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Butterfly diversity in the village Banihari, District Dakshin Dinajpur, West Bengal, India

Tapan Sarkar*

Department of Zoology, Raiganj University, Raiganj, W.B., India

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ABSTRACT

The aim of the present investigation was determine the butterfly diversity in a village Banihari, West Bengal, India and calculate the diversity indices. Pollard transect line method with minor changes was adopted for study. Survey was done at early morning with monthly interval. Butterflies were photographed with digital camera. Number of butterflies within the transect line were counted and then calculated the diversity indices with PAST 3.0 software. A total 48 butterfly species under four families were recorded during the study period. Most dominant family was Nymphalidae then followed by Pieridae, Lycaenidae and Papilionidae. Number of taxa, Shannon diversity index and Margalef species richness index were maximum at site1 and minimum at site 4. Most common butterflies were Common Mormon, Psyche, Blue Tiger, Plain Tiger, Striped Tiger, Grey Pansy, Small branded swift and Angled Castor. Moderate numbers of Butterflywere reported at the study site. Butterfly diversity depends on availability of host plants. Butterfly diversity decreased day by day due to many anthropogenic activities such as habitat loss, loss of host plant and use of pesticides.

Key words : Butterfly diversity, Shannon diversity index, Margalef's species richness index, Anthropogenic activities

Introduction

Butterflies are charming and beautiful natural creature in the earth. Limbo (2017) described butterflies as 'Winged jewel' and flying pearls due to its attractive colouration. Butterflies and moths have aesthetic value and now become a part of ecotourism. Butterflies play an important role as a component of a food chain of an ecosystem. Butterflies are important pollinators of local plants and they pollinate the plants during collection of nectar from one plant to another plant. There are several causes regarding declining species richness, diversity and abundance of butterfly species of which hurried development and urbanization are the main ones (Pocewicz *et al.*, 2009). Urbanization, habitat loss and agricultural practised are the main causes of declining butterflies diversity (Clark, 2007). Butterflies act as an indicator of the environment because butterflies are very sensitive to minor changes to habitat loss and fragmentation, climate changes (Thomas *et al.*, 1998). Along with the landscape and birds photography, butterfly photography is also increasing day by day.

A total 1501 butterflies were reported by Gaonkar (1996) in India. Larsen (1989) found 452 butterfly species from West Bengal. Total 95 butterfly species were reported by Vinithashri and Kennedy (2021) from the TNAU botanical garden, Coimatore. Singha Roy *et al.* (2012) recorded 30 butterflies from the Neora Valley National Park, West Bengal, India.Pahari *et al.* (2018) reported 67 butterfly species from the Haldia industrial belt, West Bengal. Samanta*et al.*, (2017) reported a total of 54 of butterfly species from Baghmundi, Purulia, West Bengal.

^{*}Assistant Professor

Nair *et al.* (2014) documented 49 butterfly species belonging to 5 families from the Sarojini Naidu college campus of Kolkata. Many other workers such as Nicéville (1885); Sanders (1944); Chowdhury and Das (2007); Mukherjee *et al.* (2016); and Dey *et al.* (2017) also studied the butterfly diversity in West Bengal. But no such study was done in the Dakshin Dinajpur distrct, West Bengal. So, the objectives of the study were made a check list of butterflies and determine their diversity indices.

Materials and Methods

Study area

Sampling sites: Sampling was done at a village Banihari, District-Dakshin Dinapur, West Bengal. Four sampling sites were selected for the study. Site 1 (25º42'34.10"N and 88º59'97.46"E) is located at a farm house with Bougainvillea glabra, Coriander (Coriandrum sativum), Carrot (Daucuscarota), Radish (Raphanus sativus), Ixora coccinea, Mariegold (Tagets spp.), Doronicu orientale etc plants. Site 2 (25°42'67.9"N and 88.°59'91.99"E) is situated at agricultural field and small forest with different trees such as Eucalyptus tree (Eucalyptus globulus), Teak plant (Tectona grandis), Carrot (Daucus carota), Radish (Raphanus sativus), Acacia auriculiformes, Mariegold (Tagets spp.), Doronicu orientale etc. Site 3 (25º42'00.88''N and 88º60'33.0''E) is located near few wood plants and bamboo bush on the other side. Site 4 (25º42'27.23" N and 88º60'60.38"E) is situated at agricultural field and paddy is cultivated twice in a year in this site.

Duration of the study : Study was carried out for one year from January 2019 to December 2019.

