

Diversity of butterflies with respect to altitudinal rise at various pockets of the Langtang National Park, central Nepal

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Abstract

The Langtang National Park which covers an area of 1760 sq.km was studied extensively for the occurrence and status of butterflies within the altitudinal ranges of 1500 m at Syaprubensi to 4300 m around Langtang glacier area. Addition to altitudes, the decline in floral diversity with temperature reduction in higher elevation basically controlled the species richness of butterflies specifically above 3000 m elevations. Habitat preference for diverse species of these colorful and agile insects is poorly represented above that elevation. This study conducted at different periods in 2010 and 2011 covering both the spring and summer seasons came up with a list of different status categories of 126 species. A rich diversity was noted at 1500 m (Syaprubensi) to 2900 m at Deurali on the way to the glacier (4300 m). *Parnassius hardwickei* and *Parnassius epaphus epaphus* which were seen with good population in previous studies at Dhimsa (3200 m) are at declining stage as a consequence of habitat loss and human interferences.

Keywords: Butterflies, Altitudes, Diversity, Habitat, Status

INTRODUCTION

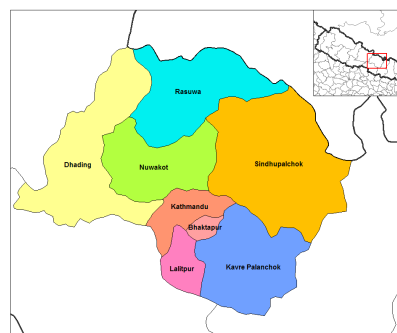
Geographical complexity of the Langtang National Park with changing ecological zones is a remarkable ground for diverse butterfly species. Varied bio-climatic zones featured here accommodate rich floral components which provide preferred habitats for butterflies of different conservation status. This park exhibits a greater diversity with 14 vegetation types under 18 ecosystem zones, ranging from upper subtropical forests below 1,500 m of altitude to the alpine meadows [1]. Changing vegetation components are the key gradients for diversification in butterfly community at different biological zones of this park. *Rhododendron arboreum*, *Lyonia ovalifolia*, *Quercus semicarpifolia*, are the prominent flora of temperate zone(1500-2500 m) while *Rhododendron barbetum*, *Abies spectabilis*, *Psuga dumosa*, *Laryx himalayana* are the characteristic vegetations of the upper reaches (3000 m to 3500 m). Scarce and shrubby vegetations are dominant above 4000 m where very limited butterfly species like *Parnassius* species and *Issoria issaea* are inhabited.

Study Area

The park was gazette in 1976 covering with an area of 1760 sq.km located within the geographical location of 27° 57'36" to 28°22'48" and 85°12'36" to 85°52'48". Bordering Nuwakot district to

the west and Sindhupalchok to the east this park has been developed into a priorities tourist's destination since its establishment.

Many potential habitats for different faunal species are found in this park. Forty-six species of mammals, 345 species of birds, 11 species of herpeto fauna, and 30 species of fish are inhabited in the park [2]. Mammal species symbolic to the Park are Snow Leopard (*Panthera uncia*), Clouded leopard (*Pardofelis nebulosa*), Musk deer (*Moschus chrysogaster*), Assamese Monkey (*Macaca assamensis*) and Red panda (*Ailurus fulgens*). Important bird species of the Park are the Impeyan pheasant (*Lophophorous impejenuis*), Ibis bill (*Ibidorhynca struthersii*), White Winged Redstart (*Phoenicurus erythogastrus*) and Snow partridge (*Lerwa lerwa*).



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MATERIAL AND METHODS

Butterfly diversity at different altitudinal pockets was studied with direct observation. Confusing species were identified in the field adopting capture and release method using a butterfly net. Not readily identifiable species in the field were collected and placed in (1992) triangular transparent envelopes for identification at the Natural History Museum in Kathmandu. Smith [3, 4], Haribal [5], Talbot [6, 7]

and Wynter and Blyth [8] were consulted for identification of the butterfly.

Forest types at every study sites were noted and vegetation was recorded with accurate field data. Floral components were identified consulting Stainton and Polunin [9] and Stainton [10]. Dominant vegetations within each quadrat of the size 50 X 50 m set at every 500 m of elevation are the basis to determine forest types. Tree species of high dominance including other vegetations like shrubs and herbs accommodated in that quadrat have been considered to decide the forest type at every 500 m of elevation. Unidentified plant species in the field were prepared into herbaria which later were identified consulting National Herbarium Department located in Godavari of Lalitpur district.

RESULT

Representations of some rare butterfly species recorded at every 500 m of elevations (1500 m to 4300 m) have been provided here. (Detail list of butterfly distributed at different range of altitude is given in the Appendix).

