

# Butterfly Diversity And Altitudinal Preferences In Talle Valley Wildlife Sanctuary, Lower Subansiri District, Arunachal Pradesh, India

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**Abstract:** The diversity of butterflies are five families like Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae along with their altitudinal preferences was monitored in ever green and semi evergreen forest in Talle Valley Wildlife Sanctuary of Arunachal Pradesh using transect count method have been followed. The maximum number of butterflies (64.70%) has been recorded within altitudinal ranges of 1600m-1800m. Sorensen's similarity index has been calculated at 0.305 between 1600m-1800m and 1800m-2500m. Only 13.23% of butterflies are commonly observed in both altitudinal ranges. More species of Nymphalidae were recorded from this area than other families. The relationship between altitude, specific habitat and butterfly diversity are highlighted in this paper.

**Key words:** Butterflies, Altitude, Diversity, Forest type, Habitat, Talle Valley WLS

## Introduction

Butterflies are arguably the best loved group of invertebrates and have been a source of inspiration for generations of natural historians and scientists. The wealth of information on butterflies is unrivalled among the invertebrates (Wahlberg *et al.*, 2003). Due to their attractiveness and omnipresence people are interested to work with this colourful insect. Butterflies are particularly important group of 'model' organisms used for centuries to investigate many areas of biological research including such diverse fields as navigation, pest control, embryology, mimicry, evolution, genetics, population dynamics and biodiversity. Butterflies are one of the most beautiful and highly adapted flying insects in the present living world. In present day, butterflies are recognized as a bio-indicator (Rocha *et al.*, 2010), flagship species (Guiney *et al.*, 2008) as well as key for ecological hotspot identification (Werner and Buszko, 2005). Butterflies have been recognized as being highly sensitive to weather and climate (Dennis, 1993). The study on butterfly helps in analysis of the local as well as

the overall environment and its purity. The limited number of species and the availability of large quantitative data make them an ideal candidate for comparative studies and biodiversity forecasting efforts (Thomas *et al.*, 2001).

Talle Valley Wildlife Sanctuary harbors variety of flora and fauna population. However, due to extreme hilly terrain, adverse climatic condition, deep gorges and inaccessible wilderness, proper documentation of the fauna population especially the invertebrates is yet to be done. In this present investigation it has been evaluated the species diversity of butterflies as well as their status and its altitudinal preference in Talle Valley wildlife in Arunachal Pradesh. There are no previous records on butterflies in Talle Valley Wildlife Sanctuary. Record says on butterflies have been written from western side of Arunachal Pradesh (Talukdar and Sarma, 2010) including Eaglenest wildlife Sanctuary (Athreya, 2006).

## Materials and methods

### Study area

In Arunachal Pradesh (91°31' E- 97°30' E and 26°28' N- 29°33' N) is a province of eastern Himalayan range of India located on the top of greater Himalayan range. The Talle Valley Wildlife Sanctuary is situated at the eastern part of the town Ziro. Ziro is the district head quarters of Lower Subansiri district of Arunachal Pradesh. Talle Valley Wildlife Sanctuary lies between 27°30'-27°39' N and 93°15'- 94°2' E. The altitude of Sanctuary ranges from H<sup>o</sup>1600m to 2750m and it covers an area of 55 sq Km. The Wildlife Sanctuary divided into two range i) Pange (range) and ii) Talle Valley (range).

### Survey

A pilot survey was done on butterfly diversity and its abundance in Talle Valley WLS using both point transect as well as line transect (Pollard and Elias, 1975) methods. Approximately 23 Km route (Manipolyang to Talle Valley anti-poaching camp) considered for the study of butterfly diversity. Depending upon the elevations of two site i.e. site 1 and site 2 has been selected to study the butterfly diversity. Maximum numbers of butterflies were identified in the natural habitat. However, few butterflies those which were difficult to identify were collected using sweep net. The collected species were photographed both under wing and upper wing and released immediately without damaging it. These photographs were used for species identification of various literatures i.e. Evans 1931, Kehimker 2010.

