Conservation

Conservation is defined as management of human use of biosphere so that it may yield sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirations prosperity.

Conservation Strategy

An integrative approach to the maintenance of biodiversity that uses appropriate principles and experiences from basic biological fields such as geneticsand ecology; from natural resource management fields such as wildlife management; and from social sciencessuch as anthropology, sociology, philosophy, and economics. (Meffeet al., 1997)



• Partnership

Formulate the Conservation Plan, Entities compiled information, developed conservation measures, and recommended actions, in collaboration with national and international organizations.

- Scientific Research and Monitoring
- 1. Enhance understanding of Butterfly biology.

- 2. Conduct research to fill information gaps and inform management.
- 3. Assess how land management practices affect the butterfly's abundance and distribution.
- Education & Outreach
- 1. Environmental education programs that lead to a greater understanding, appreciation, and support of the challenge.
- 2. Engaging communities in conservation by providing training as eco-tour guides and in reforestation activities.
- 3. Eco-tourism workshops combine indoor presentations and hands-on activities with outdoor field work to raise awareness about the importance of conserving the butterflies.
- Funding

Necessary for surveys, research, monitoring, habitat enhancement, public outreach, and further implementation of the Plans.

- Conservation Actions
- 1. Protect and manage occupied and unoccupied butterfly habitat on public lands.
- 2. Manage habitat and promote conservation, through education and public media.
- 3. Explore potential areas and promote butterfly ecotourism.
- 4. Provide adequate regulatory protection.

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Butterfly Conservation An Introduction



A Rufford Grant Project





Introduction to Butterflies

The butterflies belong Insecta and order Lepidoptera with moths. Butterflies among the insect group are the most beautiful and attractive group of insects. They are primarily day fliers and are remarkable for the delicacy and beauty of their membranous wings, covered with overlapping tiny scales and shows an infinite variety of hues through the coloring of the scales. There are about 18,000 known species of butterflies in the world. Bhutan being a country with great geographical diversity has diverse climatic conditions which contribute to Bhutan's great biodiversity and ecosystems. Bhutan is expected to have about 800 to 900 species of Bhutan. Till date in Tsirang District, 230 species of butterflies have been recorded.

Life cycle of butterflies

Butterflies as adults are short-lived insects; a few weeks in blues to eight months in Swallowtails and Brush-footed butterflies, but normally most butterflies live up to two to four weeks. The major task of an adult butterfly is to propagate its species. So, an adult butterfly their duty is to find a partner and matting (male & female), laying eggs on a suitable food plant (females) and feeding. A male who have mated with a female and a female who have laid eggs, has fulfilled its biological function.



Image source : http://paulmirocha.con

A butterfly undergoes complete metamorphosis i.e. four distinct stages of an insect: Egg, Larva (caterpillar), pupa (chrysalis) and adult.

Families of butterflies

- 1. Hesperiidae (Skippers)
- 2. Papilionidae (Swallowtails)
- 3. Pieridae (Whites & Yellows)
- 4. Nymphalidae (Brush-footed)
- 5. Lycaenidae (Blues)

Importance of butterflies

Butterfly as Pollinators: Butterflies play a big role in pollinating flowers that open during the day. But-

terflies tend to favour big, colourful flowers that have a landing platform and gather pollen on their long, thin legs as they sip nectar from a flower. Thus, helping in increasing plant diversity.

Ecosystem restoration: For transforming from egg to adult in butterflies depends on climatic conditions and plant diversity. That makes butterflies, especially sensitive to climate change, such as pollution and habitat loss. Therefore, an abundance of butterflies usually indicates a healthier ecosystem.

Butterfly maintains food chain in ecosystem: Butterflies help in maintaining a healthy ecosystem by acting as prey for many predators like birds, spiders, amphibians and other insect group.

Ecosystem value: Butterflies are indicators of a healthy environment and healthy ecosystems. Areas rich in butterflies are rich in other invertebrates which provide a wide range of environmental benefits, including pollination and natural pest control. Butterflies have been widely used by ecologists as model organisms to study the impact of habitat loss and fragmentation, and climate change.



Threats to Butterflies



Fragmentation and deterioration of habitat due tohuman exploitation of forestry,Agricultural practices,and other resources.

Climate change affects range, distribution and abundance of butterfly. It also affects in their survival, fecundity, developmental rates, and condition of larval and adults food plant.

Agricultural practices, pastureland development, urbanization also affects in butterfly population.

Non-forest activities-mining, road laying, industrial activities, clearing large forest areas for construction of dams.

Ditching and draining of wet forests, Swamps andbogs in the forest landscape.

Forest plantation practices such as cutting of broadleaved forests and plantations of exotic plant species.

