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#### MOIST TEMPERATE FOREST BUTTERFLIES OF WESTERN BHUTAN

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#### **OPEN ACCESS**



Abstract: Random surveys were carried out in moist temperate forests (1,860–3,116 m) around Bunakha Village and Dochula Pass, near Thimphu in western Bhutan, recording 65 species of butterflies. Of these, 11 species, viz., Straightwing Blue Orthomiella pontis pontis Elwes, Slate Royal Maneca bhotea bhotea Moore, Dull Green Hairstreak Esakiozephyrus icana Moore, Yellow Woodbrown Lethe nicetas Hewitson, Small Silverfork Zophoessa jalaurida elwesi Moore, Scarce Labyrinth, Neope pulahina (Evans), Chumbi Wall Chonala masoni Elwes, Pale Hockeystick Sailer Neptis manasa manasa Moore and White Commodore Parasarpa dudu dudu Westwood, are restricted to the eastern Himalaya, northeastern India and Myanmar. Two other species, Tawny Mime Chiasa agestor agestor (Gray) and Himalayan Spotted Flat Celaenorrhinus munda Moore have been only rarely recorded from Bhutan and a few individuals of the rare Bhutan Glory Bhutanitis lidderdalei Atkinson were also recorded near Bunakha.

**Keywords:** Biodiversity hotspot, *Bhutanitis lidderdalei*, Bunakha, Dochula Pass, eastern Himalaya, Ha Chu River, Lepidoptera, Wang Chu River.

Bhutan, part of the Himalayan biodiversity hotspot, is home to an estimated 750 species of butterflies (Singh & Pandey 2004). Very recently, efforts have been made to document the butterfly diversity of this region (Poel & Wangchuk 2007; Singh 2012; Wangdi et al. 2012, 2013; Wangdi & Sherub 2012a,b; Singh & Chib 2014; Tshering 2015). However, information generated on butterflies of this region is far from complete. Random surveys were

carried out in 'moist temperate forests' at elevations ranging from 1860–3116 m in the western part of Bhutan around Dochula Pass on the way to Punakha from Thimphu and also around Chukha-Bunakha villages along the Wang Chu River catchment, which lie enroute from Thimphu to Phuntsholing during late-spring, premonsoon, monsoon, post-monsoon seasons during 2009–2013 (Image 1).

# MATERIALS AND METHODS Study sites and vegetation

The study was carried out in typical forest types at different altitudes. The first site of the study was the forest around Dochula Pass (Image 1,site-I; 3116m) which is located on the way to Punakha town from Thimphu which is a moist temperate coniferous forest, dominated by *Tsuga dumosa* mixed with *Rhododendron* spp. and many broad leaved species such as *Acer* sp., *Castonopis* sp., etc. and this pass descends down to the Royal Botanical Garden at Lampere. The landmarks around the Dochula pass include 108 Druk Wangyal Khang Zhang Chortens or Stupas. The second site was the forest habitat from Chukha to Bunakha village until Tanalum check post (27°04′30.1″–27°13′55.9″N & 89°29′11.5″–89°33′58.1″E). The vegetation in and around Bunakha

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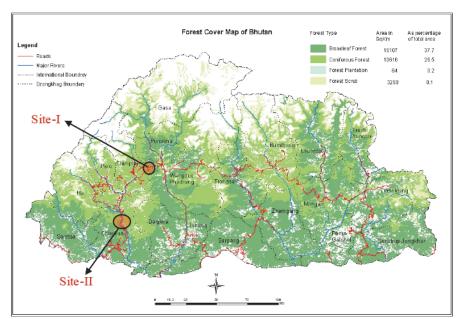


Image 1. Location of moist temperate forest study sites: site I-Dochula Pass & site II-Bunkha Village in western Bhutan.

(Source: http://www.comap.ca/kmland/display.php?ID=315)

(1,860–2,580 m; Image 1, site-II) up to higher elevations is dominated by *Populus gamblei*, *Acer compbellii*, *Alnus nepalensis*, *Pinus wallichiana* community. The vegetation varies from broad-leaved to evergreen-oak pine forests. The common tree species recorded in this area are *Alnus nepalensis*, *Acer campbelli*, *Carpinus viminea*, *Juglans regia*, *Quercus glauca*, *Rhododendron arboreum*, *Symplocos ramisissima*, *Pinus wallichiana* and *Picea spinulosa*. Other important tree species are *Benthamidia capitatum*, *Carpinus faginea*, *Celtis tetrandra*, *Coriaria nepalensis*, *Cornus capitata*, *Corylus ferox*, *Dysoxylum binectariferum*, *Lindera assamica*, *Lyonia ovalifolia*, *Persea duthei*, *Populus gamblei*, *Salix obscura*, *Toricellia tiliifolia*, *Viburnum mullaha* and *Zanthoxylum* sp.

