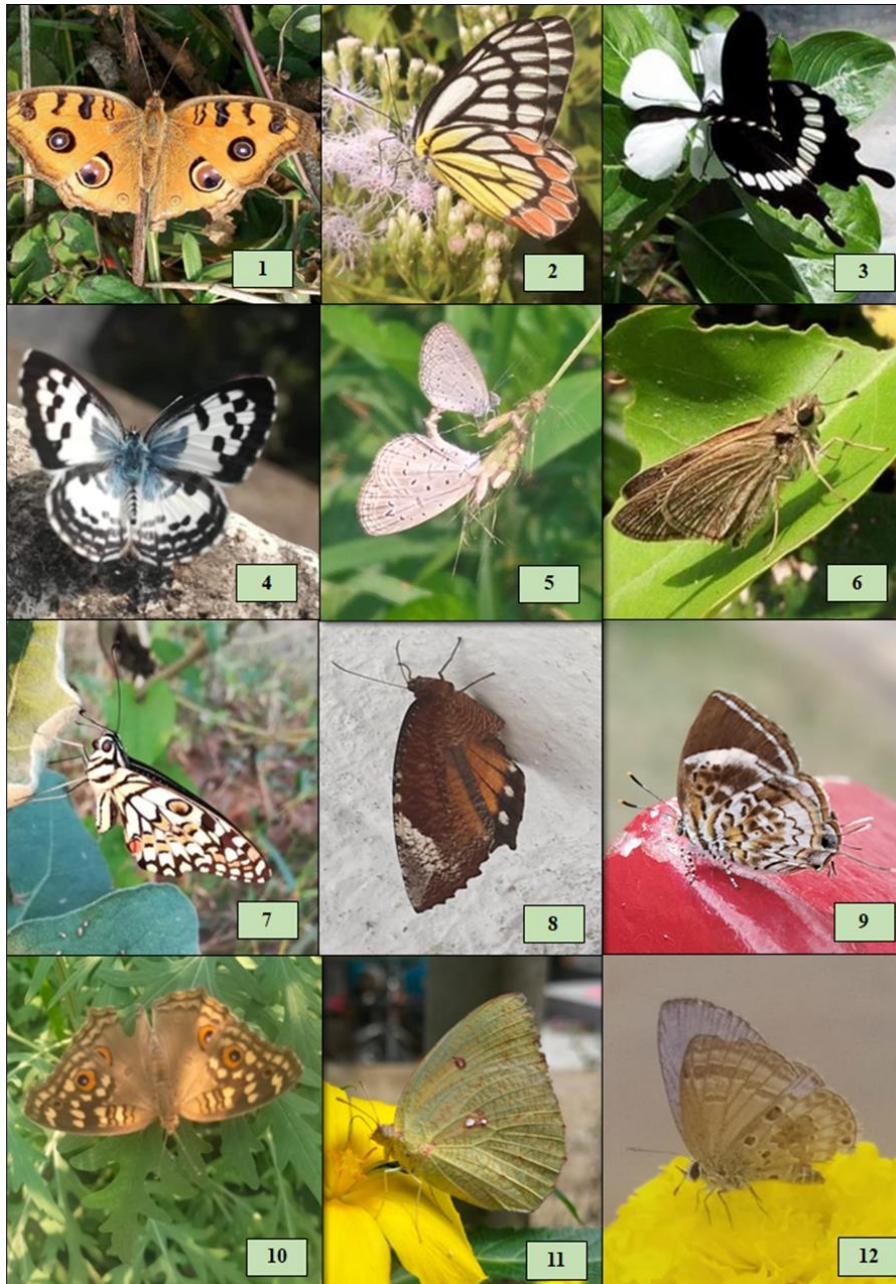


Fig 4: Photographs of different butterfly species recorded in the study area, 1) *Junonia almana*, 2) *Delias eucharis*, 3) *Papilio polytes*, 4) *Castalius rosimon*, 5) *Zizula hylax*, 6) *Borbo cinnara*, 7) *Papilio demoleus*, 8) *Elymnias hypermnestra*, 9) *Rathinda amor*, 10) *Junonia lemonias*, 11) *Catopsilia Pomona*, 12) *Chilades pandava*

Discussion

Butterflies are conspicuous insects which occupy a crucial position in the food chain and also play a significant role in

pollination (Watt and Boggs, 2003) ^[33]. These, winged hexapods are considered as the most potential taxa for biodiversity assessment which is important for both

biological conservation and for determining environmental conditions (Simonson *et al.*, 2001) [28]. Butterflies are quite well-reflective of the human induced consequences on the habitat quality and their eventual degradation (Kamar, 2022) [16].