A. Elevation: 1500-2000 m.

Total species record: 19 species

- a) Forest Type: *Schima wallichii*, *Albizzia*, *Pyrus persica*.
Rare species are: *Achillides arcturus arcturus* Westwood, (*Papilionidae*), *Dodona adinora adinora* Hewitson (*Nemeobiidae*), *Creon cleobis* Godart, *Arophala atrax* Hewitson, *A. singala* DeNiceville (*Lycaenidae*), *Euthalia aconthea suddodhana* Fruhstorfer, (*Nymphalidae*).
- b) Forest Type: *Quercus semicarpifolia*, *Rhus succedenia*, *Rhamnus nepalensis*
Total species record: 14 species
Rare species are: *Cepora nerissa phryne* Fabricius (*Pieridae*), *Jamides bochus bochus* Stoll, *Chliaria kina* Hewitson, *Rapala nissa nissa* Kollar, *Esakiozephyrus mandara dohertyi* DeNiceville and *E. icana* Moore (*Lycaenidae*).
- c) Forest Type: *Quercus lanuginosa*, *Alnus nepalensis*, *Schima wallichii*.
Total species record: 10 species
Only Satyrid species were reported in this forest. Rare species include *Dallacha hyagriva* Moore, *Lethe rohria rohria* Fabricius, and *L. insane dinarbus* Hewitson.
- d) Forest Type: *Bombax ceiba*
Total species record: 8 species.
Rare species are: *Nacaduba kurava euplea* Fruhstorfer, *Udara albocerulea* Moore (*Lycaenidae*), *Eurema laeta sikkima* Moore (*Pieridae*), *Abrota ganga* Moore 1857 (*Nymphalidae*).
- e) Forest Type: *Lyonia ovalifolia*, *Syzygium cumini*, *Myrica esculenta*, *Rhus succedenia*
Total species record: 23 species
Rare species are: *Sainia protenor euprotenor* Fruhstorfer (*Papilionidae*), *Kaniska canace canace* Linnaeus, (*Nymphalidae*), *Eurema brigitta rubella* Wallace (*Pieridae*), *Mycalesis mineus mineus* Linnaeus (*Satyridae*), *Jamides celeno aelianus* Fabricius, *Everes lacturnus assamica* Tytler, *Prosotas nora ardates* Moore, *Celastrina marginata*

marginata DeNiceville, *Heliophoros ila pseudonexus* Eliot (*Lycaenidae*).

B. Elevation: 2000 – 2500 m.

Forest Type: *Alnus nepalensis*, *Pinus wallichiana*, *Ribes acuminatum*

Total species record: 11 species

Rare species are: *Heliophorus brahma brahma* Moore, *Freyeria putli* Kollar, *Spindasis lohita himalayanus* Moore (*Lycaenidae*), *Athyma selenophora selenophora* Kollar (*Nymphalidae*), *Telictota bambusae bambusae* Moore and *Ochus subvittatus subradiatus* Moor (*Hesperiidae*).

C. Elevation: 2000-2500 m

- a) Forest Type: *Alnus nepalensis*, *Rhododendron arboretum*, *Acer campbelli*
Total species record: 16 species
Rare species are: *Dodona egeon egeon* Westwood (*Nemeobiidae*), *Borbo cinnara cinnara* Wallace (*Hesperiidae*).
- b) Forest Type: *Alnus nepalensis*, *Acer campbelli*, *Myrica esculenta*
Total species record: 23 species.
Rare species are: *Ancema ctesia ctesia* Hewitson, *Udara dilecta* Moore, (*Lycaenidae*), *Neptis soma butleri* Eliot and *Hestina nama* Doubleday (*Nymphalidae*).
- c) Forest Type: *Quercus semicarpifolia*, *Rhus succidenia*, *Ribes acuminatum*, *Alnus nepalensis*
Total species record: 21 species
Rare species are: *Syntarucus plinius* Fabricius, *Everes argiades diporides* Chapman, *E. hugelii* Gistel, *Creon cleobis* Godart, *Rapala nissa nissa* Kollar, *Heliophorus tamu tamu* Kollar (*Lycaenidae*), *Byasa alcinous pembertonii* Moore (*Papilionidae*), *Mycalesis suavolens* (*Satyridae*), *Pelopidas sinensis*, and *Taractrocer danna* (*Hesperiidae*).

D. Elevation: 2500 – 3000 m.

- a) Forest Type: *Quercus semicarpifolia*, *Alnus nepalensis*, *Berberis chitria*, *Rhododendron arboreum*.
Total species record: 4 species.
Rare species are: *Dodona egeon egeon* Westwood (*Nemeobiidae*), *Borbo cinnara cinnara* Wallace (*Hesperiidae*).
- b) Forest Type: *Rhododendron arboreum*, *Psuga dumosa*, *Alnus nepalensis*, *Abies spectabilis*.
Total species record: 7 species.
Rare species are: *Atrophaneura latrellei latrellei* Donovan (*Papilionidae*) and *Neptis ananta ochracea* Evans (*Nymphalidae*).
- c) Forest Type: *Psuga dumosa*, *Abies spectabilis*, *Betula alnoides*, *Hippophae seicifolia*, *Rhododendron arboreum*.
Total species record: 23 species
Rare species are: *Dodona dipoea dipoea* Hewitson (*Nemeobiidae*), *Heliophorus tamu tamu* Kollar, *Albulina lehna* Moore, *Creon cleobis* Godart, *Esakiozephyrus mandara dohertyi* DeNiceville, *Chrysozephyrus sikkimensis* Howarth, (*Lycaenidae*), *Neptis radha radha*

Moore (*Nymphalidae*), *Lethe baladeva baladeva* Moore, *L. insana dinarbus* Hewitson, *L. rohria rohria* Fabricius, *Aulocera saraswatti saraswatti* Kollar (*Satyridae*).

Fabricius (*Satyridae*), *Tagiades menaka menaka* Moore, *Borbo cinnara cinnara* Wallace (*Hesperiidae*).

