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## Butterflies (Lepidoptera) diversity in Maldevta region, Dehradun of Uttarakhand

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### Abstract

The study was carried out in spring seasons of 2017 and 2018 in the forest area of Maldevta region, district Dehradun of Uttarakhand. The distinct butterflies were collected/recorded from sites and preserved according to their body size. Total 26 species of butterflies were recorded in Maldevta Region, out of which family Nymphalidae with maximum number of species (14 spp.), Pieridae (7 spp.), Papilionidae (2 spp.), Lycaenidae (2 spp.) and Hesperidae (1 sp.). Analysis of relative abundance revealed that of these 26 species of butterflies, 20 species (77%) were found common, 4 species (15%) less common and 2 species (8%) uncommon.

**Keywords:** Butterflies, lepidoptera, diversity, family, maldevta

### Introduction

The insects are a constituent of the largest phylum belong to kingdom Animalia. The crustacea (Lobsters, crabs and wood lice), arachnids (Spiders, scorpions, mites and harvestmen) and centipede (millipedes and centipedes) also comprise in this group. They form the largest and most abundantly diverse group in the animal kingdom. All insects have one pair of antennae, 2 pair of wings, 3 pair of legs and have a segmented body, divided into 3 regions head, thorax and abdomen. The insects are sub-divided into different orders on the basis of their wings, antennae and legs modifications. The order Lepidoptera has third largest number of species after Coleoptera and Diptera. Lepidoptera species are differentiated into butterflies and moths. The division of these two is made on the basis of the shape of the antennae. The Lepidoptera with threadlike antennae ending in a small knot are brightly colored. The arthropod community mostly survives in forest area, trees and weeds on soil surface. Temporary refuge is also provided by forest area to those who are temporary inhabitants and visit forest ecosystem for various purposes. The Indian Himalayan Region is known for vast variety of its biodiversity and to ensure its proper conservation, protected areas in the form of *Biosphere Reserves*, National Parks, Sanctuaries and Conservation Reserves have been established (Rodger and Panwar, 1988) <sup>[20]</sup>. In recent decades, the Uttarakhand state has witnessed a superfluity of natural disasters provoked by man-made factors which have negative effect on the ecology of the region at a large scale (Tayal *et al.* 2015) <sup>[24]</sup>. From different *in-situ* conservation sites of the Indian Himalayan Region, different authors made different studies for better understanding of the critical evaluation of the species richness of the area (Arora 1995; Uniyal and Mathur 1998; Joshi *et al.*, 2008; Bhardwaj and Uniyal, 2013; Pandey *et al.*, 2013; Tewari and Rawat, 2013; Arya and Dayakrishna, 2017) <sup>[3-7, 27, 16, 8, 19,7, 1]</sup>. Singh and Bhandari (2003) <sup>[24]</sup> recorded 183 species of Butterflies from lower western Himalayan forests of Doon Valley. As such these expansions of the diversity studies are more important for keeping track on the species availability on a specific place. As butterfly ads up to the scenic beauty, also they are the best good indicators which show the unwanted activities and disruption in the environment (Kocher and Williams, 2000) <sup>[18]</sup>. As such the nature is dealing with the degradation of natural resources and pollution of environment is a major threat of range contraction biodiversity at both the latitudinal and altitudinal gradients.

Global climate change is also responsible for depleting the precious biodiversity of different insects.

Thus steps of inventorying biodiversity patterns along such gradients have strong conservation implications (Acharya and Vijayan, 2015) <sup>[1]</sup>.

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The comprehension of literature in India indicated that there is shortage of information on abundance of arthropods diversity in forest areas (Haribal, 1992) [14]. The aim of present study to know the reasons why the explicate of the occurrence of butterfly in nature is decreasing.

### Materials and Methods

Sweep nets, entomological pins, transparent envelope, collection boxes, naphthalene bolls, benzene and phenol, Insect setting boxes.

