

*Second Interim Report on*

**Distribution pattern and conservation of butterflies  
along the elevational gradient in Rangeet Valley,  
Sikkim, Eastern Himalaya.**

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## **Contents**

### **1: Field Work**

- Study Area
- Data Collection
- Results

### **2: Conservation and Outreach program**

- Poster Presentation at YETI 2017 (Tezpur)
- World Environment Day Program

## 1. FIELD WORK

### Study Area:

The present study was conducted along the transect lying within the elevation zone of 300- 3100m in Rangeet valley, Sikkim (Figure 1.). Climate (tropical to temperate) as well as vegetation type (tropical forest to sub alpine meadows) varies within the elevation of 150 m.

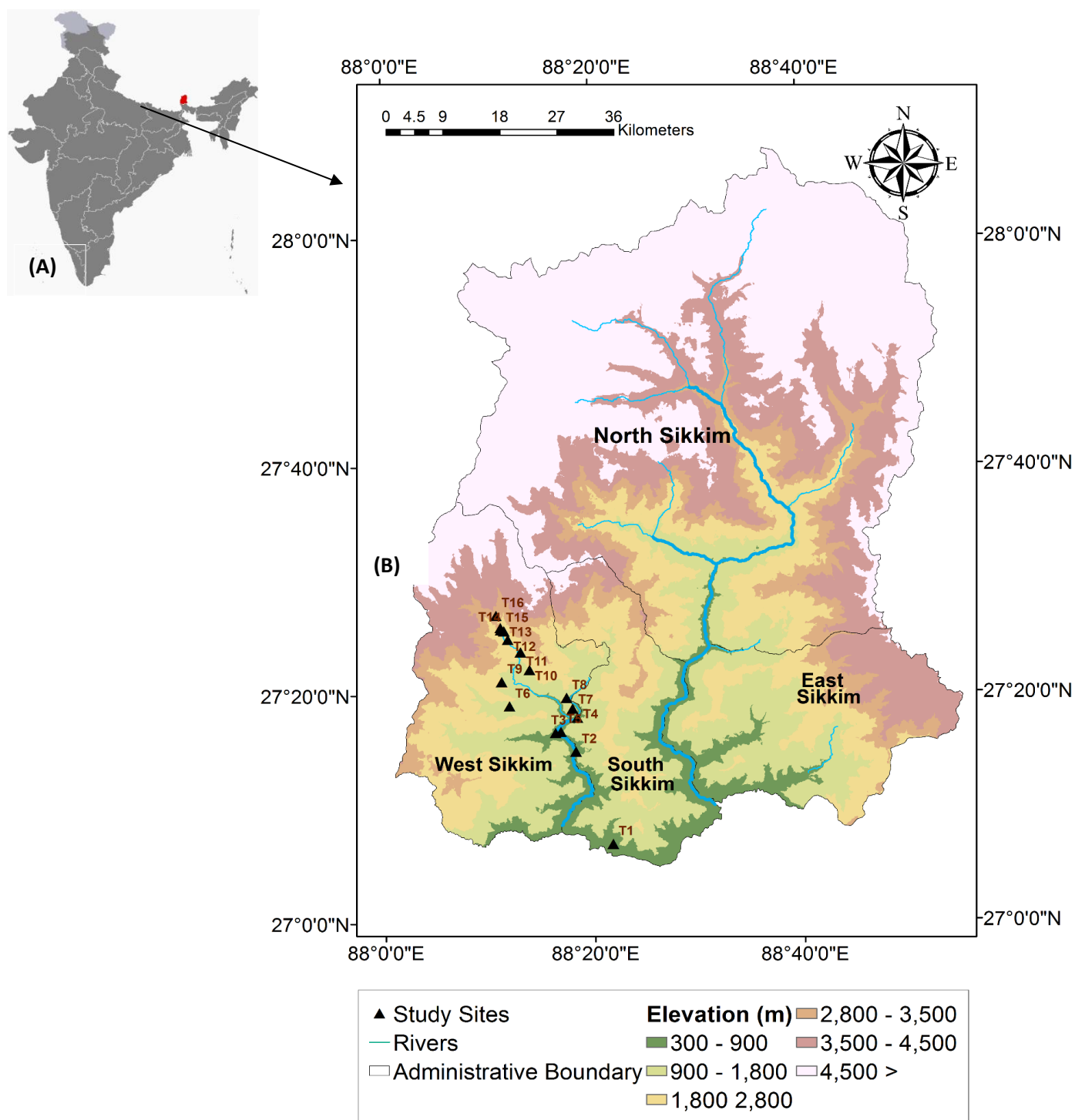
Survey of butterflies and plants were conducted along in all together 16 study sites in different elevation zones (Table: 1). Six new sampling sites between the elevation of 2000 – 3100m were established in present pre- monsoon (March – May 2016) sampling in addition to 10 sites that had already been established in post monsoon sampling (September – November, 2016). The present 6 sites lies in the Khangchendzonga National Park (KNP) which had been declared as UNSECO World Heritage Site in July 17, 2016.