- d) Forest Type: *Rhus succidenia*, *Taxus buccata*, *Leucana leucocephala*, *Quercus semicarpifolia*.
 Total species record: 16 species
 Rare species are: *Deudoryx epijarbus ancus* Fruhstorfer, *Chliaria kina* Hewitson, *Panchala birmana birmana* Moore (*Lycaenidae*), *Kaniska canace canace* Linnaeus (*Nymphalidae*), *Mycalesis heri* Moore, *Lethe rohria rohria*

- e) Forest Type: *Alnus nepalensis*, *Berberis sps*, *Ilex dipyrena*, *Salix denticulata*, *Rhododendron arboreum*.
 Total species record: 18 species
 Rare species are: *Parnassius hardwickei hardwickei* Gray (*Papilionidae*, 3200 m), *Everes hugelii hugelii* Gistel, *Aulocera loha* Doherty, *A. brahminus brahminus* Blanch, *A. saraswatti saraswatti* Kollar, *A. padma padma* Kollar and *Zophoessa maitrya maitrya* DeNiceville (*Satyridae*).

Appendix: List of Species record at different forest types.
 Elevation: 1500m - 2000 m

a. Forest Type: *Schima wallichii* / *Albizzia* / *Pyrus persica*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1	Papilionidae	<i>Byasa</i>	<i>polyeuctes</i>	<i>letincius</i>	Fruhstorfer	Uncommon
2		<i>Achillides</i>	<i>arcturus</i>	<i>arcturus</i>	Westwood	Rare
3.	Pieridae	<i>Delias</i>	<i>belladona</i>	<i>lugens</i>	Jordan	Rare
3.		<i>Eurema</i>	<i>hecabe</i>	<i>contubernalis</i>	Moore	Common
4.	Nemeobiidae	<i>Abisara</i>	<i>fylla</i>	<i>fylla</i>	Doubleday	Uncommon
5.		<i>Dodona</i>	<i>ouida</i>		Hewitson	Rare
6.		<i>Dodona</i>	<i>adinora</i>	<i>adinora</i>	Hewitson	Rare
7.	Lycaenidae	<i>Creon</i>	<i>cleobis</i>	<i>cleobis</i>	Godart	Rare
8.		<i>Celastrina</i>	<i>argiolus</i>	<i>kollari</i>	Westwood	Uncommon
9.		<i>Zizeeria</i>	<i>maha</i>	<i>maha</i>	Kollar	Common
10.		<i>Lampides</i>	<i>boeticus</i>	<i>boeticus</i>	Linnaeus	Common
11		<i>Arophala</i>	<i>atrax</i>	<i>atrax</i>	Hewitson	Rare
12.		<i>Arophala</i>	<i>singla</i>	<i>singla</i>	DeNiceville	Rare
13	Nymphalidae	<i>Neptis</i>	<i>hylas</i>	<i>kamarupa</i>	Moore	Common
14.		<i>Neptis</i>	<i>ananta</i>	<i>ochracea</i>	Evans	Uncommon
15.		<i>Athyma</i>	<i>cama</i>	<i>cama</i>	Moore	Uncommon
16.		<i>Pseudergolis</i>	<i>wedah</i>		Kollar	Common
17.		<i>Euthalia</i>	<i>aconthea</i>	<i>suddhodana</i>	Fruhstorfer	Rare
18.		<i>Vanessa</i>	<i>cardui</i>	<i>cardui</i>	Linnaeus	Uncommon
19.		<i>Vanessa</i>	<i>indica</i>		Herbst.	Uncommon
20.		<i>Aglais</i>	<i>cashmirensis</i>	<i>aeis</i>	Fruhstorfer	Common

b. Forest Type: *Albizzia* / *Quercus* / *Rhus succidenia*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Achillides</i>	<i>polyctor</i>	<i>ganesa</i>	Doubleday	Uncommon
2.		<i>Idaides</i>	<i>cloanthus</i>	<i>cloanthus</i>	Westwood	Uncommon
3.	Pieridae	<i>Catopsilia</i>	<i>pomana</i>	<i>pomana</i>	Fabricius	Common
4.		<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
5.		<i>Pieris</i>	<i>canidia</i>	<i>indica</i>	Evans	Common
6.		<i>Cepora</i>	<i>nerissa</i>	<i>phryne</i>	Fabricius	Rare
7.	Lycaenidae	<i>Jamides</i>	<i>bochus</i>	<i>bochus</i>	Stoll	Rare
8.		<i>Chliaria</i>	<i>kina</i>	<i>kina</i>	Hewitson	Rare
9.		<i>Rapala</i>	<i>nissa</i>	<i>nissa</i>	Kollar	Rare
10.		<i>Lycaena</i>	<i>phlaeas</i>	<i>baralacha</i>	Linnaeus	Uncommon
11.		<i>Heliophorus</i>	<i>epicle</i>	<i>latilimbata</i>	Fruhstorfer	Common
12.		<i>Esakiozephyrus</i>	<i>mandara</i>	<i>doherty</i>	DeNiceville	Rare
13.		<i>Esakiozephyrus</i>	<i>icana</i>		Moore	Rare

