Inventory of Butterflies and Its Role to Promote Ecotourism in Northern Sindhupalchok District of Central Nepal

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ABSTRACT

Sindhupalchok is one of the largest districts of central Nepal with area occupancy of about 2542 km². The northern side of this district exhibits complex physical feature where this study was carried out within the elevation of 850m to 4300m. The changing elevation gradients along mountain habitats act to control the distribution of butterflies at its ascending range. This study made on different periods in 2009 and 2012 brought a list of 114 species of butterflies from three different destinations of the northern side that included areas like Melamchi, Timbu (central-northern), Helambu (northern) Nakote (north-western) Panch Pokhari and adjoining region (north-eastern). The diversity of butterflies declined gradually above 3500m towards Panch Pokhari whereas species richness was noticed high at 900-2700 m from Melamchi to Helambu route including Nakote, Shermathan and Tarkyghyang. Ecotourism promotional activity can also be linked to the butterfly watch that includes rare and attractive species carrying high interest to the visiting tourists to this region. These tourists intend to watch, document and photograph these butterflies besides birds and other wildlife species. The supplementary information on these insects including other faunal components can be helpful to provide impressive knowledge to the visiting tourists to this part.

Key words: complex, composition gradients, physiographic, species, tourists

INTRODUCTION

This mid-mountain district has a rugged topography with changing altitudinal features from the low land to the snow-capped peak of the Jugal Himalaya (Department of Information (1971). This is one of the largest districts of Nepal with area coverage of 2542 km² and stands at its geographical position of 27. 7666, 85.7.

The changing effect of gradients has controlled the distribution of butterflies representing lesser but interesting species at the upper zone. This feature has created differing ecosystem types where pristine habitats for many unique species of the flora and fauna are present (Pradhan, 2013).

Butterflies play significant role to sustain and smooth run of the ecosystem besides aesthetic values. This insect can contribute significantly to promote the ecotourism which can attract several nature tourists and researchers who desire to watch and photograph beautiful and rare butterflies in their natural settings. Mexico's monarch roosting area is benefitted from the tourism as butterfly enthusiasts travel around to photograph these little beauties (Ames, 2021).

Melamchi River is a tributary of the larger Indrawati River basin that originates from the Jugal Himal at an elevation of 5875m. It joins below to Indrawati River at the Melamchi valley floor. The length of the river is 41 km and widens at downstream to the south. The lower part of this district is mostly warm and covered with the riverine forest. This also contributed to the diversity richness of butterflies where different vegetation components are present in this warm forested part (Pradhan, 2012). Being enriched with highly valued biodiversity, interesting terrains and snow capped peaks, this area is still beyond the reach to prosperous tourism which also lack complete documentation of the valuable natural history existing here (Pradhan, 2013). The present study aims to depict some of the butterfly species occurred in study areas based on observation and to promote possible butterfly inclusive eco-tourism.

Study area

This study covered three different destinations which included **a**. Melamchi to Timbu, **b**. Ambathan to Helambu and **c**. Melamchi to Panchpokhari. Melamchi, Ambathan, and Timbu are known as the Intake Zone for the well known Melamchi Water Diversion Project (fig. 1).

Melamchi: This is a narrow river valley located at its geographical position of 27.83, 85.56. The elevation of this place ranged from 800m to above 1000 m where preferred habitats for many butterfly species can be found. General vegetation noted in this valley are *Ageratum conizoides, Asparagus racemosus, Barleria cristata, Begonia picta, Cassia occidentalis, Commelina sp., Crotalaria albida, Euphorbia hirta, Koenigia sp., Osbeckia stellata* etc (Polunin & Stainton,1984).

Helambu: A popular tourist's destination has its geographical position of 28.0188, 85.5253. It is located about 28 km to the northeast direction of Kathmandu city. General vegetation noticed here are *Schima wallichii, Castanopsis indica, Tsuga dumosa Pinus roxburghii* and *Rhododendron.* The upper part includes *Alnus nepalensis, Quercus lamillosa*, *Quercus semicarpifolia* etc. (Stainton, 1997).