### Sampling site

Two sites have been selected for study the diversity and abundance of butterfly in Talle Valley Wildlife Sanctuary. These sites are namely-

**Site I** Manipolyang to Pange anti-poaching camp. Altitude of site-I approximately 1600m to 1800m and habitat is characterized by tropical evergreen forest mixed with pine temperate vegetations **Site-II** Pange anti poaching camp to Talle Valley. Altitude of site-II approximately starts with 1800m to 2750m and Talle Valley range is characterized by open pine forest and bamboo (short) forest.

## Statistical analysis

A. Sorensen's Similarity Index:

$$\beta = 2C / (S_1 + S_2)$$

Where, S<sub>1</sub>= the total number of species recorded in the first community, S<sub>2</sub>= the total number of species recorded in the second community and C= the number of common species to both communities.

## Results

The survey conducted for a period of one year (July 2013 to 2014) reveals the presence of 68 species of butterflies belong to five families from both sampling site i.e. site 1 and Site 2. Out of the total butterfly species listed in the Talle Valley Wildlife Sanctuary, 59 species are habitat specialized, only 9 species are in the generalist. Nymphalidae dominates with 26 species followed by Papilionidae, Pieridae, Lycaenidae each having 12 species and Hesperidae 6 species. During this study period it has been observed that out of 68 species 72.05% are common; 16.17% are uncommon and 11.76% are rare (Fig.1). The percent similarity or species overlap across the two sites, i.e. site 1 & site 2 is 13.23%. The maximum number of butterflies recorded 64.70% in site 1 i.e. Manipolyang and Pange (Fig.2) followed by 22.05% in site 2 i.e. Pange to Talle Valley range.

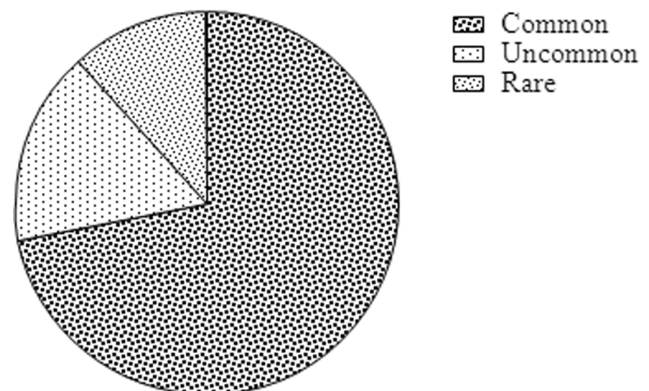


Fig. 1. Status of butterflies in Talle Wild life Sanctuary. Different categories of butterfly may be express in terms of percentage or in numbers

Table 1 : Butterfly recorded from Talle Valley Wildlife Sanctuary.