c. Forest Type: *Quercus* / *Alnus nepalensis* / *Achima wallichii*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Satyridae	<i>Dallacha</i>	<i>hyagriva</i>	<i>hyagriva</i>	Moore	Uncommon
2.		<i>Ypthima</i>	<i>newara</i>		Moore	Common
3.		<i>Ypthima</i>	<i>sakra</i>		Moore	Common
4.		<i>Ypthima</i>	<i>nareda</i>	<i>nareda</i>	Kollar	Common
5.		<i>Ypthima</i>	<i>parasakra</i>		Eliot	Common
6.		<i>Callerebia</i>	<i>scanda</i>	<i>opima</i>	Watkins	Common
7.		<i>Callerebia</i>	<i>hybrida</i>	<i>hybrida</i>	Butler	Common
8.		<i>Lethe</i>	<i>rohria</i>	<i>rohria</i>	Fabricius	Common
9.		<i>Lethe</i>	<i>insana</i>	<i>dinarbus</i>	Hewitson	Rare

d. Forest Type: *Bombax ceiba* / *Quercus lanuginosa* / *Rhus seccedenia*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Idaides</i>	<i>sarpedon</i>	<i>luctatus</i>	Fruhstorfer	Common
2.	Pieridae	<i>Delias</i>	<i>belladona</i>	<i>lugens</i>	Jordan	Common
3.		<i>Eurema</i>	<i>laeta</i>	<i>sikkima</i>	Moore	Rare
4.	Lycaenidae	<i>Actyolepsis</i>	<i>puspa</i>	<i>gisca</i>	Fruhstorfer	Common
5.		<i>Udara</i>	<i>alboerulea</i>		Moore	Common
6.		<i>Nacaduba</i>	<i>kurava</i>	<i>euplea</i>	Fruhstorfer	Rare
7.		<i>Lampides</i>	<i>boeticus</i>		Linnaeus	Common
8.	Nymphalidae	<i>Abrota</i>	<i>ganga</i>		Moore	Rare

d. Forest Type: *Quercus* / *Lyonia ovalifolia* / *Myrica esculenta*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Achillides</i>	<i>polyctor</i>	<i>ganesa</i>	Doubleday	Uncommon
2.		<i>Sainia</i>	<i>protenor</i>	<i>euprotenor</i>	Fruhstorfer	Rare
3.		<i>Idaides</i>	<i>sarpedon</i>	<i>luctatus</i>	Fruhstorfer	Common
4.	Pieridae	<i>Delias</i>	<i>belladona</i>	<i>lugens</i>	Jordan	Common
5.		<i>Gonepteryx</i>	<i>rhamni</i>	<i>nepalensis</i>	Doubleday	Common
6.		<i>Eurema</i>	<i>hecabe</i>	<i>contubernalis</i>	Moore	Common
7.		<i>Eurema</i>	<i>brigitta</i>	<i>rubella</i>	Wallace	Uncommon
8.		<i>Catopsilia</i>	<i>pyranthe</i>	<i>pyranthe</i>	Fabricius	Uncommon
9.		<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
10.	Lycaenidae	<i>Everes</i>	<i>lacturnus</i>	<i>assamica</i>	Tytler	Rare
11.		<i>Zizina</i>	<i>otis</i>	<i>otis</i>	Fabricius	Rare
12.		<i>Zizeeria</i>	<i>maha</i>	<i>maha</i>	Kollar	Common
13.		<i>Actyolepsis</i>	<i>puspa</i>	<i>gisca</i>	Fruhstorfer	Common
14.		<i>Jamides</i>	<i>celeno</i>	<i>aelianus</i>	Fabricius	Uncommon
15.		<i>Prosotas</i>	<i>nora</i>	<i>ardates</i>	Moore	Rare
16.		<i>Celatoxia</i>	<i>marginata</i>	<i>marginata</i>	DeNiceville	Uncommon
17.		<i>Heliophorus</i>	<i>ila</i>	<i>pseudonexus</i>	Eliot	Rare
18.	Nymphalidae	<i>Cethosia</i>	<i>biblis</i>	<i>tisamena</i>	Fruhstorfer	Rare
19.		<i>Stibochiona</i>	<i>nicea</i>		Gray	Rare
20.		<i>Cyrestis</i>	<i>thyodamus</i>	<i>thyodamus</i>	Boisduval	Uncommon
21.		<i>Kaniska</i>	<i>canace</i>	<i>canace</i>	Linnaeus	Rare
22.		<i>Precis</i>	<i>iphita</i>		Cramer	Common
23.	Satyridae	<i>Mycalesis</i>	<i>mineus</i>	<i>mineus</i>	Linnaeus	Uncommon
24.		<i>Mycalesis</i>	<i>perseus</i>	<i>blasius</i>	Fabricius	Uncommon
25.		<i>Callerebia</i>	<i>hybrida</i>		Butler	Common

Elevation: 2000 m- 2500 m

a. Forest Type: *Alnus nepalensis* / *Rhododendron arboretum* / *Pinus wallichiana*

S.No	Family	Genus	species	subspecies	Authority	Local Status
1.	Lycaenidae	<i>Heliophorus</i>	<i>brahma</i>	<i>brahma</i>	Moore	Rare
2.		<i>Freyeria</i>	<i>putli</i>		Kollar	Uncommon
3.		<i>Spindasis</i>	<i>lohita</i>	<i>himalayanus</i>	Moore	Rare
4.	Nymphalidae	<i>Argyreus</i>	<i>hyperbius</i>	<i>hyperbius</i>	Linnaeus	Uncommon
5.		<i>Athyma</i>	<i>selenophora</i>	<i>selenophora</i>	Kollar	Uncommon
6.	Hesperiidae	<i>Tellicota</i>	<i>bambusae</i>	<i>bambusae</i>	Moore	Rare
7.		<i>Polytremis</i>	<i>eltola</i>	<i>eltola</i>	Hewitson	Common
8.		<i>Notocrypta</i>	<i>curvifascia</i>		Felder	Common
9.		<i>Ochus</i>	<i>subvittatus</i>	<i>subradiates</i>	Moore	Uncommon
10.		<i>Pseudocoladenia</i>	<i>dan</i>	<i>fatih</i>	Kollar	Common
11.		<i>Potanthus</i>	<i>pseudomaesa</i>	<i>clia</i>	Evans	Rare