Butterflies in Maldevta have a wide range of variations in species. Present study was implemented to understand the diversity and availability of butterfly species from Maldevta region of Dehradun District. The samplings for collection of butterflies species were started from February 2017 to February 2019.

Total 26 species of different butterflies showing variations were collected/recorded between, February 2017 to February 2019. The study period was divided into four seasons of observations [pre- spring (February), spring (March end), pre-

monsoon (June end), monsoon (July and September). Field observations were carried out early mornings from sunrise to 10:30 and in the evenings from 16:00 to sunset, except for extreme weather conditions like heavy rains, chilling and high winds. Occasional surveys were also conducted to explore species diversity. The Pollard walk method was followed to record the butterflies twice a month. A total of six separations were evenly laid throughout the study area. Each intersect of field had a fixed route of 200 m in length and butterflies were recorded from both the sides up to the distance of 5 m to ensure consistency in the observation field. These separations were walked at a stable pace with short halts during the walk to document the butterflies for proper identification. Visual observations in the field were sustained by Olympus 8×42 binoculars and Nikon B 700 Point and Shoot Camera. Butterflies were photo-documented and identified with the help of previous scientific literature (; Evans, 1932 de Niceville 1890; Wynter-Blyth, 1957; Kunte, 2000; Kehimkar, 2008) [11, 12, 29, 18, 14].



Fig 1: Map showing location of Maldevta

### Physiography

Maldevta (Dehradun), Figure 1; is a great place to enjoy nature's scenic beauty; it is quite away from civilization. The study area has latitude: 30.32° and longitude: 78.10° with an elevation of 855 meters above sea level. The average annual temperature remains near 21.50 °C. The butterflies were collected/observed 6.00 to 9.00 and from 17.00 to 19.30 during spring season from different sites of forest area of Maldevta.

Butterflies were collected with the help of a specified butterfly net. After netting, the voucher specimens (non-schedule species only) were collected and preserved for identification. In the laboratory, butterflies samples were relaxed in the relaxing chamber for two to three days. After relaxing, the specimens were stretched on the stretching board with the help of entomological pins and paper strips. The wings were spread using paper strips. Antennae and abdomen are kept in proper position. The set and pinned specimens were allowed to dry in drying chamber for 2-3 days depending upon the climatic conditions. The dried specimens are transferred to air tight insect boxes which are already treated with benzene and containing powdered naphthalene. A label written legibly with name of locality, date, latitude and longitude is pinned below the specimen.

Later, these were deposited as the National Zoological

Collections (NZC) at Entomology Museum, Zoological Survey of India, Dehradun, Uttarakhand. For the identification of butterflies, were followed.

The abundance status provided here is based on an arbitrary frequency scale and was quantified as follows: Common (encountered 6-10 times), Less Common (3-5 times), and Uncommon (only once or twice). The entire habitat where the collections and observations were made was classified in three following broad categories, viz., Grassy, Scrubby and Riverine

Butterflies diversity was worked out using various indices of diversity.

i) Index of Species Diversity (Shannon and Weaver 1963)

$$\text{Shannon Weaver's index } (H') = -\sum p_i \log_e p_i$$

Where,  $p_i$  = importance probability of each species ( $n_i/N$ )

$n_i$  = importance value for each species

$N$  = total of importance value

### Results and Discussion

During the study, total 26 species of butterflies referable to five families viz., Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae were recorded/collected from Maldevta region of state Uttarakhand (Table 1). The family

Nymphalidae was with maximum number of species i.e., 14 (54%) followed by Pieridae, 7 spp. (27%), Papilionidae, 2 spp. (7%), Lycaenidae, 2 spp. (8%) and Hesperidae, 1 sp. (4%). The family Papilionidae was represented by one subfamily, Papilioninae (2 spp.); family Pieridae by two subfamilies, Pierinae (2 spp.) and Coliadinae (5 spp.); family Nymphalidae by five subfamilies, Nymphalinae (4 spp.); Biblidinae (1 sp.), Limenitidinae (1 sp.), Satyrinae (5 spp.) and Danaeinae (3 spp.); family Lycaenidae by two subfamilies, Lycaeninae (1 sp.) and Polyommatae (1 sp.); family Hesperidae by one subfamily, Pyrginae (1 sp.)