**Table 1.** Details of sampling location of butterflies in Rangeet Valley, Sikkim, Eastern Himalaya.

Study Sites	Area Code	Elevation (m)	Latitude	Longitude	Sampling Effort
Kitam <sup>1</sup>	T1	400	27° 06' 47.18" N	88° 21' 40.45" E	7
Tatopani	T2	550	27° 18' 14.44" N	88° 18' 14.44" E	7
Legship	T3	700	27° 16' 33.79" N	88° 16' 08.56" E	7
Rangeet Bridge	T4	850	27° 17' 56.74" N	88° 18' 20.50" E	7
Rangeet Nagar	T5	1100	27°16'45.29"N	88°16'49.33"E	3
Rimbi	T6	1300	27° 18' 51.76" N	88° 11' 49.82" E	7
Tashiding 1	T7	1450	27° 18' 43.64" N	88° 17' 55.69" E	7
Tashiding 2	T8	1600	27° 19' 44.93" N	88° 17' 21.17" E	7
Khecheparli	T9	1750	27°21'7.57"N	88°11'12.41"E	5
Yuksom	T10	1900	27° 21' 51.68" N	88° 12' 52.88" E	7
Pha Khola Dewrali <sup>*1</sup>	T11	2100	27°23'44.16"N	88°13'1.30"E	2
Sachen <sup>*1</sup>	T12	2300	27°24'50.07"N	88°11'49.12"E	2
Gaikhurey <sup>*1</sup>	T13	2500	27°25'36.54"N	88°11'28.13"E	2
Bakhim <sup>*1</sup>	T14	2700	27°25'41.30"N	88°11'10.98"E	2
Merek <sup>*1</sup>	T15	2900	27°25'52.84"N	88°11'8.33"E	2
Tshoka <sup>*1</sup>	T16	3100	27°26'58.02"N	88°10'43.29"E	2

\* Transects established during pre- monsoon sampling (March – May 2107)

<sup>1</sup> Transects where vegetation survey was conducted



**Figure 1.** Map of study area, (A) Map of India showing Sikkim (in red, source - wikipedia), (B) Digital Elevation Model of Sikkim showing sampling location of butterflies; elevation categories corresponds to major vegetation types.

### **Data Collection:**

Fixed with circular plot method along transects was followed to survey butterflies from June 2016 to May 2017 covering three seasons; monsoon (June - August 2016), post- monsoon (September – November 2016) and pre monsoon (March – May 2017). A total of 16 transects were established along different elevation zone. 8 to 10 points were laid along the transects within the distance of 100m depending upon accessibility. Butterflies lying within the 5m radius from center of the points were counted for 5 minutes.

Vegetation sampling was conducted in altogether 7 study sites till present date (Table.1). 5 quadrates (10 m X 10m) were established in each transects for quantification of trees. Within each such quadrates 5m X 5m were laid for quantification of shrubs.

### **Results:**

We observed a total of 222 species representing six families during the study after completion of 746 point counts. Family Nymphalidae was represented by 93 species, Lycaenidae by 39 species, Hesperidae by 34 species, Pieridae by 28 species, Papilionidae by 23 species and Riodinidae by 5 species.

Details of the statistical analysis will be provided in the final report.

