P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-7, ISSUE-3, July-2018

E: ISSN No. 2349-9443 Asian Resonance

A Preliminary Study on Butterfly Diversity in Garbhanga Reserve Forest, Basistha, Assam, India

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Abstract

The word *lepidos* means scales and *ptera* means wings, therefore, the Lepidoptera are insects having wings covered with scales, which distinguish them from all other insects. The butterflies are diurnal and distinguished from moths by the presence of knobbed antennae, wings held vertical at rest, head and thorax hind wing produced at base near costa, eggs dome or upright shaped, larva/caterpillar with five pairs of legs, body of larva may be covered with spines, chrysalid or pupa.

There are over 17,000 species of butterflies known over the globe, of which about 1500 occur in India. India is one of the 12th mega diversity centre's in the world. Moreover, out of 27 hot spots in the world, two, *viz.,* North-eastern India and Western Ghats are very rich in diversity of species and their population. They are commonly seen before and after monsoon months depending on the climatic conditions in various parts of the country. The northeastern region of India, south of the Brahmaputra river, is part of globally recognized Indo- Myanmar biodiversity hotspot and is host to remarkable biodiversity that includes a high proportion of endemic, rare and endangered species. The high species richness and endemism make this an especially important region for butterfly diversity and conservation in India.

In many parts of India, the spring season is the favourable time for butterflies whereas in arid parts of North and Northwest India, the monsoon and post-monsoon periods are favourable months as the spring is delayed until monsoon. In the hills, butterflies are available only for a short period because the spring is much delayed and summer being very short. They are found in jungles and forests of plains, hills, mountains where they prefer damp, shady and sandy places, near streams. Their larvae or caterpillars feed on tender leafy plants but adults often visit flowers of nectariferous plants. Some of the species are attracted to saps of injured plants, rotten fruits, sugars, horse droppings and toddy. Their food plants may be specific or many. The Basistha forest is located in the south-east corner of Guwahati city. The forest area falls under the region of Garbhanga reserve forest which is populated by butterfly reserve. The seasonality of nymphalid butterfly was examined in Garbhanga reserve forest (saikia et.al, 2016). A comparative systematical study on butterfly mud puddling localities and surface forest samples was undertaken in the region. The present study on diversity of butterfly in the habitat was compared with the vegetation, season and arrangement of its taxanomic category.

Keywords: Lepidoptera, Larva, Basistha, Garbhanga, Monsoon, Biodiversity.

Introduction

Butterflies are generally regarded as one of the best taxonomically studied group of insect (Robinson, et. al 1997). Tiple (2011) referred that there are over 28,000 species of butterflies in the world. Braby (2004) described that around the world butterfly is divided into 6 families which are Hesperidae, Papilionidae, Pieridae, Nymphalidae, Riodinidae and Lycanidae. The north-eastern region of India, south of the Brahmaputra river, is part of globally recognized Indo- Myanmar biodiversity hotspot and is host to remarkable biodiversity that includes a high proportion of endemic, rare and endangered species. The high species richness and endemism make this an especially important region for butterfly diversity and conservation in India. North east India is one of the richest in biological values, high in endemism and holds a large number of rare species that

are under the serious threat. The region is among the 34 Hot spots of the world, identified in India, the other being in Western Ghats. The regions support a rich butterfly fauna because of its average annual rainfall that often exceeds 2,000 mm, which is ideal for most flora and fauna. The international (ICUN) has nominated north eastern India as one of the Swallowtail- rich zone under the Swallowtail Conservation Action Plan (1984). The northeast India extending from Sikkim through Assam to North Burma up to Shan state is one of the richest and interesting butterfly areas in the world described by Evans (1932) hence it is required proper exploration in various ecological pockets of natural and distributed habitat. Among other northeastern states 104 species of butterfly from Meghalaya , 695 species from Sikkim and 962 species from Assam have been recorded by Evas (1932); Wyneter-Blyth (1957); Haribal (1992).