Analysis of relative abundance revealed that of these 26 species of butterflies, 21 species (81%) were found common, 3 species (11%) less common and 2 species (8%) uncommon. Observations on their occurrence in different habitats unveiled the fact that 10 species preferred scrubby habitat, 6 species grassy habitat, 5 species grassy and scrubby habitat and 5 species preferred scrubby and riverine habitat (Table-1). It was observed that average population size @ Evenness of the species among each other is 0.975. The Shannon-Weaver Diversity Index is having the value of 3.2. The total 940 individuals spotted at the total 40 study visits. Average population size of each species is about 36.20 individuals. The butterflies species observed during the survey, their individual count and abundance index (AI) is as given in the Table 1. *Papilio polytes romulus* Cramer, *Graphium doson* (C &

R Felder), *Pieris brassicae napalensis* Linnaeus, *Pieris canidia indica* Evans, *Eurema brigitta rubella* (Wallace), *Eurema hecabe hecabe* (Linnaeus), *Eurema laeta laeta* (Boisduval), *Catopsilia pomona* (Fabricius), *Colias fieldi* Menetries, *Vanessa cardui* (Linnaeus), *Vanessa indica* (Herbst), *Junonia lemonias persicaria* (Fruhstorfer), *Junonia iphita* (Cramer), *Ariadne merione* (Cramer), *Neptis hylas kamarupa* Moore, *Mycalis mineus mineus* (Linnaeus), *Ypthima asterope* (Klung), *Ypthima baldus* (Fabricius), *Elymnias hypermnestra undularis* (Drury), *Callerebia hybrida* Butler, *Euplea core core* (Cramer), *Parantica aglea melanoides* Moore, *Danaus chrysippus chrysippus* (Linnaeus), *Heliophorus sena* (Kollar), *Pseudozizeeria maha* (Kollar) and *Sarangesa dasahara* (Moore) @ 2.13, 1.70 4.26, 5.96, 5.53, 6.38, 5.11, 5.74, 3.83, 4.04, 2.55, 2.77, 2.98, 2.34, 3.19, 2.55, 6.60, 3.62, 2.77, 2.98, 2.87, 3.51, 2.13, 6.17 and 1.91, respectively.

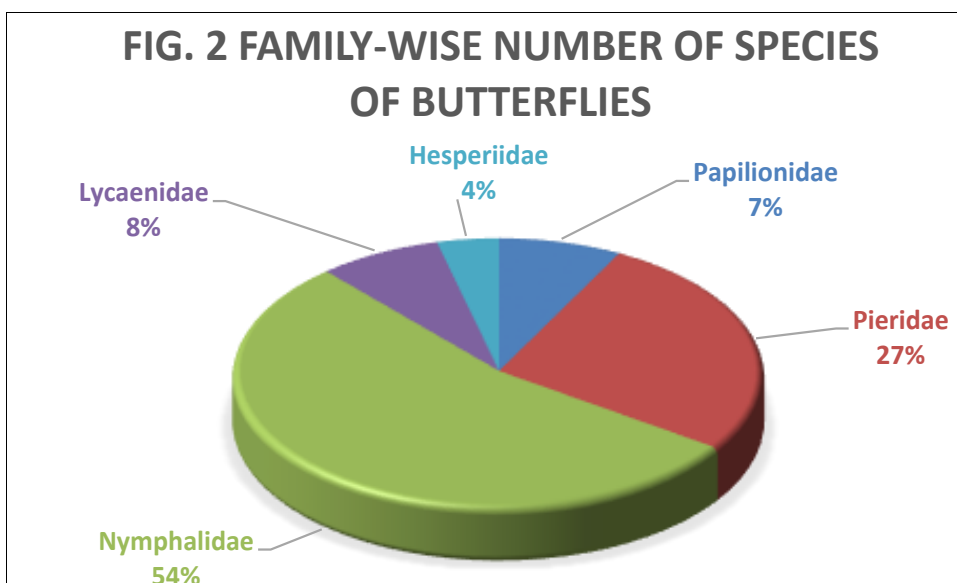
The family Nymphalidae has the highest number of species (14 spp.), in the study area with the highest abundance (504 individuals). The family Pieridae (7 spp.) was the second most species rich family represented by ...252... Individuals, followed by Papilionidae (...74.... individuals) and Lycaenidae (...74....individuals) with 2 spp each, and Hesperidae (...36.....individuals) with one species. The Maximum (62) individuals were recorded for *Ypthima baldus* (Fabricius), followed by *Ypthima asterope* (Klung) and *Eurema hecabe hecabe* (Linnaeus) with 60 individuals of each).