## **2. COMMUNICATION AND OUTREACH PROGRAM**

### **Poster Presentation Yeti 2017:**

Poster on the current work was presented in the Young Ecologist Talk and Interact 2017(National Conference), Tezpur University, Assam, India. Trends in the distribution of butterflies and prioritizing area for conservation were discussed in the event.

### **World Environment Day (June 5<sup>th</sup> 2017):**

World Environment Day was celebrated in Sakyong Chisopani School, Sigtam Sikkim in collaboration with the Butterfly and Moths of Sikkim Nature Conservation Society (BAMOS NCF). The program was conducted as a part of present project supported by the Rufford foundation.

BAMOS team interacted with the students. Conservation of butterflies and pursuing career on as a Lepidopterist was discussed with the students. Photographs of butterflies taken all over from Sikkim were shown to the students. As the part of the programs host plants of butterflies such as *Zinnia*, *Salvia splendens*, *Agretum*, *Celosia pulmosa*, *Azadirachta indica*, *Delonix regia*, etc. Posters of butterflies were distributed to the school and students.



*Thank You BAMOS for the beautiful day*

Figure 2. World Environment Day, Sakyong School, Supported by Rufford Foundation.



Figure 3. Presentation by Dr. Sanjyok Rai (BAMOS NCF). Figure 4. Distribution of Butterfly poster by BAMOS NCF



Figure 5. School students planting Figure 6. School students with plants. Figure 7. BAMOS NCF team planting butterfly host and nectar plants.



# Butterfly enthusiasts spend WED at Sakyong-Chisopani JHS



## SUMMIT REPORT

SINGTAM, 05 JUNE: A four-member team from Butterflies and Moths of Sikkim Nature Conserving Society visited Sakyong Chisopani Junior High School to celebrate World Environment Day today.

The program was conducted in collabora-

tion with BAMOS NCF with support from Rufford Foundation, a press release informs.

The daylong program had environmental talks from the teachers, headmaster, guests and students of the school.

BAMOS member, Dr Sanjog Rai, interacted with the students and

informed them about the significance of butterflies and other insects in the ecology.

Dr Rai further said the theme of BAMOS for this year World Environment Day was Butterfly Conservation.

Varieties of saplings were planted in the school campus by the

four Houses of the school (Orchid, Jasmine, Lily and Daffodils) along with their respective House Masters.

A workshop was also conducted by Dr Sanjog Rai and Nawang G Bhutia for the students of senior classes with pictorial presentation through laptop.

Figure 8. Program covered in Summit Times newspaper , 6th June 2017

# Distribution Pattern of Butterflies along the Elevational Gradient in Rangeet Valley, Sikkim, Eastern Himalaya



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## INTRODUCTION

Sikkim, a small Himalayan state of India, is a part of globally significant biodiversity hotspot. Biodiversity studies along the elevation gradient and understanding their determining factors has been an important tool in conservation planning through identification of area of priority in the mountain ecosystem. Butterfly diversity is high with approximately 690 species recorded from the region<sup>1</sup>. The present study aims to investigate the trend butterfly diversity along the elevational gradient in the Rangeet Valley in south and west Sikkim.

## MATERIALS AND METHODS

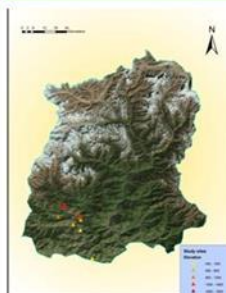


Fig 1: Map showing study areas along south-western region of Sikkim.

Along the transects, permanent points were marked at 50-100 m apart<sup>2</sup>. Butterflies within the 5 m radius plot from the center of the point were recorded for 5-10 minutes. We sampled the butterflies along eight elevational locations during the monsoon and post-monsoon of 2016 (June- November). A total of 290 point count were conducted.

We estimated species richness, abundance and diversity of butterflies from elevation sites. We estimated non parametric parameters (Chao 1 and Jack 1) using Estimat S version 9.1.0. We then generated standard plots to estimate the relationship of these variable with the elevation.