A total number of 67 butterfly species belonging to six families were obtained from the study site. Among the six families that were observed at the study site, family Nymphalidae was found to be the dominant family in terms of percentage composition which is similar to the results obtained from various studies that were conducted at different parts of West Bengal such as East Calcutta Wetlands (Chowdhury and Soren, 2011) [5], Krishnanagar, Nadia (Dey and Ghosh, 2016) [8] Rampurhat (Pandit *et al.*, 2018) [22]. A total number of 7 butterfly species was found belonging to the family Papilionidae from the study area, while Pandit *et al.* (2018) [22] recorded the presence of 5 species from Rampurhat and Kamar (2022) [16] documented 9 species from Bolpur-Shantiniketan Urban area. Under the family Pieridae, 14 butterfly species were recorded from the study site, which was in contrary of the studies of Pandit *et al.* (2018) [22] and Kamar (2022) [16], where only 7 and 14 Species were observed respectively. Whereas, from Midnapore Urban area 12 butterfly species were recorded under family Pieridae (Biswas *et al.*, 2019) [3]. From the sampled areas, a total number of 15 butterfly species were counted under the family Lycaenidae and 4 butterfly species under the family Hesperidae, whereas, 19 species belonging to Lycaenidae family and 11 species to the Hesperidae family were documented from the Bolpur-Shantiniketan Urban area (Kamar, 2022) [16]. In the current study, family Riodinidae was composed of only one species, which is similar to the findings of Biswas *et al.* (2019) [3] from Midnapore Urban area.

While considering the values of Shanon-Wiener diversity index of the observed butterfly community, family Nymphalidae had the highest value (2.94) which is quite similar to the findings of Pandit *et al.* (2018) [22] from Rampurhat where family Nymphalidae had the highest value (2.14). At the study site maximum species evenness was noted in the family Hesperidae (0.96) whereas in Rampurhat, maximum species evenness was observed in the Nymphalidae family (0.8310) (Pandit *et al.*, 2018) [22].

Butterfly diversity of any particular area is directly related to the plant diversity of the respective area. Butterflies belonging to family Nymphalidae and Hesperidae were mostly found in areas comprised of herbaceous plants, whereas butterflies belonging to families Papilionidae, Lycaenidae and Pieridae preferred shrubs and areas enriched with trees (Mukherjee and Mondal, 2020) [20]. The abundance of butterfly species was also influenced by various climatic factors such as precipitation, humidity, temperature that provided stability to the butterfly community existing in the study areas. The butterflies were mostly found basking in the sun during the early hours of the day, or hovering near its specific host plants. Few butterfly species were found mud puddling in soil pits. Thus, the overall diversity and abundance of butterfly community was largely dependent on the ecosystem resources of the associated area.

The high species abundance and diversity of butterfly community in the study area was due to the presence of vast agricultural fields, rural landscape and considerably less human interference in certain areas which have thus

provided a suitable habitat for the conglomeration of butterfly community. Reduced exploitation of natural resources of the study areas might be due to uneven distribution of human population, with few villages having very high population density leaving the other areas with minimum population. Most of the population was engaged in rural economic activities and urbanization was observed in areas with better facilities. Excessive development might have a negative impact on diversity and abundance of the butterfly community of a region. Therefore, conducting systematic surveys on butterfly fauna of the study areas and its surroundings is of utmost importance to state the habitat health and ecosystem functioning of that region.



Fig 5: Photographs of different butterfly species recorded in the study area, 13) *Zizeeria karsandra*, 14) *Ariadne merione*, 15) *Graphium doson*, 16) *Acraea terpsicore*, 17) *Euthalia aconthea*, 18) *Cepora Nerissa*, 19) *Tirumala limniace*, 20) *Rapala manea schistacea*, 21) *Catopsilia pyranthe*, 22) *Melanitis leda*, 23) *Belenois aurota*, 24) *Junonia atlites*.

Conclusion

The present study documented the presence of a diverse butterfly community at the selected study sites of Suti block II. The rural landscape, along with the vast agricultural fields has provided a suitable habitat for the assemblage of butterfly community. The present study is one of the first survey-based studies that was conducted in this region. As butterflies are susceptible to any minor fluctuations in the habitat conditions, land utilization pattern has to be taken care of in order to conserve habitat as well as the butterfly fauna residing in the region. Thus, the data recorded in this study will prove to be beneficial as a source of reference for future systematic survey-based studies.

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