Sampling techniques and species identification

For study the butterfly diversity transect walk method was adopted (Pollard, 1977; Pollard and Yates, 1993). Sampling was done once in a month. For study the butterfly richness and abundance Pollard transect method was slightly modified (Kunte, 1997). In each sampling sites a 300 m line transect was established. Survey was done at early morning during bright sunny days. During the survey, walked slowly for 1.00 hrs.within the transect and number of butterflies along with species were counted. Photographs of butterfly were taken with the help of a digital camera (canon). Butterflies were identified with the help of following referencesEvans (1932), Wynterblyth (1957); Haribal (1992); Kunte (2000); Kehimkar (2008), Basu Roy *et al.* (2007) and Gunathilagaraj *et al.* (2015).

Measurement of diversity- Diversity indices such as dominance index, Shannon diversity index, Margalef species richness index, evenness index and â diversity were calculated by PAST 3.0 software (Hammer, 2001)

Results and Discussion

A total 48 butterfly species belonged to 35 genera and four families were recorded during the study period. Most dominant family was Nymphalidae (with 28 species, 58%) then followed by Pieridae (with 9 species, 19%), Lycaenidae (with 7 species, 15%) and Papilionidae (with 4 species, 8%) (Table 1 and Fig. 1). Common Mormon, Psyche, Blue Tiger, Plain Tiger, Striped Tiger, Grey Pansy, Small branded swift and Angled Castor were found very common during the survey. Common Barron, Brown King Crow, Indian Sunbeam, Red spot Common Jezebel and Common Emigrant were reported very rarely. Highest number of butterfly species were reported at site 1 (44 species) followed by site 2 (37 species), site 3 (35 species) and site 4 (33 species) (Fig. 2). Site wise distributions of different family are given in the Figure 2. Site 1 is rich in different