Panchpokhari: A place with five lakes stands at its geographical position of 28.023 and 85. 43. The considered elevation for this study ranged from 1200- 4300m. General vegetation en route and around this place include *Rhododendron arboreum, Quercus semicarpifolia, Pinus wallichiana* and *Pinus roxburghii* while alpine vegetation includes, *Arundinaria* sp, *Rhododendron arboreum, Pinus wallichiana, Quercus semicarpifolia, Juniperus recurva, Betula* sps etc (Polunin & Stainton, 1984).

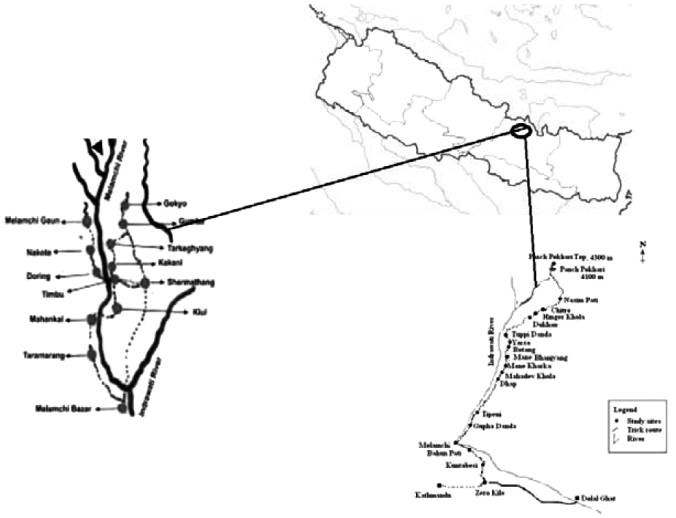

FIG.1. Study area at northern Sindhupalchok district depicting study routes at Melamchi, Helambu and Panchpokhari.

Climate

Climatic pattern of Sindhupalchok distric is depicted in fig. 2. The valley floor of Melamchi is a warmer place influenced with tropical climate while subtropical climate occurs at the Timbu and Nakote areas. The temperate climate prevails at the Tarkyghyang and Shermathan and cold alpine climate can be experienced at the Panch Pokhari and adjoining areas.

The upper part of the Melamchi valley receives much rain than the floor area. The major precipitation occurs mainly due to the arrival of South-west monsoon in June to August. The average annual rainfall recorded in the Melamchi is about 2596mm. The winter rain is only for a brief period brought mainly by the western Mediterranean wind.

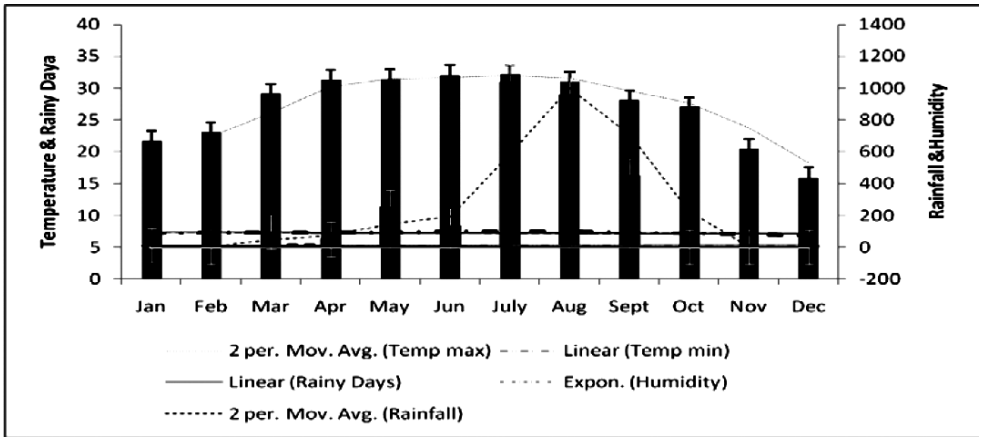

FIG. 2. Climatic pattern of Sindhupalchok district.

MATERIALS AND METHODS

Random field observation was made considering straight walk and side areas of the trail where different butterfly species were observed. Field identification was done with expert's knowledge and consulting books of Smith (1989) and Khanal & Smith (1997).