S.No	Common name	Scientific name	Status	Place
<b>Family: Papilionidae</b>				
1.	Common Peacock	<i>Papilio polyctor</i> Boisduval	Common	Tragophan point
2.	Paris Peacock	<i>Papilio paris</i> Linnaeus	Uncommon	Talle anti poaching camp
3.	Common Windmill	<i>Atrophaneura polyeuctes</i> Doubleday	Common	In between Pange and Manipolyang
4.	Glassy Bluebottle	<i>Graphium cloanthus</i> Westwood	Common	Pange (lower)
5.	Common Bluebottle	<i>Graphium sarpedon</i> Linnaeus	Common	Pange (lower)
6.	Yellow Helen	<i>Papilio nephelus</i> Boisduval	Common	Pange (lower & upper)
7.	Red Helen	<i>Papilio helenus</i> Linnaeus	Common	In between Pange and Manipolyang
8.	Red Helen	<i>Papilio helenus</i> Linnaeus	Common	Pange (lower & Upper)
9.	Common Mormon	<i>Papilio polytes</i> Linnaeus	Common	In between Pange and Manipolyang
10.	Great Mormon	<i>Papilio memnon</i> Linnaeus	Common	In between Pange and Manipolyang
11.	Great Jay	<i>Graphium eurypylus</i> Linnaeus	Uncommon	Pange (lower)
12.	Common Birdwing	<i>Troides helena</i> Linnaeus	Common	Manipolyang, Pange & Talle
<b>Family: Pieridae</b>				
13.	Common Grass Yellow	<i>Eurema hecabe</i> Linnaeus	Common	Talle anti poaching camp
14.	Small Grass Yellow	<i>Eurema brigitta</i> Cramer	Common	Manipolyang, Pange & Talle
15.	Tailed Sulphur	<i>Dercas verhuelli</i> Hoeven	Uncommon	Manipolyang
16.	Common Emigrant	<i>Catopsilia pomona</i> Fabricius	Common	In between Pange and Manipolyang
17.	Yellow Orange tip	<i>Ixias pyrene</i> Linnaeus	Common	Manipolyang to Pange
18.	Great Orange tip	<i>Hebomoia glaucippe</i> Linnaeus	Common	Manipolyang to Pange
19.	Pale Wanderer	<i>Pareronia avatar</i> Moore	Uncommon	Talle anti poaching camp
20.	Large Cabbage White	<i>Pieris brassicae</i> Linnaeus	Common	Pange (lower & Upper)
21.	Indian Cabbage White	<i>Pieris canidia</i> Sparrman	Common	Pange (lower & Upper)
22.	Spotted Sawtooth	<i>Prioneris thestylis</i> Doubleday	Common	Pange (lower)
23.	Hill Jezebel	<i>Delias belladonna</i> Fabricius	Common	In between Manipolyang to Pange
24.	Chocolate Albatross	<i>Appias lyncida</i> Cramer	Common	Manipolyang
<b>Family: Nymphalidae</b>				
25.	Plain Tiger	<i>Danaus chrysippus</i> Linnaeus	Common	Talle camp
26.	Chestnut Tiger	<i>Parantica sita</i> Kollar	Common	In between Manipolyang to Pange
27.	Common Beak	<i>Libythea lepita</i> Moore	Uncommon	In between Pange to Talle
28.	Common Crow	<i>Euploea core</i> Cramer	Common	In between Manipolyang to Pange
29.	Striped Blue Crow	<i>Euploea mulciber</i> Cramer	Common	Manipolyang to Pange
30.	Magpie Crow	<i>Euploea radamanthus</i> Fabricius	Common	Manipolyang
31.	Common Nawab	<i>Polyura athamas</i> Drury	Common	Manipolyang, Pange
32.	Rusty Forester	<i>Lethe bhairava</i> Moore	Uncommon	In between Manipolyang to Pange
33.	Common Woodbrown	<i>Lethe sidonis</i> Hewitson	Uncommon	Tragophan point

34. Dusky Labyrinth	<i>Neope yama</i> Moore	Rare	In between Manipolyang to Pange
35. White Edged Bushbrown	<i>Mycalesis mestra</i> Hewitson	Rare	In between Manipolyang to Pange
36. Himalayan Five ring	<i>Ypthima sacra</i> Moore	Uncommon	Pange to Talle
37. Nigger	<i>Orsotrioena medus</i> Fabricius	Common	Manipolyang to Pange
38. Large Silverstripe	<i>Childrena childreni</i> Gray	Common	Manipolyang to Pange & Talle camp
39. Green Commodore	<i>Sumalia daraxa</i> Doubleday	Rare	Pange (lower)
40. Commodore	<i>Auzakia danava</i> Moore	Rare	Manipolyang (upper)
41. Sullied Sailer	<i>Neptis soma</i> Moore	Rare	Manipolyang to Pange
42. Yellow Sailer	<i>Neptis ananta</i> Moore	Rare	Pange (upper)
43. Common Map	<i>Cyrestis thyodamas</i> Boisduval	Uncommon	Pange (lower)
44. Tabby	<i>Pseudergolis wedah</i> Kollar	Common	In between Manipolyang to Pange
45. Common Fivering	<i>Ypthima baldus</i> Fabricius	Common	In between Pange to Talle
46. Common Jester	<i>Symbrenthia hippoclus</i>	Common	Pange to Talle
47. Blue Admiral	<i>Kaniska canace</i> Linnaeus	Rare	Pange (Upper)
48. Blue Pansy	<i>Junonia orithiya</i> Linnaeus	Common	Talle camp
49. Peacock Pansy	<i>Junonia almana</i> Linnaeus	Common	In between Manipolyang to Pange
50. Grey Pansy	<i>Junonia atlites</i> Linnaeus	Common	Manipolyang