Table 1: Systematic list of Butterflies

Serial no.	Species and their respective orders	Common name	Habitat	Abundance Index (AI)	Status
<b>Family Papilionidae</b>					
<b>Subfamily Papilioninae</b>					
1	<i>Papilio polytes romulus</i> Cramer	Common Mormon	Scrubby	2.13	C
2	<i>Graphium doson</i> (C & R Felder)	Common Jay	Scrubby & Riverine	1.70	C
<b>Family Pieridae</b>					
<b>Subfamily Pierinae</b>					
3	<i>Pieris brassicae napalensis</i> Linnaeus	Large Cabbage White	Scrubby	4.26	C
4	<i>Pieris canidia indica</i> Evans	Indian Cabbage White	Scrubby	5.96	C
<b>Subfamily Coliadinae</b>					
5	<i>Eurema brigitta rubella</i> (Wallace)	Small Grass Yellow	Scrubby	5.53	C
6	<i>Eurema hecabe hecabe</i> (Linnaeus)	Common Grass Yellow	Scrubby	6.38	C
7	<i>Eurema laeta laeta</i> (Boisduval)	Spotless Grass Yellow	Scrubby	5.11	C
8	<i>Catopsilia pomona</i> (Fabricius)	Common Emigrant	Scrubby	5.74	C
9	<i>Colias fieldi</i> Menetries	Dark Clouded Yellow	Scrubby	3.83	L C
<b>Family Nymphalidae</b>					
<b>Subfamily Nymphalinae</b>					
10	<i>Vanessa cardui</i> (Linnaeus)	Painted Lady	Scrubby and Grassy	4.04	C
11	<i>Vanessa indica</i> (Herbst)	Indian Red Admiral	Scrubby and Grassy	2.55	C
12	<i>Junonia lemonias persicaria</i> (Fruhstorfer)	Lemon Pansy	Scrubby and Grassy	2.77	C
13	<i>Junonia iphita</i> (Cramer)	Chocolate Pansy	Scrubby and Grassy	2.98	C
<b>Subfamily Biblidinae</b>					
14	<i>Ariadne merione</i> (Cramer)	Common Csator	Scrubby	2.34	L C
<b>Subfamily Limenitidinae</b>					
15	<i>Neptis hylas kamarupa</i> Moore	Common Sailor	Scrubby	3.19	C
<b>Subfamily Satyrinae</b>					
16	<i>Mycalis mineus mineus</i> (Linnaeus)	Dark-brand Bushbrown	Grassy	2.55	C
17	<i>Ypthima asterope</i> (Klung)	Common Threering	Grassy	6.38	C
18	<i>Ypthima baldus</i> (Fabricius)	Common Fivering	Grassy	6.60	C
19	<i>Elymnias hypermnestra undularis</i> (Drury)	Common Palmfly	Scrubby and Riverine	3.62	C
20	<i>Callerebia hybrida</i> Butler	Hybrid Argus	Scrubby and Grassy	2.77	L C
<b>Subfamily Danaeinae</b>					
21	<i>Euplea core core</i> (Cramer)	Common Crow	Scrubby and Riverine	2.98	C
22	<i>Parantica aglea melanoides</i> Moore	Glassy tiger	Scrubby and Riverine	2.87	C
23	<i>Danaus chrysippus chrysippus</i> (Linnaeus)	Plain Tiger	Scrubby and Riverine	3.51	C
<b>Family Lycaenidae</b>					
<b>Subfamily Lycaeninae</b>					