b. Forest Type: *Alnus nepalensis* / *Rhododendron arboretum*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Menelaides</i>	<i>helenus</i>	<i>helenus</i>	Linnaeus	Uncommon
2.	Hesperiidae	<i>Tagiades</i>	<i>menaka</i>	<i>menaka</i>	Moore	Rare
3.		<i>Borbo</i>	<i>cinnara</i>	<i>cinnara</i>	Wallace	Rare

c. Forest Type: *Alnus nepalensis* / *Albizia*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Menelaides</i>	<i>helenus</i>	<i>helenus</i>	Linnaeus	Uncommon
2.	Pieridae	<i>Catopsilia</i>	<i>pomana</i>	<i>pomana</i>	Fabricius	Common
3.		<i>Gonepteryx</i>	<i>rhamni</i>	<i>nepalensis</i>	Doubleday	Common
4.		<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
5.		<i>Pieris</i>	<i>canidia</i>	<i>indicia</i>	Evans	Common

6.		<i>Eurema</i>	<i>hecabe</i>	<i>contubernalis</i>	Moore	Common
7.	Lycaenidae	<i>Ancema</i>	<i>ctesia</i>	<i>ctesia</i>	Hewitson	Rare
8.		<i>Udara</i>	<i>dilecta</i>		Moore	Uncommon
9.		<i>Udara</i>	<i>albocerulea</i>		Moore	Uncommon
10.		<i>Celastrina</i>	<i>argiolus</i>	<i>kollari</i>	Westwood	Common
11.		<i>Lampides</i>	<i>boeticus</i>		Linnaeus	Common
12.	Nemeobiidae	<i>Abisara</i>	<i>fylla</i>	<i>fylla</i>	Doubleday	Common
13.		<i>Zemeros</i>	<i>flegyas</i>	<i>indicus</i>	Fruhstorfer	Common
14.	Nymphalidae	<i>Neptis</i>	<i>ananta</i>	<i>ochracea</i>	Evans	Uncommon
15.		<i>Neptis</i>	<i>soma</i>	<i>butteri</i>	Eliot	Rare
16.	Satyridae	<i>Callerebia</i>	<i>scanda</i>	<i>caeca</i>	Watkins	Common
17.		<i>Callerebia</i>	<i>hybrida</i>		Butler	Uncommon
18.		<i>Callerebia</i>	<i>annada</i>	<i>opima</i>	Watkins	Uncommon
19.		<i>Ypthima</i>	<i>sakra</i>		Moore	Common

d. Forest Type: *Quercus / Rhus succidenia*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Atrophaneura</i>	<i>alcinous</i>	<i>pembertoni</i>	Moore	Rare
2.	Lycaenidae	<i>Udara</i>	<i>dilecta</i>		Moore	Uncommon
3.		<i>Celatoxia</i>	<i>marginata</i>	<i>marginata</i>	DeNiceville	Uncommon
4.		<i>Celastrina</i>	<i>argiolus</i>	<i>kollari</i>	Westwood	Common
5.		<i>Syntarucus</i>	<i>plinius</i>		Fabricius	Rare
6.		<i>Lampides</i>	<i>boeticus</i>		Linnaeus	Common
7.		<i>Heliophoros</i>	<i>androcles</i>	<i>coruscans</i>	Moore	Common
8.		<i>Ziseeria</i>	<i>maha</i>	<i>maha</i>	Kollar	Common
9.		<i>Everes</i>	<i>argiades</i>	<i>diporides</i>	Chapman	Rare
10.		<i>Everes</i>	<i>hugelli</i>	<i>hugelli</i>	Gistel	Rare
11.		<i>Creon</i>	<i>cleobis</i>	<i>cleobis</i>	Godart	Rare
12.		<i>Rapala</i>	<i>nissa</i>	<i>nissa</i>	Kollar	Rare
13.		<i>Heliophoros</i>	<i>tamu</i>	<i>tamu</i>	Kollar	Rare
14.	Nymphalidae	<i>Athyma</i>	<i>opalina</i>	<i>orientalis</i>	Elwes	Common
15.		<i>Neptis</i>	<i>hylas</i>	<i>kamarupa</i>	Moore	Common
16.		<i>Precis</i>	<i>iphita</i>		Cramer	Common
17.	Satyridae	<i>Callerebia</i>	<i>hybrida</i>		Butler	Common
18.		<i>Callerebia</i>	<i>scanda</i>	<i>opima</i>	Watkins	Common
19.		<i>Mycalesis</i>	<i>suavolens</i>	<i>tytleri</i>	Talbot	Uncommon
20.	Hesperiidae	<i>Taractrocera</i>	<i>danna</i>		Moore	Rare
21.		<i>Pelopidas</i>	<i>sinensis</i>		Mabille	Common