#### Sampling

Observations were recorded during day time (10:30–15:00 hr) around Dochula Pass (site-I) by trekking down to the Royal Botanical Garden at Lampere on 08 July 2009 (monsoon season). Surveys were also carried out in and around Chukha-Tsimasham-Bunakha Village (Site-II) by trekking along the highway up to Talalium check post before Chapcha while moving towards Thimphu. Surveys in site-II were carried out (10:00–15:00 hr) on 12–14 and 16 May 2009 (pre-monsoon season when day time temperatures varied between 17.8–20 °C and relative humidity varied between 71–78 %), 09 July 2009 (monsoon season), 27–28 April 2011 (late spring season) and 21-22 September 2012 (post monsoon season). All

the butterflies encountered while walking along the highway and a trail going down to the river Wang Chu were noted and photographed for identification.

#### Identification of butterflies

Identification of butterflies was done with the help of field guides (Evans 1932; Wynter-Blyth 1957; Haribal 1992; Smith 1989, 2006; Kehimkar 2008) as well as web resources (http://www.ifoundbutterflies.org/ and http://flutters.org/). Photographs were compared with the specimens at National Forest Insect Reference Collection at Forest Research Institute, Dehradun, India.

#### **RESULTS AND DISCUSSION**

A total of 65 species were recorded during these short surveys from the two sites that are listed in the Appendix. Butterflies recorded in this study belonged to five families. Maximum number of species were from Nymphalidae, followed by Lycaenidae, Pieridae, Papilionidae and Hesperiidae. the collections were from Bunakha except for nine species (Golden Sapphire Heliophorus brahma, Green Sapphire Heliophrous androcles, Dull Green Hairstreak Esakiozephyrus icana, Slate Royal Maneca bhotea, Yellow Woodbrown Lethe nicetas, Chumbi Wall Chonala masoni, Scarce Labyrinth Neope pulahina, Small Silverfork Zophoessa jalaurida elwesi and Blue Pansy Junonia orithiya) which were recorded from Dochula only. The reason for the few records being overcast and cold weather conditions prevailing at Dochula Pass on

the day of survey. Besides, a few individuals (3+) of the rare Bhutan Glory, *Bhutanitis lidderdalei* Atkinson (listed in CITES-Appendix II) were also recorded at Tsimasham near Bunakha on 22 September 2012. Of the various species recorded in this study, the following were of interest being mainly new records for Bhutan.

#### 1. Tawny Mime *Chiasa agestor agestor* (Gray) (Image 2).

One individual was photographed perched on *Coriaria nepalensis* shrub in a forest dominated by *Quercus glauca* trees along the highway near Bunakha on 14 May 2009. This sub-species was reported as 'not rare' from Sikkim to Dawnas (Myanmar) by Evans (1932). Wynter-blyth (1957) reported it from clearings in oak forests during early April in the eastern Himalaya Smith (1989) reported it from central to western Nepal. Recorded from Linza in Tholung Valley in light wooded country in Sikkim by Haribal (1992). The species was reported by Kehimkar from Himalaya and hills of northeastern India (2008) between 1,200–2,590 m. No earlier records from Bhutan.

## 2. Straightwing Blue *Orthomiella pontis pontis* Elwes (Image 3).

A few individuals were recorded on wet mud on the highway near Bunakha Village (n=3) and in Bunakha Village (n=4) on 13 May 2009 and also on 28 April 2011. Evans (1932) reported this species from Sikkim, northeastern India and Myanmar including Arunachal Pradesh. It prefers dense jungle between 900–1800 m from March to June and is 'very local' from Sikkim to Assam and northern Myanmar as reported by Wynter-Blyth (1957). Smith (1989) recorded it from Nepal between 1,950–2,040 m during April. Not reported earlier from Bhutan.