**Family: Lycaenidae**

51. Punchinello	<i>Zemeros flegyas</i> Cramer	Common	In between Manipolyang to Pange
52. Large Oakblue	<i>Arhopala amantes</i> Hewitson	Common	Manipolyang to Pange
53. Common Imperial	<i>Cheritra freja</i> Fabricius	Common	Manipolyang to Pange
54. Common Tit	<i>Hypolycaena erylus</i> Godart	Common	Manipolyang to Pange
55. Fluffy Tit	<i>Zeltus amasa</i> Hewitson	Uncommon	Manipolyang to Pange
56. Orchid Tit	<i>Chliaria othona</i> Hewitson	Rare	Pange to Manipolyang
57. Striped Punch	<i>Dodona adonira</i> Hewitson	Common	In between Manipolyang to Pange
58. Lesser Punch	<i>Dodona dipoea</i> Hewitson	Common	Trogophan point
59. Common Hedge Blue	<i>Acytolepis puspa</i> Horsfield	Common	Manipolyang to Pange & Talle camp
60. Common Cerulean	<i>Jamides celeno</i> Cramer	Common	In between Manipolyang to Pange
61. Metallic Cerulean	<i>Jamides alecto</i> C. & R. Felder	Common	In between Manipolyang to Pange
62. Purple Sapphire	<i>Heliophorus epicles</i> Godart	Common	Pange (lower)

**Family: Hesperidae**

63. Dark Yellow Banded Flat	<i>Celaenorrhinus aurivittata</i> Moore	Common	In between Manipolyang to Pange
64. Fulvous Pied Flat	<i>Pseudocoladenia dan</i> Fabricius	Common	Manipolyang, Pange & Talle camp
65. Chestnut Angle	<i>Odontoptilum angulata</i> C & R Felder	Uncommon	Pange to Talle camp
66. Common Dartlet	<i>Oriens goloides</i> Moore	Common	Manipolyang to Pange
67. Chestnut Bob	<i>Iambrix salsala</i> Moore	Common	Manipolyang to Pange
68. Common Banded Demon	<i>Notocrypta paralysos</i> Wood-Mason & de Niceville	Common	In between Manipolyang to Pange

In the family Papilionidae, *Papilio paris* (Paris Peacock) and *Graphium eurypylus* (Great Jay) have been inhabited and encountered with red Helen (*Papilio helenus*) in Talle Valley. As far as Pierids are concerned, it has been recorded in the month of June and interestingly *urema brigitta* (Small Grass Yellow) recorded in high altitude region, 2275m i.e. site 2 (in Talle Valley anti poaching camp). Common Emigrant was the maximum encountered butterfly of Pieridae family.

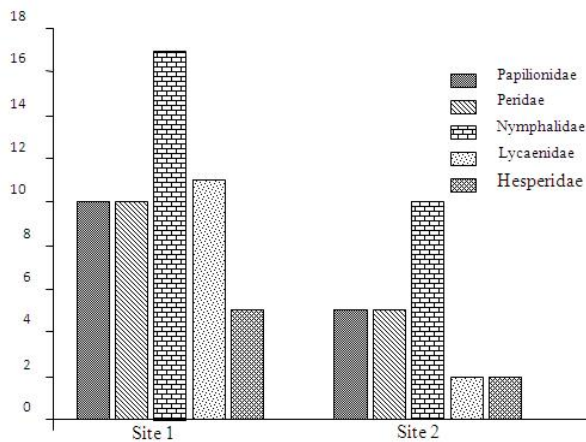


Fig. 2. Butterfly species diversity in two different site (1&2) in Talle Wildlife Sanctuary

The brush footed butterfly, Nymphalids were recorded in highest number in Talle Valley Wildlife Sanctuary. It has been observed that butterfly species have different flight periods according to favorable climatic condition. Chestnut Tiger (*Parantica sita*) occupied the apex of the hierarchy of abundance and their flight period in June followed by Glassy Tiger (*Parantica aglea*).