RESULTS AND DISCUSSION

This work includes a total of 114 species which were recorded in 2009 and 2012 from a. Ambathan (1400m) to Nakote (1940m), b. Melamchi Bazaar (850m) to Timbu (1350m), Tarkyghang (2754m), Shermathan (2520m) and c. Gupha Danda-Panchpokhari (1200- 4300m) of the northern side. \

TABLE 1. Total number of species recorded in the study areas.

Study location	Elevation (m)	Species record at each location
Melamchi Bazaar to Timbu	859-1350	79
Helambu Area (Tarkyghyang, Shermathan and Nakote)	1940- 2754	83
Panchpokhari and adjoining area.	1200-4300	46
Total species record		114

The elevation range of 850 – 1350 m from Melamchi to Timbu brought a list of 79 species (table1). *Troides aeacus,* a CITES II listed species was seen at 850m in the Melamchi, 1640 m and 1700 m in the Ambathan and Doring areas respectively (Annex 1). Among the recorded butterflies *Catophaga lyncida*, *Spalgis epeus*, *Arophala eumolphus*, *Belenois aurota*, *Flos areste*, *Catacryshops strabo*, *Miletus chinensis*, *Lycaena phlaeas*, *Neptis soma, Neptis clinia*, *Cynitea lepidea*, *Stibochiona nicea*, *Polyuera athamas*, *Byasa alcinous*, *Sainia rhetenor*, *Cadugoides epycides*, *Danaus tytia*, *Tagiades menaka* and *Caltorius tulsi* were assessed as locally rare species. They were sighted with less than three individuals in their frequencies.

The observation made at the Nakote, Tarkygyhang and Shermathang (1400-2754m) of the Helambu region revealed 83 species and the area from Gupha Danda (1200m) to the Panch Pokhari (4300m) represented 46 species where the diversity decreased with subsequent rise in elevation (Annex 1).

Among different activities essential to promote the ecotourism, butterfly watching is also a flourishing activity in many countries similar to bird watching and wildlife safaris. Eshun *et al.* (2014) mentioned how the ecotourism activities on the Bobiri Butterfly Sanctuary contribute to the conservation of the fauna and flora in the Sanctuary and towards the development of the local community. This study also found some semblance of ecotourism based on the Bobiri Butterfly Sanctuary as a conservation and development tool.

Helambu region has the basic infrastructure for tourism and has already been developed but reveals least information on the local biodiversity. Due to scenic beauty, incredible

landscape, diverse cultural and natural diversity, Panchpokhari can be expected to attract many nature tourists if the knowledge of the high altitude biodiversity can be provided to them (Pradhan *et al.*, 2009). Next interesting and possible destination could be the Bhairab Kund (4200m) which is a high land lake where unique butterflies and varied faunal components are sheltered in their pristine nature.

A list of the recorded species with their family, common and scientific names and location has been provided in the Annex 1.

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ANNEX 1

Recorded butterfly species at Melamchi, Helambu and Panchpokhari of the northern Sindhupalchok district of central Nepal.

S.N.	Family	Common Name	Scientific name	M	H	PP
1.	Pieridae	Large Cabbage White	*Pieris brassicae* Linnaeus	+	+	+
2.		Indian cabbage White	*Pieris canidia* Sparman	+	+	+
3.		Common Grass Yellow	*Eurema hecabe* Linnaeus	+	+	+
4.		Spotless Grass Yellow	*Eurema laeta* Boisduval	+	+	+
5.		Lemon Emigrant	*Catopsilia pomana* Fabricius	+	+	+
6.		Mottled Emigrant	*Catopsilia pyranthe* Linnaeus	+	+	
7.		Common Brimstone	*Gonepteryx rhamni* Linnaeus	+	+	+
8.		Dark Clouded Yellow	*Colias fieldii* Menetries	+	+	+
9.		Pale Clouded Yellow	*Colias erate* Esper		+	+
10.		Great Blackvein	*Metaporia agathon* Gray	+		
11.		Bath White	*Pontia daplidice* Linnaeus	+		
12.		Chocolate Albatross	*Catophaga lyncida* Cramer	+	+	
13.		Psyche	*Cepora nerissa* Fabricius	+		
14.		Pioneer	*Belenois aurota* Fabricius	+	+	+