Objective of the Paper

The present study deals with diversity of butterfly found within the study area with the following objectives under-

1. To prepare a preliminary checklist of the butterflies from study site.
2. To access the abundance &diversity of butterflies fauna in Basistha area near Garbhanga .
3. To find out the rare and endangered taxa of butterfly.

Review of Literature

Butterflies are generally regarded as one of the best taxonomically studied group of insect (Robinson, et. al1997). Tiple (2011) referred that there are over 28,000 species of butterflies in the world. Braby (2004) described that around the world butterfly is divided into 6 families which are Hesperidae, Papilionidae, Pieridae, Nymphalidae, Riodinidae and Lycanidae.

India host about 1,504 species of butterflies (Tripal, 2011) of which peninsular India host 351 and Western Ghats 334 species. In central India about 177 of the butterfly species was reported in the central provinces (Vidarbha, Madhya Pradesh and Chattisgarh) by D'Abreau in 1931. Nearly 200 species of butterflies have been reported in Odisha out of which 170 species are found in Bonai forest division of Sundergarh district reported by Mohapatra, et.al. (2012). The study of biodiversity of Lepidoptera carried out by Kumar in 2013 in different sites of Jhagadia, Taluka, Ankleswar, under the district of Bharuch, he reported a total of 484 individual belonging on 58 species of 9 families were identified. Later on Kumar (2014) recorded 948 individuals of butterflies from the various study sites of Jhansi. The study of diversity of butterflies at Tamil Nadu under the district Tirvalunar which constitute the 9 talukas was studied by Prabakarana, et. al. (2014) and they got a total of 63 genera and 97 species belonging to the 5 families. A total of 49 species of butterflies under the 5 families and 36 genera were recorded by Nair, Mitra and Aditya (2014) in the Sarojini Naidu College campus Dum Dum, Kolkata. Nymphalidae was recorded as the most dominant family in of number of species, represented by 20 species followed by Lycanidae (12), Pieridae (10), Papiliodae (60), and Hesperidae (1). Later on the study of butterfly diversity around the Neora Valley National Park of West Bengal by Roy et. al. (2012) they recorded a total 30 butterfly species belonging to families of Hesperionidae, Papilionidae, Pieriidae, Nymphalidae and Lycanidae. Haris (2014) recorded 55 butterflies' species belonging to 5 families during their study of butterfly diversity from Indian Institute of Forest Management at Bhopal. Thangpandian, et. al. (2014) recorded a total of 47 butterflies species belonging to 5 families were observed during their study of diversity and status of butterflies in the city Chennai. Georage, et. al. (2014) reported a total of 22 species of butterflies belonging to 4 families from Vimala College. Thissur, Kerala, among them the family Nymphalidae showed the maximum species richness, comprising of 10 species, followed by family Papilionidae and Pieridae, Lycanidae with 2 species and the endemic species like Melontis Idea, Euploea core, Junoniaiphita and Junonia alma could be observed.

Chandekar and Nimbalkar in 2015 described a total of 56 species of butterflies belonging to families namely Papilionidae (4), Pieridae (12), Nymphalidae (21), Lycanidae (15), and Hesperidae (4). From insects are the Uplanv Nature camp under the Kalaburrage district a total of 61 butterflies belonging to 5 families were recorded by Kanya, Sarof and Jadish, (2016).Mohapatra in 2016 recorded a total of 45 butterfly species belonging to 5 families, 14 sub-families and 35 genera were recorded from Regional Institute of Education campus, Bhubhaneshwar, Odisha. The study of diversity of butterfly is carried out on Rawanwadi Reservoir, Bhemdara (Maharastra) by Patil, et. al. (2017), they reported a total of 84 species belonging to 5 families and 54 genera were recorded and among which 52.38% were common, 28.57% were occasional and 19.4% species were rare. Family Nymphalidae consist maximum number of species i.e. 32 from 19 genera. This number is followed by Lycanidae with 19 genera and 20 species. Pieridae consist of 13 species of 7 genera and Hesperidaeconsist of 7 species of 6 genera. Minimum number of species were recorded in Papilionidae i.e. 6 species and 3 genera. Pal, et. al. (2015) reported a total of 91 butterfly species from the Northern parts of Bengal. Ganvir and Khune in 2016 a total of 24 species of butterflies were recorded belonging to 20 genera and 5 families from the Silezari site of Gandia district, Maharastra. Later on a biodiversity of butterfly is carried out by Ghosh and Shaha in 2016 and they reported a total of 51 butterfly species belonging to 5 families from the Taki, North 24 Parganas, and West Bengal.