## 3. Slate Royal *Maneca bhotea bhotea* Moore (Image 4).

One individual was reported nectaring on flowers on 8 July 2009, about 1km before Dochula from Thimphu along the side of the road. Tytler (1925) recorded it during June–July from Kabru Peak and Suroifui in Manipur between 2,400–2,700 m and also Sikkim. Evans (1932) reports it to be a rare species from Sikkim to Assam. Wynter-blyth (1957) found it to be 'rare' from Darjeeling to Assam during May–July, in October in Naga Hills and during January in Khasi Hills. The species is 'very rare' in central Nepal between 2,484–2,700 m during May–June and is 'rare' in Sikkim and Assam according to Smith (1989). Khanal et al. (2013) collected four specimens from central Nepal between 2,484–2,730 m. A male collected by Ollenbach from Darjeeling, West Bengal on 13 June 1909 is kept in National Insect Collection

at Forest Research Institute, Dehradun. Not reported earlier from Bhutan.

#### 4. Dull Green Hairstreak *Esakiozephyrus icana* Moore (Image 5).

Two individuals of this species were recorded feeding on the wet ground along the road below Dochula Pass in Bhutan. This is probably the eastern most record of this species in the Himalaya. It occurs in western and central Nepal from 1,850–2,636 m from June to August as reported by Smith (1989). Evans (1932) reported it to be 'rare' from Kullu to Kumaon. Also occurs in western China (Smith 1989). Its range in the Himalaya extends from Himachal Pradesh to Uttarakhand as per Kehimkar (2008). Not reported earlier from Bhutan.

## 5. Yellow Woodbrown *Lethe nicetas* Hewitson (Image 6).

One individual was recorded on 08 July 2009 below Dochula Pass along the road side vegetation. Both Evans (1932) and Wynter-blyth (1957) found this species to be 'not rare' from Kullu to Arunachal Pradesh and Manipur. Poel & Wangchuk (2007) found it to be 'fairly common' between 1,700–2,600 m along the forest trails, occasionally visiting sweaty shoes in Bhutan. Haribal (1992) found it 'rare' in Sikkim. Recorded as uncommon from 1860–2800 m during July and November in Nepal by Smith (1989). Its range extends from Himachal Pradesh to Arunachal Pradesh, northeastern India, Nepal, Bhutan and Myanmar as per Kehimkar (2008).

## 6. Small Silverfork *Zophoessa jalaurida elwesi* Moore (Image 7).

One individual was recorded on herbaceous vegetation along the road below Dochula Pass on 08 July 2009. Haribal (1992) found it in Sikkim between 2,000–3,000 m on slopes covered with bamboo whereas it is 'not rare' in Sikkim as per Evans (1932). Also occurs from east to central Nepal as 'local' but 'not rare' between 2700–3840 m from July to September as recorded by Smith (1989). A female collected by Ollenbach on 11 September 1915 at Tendong, Sikkim is kept in the National Insect Collection at Forest Research Institute, Dehradun. Sub-species *elwesi* not reported earlier from Bhutan.

## 7. Scarce Labyrinth *Neope pulahina* (Evans) (Image 8).

One individual was recorded feeding on animal refuse along the road below Dochula Pass on 8 July 2009. A rare species found from Sikkim to Arunachal Pradesh, Manipur, Nepal, Bhutan and Myanmar between 1,200–2,800 m from May–July as per Evans (1932), Smith (1989), Haribal (1992), and Kehimar (2008). A female collected by Ollenbach on 27 June 1904 from Darjeeling,



Image 2. Tawny Mime Chiasa agestor agestor (Gray)



Image 3. Straightwing Blue Orthomiella pontis pontis Elwes



Image 4. Slate Royal *Maneca bhotea bhotea* Moore



Image 5. Dull Green Hairstreak Esakiozephyrus icana Moore



Image 6. Yellow Woodbrown *Lethe nicetas* Hewitson



Image 7. Small Silverfork Zophoessa jalaurida elwesi Moore



Image 8. Scarce Labyrinth Neope pulahina (Evans)



Image 9. Chumbi Wall *Chonala masoni* Elwes



Image 10. Pale Hockeystick Sailer Neptis manasa manasa Moore



Image 11. White Commodore *Parasarpa dudu dudu* Westwood



Image 12. Himalayan Spotted Flat Celaenorrhinus munda Moore

West Bengal is kept in the National Insect Collection at Forest Research Institute, Dehradun. Not reported earlier from Bhutan.