15.		Psyche	*Leptosia nina* Fabricius	+		
16.		Hill Jezebel	*Delias belladonna* Fabricius	+	+	+
17.		Redbase Jezebel	*Delias pasithoe* Linnaeus	+		
18.		Painted Jezebel	*Delias hyparete* Wallace	+		
19.		Yellow Orange Tip	*Ixias pyrene* Butler	+	+	
20.	Lycaenidae	Grass Jewel	*Freyeria trochilus* Freyer	+	+	
21.		Apefly	*Spalgis epeus* Westwood	+		
22.		Bright Sunbeam	*Curetis bulis* Westwood	+	+	
23.		Green Oakblue	*Arophala eumolphus* Cramer	+		
24.		Hooked Oakblue	*Arophala paramuta* DeNiceville	+		
25.		Plushblue	*Flos areste* Hewitson	+		
26.		Indian Oakblue	*Arophala atrax* Hewitson	+	+	
27.		Common Hedgeblue	*Actyolepsis puspa* Horsfield	+	+	+
28.		Margined Hedgeblue	*Celatoxia marginata* DeNiceville	+		
29.		Dark Cerulean	*Jamides bochus* Stoll		+	+
30.		Peablue	*Lampides boeticus* Linnaeus	+	+	+
31.		Forget me not Blue	*Catacryshops strabo* Fabricius		+	
32.		Pale Hedgeblue	*Pseudozizeeria maha* Kollar	+	+	

33.		Common Brownie	*Miletus chinensis* Felder	+		
34.		Longbanded Silverline	*Spindasis lohita* Horsfield	+		
35.		Common Copper	*Lycaena* phlaeas Linnaeus		+	+
36.		Chapman's Cupid	*Everes argiades* Pallas		+	
37.		Pale Hedgeblue	*Udara dilecta* Moore			+
38.		Powdery Green Sapphire	*Heliophorous tamu* Kollar		+	
39.		Purple Sapphire	*Heliophorus epicle Godart*	+		
40.		Green Sapphire	*Heliophorus androcles* Westwood	+	+	
41.	Nymphalidae	Peacock Pansy	*Precis almana* Linnaeus		+	
42.		Lemon Pansy	*Precis lemonias* Linnaeus		+	
43.		Chocolate Pansy	*Precis iphita* Cramer		+	
44.		Grey Pansy	*Precis atlites* Linnaeus	+		
45.		Lemon Pansy	*Precis orithya* Linnaeus	+		
46.		Red Admiral	*Vanessa indica* Herbst		+	+
47.		Painted Lady	*Vanessa cardui* Linnaeus		+	+
48.		Common Eggfly	*Hypolymnas bolina* Linnaeus	+		
49.		Yellow Sailor	*Neptis ananta* Moore	+	+	
50.		Common Sailor	*Neptis hylas* Linnaeus	+	+	+
51.		Pallas Sailor	*Neptis sappho* Pallas	+		
52.		Clear Sailor	*Neptis clinia*		+	

53.		Sullied Sailor	*Neptis soma* Moore		+	+
54.		Grey Count	*Cynitia lepidea* Butler		+	
55.		Indian Fritillary	*Argyreus hyperbius* Linnaeus	+	+	+
56.		Common Nawab	*Polyura athamas* Drury	+		
57.		Popinjay	*Stibochiona nicea*	+		
58.		Common Laeopard	*Phalanta phalantha* Drury	+	+	+
59.		Common Lascar	*Pantoporia hordonia*	+	+	
60.		Indian Tortoiseshell	*Aglais cashmirensis* Kollar	+	+	+
61.		Queen of Spain Fritillary	*Issoria issaea* Doubleday		+	+
62.		Common Baron	*Euthalia aconthea* Cramer		+	+
63.		Sergeant Major	*Abrota ganga* Moore		+	
64.		Common Sergeant	*Athyma perius* Linnaeus	+	+	
65.		Common Map	*Cyrestis thyodamus* Boisduval	+	+	+
66.		Orange Oakleaf	*Kallima inachus* Boisduval		+	
67.		Orange Staff Sergeant	*Athyma cama* Moore	+	+	
68.		Himalayan Sergeant	*Athyma opalina* Kollar	+	+	+
69.		Circe	*Hestina nama* Doubleday		+	
70.		Newar Threering	*Ypthima newara* Moore	+	+	+
71.		Himalayan Fivering	*Ypthima sakra* Moore	+	+	+