Materials and Method

Study Area

The survey of diversity of butterfly was carried out at Basistha forest area which falls under Garbhanga reserve forest. It is located in the south-east corner of Guwahati city. The total forest area cover is 18,860.58 hectare and surrounded by 18 villages within the forest. The reserve forest is located

between 91^0 36′ 25″ E to 91^0 47′ 45″ E longitude and 26^0 05′ 31″N to 25^0 54′ 12″N latitude. Atmospheric temperature: - 38. 56^0 + 2 c in the month of July and 19^0 in the month of February. Rainfall was recorded of about 1700.00mm during the period of study.

Location on Map

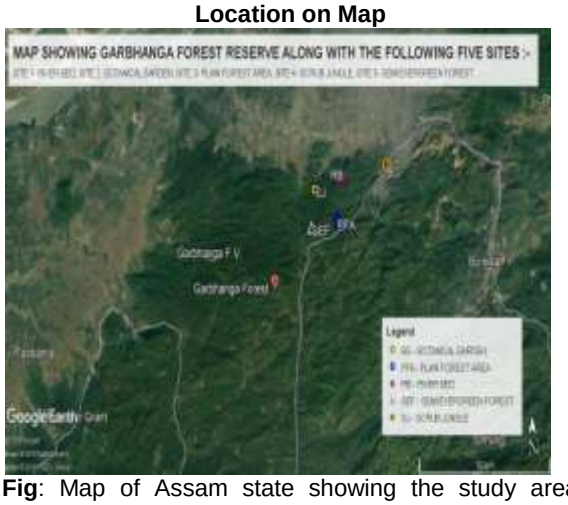


Fig: Map of Assam state showing the study area (a)the five habitat types- BG- Botanical garden, RB- river bed, PFA- plain forest area, SJ- scrub jungle, SEF- semi-evergreen forest, (Satellite view map) .

Survey Method

The study was carried out from June 2017, May 2018. Survey was conducted in the part of Garbhanga reserve forest with the sites choosed as Basistha. Digital camera, field notes, photograph (camera: Nikon 5300, Nikon D810 FX) and observation of butterfly were taken during the day light hours.

During the study, butterflies were recorded by walking on fixed transects (Pollard & Yates, 1993) in different habitats. Butterfly species density and relative abundance were assessed quantitatively across the different habitats.

Data Analysis

The butterflies were identified by observing their morphology as well as their particular behaviour. The identification was made with the help of references to Haribal (1992) and cross checked with Evans (1932), Mani (1986), Bingham (1905), Kehimker (2008), Winter-Blyth (1957), Kunte (2000), and Talbot (1978). The host specific plants were also recorded.

An effort has been made to use the latest nomenclature and common names as far as possible as per Evan (1932).

Results & Discussion

In the present study, species were found various site of reserve forest. The result of the study is given in the table.