Illegal collection and trades could also leads to reducing the population of butterflies and even extinction of endangered species.

Especially when rare or protected butterflies are collected from wild,can have influence on species sustainability.







Introduction



Material & Methods

Butterflies were studied through photo documentation and collection of representative voucher specimens. "Pollard Walk method" was adopted with modifications based on geographical and climate conditions of the area. "Standard Line Transect" were identified with the help of GPS coordinates. Field identifications were carried out with the help of reference books; in case of taxonomically difficult species experts were consulted. Sample specimens were preserved as and when collected from the field with proper information at Department of Science, Mendrelgang Central School, Tsirang. On the completion of the study, the sample specimens will be deposited at "Invertebrate Referral Collection Centre" NBC, Thimphu.



Results

Total 145 species distributed in five families have been identified from the study area (Appendix 1). Nymphalidae was dominant family with 74 species (51.03 %) followed by Lycaenidae 30 species (20.68 %), Pieridae 16 species (11.03 %), Hesperiidae 13 species (8.96 %). The Papilionidae family was the least diverse with 12 species (8.30 %) (Fig. 1). 28 species of butterflies are added to the known list of butterflies recorded by Singh (2012), Singh & Chib (2014) and Singh (2014) from the Tsirang region.

I4 species of the butterfly were covered under protected species category of Indian Wildlife (Protection) Act (IWPA), 2002 like Allotinus drumila drumila comes under schedule I of the Act while Aemona amathusia amathusia, Melanitis zitenius, Lethe sinorix, Euthalia durga durga, E. nara nara, Spindasis lohita himalayanus, Orthomiella pontis pontis, Halpe homolea filda comes under schedule II of the Act. Eupleea mulciber mulciber, Euthalia lubentina, Pelopidas assamensis, P. sinensis are also protected species under the schedule IV of the IWPA but none of these butterfly species are included in the protected list of Forest and Nature Conservation Act 1995 and Forest and Nature Conservation Rules of Bhutan 2006. Few species such as Parantica melaneus, Childrena childreni, Apatura sordida, Euthalia nara, Aemona amathusia, Abrota ganga, Dichorrhagia nesimachus, Apatura chevana, Prioneris thetylis, Dercas verhuelli, Troides helena, Stiboges nymphidia, Allotinus drumila, Potanthus nesta, Pelopidas assamensis and P. sinensis should be given conservation priority as they are found rarely in the study area. These indicates the importance of extensive survey of butterfly fauna in the area to find out the species of conservation and printance.



SI. N 1.	Nymphalidae	No. of Species 74	% 51.03
2.	Papilionidae	12	8.30
3.	Pieridae	16	11.03
4.	Lycaenidae	30	20.68
5.	Hesperiidae	13	8.96
TOTAL		173	100

le 1: Family composition of butterflies recorded from Tsirang Percentage of butterflies recorded in different families



• Nymphalidae • Papilionidae = Pieridae • Lycaenidae • Hesperidae

Space for Pictures



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Rufford





Photographed by : Irungbam Jatishwor Singh & Meenakshi Chib, MMSS



Photographed by : Irungbam Jatishwor Singh & Meenakshi Chib, MMSS



Photographed by : Irungbam Jatishwor Singh & Meenakshi Chib, MMSS



Photographed by : Irungbam Jatishwor Singh & Meenakshi Chib, MMSS



CURRENT STATE OF KNOWLEDGE



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Introduction

Bhutan lies within the Eastern Himalayas, and one of the world's biodiversity hotspots. The country links two biogeographical realms of the temperate Eurasia and the Indo-Malayan realm of the Indian sub-continent. The country is rich in species biodiversity and has a very comprehensive protected areas system. There are 10 protected areas in Bhutan and along with its biological corridors serves as a globally unique system for in-situ conservation of biodiversity. The wild flora and fauna of the Bhutan is very rich but the fauna remains poorly known. There are 178 species of mammals which includes 24 internationally threatened species and 64 species which are nationally endangered (Mackinnon 1991). Around 770 species of avifauna have been recorded form Bhutan (Mackinnon 1991, RGoB 1996); and 5446 species of vascular plants of which 760 are endemic to eastern Himalayas and 50 or more are endemic to Bhutan itself (Yonzon 1992; Sherpa et al. 1991).



Brief History on Lepidoptera study in Bhutan:

Hampson (1892-1896) and Bell & Scott (1937) in "Fauna of British India" series reported 231 species of moths present in Bhutan. Recent, records on the study of moths from Bhutan are found in Schintlmeister (2004), Brechlin (2009; 2010), Singh & Kitching (2013), Singh (2015) which leads to discovery of many new species of moths new to science.