Elevation: 2500 m – 3000 m

a. Forest Type: *Quercus / Alnus nepalensis / Rhododendron arboreum*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Nemeobiidae	<i>Abisara</i>	<i>fylla</i>	<i>fylla</i>	Doubleday	Common
2.	Hesperiidae	<i>Tagiades</i>	<i>menaka</i>	<i>menaka</i>	Moore	Uncommon

b. Forest Type: *Rhododendron arboretum/ Psuga dumosa/ Alnus nepalensis*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Atrophaneura</i>	<i>latrellei</i>	<i>latrellei</i>	Donovan	Rare
2.	Nymphalidae	<i>Neptis</i>	<i>ananta</i>	<i>ochracea</i>	Evans	Uncommon
3.		<i>Phalantha</i>	<i>phalanta</i>		Drury	Uncommon
4.		<i>Vanssa</i>	<i>cardui</i>		Linnaeus	Common
5.		<i>Cyrestis</i>	<i>thyodamus</i>	<i>thyodamus</i>	Boisduval	Common
6.		<i>Neptis</i>	<i>hylas</i>	<i>kamarupa</i>	Moore	Common
7.		<i>Athyma</i>	<i>opalina</i>	<i>orientalis</i>	Elwes	Common

c. Forest Type: *Quercus / Hippofe selecifolia / Rhododendron*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Idaides</i>	<i>cloanthus</i>	<i>cloanthus</i>	Westwood	Common
2.		<i>Menelaides</i>	<i>helenus</i>		Linnaeus	Common
3.	Pieridae	<i>Colias</i>	<i>fieldii</i>	<i>fieldii</i>	Menetries	Common
4.	Lycaenidae	<i>Heliophoros</i>	<i>tamu</i>	<i>tamu</i>	Kollar	Rare
5.		<i>Albulina</i>	<i>lehana</i>		Moore	Rare
6.		<i>Creon</i>	<i>cleobis</i>	<i>cleobis</i>	Godart	Rare
7.		<i>Esakiozephyrus</i>	<i>mandara</i>	<i>doherty</i>	DeNiceville	Rare
8.		<i>Chrysozephyrus</i>	<i>sikkimensis</i>		Howarth	Rare

9.		<i>Syntarucus</i>	<i>plinius</i>		Fabricius	Rare
10.	Nemeobiidae	<i>Dodona</i>	<i>dipoea</i>	<i>dipoea</i>	Hewotson	Rare
11.		<i>Abisara</i>	<i>fylla</i>	<i>fylla</i>	Doubleday	Common
12.	Nymphalidae	<i>Neptis</i>	<i>radha</i>	<i>radha</i>	Moore	Rare
13.		<i>Cyrestis</i>	<i>thyodamus</i>	<i>thyodamus</i>	Boisduval	Uncommon
14.	Satyridae	<i>Aulocera</i>	<i>saraswatti</i>	<i>saraswatti</i>	Kollar	Common
15.		<i>Lethe</i>	<i>baladeva</i>	<i>baladeva</i>	Moore	Common
16.		<i>Lethe</i>	<i>insana</i>	<i>dinarbus</i>	Hewitson	Common
17.		<i>Lethe</i>	<i>rohria</i>	<i>rohria</i>	Fabricius	Uncommon
18.		<i>Callerebia</i>	<i>hybrida</i>		Butler	Common
19.		<i>Callerebia</i>	<i>scanda</i>	<i>opima</i>	Watkins	Common
20.		<i>Ypthima</i>	<i>baldus</i>	<i>baldus</i>	Fabricius	Rare
21.	Danaidae	<i>Eiploea</i>	<i>mulciber</i>	<i>mulciber</i>	Cramer	Uncommon
22.		<i>Parantica</i>	<i>tytia</i>	<i>tytia</i>	Gray	Rare

d. Forest Type: *Alnus nepalensis*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Pamassius</i>	<i>hardwickei</i>	<i>hardwickei</i>	Gray	Rare
2.	Pieridae	<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
3.	Lycaenidae	<i>Lampides</i>	<i>boeticus</i>		Linnaeus	Common
4.		<i>Zizeeria</i>	<i>maha</i>	<i>maha</i>	Kollar	Common
5.		<i>Celastrina</i>	<i>argiolus</i>	<i>kollari</i>	Westwood	Common
6.		<i>Actyolepsis</i>	<i>puspa</i>	<i>gisca</i>	Fabricius	Common
7.		<i>Everes</i>	<i>hugelli</i>	<i>hujelli</i>	Gistel	Rare
8.	Nymphalidae	<i>Vanessa</i>	<i>cardui</i>		Linnaeus	Uncommon
9.		<i>Aglais</i>	<i>cashmirensis</i>	<i>aesis</i>	Fruhstorfer	Common
10.		<i>Pseudergolis</i>	<i>wedah</i>		Kollar	Common
11.	Satyridae	<i>Callerebia</i>	<i>scanda</i>	<i>opima</i>	Watkins	Common
12.		<i>Aulocera</i>	<i>loha</i>		Doherty	Rare
13.		<i>Aulocera</i>	<i>brahminus</i>	<i>brahminus</i>	Blanch	Rare
14.		<i>Aulocera</i>	<i>padma</i>	<i>padma</i>	Kollar	Rare
15.		<i>Aulocera</i>	<i>saraswatti</i>	<i>saraswatti</i>	Kollar	Common
16.		<i>Zophoessa</i>	<i>maitrya</i>	<i>maitrya</i>	DeNiceville	Rare
17.		<i>Ypthima</i>	<i>sakra</i>		Moore	Common