Table 1: List of Butterfly Species Found in Different Habitat

			Occurrence				
Sl No	**Scientific Name**	**Common Name**	**Site-1 (River Bed)**	**Site-2 (Botanical Garden)**	**Site-3 (Plain Forest Area)**	**Site-4 (Scrub Jungle)**	**Site-5 (Semi-Evergreen Forest)**
1	*Ariadne merione*	Common castor	-	+	+	+	-
2	*Arnettamercara*	Coorg forest hooper	-	+	+	+	-
3	*Athymanefte*	Color sergeant	+	-	+	+	-
4	*Athymaperius*	Common sergeant	+	+	+	+	+
5	*Catopsilia Pomona*	Common emigrant	+	+	-	-	-
6	*Charaxesprotoclea*	Flame-bordered emperor	-	+	-	-	-
7	*Cheritrafreja*	Common imperial	-	-	+	+	-
8	*Cirrochroaaoris*	Large yeomen	+	-	+	+	-
9	*Cirrochroatyche*	Common yeomen	+	-	+	+	-
10	*Papiliopolytes*	Common mormon	+	+	+	+	+
11	*Danauschrysippus*	Plain tiger	-	-	-	+	+
12	*Danausgenutia*	common tiger	-	-	+	+	+
13	*Elymniashypermnestra*	common palmfly	-	-	+	+	-
14	*Elymniasmalelas*	spotted palmfly	+	-	+	+	-
15	*Euploea core*	common crow	+	+	-	+	-
16	*Euploeamulciber*	striped blue crow	+	+	+	+	+
17	*Euploea Sylvester*	double branded crow	+	+	+	+	+
18	*Euremablanda*	three spot grass yellow	-	+	+	-	-
19	*Gandcaharinaassamica*	tree yellow	-	+	+	-	-
20	*Graphiumdoson*	common jay	-	+	+	-	-
21	*Graphiumsarpedon*	common bluebottle	+	-	+	+	-
22	*Hasorachromus*	common banded awl	+	-	+	+	+
23	*Heliconiuserato*	red postman	-	+	-	-	-
24	*Jamidesceleno*	common cerulean	-	+	-	-	-
25	*Leptosianina*	psyche	-	-	+	+	+
26	*Letha confuse*	banded tree brown	-	-	+	+	+

27	*Matapa aria*	common red eye	-	+	+	+	-
28	*Melantisleda*	common evening brown	-	-	+	+	+
29	*Mnasitheusnitra*	nitra skipper	+	-	+	+	+
30	*Mycalesismineus*	darkbrandbushbrown	-	+	+	+	+
31	*Mycalesisperseus*	common bushbrown	+	-	+	+	+
32	*Neptishylas*	common sailor	+	+	+	+	+
33	*Pantoporiahordonia*	common lascar	-	+	+	+	-
34	*Papilioclytia*	common mime	+	-	+	+	-
35	*Papiliohelenus*	red Helen	-	+	+	-	+
36	*Papiliomemnon*	great mormon	-	+	+	+	+
37	*Papilio s protenor*	spangle	+	-	+	-	+
38	*Paranticasita*	chestnut tiger	-	+	-	-	-
39	*Pierisrapae*	small cabbage white	-	+	+	+	-
40	*Précis iphita*	chocolate pansy	+	+	+	-	-
41	*Précis lemonias*	lemon pansy	+	-	+	-	-
42	*Spindasislohita*	long banded silverline	+	+	+	+	-
43	*Symbrenthianipanda*	blue tail jester	-	-	+	+	+
44	*Syntarcusplinius*	zebra blue	+	-	+	-	+
45	*Tagiadesjapetus*	common snow flat	-	+	+	-	-
46	*Vindulaerota*	cruiser	-	-	-	+	+
47	*Ypthimabaldus*	common fivering	-	+	+	+	+
48	*Zipoetisscylax*	dark catseye	+	-	+	+	+
49	*Zizeeriakarsandra*	dark grass blue	+	+	+	+	+
50	*Elymniaspatna*	blue-stripped palmfly	+	-	+	+	+
51	*Plebejusargus*	silver studded blue	+	+	+	+	-
52	*Mycalesismestra*		+	-	+	+	-
53	*Spialiagalba*	Indian skipper	+	-	+	+	-
54	*Lebadeamartha*	knight	+	+	+	-	-