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Family	Common name		Scientific name		Observed			
5				Site 1	Site 2	Site 3	Site 4	
Papilionidae	1)	Common Mormon	Papiliopolytes (Linnaeus, 1758)	8	2	5	0	
1	2)	Blue Mormon	Papiliopolymnestor (Cramer, 1775)	6	2	7	3	
	3)	Lime	Papiliodemoleus (Linnaeus, 1758)	5	1	4	4	
	4)	Common Mime	Papilioclytia (Linnaeus, 1758)	0	3	2	0	
Pieridae	5)	Psyche	Leptosianina (Fabricius, 1793)	8	9	7	6	
	6)	Common Gull	Ceporanerissa (Fabricius, 1775)	4	3	7	0	
	7)	Red spot Common Jezebel	Ixias pyrene (Linnaeus, 1764)	2	1	0	0	
	8)	Common Jezebel	Delias eucharis (Drury, 1773)	4	2	2	3	
	9)	Common Wanderer	Pareroniavaleria (Cramer, 1776)	13	8	4	3	
	10)	Common Emigrant	<i>Catopsilia Pomona</i> (Fabricius, 1775)	2	1	0	2	
	11)	mottled Emigrant	Catopsiliapyranthe (Linnaeus, 1758)	18	11	8	7	
	12)	Common Grass Yellow	<i>Euremahecabe</i> (Linnaeus, 1758)	17	11	8	9	
	13)	Three Spot Grass Yellow	Euremablanda (Boisduval, 1836)	11	7	4	8	
Lycaenidae	14)	Indian Sunbeam	Curetisthetis (Hubner, 1819)	2	1	0	0	
	15)	Zebra Blue	Tarucusplinius (Fabricius, 1793)	0	2	2	0	
	16)	Ciliate Blue	Antheneemolus (Godart, 1823)	2	4	2	1	
	17)	Dark Grass Blue	Zizeeriakarsandra (Moore, 1865)	4	5	0	3	
	18)	Tiny Grass Blue	Zizulahylax (Fabricius, 1775)	8	0	2	1	
	19)	Grass Jewel	Chiladestrochylus (Freyer, 1845)	11	0	3	0	
	20)	Lime Blue	Chiladeslajus (Cramer, 1782)	5	7	0	4	
Nymphalidae	21)	Blue Tiger	Tirumalalimniace (Cramer, 1775)	14	12	4	2	
r (j inprianciae	22)	Plain Tiger	Danauschrysippus (Linnaeus, 1758)	12	4	7	2	
	23)	Striped Tiger	Danausgenutia (Cramer, 1779)	14	11	8	3	
	24)	Common Crow	Euploeg core (Cramer, 1780)	10	8	7	4	
	25)	Brown King Crow	Euploeaklugii (Moore, 1858)	2	0	0	2	
	26)	Common Evening	Melanitisleda (Linnaeus, 1758)	11	0	7	0	
	_0)	Brown	(<u>Liliacas</u>) 1700)		0		0	
	27)	Palmfly	Discophorasondaica(Boisduval, 1836)	8	7	4	2	
	28)	Common Palmfly	Elymniashypermnestra (Linn, 1763)	9	4	7	1	
	29)	Dark evening Brown	Melantisphedima (Cramer, 1780)	7	4	0	0	
	30)	Common Five Ring	Ynthimabaldus (Fabricius, 1775)	5	2	0	0	
	31)	Common Leopard	Phalantanhalantha (Drury, 1773)	15	12	11	4	
	32)	Commander	Moduzanrocris (Cramer 1777)	2	0	1	0	
	33)	Angled Castor	Ariadne ariadne (Linnaeus 1764)	12	8	4	1	
	34)	Common Castor	Ariadne merione (Cramer 1777)	0	4	5	2	
	35)	Common Barron	Futhaliaaconthea (Hewitson 1874)	2	0	0	0	
	36)	Chocolate Pansy	Iunoniginhtig (Cramer 1779)	4	0	1	0	
	37)	Long-branded Bushbrown	Mycalesisvisala (Moore, 1858)	5	2	0	0	
	38)	Grev Pansy	<i>Junoniaatlites</i> (Linnaeus, 1763)	14	12	9	10	
	39)	Peacock Pansy	Junonigalmana (Linnaeus 1758)	12	10	11	7	
	40)	DanaidEggfly	Hunolimnasmisinnus (Linnaeus, 1764)	2	0	0	, 1	
	41)	Pale Palm Dart	Telicota colon (Fabricius 1775)	4	2	4	5	
	42)	Small branded swift	Pelonidas mathias (Fabricius)	10	11	12	14	
	43)	Rice Swift	Borhocinnara (Wallace 1866)	7	0	8	10	
	44)	Painthush Swift	Baorisfarri (Moore 1878)	5	о 4	0	10	
	-11) (15)	Conjoined swift	Pelonidas conjuncta (Herrich-Schaffer 1860)	2	- -	1	- r 7	
	-±5) (16)	Large branded swift	Pelonidas subochracea(Moore 1878)	<u> </u>	7	-± 0	/ つ	
	+0) 17)	Boyan's Swift	Pseudaharhahezani (Maara 1878)	0	7	2	∠ 0	
	-17) //R)	Dark Branded Swift	Pelonidas agna(Moore 1866)	4	0	∠ 2	0	
	+0)	Dark Dranded Swill	1 ciopiano uzim(11001e, 1000)	т	0	4	0	

Table 1. Check list of butterfly species with family, common and scientific name in four sampling sites of the study village of District Dakshin Dinajpur.

flowering plants which are the host plant of butterflies. Site 4 is agricultural field and only paddy plants are present. So butterfly diversity was very low at site 4. Many others workers also reported that the Nymphalidae family was most dominant family due to their polyphagus food habit and strong fliers (Raut and Pendharkar, 2010; Padhye *et al.*, 2012; Majumder *et al.*, 2012).

Number of butterfly taxa ranged from 33 to 44 with average $37.25 (\pm 4.79)$ at four sampling sites during the survey. Altogether 688 individuals were found during the study. Average value (±SD, with range) of dominance index, Shannon diversity index, Margalef species richness index, Evenness index and Berger-Parker are shown in the Table 2. Low Shannon diversity index and Margalef species richness index were reported during the study that indicated the low vegetation particularly different flowering plants in this area. Shannon diversity (4.228 -3.964) and Margalef species richness index (7.817-9.83) of butterfly were recorded in Howraha district greater than the present study. As flowering plants plays an important role in the survival of butterfly because it provides food and shelter. More butterfly diversity was found in Site 1 due to the presence of huge gardening and vegetable plants. Similar findings were suggested by Dev et al. (2017). Lowest butterfly diversity was reported in site 4 due to presence of only rice plants. Abundance of butterfly species depends on availability of larval host plants and vegetation which provides nectar of butterflies (Thomas, 1995 and Harrington and Stork 1995).Bamboo bushes hosts less diversity of butterfly species (Vu and Vu, 2011). Lycaenidae was the most dominant family in the study area. So, concluded that this are rich in host plants (Padhye et al., 2012, Boruah, 2018). In the present study, diversity and species richness of butterfly in the four sampling sites varied slightly as a matter of differences in vegetation. High evenness index and low dominance index indicates butterfly species are evenly

Table 3. Pairwise beta diversity of butterfly species betweenfour sampling sites.