72.		Treble Silverstripe	*Lethe baladeva* Moore			+
73.		Common Woodbrown	*Zophoessa sidonis* Hewitson		+	+
74.		Common Bushbrown	*Mycalesis perseus* Fabricius	+	+	
75.		Brand Bushbrown	*Mycalesis mineus* Linnaeus		+	
76.		Pallid Argus	*Callerebia scanda* Kollar		+	+
77.		Ringed Argus	*Callerebia annada* Moore			+
78.		Striated Satyr	*Aulocera saraswati* Kollar		+	
79.		Jungle Brown	*Orsotrioena medus* Fabricius	+	+	
80.		Common Evening Brown	*Melanitis leda* Linnaeus	+	+	
81.		Common Indian Crow	*Euploea core* Cramer	+	+	
82.		Striped Blue Tiger	*Euploea mulciber* Cramer	+	+	
83.		Glassy Tiger	*Danaus aglea* Stoll	+	+	
84.		Chestnut Tiger	*Danaus tytia* Oray	+		+
85.		Plain Tiger	*Danaus chryssipus* Linnaeus	+	+	
86.		Common Tiger	*Danaus genutia* Cramer	+	+	+
87.		Blue Glassy Tiger	*Tirumala limniace* Cramer	+		
88.		Yellow coster	*Acraea issoria* Hubner	+	+	+

89.	Riodinidae	Dark Judy	*Abisara fylla* Doubleday	+	+	
90.		Punchinello	*Zemeros flegyas* Cramer	+	+	+
91.	Papilionidae	Great Mormon	*Papilio memnon* Linnaeus	+		
92.		Common Mormon	*Papilio polytes* Linnaeus	+	+	+
93.		Spangle	*Sainia protenor* Cramer	+	+	
94.		Common Rose	*Pachiliopta aristolochae* Fabricius	+		
95.		Rose Windmill	*Atrophaneura latrellei* Donavan	+	+	+
96.		Common Bluebottle	*Graphium sarpedon* Linnaeus	+	+	+
97.		Red Helen	*Menelaides helenus*	+	+	
98.		Common Peacock	*Achillides polyctor* Boisduval	+	+	+
99.		Blue Peacock	*Achillides arcturus* Westwood		+	+
100.		Chinese Windmill	*Byasa alcinous* Klug		+	+
101.		Common Windmill	*Byasa polyeuctes* Doubleday		+	+
102.		Tailed Jay	*Idaides agamemnon* Linnaeus	+	+	
103.		Common Redbreast	*Sainia rhetenor* Westwood		+	
104.		Lime Swallowtail	*Papilio demoleus* Linnaeus	+		
105.		Golden Birdwing	*Troides aeacus* C &R Felder	+	+	

106.		Lesser Mime	*Cadugoides epycides* Hewitson	+		
107.	Hesperiidae	Fulvous Pied Flat	*Pseudocoladenia dan* Fabricius	+	+	+
108.		Grass Demon	*Udaspes folus* Cramer		+	+
109.		Restricted Demon	*Notocrypta curvifascia* Felder		+	
110.		Spotted Snowflat	*Tagiades menaka* Moore	+		
111.		Water Snowflat	*Tagiades litigiosa* Moschler	+		
112.		Purple Swift	*Caltorius tulsi*		+	
113.		Small Branded Swift	*Pelopidas mathias* Fabricius		+	
114.		Chinese Branded Swift	*Pelopidas sinensis* Mabille		+	+

M = Melamchi (859-1350 m), H = Helambu area (Tarkyghyang, Shermathan and Nakote, 1940-2754 m), PP = Panch pokhari region (1200-4300), + = Presence.