24	<i>Heliophorus sena</i> (Kollar)	Sorrel Sapphire	Grassy	2.13	U C
<b>Subfamily Polyommatainae</b>					
25	<i>Pseudozizeeria maha</i> (Kollar)	Pale Grass Blue	Grassy	6.17	C
<b>Family Hesperidae, Subfamily Pyrginae</b>					
26	<i>Sarangesa dasahara</i> (Moore)	Common Small Flat	Grassy	1.91	U C

C = Common, LC = Less common, U C = Uncommon



Photographs of different butterflies species

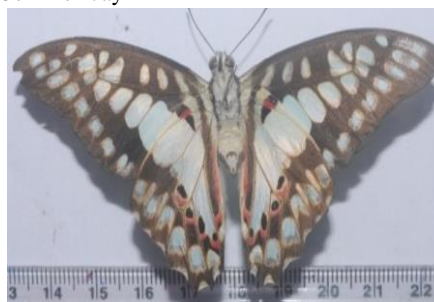
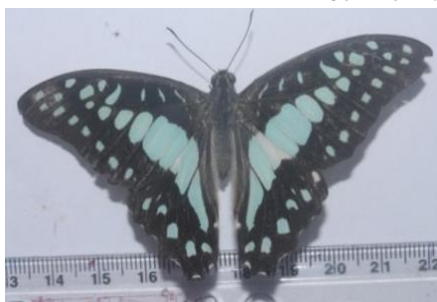
**Upper-side**

**Under-side**

Scientific name: *Papilio polytes romulus* Cramer  
Common name: Common Mormon



Scientific name: *Graphium doson* (C & R Felder)  
Common name: Common Jay



Scientific name: *Pieris brassicae napalensis* Linnaeus  
Common name: Large Cabbage White



Scientific name: *Pieris canidia indica* Evans  
Common name: Indian Cabbage White



Scientific name: *Eurema brigitta rubella* (Wallace)  
Common name: Small Grass Yellow



Scientific name: *Eurema hecabe hecabe* (Linnaeus)  
Common name: Common Grass Yellow



Scientific name: *Eurema laeta laeta* (Boisduval)  
Common name: Spotless Grass Yellow



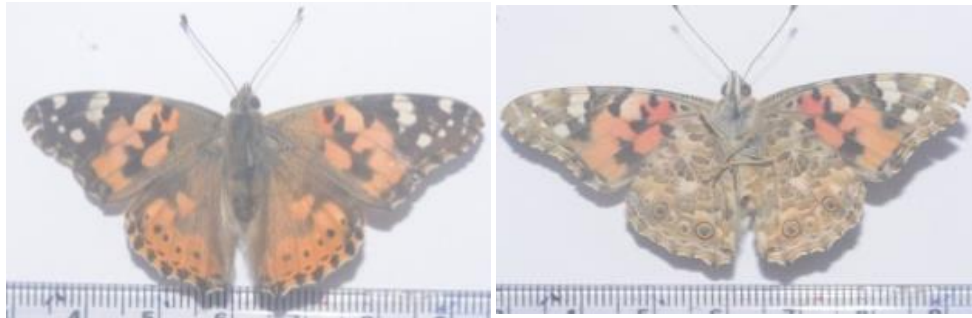
Scientific name: *Catopsilia pomona* (Fabricius)  
Common name: Common Emigrant