Fig 3: Butterflies of six families observed during the study. A) *Patilio bianor*, B) *Capila jayadeva*, C) *Chlaria otkona*, D) *Dercas ver-hulst*, E) *Abisara fylla*, F) *Euploea mulciber*

## RESULTS

We observed a total of 859 butterflies 159 species and six families after the completion of 130 point count during the study. Species richness pattern followed declining trend along the elevation gradient ( $R^2 = 0.91$ ;  $P < 0.01$ ) with maximum species below 500 m. Jack 1 also predicted declining trend of species richness ( $R^2 = 0.87$ ,  $P < 0.01$ ) (Fig 3 A).

Both diversity ( $R^2 = 0.72$ ;  $P < 0.05$ ) and abundance ( $R^2 = 0.88$ ;  $P < 0.01$ ) showed declining trend with the rise in elevation (Fig 3, B,C).

Species of family Nymphalidae was most dominant (46%) while Riodinidae consisted of lowest number of species (2%) (Fig 4).

A total of five species protected under Schedule I and 20 species protected under Schedule II of Wildlife Protection Act of India (1972) was recorded in the study (Tab 2).

Table 1: Species Richness, Species Diversity, Chao1 estimator, Jack 1 estimator along different elevation zone

Study Site	Area Code	Elevation	Species Richness	Species Diversity	Chao 1 (Mean $\pm$ SD)	Jack 1 (Mean $\pm$ SD)
Kitam	T1	400m	66	3.73	92.97 $\pm$ 14.11	91.35 $\pm$ 5.33
Tatopani	T2	550m	62	3.81	125.98 $\pm$ 12.72	90.28 $\pm$ 6.08
Lepthap	T3	700m	51	3.66	60 $\pm$ 5.86	68.4 $\pm$ 3.57
Rangeet Bridge	T4	850m	41	3.38	62.78 $\pm$ 1.78	63.85 $\pm$ 3.45
Darap	T5	1300m	27	3.02	28.93 $\pm$ 6.26	37.73 $\pm$ 3.42
Tashiding 1	T6	1450m	35	3.3	60.25 $\pm$ 14.48	56.45 $\pm$ 5.03
Tashiding 2	T7	1600m	23	3.04	34.4 $\pm$ 7.87	37.5 $\pm$ 3.03
Yuksum 1	T8	1750m	8	1.98	14.82 $\pm$ 7.48	13.4 $\pm$ 1.99
Yuksum 2	T9	1900m	18	2.69	82.438.69	29.7 $\pm$ 3.18

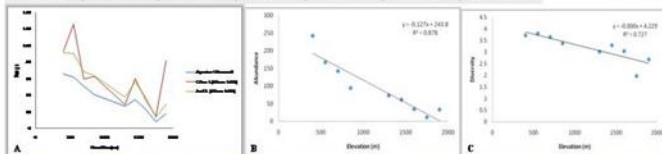


Fig 3: Elevation distribution pattern of butterflies; Elevation variation in A) Species Richness (Observed, Chao1 and Jack 1), B) Abundance and C) Diversity.

Table 2: Species of different families protected under Wildlife Protection Act of India (1972)

Family	Total Abundance	Schedule I (I/V)	Schedule II (II)
Hesperiidae	22	—	—
Lycenidae	19	2	1
Nymphalidae	72	1	12
Papilionidae	19	2	1
Pieridae	23	—	5
Riodinidae	3	—	1
Total	158	5	20

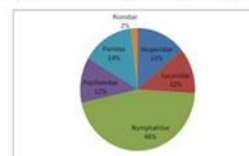


Fig 4: Family-wise trend in species richness

## CONCLUSION

More sampling effort is required to support the study. Abiotic and biotic factors needs to be enumerated. We aim to conducted phylogenetic analysis to understand the elevation distribution pattern of closely related species.

## REFERENCES

- Menna, H. *The butterflies of Sikkim Himalaya and their natural history*. (Sikkim Nature Conservation Foundation, (1992).
- Acharya, B. K. & Vijayan, L. Butterfly diversity along the elevation gradient of Eastern Himalaya, India. *Ecol. Res.* **30**, 909–919 (2015).

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YETI TEZPUR, 4th-7th Jan 2017.

Figure 9. Clip of the poster presented at YETI 2107 meet, Tezpur University, Assam, India