d. Forest Type: *Rhus succidenia* / *Quercus* / *Taxus baccata* / *Leucana leucocephala*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Pieridae	<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
2.		<i>Delias</i>	<i>belladona</i>	<i>lugens</i>	Jordan	Common
3.	Lycaenidae	<i>Deudorix</i>	<i>epijarbus</i>	<i>ancus</i>	Fruhstorfer	Rare
4.		<i>Heliophoros</i>	<i>epicle</i>	<i>latilimbata</i>	Fruhstorfer	Common
5.		<i>Chliaria</i>	<i>kina</i>		Hewitson	Rare
6.		<i>Panchala</i>	<i>birmana</i>	<i>birmana</i>	Moore	Rare
7.	Nemeobiidae	<i>Abisara</i>	<i>fylla</i>	<i>fylla</i>	Doubleday	Common
8.		<i>Zemeros</i>	<i>flegyas</i>	<i>flegyas</i>	Guerin	Common
9.		<i>Dodona</i>	<i>egeon</i>	<i>egeon</i>	Westwood	Uncommon
10.	Nymphalidae	<i>Kaniska</i>	<i>canace</i>	<i>canace</i>	Linnaeus	Rare
11.		<i>Pseudergolis</i>	<i>wedah</i>	<i>wedah</i>	Kollar	Uncommon
12.		<i>Precis</i>	<i>iphita</i>	<i>iphita</i>	Cramer	Common
13.	Satyridae	<i>Lethe</i>	<i>rohria</i>	<i>rohria</i>	Fabricius	Rare
14.		<i>Mycalesis</i>	<i>heri</i>		Moore	Uncommon
15.	Hesperiidae	<i>Tagiades</i>	<i>menaka</i>	<i>menaka</i>	Moore	Rare
16.		<i>Borbo</i>	<i>cinara</i>	<i>cinara</i>	Wallace	Rare

Elevation: 3000 m – 3500 m

a. Forest Type: *Abies spectabilis* / *Rhododendron barbetum* / *Picea smithiana* / *Psuga dumosa*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Pamassius</i>	<i>hardwickei</i>	<i>hardwickei</i>	Gray	Rare
2.	Pieridae	<i>Pieris</i>	<i>brassicae</i>	<i>nepalensis</i>	Doubleday	Common
3.		<i>Eurema</i>	<i>hecabe</i>	<i>contubernalis</i>	Moore	Common
4.		<i>Gonepteryx</i>	<i>rhamnii</i>	<i>neplensis</i>	Doubleday	Common
5.	Lycaenidae	<i>Heliophoros</i>	<i>androcles</i>	<i>coruscans</i>	Moore	Common
6.		<i>Lycaena</i>	<i>phlaeas</i>	<i>baralacha</i>	Moore	Common
7.		<i>Celastrina</i>	<i>argiolus</i>	<i>kollari</i>	Westwood	Common
8.	Nymphalidae	<i>Phalanta</i>	<i>phalantha</i>		Drury	Uncommon
9.		<i>Argyneus</i>	<i>hyperbius</i>	<i>hyperbius</i>	Linnaeus	Uncommon
10.		<i>Issoria</i>	<i>issaea</i>	<i>issaea</i>	Doubleday	Common
11.		<i>Aglais</i>	<i>cashmirensis</i>	<i>aesis</i>	Fruhstorfer	Common

12.		<i>Vanessa</i>	<i>cardui</i>		Linnaeus	Common
13.		<i>Childrena</i>	<i>childreni</i>		Gray	Rare
14.	Satyridae	<i>Aulocera</i>	<i>padma</i>	<i>padma</i>	Kollar	Rare
15.		<i>Ypthima</i>	<i>sakra</i>		Moore	Common
16.		<i>Ypthima</i>	<i>parasakra</i>		Eliot	Common
17.		<i>Zophoessa</i>	<i>sidonis</i>	<i>sidonis</i>	Hewitson	Common
18.		<i>Zophoessa</i>	<i>jalaurida</i>	<i>jalaurida</i>	DeNiceville	Rare

b. Forest Type: *Rhododendron setosum* / *Rhododendron lepidatum* / *Abies spectabilis* / *Psuga dumosa*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Pieridae	<i>Colias</i>	<i>erate</i>	<i>glicia</i>	Fruhstorfer	Uncommon
2.		<i>Colias</i>	<i>fieldii</i>	<i>fieldii</i>	Menetries	Common
3.		<i>Catopsilia</i>	<i>pomana</i>	<i>pomana</i>	Fabricius	Common
4.		<i>Pieris</i>	<i>canidia</i>	<i>indica</i>	Evans	Common
5.	Lycaenidae	<i>udara</i>	<i>dilecta</i>		Moore	Common
6.		<i>Celatoxia</i>	<i>marginata</i>	<i>marginata</i>	DeNiceville	Uncommon
7.	Nemeobiidae	<i>Zemeros</i>	<i>flegyas</i>	<i>indicus</i>	Fruhstorfer	Common
8	Satyridae	<i>Ypthima</i>	<i>nareda</i>	<i>nareda</i>	Kollar	Common
9..		<i>Callerebia</i>	<i>scanda</i>	<i>opima</i>	Watkins	Common
10..	Danaidae	<i>Euploea</i>	<i>mulciber</i>	<i>mulciber</i>	Cramer	Uncommon
11.	Hesperiidae	<i>Potanthus</i>	<i>psudomaesa</i>	<i>clio</i>	Evans	Rare