Scientific name: *Colias fieldi* Menetries  
Common name: Dark Clouded Yellow



Scientific name: *Vanessa cardui* (Linnaeus)  
Common name: Painted Lady



Scientific name: *Vanessa indica* (Herbst)  
Common name: Indian Red Admiral



Scientific name: *Junonia lemonias persicaria* (Fruhstorfer)  
Common name: Lemon Pansy



Scientific name: *Junonia iphita* (Cramer)  
Common name: Chocolate Pansy



Scientific name: *Ariadne merione* (Cramer)  
Common name: Common Csator



Scientific name: *Neptis hylas kamarupa* Moore  
Common name: Common Sailor



Scientific name: *Mycalesis mineus mineus* (Linnaeus)  
Common name: Dark-band Bushbrown



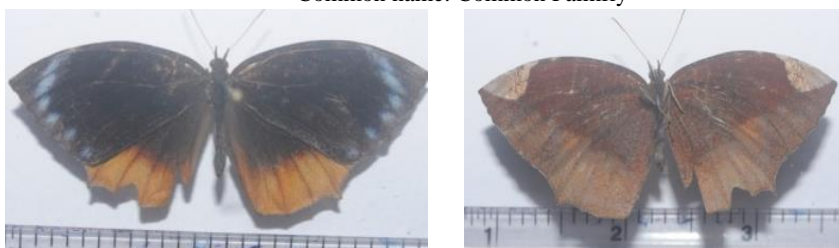
Scientific name: *Ypthima asterope* (Klung)  
Common name: Common Threering



Scientific name: *Ypthima baldus* (Fabricius)  
Common name: Common Fivering



Scientific name: *Elymnias hypermnestra undularis* (Drury)  
Common name: Common Palmfly



Scientific name: *Callerebia hybrida* Butler  
Common name: Hybrid Argus



Scientific name: *Euplea core core* (Cramer)  
Common name: Common Indian Crow



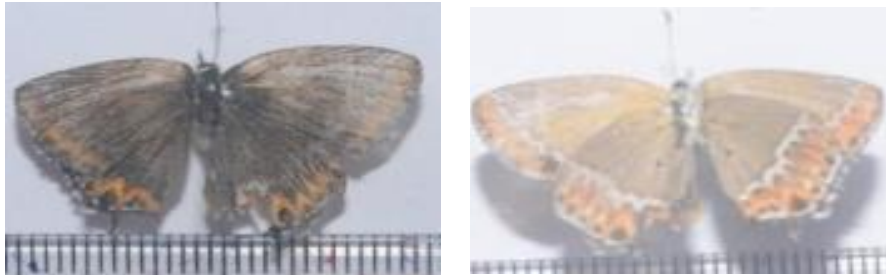
Scientific name: *Parantica aglea melanoides* Moore  
Common name: Glassy tiger



Scientific name: *Danaus chrysippus chrysippus* (Linnaeus)  
Common name: Plain Tiger



Scientific name: *Heliophorus sena* (Kollar)  
Common name: Sorrel Sapphire



Scientific name: *Pseudozizeeria maha* (Kollar)  
Common name: Pale Grass Blue



Scientific name: *Sarangesa dasahara* (Moore)  
Common name: Common Small Flat





### Conclusion

Butterflies are sensitive to alteration in the landscape, loss of vegetation structure and habitat degradation. Urbanization imperils butterfly diversity with the deterioration of environmental conditions. Butterflies, an ecological indicator serves many ecosystem services, therefore, attention should be given to conserving and protecting the butterfly diversity especially, in urban habitats. The present study can establish important information in the form of a scientific reference for assessing the environmental changes in the locality, in upcoming times. Long-term ecological studies of the butterfly diversity with reference to vegetation cover in the habitat should be carried out as the list is not final and exhaustive. This study can inculcate interest among different citizens and can promote conservation efforts by establishing butterfly-friendly plantations with the help of the local authorities.

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