Table 2: Showing Relative Abundance of Butterflies Found in the Study Sites

Sl no	Scientific name	Family	Relative abundance
1	*Papiliopolytes*	Papilionidae	Very common
2	*Graphiumdoson*	Papilionidae	Frequent
3	*Graphiumsarpedon*	Papilionidae	Very common
4	*Papilioclytia*	Papilionidae	Frequent
5	*Papiliohelenus*	Papilionidae	Frequent
6	*Papiliomemnon*	Papilionidae	Frequent
7	*Papilio s protenor*	Papilionidae	Rare
8	*Catopsilia Pomona*	Pieridae	Very common
9	*Euremablanda*	Pieridae	Frequent
10	*Gandacaharinaassamica*	Pieridae	Very common
11	*Leptosia nine*	Pieridae	Very common
12	*Pierisrapae*	Pieridae	Frequent
13	*Cheritrafreja*	Lycaenidae	Rare
14	*Jamidesceleno*	Lycaenidae	Common
15	*Spindasislohita*	Lycaenidae	Occasional
16	*Syntarucsplinius*	Lycaenidae	Very common
17	*Zizeeriakarsandra*	Lycaenidae	Frequent
18	*Plebejusargus*	Lycaenidae	Occasional
19	*Ariadne merione*	Nymphalidae	Very common
20	*Athymanefta*	Nymphalidae	Very common
21	*Athymaperius*	Nymphalidae	Very common
22	*Charaxesprotoclea*	Nymphalidae	Common
23	*Cirrochroaaoris*	Nymphalidae	Frequent
24	*Cirrochroatyche*	Nymphalidae	Frequent
25	*Danauschrysippus*	Nymphalidae	Very common
26	*Danausgenutia*	Nymphalidae	Very common
27	*Elymniashypermnestra*	Nymphalidae	Very common
28	*Elymniasmalelas*	Nymphalidae	Uncommon
29	*Euploea core*	Nymphalidae	Very common
30	*Euploeamulciber*	Nymphalidae	Occasional

31	*Euploea Sylvester*	Nymphalidae	Frequent
32	*Heliconiuserato*	Nymphalidae	Common
33	*Précis lemonias*	Nymphalidae	Abundant
34	*Melanitisleda*	Nymphalidae	Frequent
35	*Mycalesismineus*	Nymphalidae	Very common
36	*Lebadaemartha*	Nymphalidae	Frequent
37	*Mycalesisperseus*	Nymphalidae	Very common
38	*Neptishylas*	Nymphalidae	Very common
39	*Pantoporiahordonia*	Nymphalidae	Very common
40	*Paranticasita*	Nymphalidae	Uncommon
41	*Symbrenthianiphanda*	Nymphalidae	Occasional
42	*Précis iphita*	Nymphalidae	Abundant
43	*Vindulaerota*	Nymphalidae	Frequent
44	*Ypthimabaldus*	Nymphalidae	Frequent
45	*Zipoetisscylax*	Nymphalidae	Occasional
46	*Letha confuse*	Nymphalidae	Very rare
47	*Elymniaspatna*	Nymphalidae	Frequent
48	*Mycalesismestra*	Nymphalidae	Common
49	*Arnettamercara*	Hesparidae	Common
50	*Hasorachromus*	Hesparidae	Occasional
51	*Matapa aria*	Hesparidae	Frequent
52	*Mnasitheusnitra*	Hesparidae	Frequent
53	*Tagidesjapetus*	Hesparidae	Very common
54	*Spialiagalba*	Hesparidae	Occasional

Table 3: List of 3 Rare Taxa Recorded along with their Respective Taxonomic Families