Elevation: 3500 m- 4000m

Forest Type: *Rhododendron lepidatum* / *Berberis*

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Parnassius</i>	<i>hardwickei</i>	<i>hardwickei</i>	Gray	Rare
2.		<i>Parnassius</i>	<i>epaphus</i>	<i>epaphus</i>	Oberthur	Rare
3.	Lycaenidae	<i>Lycaena</i>	<i>phlaeas</i>	<i>barlacha</i>	Moore	Common
4.	Nymphalidae	<i>Issoria</i>	<i>issaea</i>	<i>issaea</i>	Doubleday	Common
5.		<i>Vanessa</i>	<i>cardui</i>		Linnaeus	Common
6.		<i>Aglais</i>	<i>cashmirensis</i>	<i>aesis</i>	Fruhstorfer	Common
7.		<i>Kukenthaleia</i>	<i>gemmata</i>	<i>gemmata</i>	Butler	Rare
8.	Satyridae	<i>Aulocera</i>	<i>swaha</i>	<i>swaha</i>	Kollar	Rare

Elevation: 4000m – 4300 m

Forest Type: *Rhododendron setosum* (Shrubby vegetation)

S.No.	Family	Genus	species	subspecies	Authority	Local Status
1.	Papilionidae	<i>Parnassius</i>	<i>epaphus</i>	<i>epaphus</i>	Oberthur	Rare
2..	Nymphalidae	<i>Issoria</i>	<i>issaea</i>	<i>issaea</i>	Doubleday	Common

E. Elevation 3000 – 3500 m

a. Forest Type: *Abies spectabilis*, *Quercus semicarpifolia*, *Picea smithiana*, *Psuga dumosa*,

b. *Berberis macrosepala*, *Rhododendron*.

Total species record: 18 species.

Rare species are: *Parnassius hardwickei hardwickei* Gray (Papilionidae), *Argyneus hyperbius hyperbius* Linnaeus, *Childrena childreni* Gray (Nymphalidae), *Aulocera padma padma* Kollar, *Zophoessa jalaurida jalaurida* DeNiceville (Satyridae).

c. Forest Type: *Rhododendron setosum*, *R. lepidatum*, *Abies spectabilis*, *Psuga dumosa*, *Betula utilis*,

d. *Astragalus pycnorhizus* and *Quercus semicarpifolia*.

Total species record: 11 species.

Rare species are: *Colias erate glicia* Fruhstorfer, *Colias fieldii fieldii* Menetries (Pieridae), *Celatoxia marginata marginata* Deniceville (Lycaenidae) and *Potanthus pseudomaesa clio* Evans (Hesperiidae).

F. Elevation 3500- 4000 m.

Forest Type: *Betula utilis*, *Rhododendron lepidatum*, *Rhododendron anthopogan*, *Rhododendron*

setosum, *Berberis macrosepala*, *Juniperus recurva*, *Larix*.

Total species record: 10 species.

Rare species are: *Parnassius hardwickei hardwickei* Gray, *P. epaphus epaphus* Oberthur (Papilionidae), *Kukenthaleia gemmata* Butler (Nymphalidae) and *Aulocera swaha* Kollar (Satyridae).

G. Elevation 4000 – 4300 m

Vegetation Type: Shrubby vegetation *Rhododendron setosum*, *Rhododendron campanulatum*, *Crotoneaster microphyllus*, *Hippophae rhamnoides*.

Total species record: 2 species

Parnassius epaphus epaphus Oberthur (Papilionidae) and *Issoria issaea issaea* Doubleday (Nymphalidae) are the only species recorded in this habitat.

DISCUSSION

This study conducted in 2009 to 2011 revealed out a list of 126 species of butterflies including 73 species which are rare under the local status. Various forest types were visited to obtain maximum possible diversity within the range of 1500 to 4300 m. At the

elevation of 1500-2000 m, *Lyonia / Syzigium* forest represented 23 species. Likewise, *Schima / Albizzia* forest at the same range provided 19 species. *Bombax ceiba* habitat at this range provided 8 species only. Of the observed two forest types at 2000-2500 m, *Alnus / Acer* forest represented 23 species while 21 species were reported at *Quercus / Rhus* forest. *Alnus nepalensis* and *Rhododendron arboreum* forest at 2500 m to 3000 m provided a least diversity of two species as compared to *Psuga dumosa -Abies spectabilis* forest where diversity of 23 species were reported. The diversity started decreasing at subsequent additional elevation above 2500 m. *Abies / Quercus* forest at 3000-3500 m of elevation provided 18 species as compared to *Betula / Rhododendron* forest at 3500-4000 m where 10 species were reported. Shrubby *Rhododendron* ecosystem at 4000-4300 m provided least representation of 2 species only.

Considering family-wise diversity, the highest diversity record was made in the family Lycaenidae which included 36 species. Other representations include Nymphalidae 22 species, Papilionidae 11, Pieridae 15, Nemeobiidae 6, Satyridae 24, Hesperidae 11 and Danaidae 2 species. Diverse habitat preferences were found at the elevation of 1500 – 2000 m where 85 species occurred. This elevation is influenced basically with the warm temperate climate sheltering butterflies of different habitat types. Cold climatic condition, scarce vegetation and few preferable habitats are the main causes of less diversity in higher elevation.

Significant records in this study include *Parnassius hardwickei hardwickei* and *P. epaphus epaphus* which are Himalayan specific butterflies restricted above the elevation of 3200 meter. The first one is a hypsobiont species which dwells both in the forest (3200 m) and talus habitat types (4000 m).

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