#### 8. Chumbi Wall Chonala masoni Elwes (Image 9).

One individual was noted sucking salt from a rock along the road below Dochula Pass on 8 July 2009. Evans (1932) reported it to be 'not rare' from Sikkim to Bhutan. Haribal (1992) reported it from Upper Teesta Valley in Sikkim. Also recorded in August from Mayodia Pass (~2,200m) in Dibang Valley District, Arunachal Pradesh by the author (unpublished). Not reported earlier from

#### 9. Pale Hockeystick Sailer *Neptis manasa manasa* Moore (Image 10).

One individual was noted on the road side rocks sucking salts on wet sand along the bridge below Chaukha. Evans (1932) reports it to be 'very rare' from Sikkim to Shan states in Myanmar while Smith (1989) reported it from Kathmandu Valley in central Nepal where it was very rare during May–June between 1,800–2,372 m. Also recorded in Mishmi Hills in lower Dibang Valley, Aunachal Pradesh in June by Gogoi (2012). Khanal et al. (2013) collected five specimens from central Nepal between 1,520–2,151 m.

## 10. White Commodore *Parasarpa dudu dudu* Westwood (Image 11)

One individual was noted drinking salt from wet sand from eroded rocks along the river bridge (1800m) near Chaukha. Evans (1932) reports it as a 'rare' species occurring from Sikkim to Shan States in Myanmar. Wynter-Blyth (1957) and Smith (1989) reported it from central Nepal during April-May and July-October up to Sikkim, hills of northeastern India up to southern Shan States, Formosa and Hongkong and in Sikkim between 1200-1500 m. Haribal (1992) recorded it flying around tree tops and ridges in Sikkim. Also occurs in Bhutan in forested areas between 1,400-2,650 m as reported by Kehimkar (2008) and from Trashiyangtse Valley, eastern Bhutan by Wangdi et al. (2013) and between 1,400-2,500 m in Bhutan by Poel & Wangchuk (2007). Khanal et al. (2013) collected two specimens from central Nepal between 1850-1880 m.

# 11. Himalayan Spotted Flat *Celaenorrhinus munda* Moore (Image 12)

Two individuals recorded near Bunakha, amongst which one was photographed basking in sunlight on leaves on a hillside on 14 May 2009 along the highway near Tanalium check post. Reported as 'rare' from Murree (Pakistan) to Sikkim and Shan States (Myanmar) by Evans (1932). Captain F.M. Bailey recorded it in central Nepal in May (Smith 1989, 2006). Not reported

earlier from Bhutan.

Observations made in this study indicate that the moist temperate forests in western Bhutan is home to a number of rare and perhaps threatened species that are restricted to the eastern Himalaya, northeastern India and Myanmar. Further studies are needed to unveil the rich butterfly diversity existing in these little known forests.

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#### Appendix 1. Butterflies recorded in moist temperate forests of Bhutan (Dochula Pass and Bunakha)

	Family /Species	Month of record	Sites
A.	Papilionidae		
1	Common Windmill Atrophaneura polyeuctes (Doubleday)	May	Bunakha
2	Rose Windmill Atrophaneura latreillei (Donovan)	May	Bunakha
3	Tailed Redbreast <i>Papilio bootes</i> Westwood	May	Bunakha
4	Tawny Mime <i>Chiasa agestor</i> (Gray)*	May	Bunakha
5	Blue Peacock <i>Papilio arcturus</i> Westwood	May	Bunakha
6	Glassy Blue Bottle <i>Graphium</i> cloanthus Westwood	May	Bunakha
7.	Bhutan Glory <i>Bhutanitis lidderdalei</i> Atkinson	Sept.	Bunakha
В.	Pieridae		
8	One spot Grass Yellow <i>Eurema</i> brigitta (Cramer)	Sept	Bunakha
9	Common Brimstone Gonepteryx rhamni (Linnaeus)	May	Bunakha
10	Indian Cabbage White Pieris canidia (Sparrman)	Sept	Bunakha
11	Large Cabbage White <i>Pieris brassicae</i> (Linnaeus)	May	Bunakha
12	Hill Jezebel <i>Delias belladonna</i> (Fabricius)	April Sept	Bunakha
13	Dark Jezebel <i>Delias berinda</i> <i>berinda</i> Moore	July	Bunakha
14	Spot Puffin Appais lalage (Doubleday)	May	Bunakha
15	Dark Clouded Yellow <i>Colias</i> <i>fieldii</i> Ménétriés	May	Bunakha
16	Colias sp.	May	Bunakha
C.	Lycaenidae		
17	Straightwing Blue Orthomiella pontispontis Elwes*	May	Bunakha
18	Silver Forget-me-not <i>Catochysops</i> panormus (C & R. Felder)	May	Bunakha
19	Bhutya Lineblue <i>Prosotas bhutia</i> (DeNiceville)	May	Bunakha
20	Plain Hedge Blue <i>Celastrina lavendularis</i> (Moore)	May	Bunakha
22	Large Hedge Blue <i>Celastrina huegelii</i> Moore	Sept	Bunakha
23	Hill Hedge blue <i>Celastrina argiolus</i> (Linnaeus)	July	Bunakha
24	Pale Hedge Blue <i>Udara dilecta</i> (Moore)	July	Bunakha
25	Tailless Bushblue <i>Arhopala ganesha</i> (Moore)	April	Bunakha
26	Purple Sapphire <i>Heliophorus epicles</i> Godart	Sept	Bunakha
27	Golden Sapphire <i>Heliophorus brahma</i> Moore	July	Dochula
28	Green Sapphire <i>Heliophrous</i> androcles Doubleday & Hewitson	July	Dochula
29	Dull Green Hairstreak <i>Esakiozephyrus</i> icana Moore*	July	Dochula
30	Slate Royal Maneca bhotea Moore*	July	Dochula
31	Common Flash Rapala nissa (Kollar)	May	Bunakha
32	Mixed Punch <i>Dodona ouida</i> (Hewtison)	April-May	Bunakha