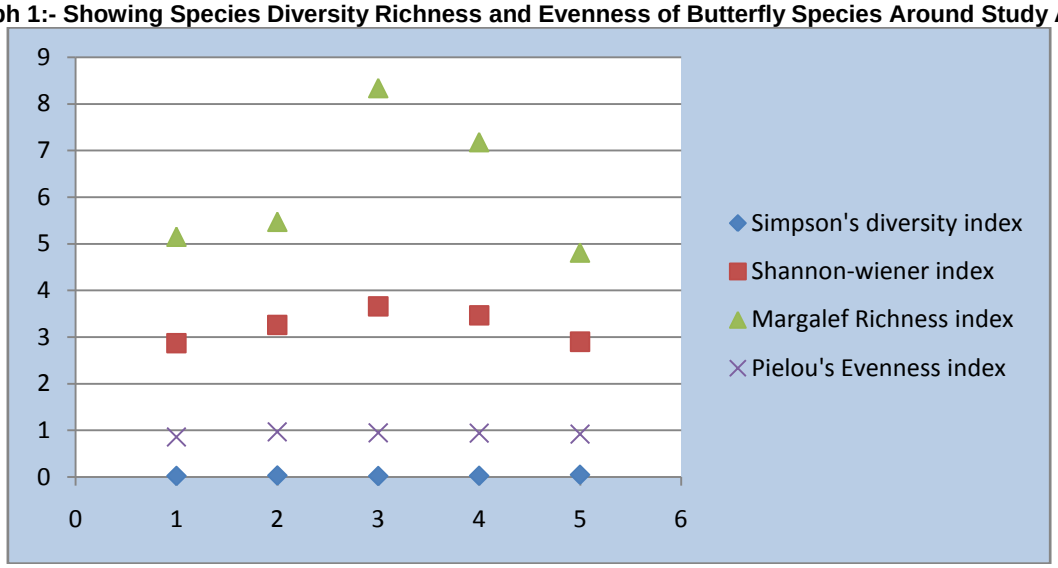
Family	Scientific name
Papilionidae	*Papilios protenor*
Lycaenidae	*Cheritra freja*
Nymphalidae	*Letha confuse*

Data Analysis

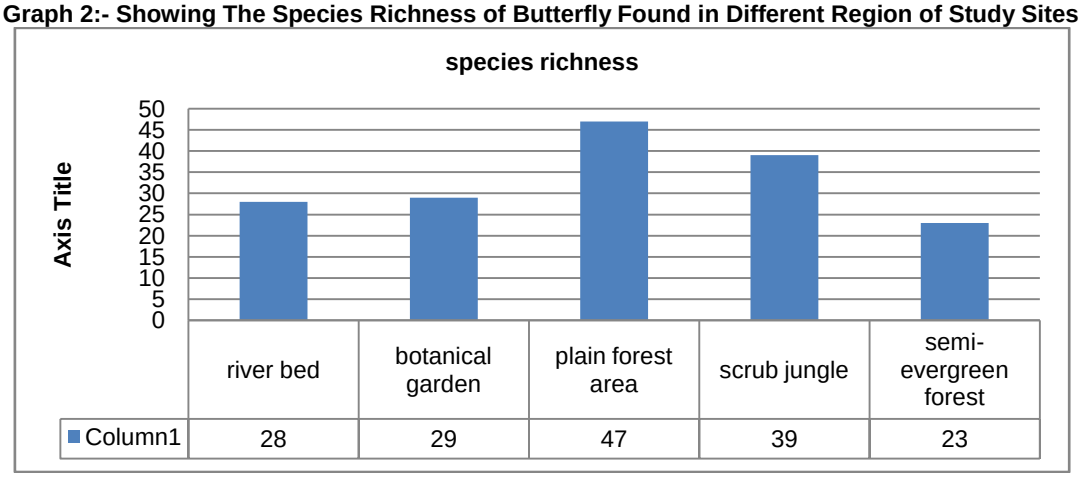
Table 4: Species Diversity Richness and Evenness of Butterfly Species from Study Areas (SA 1,2 ,3, 4 & 5) In And Around Reserve Forest of Garbhanga

Diversity index	SA-1 (River bed)	SA-2 (Garden)	SA-3 (Plain forest area)	SA-4 (Scrub Jungle)	SA-5 (Semi-Evergreen forest)
Butterfly species	28	29	47	39	23
Simpson's diversity index	0.025	0.034	0.023	0.028	0.050
Shannon wiener diversity	2.87	3.26	3.66	3.47	2.90
Margalef richness index	5.15	5.47	8.34	7.18	4.81
Pielou's evenness index	0.86	0.97	0.95	0.94	0.92