	1 0		
Site 1	Site 2	Site 3	Site 4
0			
0.18519	0		
0.21519	0.25	0	
0.19481	0.2	0.23529	0
	Site 1 0 0.18519 0.21519 0.19481	Site 1 Site 2 0 0 0.18519 0 0.21519 0.25 0.19481 0.2	Site 1 Site 2 Site 3 0 0 0 0.18519 0 0 0.21519 0.25 0 0.19481 0.2 0.23529

distributed in this area. Moderate numbers of butterfly species were found in the study sites.

Over all Global beta diversities (Whittaker) indices was 0.28859. Highest pairwise beta diversity was reported between site 2 and site 3 and lowest value was recorded in between site 1 and site 2 (Table 3).

The Bray-Curtis dissimilarity is ranged from 0 to 1. Bray-Curtis dissimilarity is calculating by using the species abundant data between two habitats. Highest Bray-Curtis dissimilarity was found between site 1 and site 4 and less Bray-Curtis dissimilarity was reported between site 1 and site 2. This indicates that Site 1 and site 4 share less common butterfly species but site 1 and site 2 share more common butterfly species. The value of Bray-Curtis dissimilarity supported the vegetation of the area because site 1 with more diverse of plants variety but less variety of plants was found in site 4. Vegetation of site 1 and site 2 are more or less similar.

Threats of butterfly diversity are many anthropogenic activities such as monoculture of plants, use of pesticide in agriculture, use of herbicide, destruction of host plants etc. Birds, spiders and lizards are

 Table 4. Bray-Curtis dissimilarity index of butterflies between four sampling sites.

	1 0				
	Site-1	Site-2	Site-3	Site-4	
Site-1	1				
Site-2	0.306	1			
Site-3	0.360	0.338	1		
Site-4	0.488	0.384	0.359	1	

Table 2. Number of taxa and diversit	v indices of butterflies at four same	pling sites with average and	standard deviation
	•		

Site 1	Site 2	Site 3	Site 4	Average (±SD)
44	37	35	33	37.25 (±4.79)
0.03102	0.0383	0.03749	0.04635	0.0382 (±0.0062)
3.598	3.393	3.395	3.252	3.40 (±0.142)
7.411	6.727	6.513	6.421	6.768 (±0.447)
0.9507	0.9396	0.9549	0.9302	0.9438 (±0.0111)
0.05438	0.05687	0.06486	0.09589	0.068 (±0.019)
	Site 1 44 0.03102 3.598 7.411 0.9507 0.05438	Site 1 Site 2 44 37 0.03102 0.0383 3.598 3.393 7.411 6.727 0.9507 0.9396 0.05438 0.05687	Site 1Site 2Site 34437350.031020.03830.037493.5983.3933.3957.4116.7276.5130.95070.93960.95490.054380.056870.06486	Site 1Site 2Site 3Site 4443735330.031020.03830.037490.046353.5983.3933.3953.2527.4116.7276.5136.4210.95070.93960.95490.93020.054380.056870.064860.09589

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Fig. 3. Photographs of some observed butterflies with their common name in the village Banihar.

natural enemy of butterfly. Butterflies are also killed for decoration in many parts of country. Indiscriminate use of pesticides in agriculture is an important threat of butterfly diversity in the study sites. Kuussaari et al. (2007) proposed that butterfly diversity and richness increased with the availability and the heterogeneity of the host plants. Non-availability of nectar plant causes declined of butterfly species (Vinithashri and Kennedy, 2021). Anthropogenic activities affected the butterfly diversity badly (Blair and Launer, 1997). The presence of Common Jezebel is indicated that the District contains some hemiparasitic plants, Larval Host Plant conducive for the species. Plantation of Eucalyptus tree (Eucalyptus globulus) have been increased in last few years in this village, this plants hampered many indigenous flowering plants which are the host plants of many butterfly. Moderate numbers of butterfly species were found in the study site but their number gradually decreased da by day due many anthropogenic activities.

Conclusion

Moderate numbers of Butterfly were reported at the study site. Butterfly diversity depends on availability of host plants. Butterfly diversity decreased day by day due to many anthropogenic activities such as habitat loss, loss of host plant and use of pesticide.

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Conflict of interest-There is no matter of conflict of interest.

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