33	Common Punch <i>Dodona durga</i> (Kollar)	May	Bunakha
34	Striped Punch <i>Dodona adonira</i> Hewitson	May	Bunakha
35	Tailed Judy <i>Abisara neophron</i> (Hewitson)	Sept	Bunakha
D.	Nymphalidae		
36	Yellow Woodbrown <i>Lethe nicetas</i> Hewitson*	July	Dochula
37	Common Woodbrown <i>Lethe sidonis</i> (Hewitson)	July Sept	Bunakha
38	Long-brand Bushbrown <i>Mycalesis</i> visala Moore	July	Bunakha
39	Chumbi Wall <i>Chonala masoni</i> (Elwes)*	July	Dochula
40	Veined Labyrinth <i>Neope pulaha</i> (Moore)	April July	Bunakha
41	Scarce Labyrinth <i>Neope pulahina</i> Evans*	July	Dochula
42	Small Silverfork Zophoessa jalaurida elwesi Moore*	July	Dochula
43	Pallid Argus Callerebia scanda (Kollar)	Sept	Bunakha
44	Himalayan Fivering <i>Ypthima sakra</i> Moore	Sept	Bunakha
45	Chocolate Pansy <i>Junonia iphita</i> (Cramer)	Sept	Bunakha
46	Blue Pansy <i>Junonia orithiya</i> (Linnaeus)	July	Dochula
47	Chestnut Tiger Parantica sita (Kollar)	Sept	Bunakha
48	Red Lacewing Cethosia biblis (Drury)	May Sept	Bunakha
49	Grand Duchess <i>Euthalia patala</i> (Kollar)	Sept	Bunakha
50	Common Tortoise Shell <i>Aglais</i> cashmiriensis (Kollar)	May	Bunakha
51	Chocolate Tiger <i>Parantica melaneus</i> (Cramer)	May	Bunakha
52	Painted Lady <i>Vanessa cardui</i> (Linnaeus)	May	Bunakha
53	Indian Red Admiral <i>Vanessa indica</i> (Herbst)	April May	Bunakha
54	Queen of Spain Fritillary <i>Issoria</i> <i>lathonia</i> (Linnaeus)	May	Bunakha
55	Sullied Sailer Neptis soma Moore	Sept	Bunakha
56	Pale Hockeystick Sailer <i>Neptis manasa</i> Moore*	May	Bunakha
57	Himalayan Sergeant Athyma orientalies Elwes	May Sept	Bunakha
58	White Commodore <i>Parasarpa dudu</i> (Doubleday)*	May	Bunakha
59	Yellow Coster <i>Acraea issoria</i> (Hubner)	May	Bunakha
60	Circe Hestina nama (Doubleday)	Sept	Bunakha
F.	Hesperiidae		
61	Spotted Demon <i>Notocrypta</i> feisthameli (Boisduval)	May	Bunakha
62	Brown Bush Bob <i>Pedesta pandita</i> de Nicéville	May	Bunakha
63	Chequered Ace <i>Solvia lucasii separata</i> Moore	July	Bunakha
64	Contiguous Swift <i>Polytremis lubricans lubricans</i> Herrich-Schäffer	Sept	Bunakha
65	Himalayan Spotted Flat Celaenorrhinus munda Moore*	May	Bunakha

<sup>\*</sup> Rare records for Bhutan