In comparison butterflies has been studied extensively. Previous studies could be found at Evans (1927, 1932), Talbot (1939, 1947), Wynter-Blyth (1957), Yazaki & Kanmuri (1985) and Harada (1987a, 1987b). More recently, Van der Poel & Wangchuk (2007), Singh (2012), Wangdi et al. (2012, 2013), Wangdi & Sherub (2012a, 2012b, 2014), Harada et al. (2012), Dorji & Motoki (2013), Dorji (2014), Singh & Chib (2014), Singh (2014), Nidup et al. (2014), Nidup (2015) and Singh & Chib (2015).

Collectively this works gives an overview of the rich Lepidoptera fauna of Bhutan. However, a comprehensive list of Lepidoptera is not available for Bhutan.

Present status on Lepidoptera fauna in Bhutan:

In the last decade, the studies of the lepidoptera fauna has been initiated by different institutes and individuals in Bhutan and few checklist are available in the form of published articles or in booklets. Wangdi & Sherub (2012a, 2012b, 2014) provides brief idea on the rich Nymphalidae, Papilionidae and Hesperiidae fauna of Bhutan. Singh (2012), Wangdi et al. (2012, 2013), Singh & Chib (2014), Singh (2014), Nidup et al. (2014), Nidup (2015) provides few checklist of butterflies from Southern and eastern parts of Bhutan. Singh & Chib (2015) published a checklist on butterflies of Bhutan. This is the first complete checklist on the butterfly of Bhutan which reports the presence of 670 sp. [Papilionidae (55 sp.); Pieridae (51 sp.); Nymphalidae (265 sp.); Lycaenidae (160 sp.); Hesperiidae (139 sp.)] in all parts of Bhutan (Table 1).

In contrast, moths have been poorly studied. Brechlin (2009) and Singh & Kitching (2013) published checklist on Saturniidae (27 sp.), Brahmaeidae (2 sp.) and Sphingidae (27 sp.) of Bhutan respectively. In 2014, National Biodiversity Centre, Thimphu initiated a nationwide project on documentation of the moths fauna of Bhutan. As a result, a preliminary checklist on moths of Bhutan have been developed (Table 2) based on survey conducted during 2014 to 2015, which is the first officially available data on the moths fauna of Bhutan.



ralis: Graphium doson: Papilio demoleus: Papilio Memnor ensis: Delias agostina: Pieris erutae montana: Polyura athamas: Parasarpa zayla inatus: Cynoides no

2nd Row (L to R): *Callambulyx poecillus: Rhagastis albomar* 3rd Row (L to R): *Saturnia thibeta: Loepa diffunoccidentalis*: a Polinda: Dontia d · Funk

Row (L to R): Plutodes subcaudata; Comostola hauensteini; Chrysocraspeda sp. (cf) dipyramida; Abisara neophron; Celestrina argiolus; Petrelaea dana: Heliophorus epicles. Conclusion:

Overall observation shows that the studies on Lepidoptera fauna in Bhutan is lacking behind. Thus there is a need to focus on studies of this little known group of insects in Bhutan. Some studies on butterfly and moth has been going on in different parts of Bhutan but still could not develop a complete database on Lepidoptera fauna. To sum it up, the data for Bhutan is very limited. The general problem is the low number of enthusiasts with limited knowledge due to limited access to identification literature and limited data sharing.

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1	Papilionidae	55	
2	Pieridae	51	
3	Nymphalidae	265	
4	Lycaenidae	160	
5	Hesperiidae	139	
	Total	670	

Table 1: Butterflies of Bhutan

Table 2: Moths of Bhutan

SI. no	Superfamilies	Families	No. of species
А	Cossoidea	I. Cossidae	5
в	Zygaenoidea	I. Zygaenidae II. Limacodidae	9 28
с	Pyraloidea	I. Pyralidae II. Crambidae	13 70
D	Drepanoidea	I. Drepanidae	19
E	Lasiocampoidea	I. Lasiocampidae	10
F	Bombycoidea	I. Eupterotidae II. Brahmaeidae III.Saturniidae IV.Bombycidae V. Sphingidae	5 2 20 5 77
G	Geometroidea	I. Uraniidae II. Geometridae	14 113
н	Noctuoidea	I. Notodontidae II. Erebidae III.Euteliidae IV.Nolidae V. Noctuidae	22 128 4 13 48
1	Tortricoidea	I. Tortricidae	2
J	Tineoidea	I. Tineidae II. Hepialidae	1 1
к	Thyridoidea	I. Thyrididae	10
L	Calliduloidea	I. Callidulidae II. Ethimiidae III.Yponomeutidae IV.Dorepaniidae V. Lecithoceridae	4 1 1 1
	623		

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