Graph 1:- Showing Species Diversity Richness and Evenness of Butterfly Species Around Study Area



Graph 2:- Showing The Species Richness of Butterfly Found in Different Region of Study Sites



The present study provides a checklist of butterfly diversity of Garbhanga reserve forest, Basistha area. In the present study it is found that Nymphalidae is represented by 30 species followed by papilionidae 7 species, lycaenidae 6 species, hesperidae 6 species and pieridae 5 species. The relative abundance of Nymphalidae is highest (56%) followed by lycaenidae (11%) , hesperidae (11%) , papilionidae (13%) and pieridae (9%). It has been found that 495 individuals belong to Nymphalidae family, which is most found species in the study sites followed by 136 individuals of papilionidae family, 108 of lycaenidae, 82 of hesperidae family and pieridae family with 53 numbers of individuals. This findings is in conformity with various studies conducted in Guwahati city (Ali and Basistha, 2000).

Observation of 54 butterfly species including 3 rare taxa were recorded that belong to different families; papilio s protenor, cheritra freja, letha confuse and 18 dominant taxa were recorded in the study sites. Margalef richness index (D) were found to greater in the forest edges of plain forest area (study site -3) however shannon-wiener diversity index (H) is also found to be highest in study site of plain forest area. Although the species richness in all study sites of the study area is more or less found to be uniform. The Evenness of butterfly species were found to be greater in botanical garden (study sites-2). In the study it is found that diversity of butterfly individuals ranges from 2.87 to 2.90 and 0.025 -0.050 and richness ranges from 5.15-4.81. Thus , this study clearly reveals that GRF is suitable for butterfly species diversity. The climatic condition together with good vegetation cover and water bodies harbours a good diversity of butterfly in reserve forest area.

The vegetation that were recorded in the study area are- *Adonidia merrillii, Agertum conyzoides, Cantharanthus roseus, Helianthus annuus, Heliconia latispatha, Hisbiscus rosa, Ixora macrophylla, Lantana camara, Mussaendra froudosa, Rosa damascene, Solanum indicum,* one of the other reason for richness of butterfly is due to the presence of larval food plants.

Conclusion

The present study reveals that the GRF (Basistha) is very rich in butterfly diversity as it counts 54 species belonging to different families of which some butterflies are protected under various Schedule of Wildlife (Protection) Act,1972 and IUCN Red List. 4 unidentified butterflies were found from the study sites during survey. Maximum butterflies were recorded during the rainy season. The present study states that the diversity of Nymphalidae family was the largest with more number of species, pieridae was the less number of species. This study might assume great taxonomic significancance and might initiates conservation strategies in due course of time for preservation of various butterflies groups.

Though study is only a preliminary observation on the butterfly species diversity at Garbhanga reserve forest(GRF) , it has some significance as it can be used in monitoring ecosystem health, stability and functioning from the present study area. Conservation of these important pollinators is essential for sustainable development. Anthropogenic disturbances from cutting of tree, burning of grassland etc are posing threats for the ecosystem and fauna of the butterfly. Most studies of butterfly, response to climate change have focused on the effect of temperature changes, but changes in precipitation patterns can be of important. Butterfly diversity varies with seasons. They are abundant only a few months and rare or absent during other months of the year. The abundance of diverse species was positively affected by approachingsummer, high relative humidity and more rainfall. The diversity of butterfly community is controlled by various ecological determinantsand is known for their value as an important ecological indicator group.

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Photo Plate

Ypthima baldus (Nymphalidae)

Precis iphita (Nymphalidae)

Eurema blanda,(Pieridae)

Papilios protenor (Papilionidae)

Papilio helenus (Papilionidae)

Cheritra freja (Lycaenidae)

P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-7, ISSUE-3, July-2018
E: ISSN No. 2349-9443 Asian Resonance

Jamides celeno (Lycaenidae)

Cirrochroa aoris (Nymphalidae)