The Lycaenids are characterized by blue upper sides, threadlike tails and smallest butterflies. Among the Lycaenidae Common Hedge Blue (*Acytolepis puspa*) are recorded in maximum in number followed by Grey Pansy (*Junonia atlites*) i.e. Nymphalidae. The family Hesperidae is the third largest family of the butterflies in the world. Only 6 species belong to this family as reported from the area during our study period.

### Similarity of sites for species

Sorensen's Similarity Index of two sites (Site 1: Manipolyang to Pange & Site 2: Pange to Talle Valley anti camp) during the July, 2013 to July, 2014, 0.305. The low value of this index

is an indicator of high beta diversity in this area which indicates the unique butterfly diversity into both two sites of Talle Wildlife.

### Discussion

It is an apparent reason to feel optimistic justification that has done project on butterflies at Talle Valley. It was constituted as wildlife sanctuary by curving out 337 sq km from erstwhile Talle Valley reserve forest. The Talle Valley is quite calm place. It is a green hidden land and an unexplored area. Due to dense forest and bamboo thickets visual encounter method as the best method to study the status of butterflies. The present study is the first time that butterflies are evaluated in the Talle Wildlife Sanctuary in Lower Subansiri district of Arunachal Pradesh. The eastern Himalayan state of Arunachal Pradesh has been recognized as one of the twelve mega biodiversity hotspot in the world (Myers et al, 2000). The earlier published literatures like Evans, 1931 and Kehimkar, 2008, revealed that the maximum number of butterflies is recorded from this Himalayan state.

Butterflies are good indicator of habitat quality (Kocher and Williams, 2000). They are dependent on specific host plants as well as nectar directly or indirectly reflect the plant diversity of an ecosystem or a particular habitat. It also implies the change in butterfly diversity and distribution. This study showed that different types of forest and altitude influence the butterfly diversity. Result indicated that the maximum number of butterflies recorded in site 1 which habitat dominated by tropical evergreen and mix with pin forest with a medium elevation ranges from 1600m-1800m. The abundance of species is found to be determined by the factors like food (flowering plant as well as host plant) water resource and vegetation pattern (Kakati and Kalita, 2002).

Altitude differences play a critical role for particular habitat and habitat specificity of butterflies can be directly related to the availability of food plants (Thomas, 1995). Each habitat has a specific suitable micro-environment which prefer particular butterfly species. For example *Papilio polyctor* recorded with an elevation of 2500m in Talle WLS. Different research work has been indicated that highest numbers of

butterflies found in low and middle elevation in Aralam Wildlife Sanctuary (Sreekumar and Balakrishnan, 2001), Nilgiri mountains (Larsen, 1987).

Mud peddling is one of the commonly observed behavior in tropical butterflies (Beck *et al.*, 1999). In this study, it has been observed that *Papilio paris* from Papilionidae and several species from Lycaenidae family i.e. *Jamides alecto*, *Jamides celeno* were seen mud puddling on soggy places. Mud peddling is essential for fulfill their salt requirement and protein deficiency (Beck *et al.*, 1999).

Butterflies possess unique quality of habitat specificity that helps to maintain the natural environment of a particular habitat. By specific selection of larval as well as nectar host plants in particular habitat of butterflies, restoration of habitat sustained in our surrounding could be possible. In this present investigation it has been revealed that little survey was done proper documentation in this Talle Wildlife Sanctuary will yield more species.

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