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Study on Species Distribution of Pierid and Lycaenid Butterflies from Three Different Elevational Gradients of Kumaun Region of Uattarakhand, India

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ABSTRACT: This study was done to identify the various species of butterflies of family Pieridae and Lycaenidae in three different elevations of Kumaon region. A total number of 208 individuals comprising 6 species of butterflies belonging to 2 families (Pieridae and Lycaenidae) were captured during the surveys carried out in the months of May-June in 2013 and 2014 at 3 different sites situated at three different elevation gradients i.e. Dwarahat, Pandav kholi and Bageshwar. Family Pieridae was found to be distributed in approximately all conditions, whereas family Lycaenidae was abundant in Dwarahat, absolutely absent in Pandav kholi and was less distributed in Bageshwar.

Key Words: Taxonomy, butterflies, Lepidoptera, Kumaun

INTRODUCTION

Of the estimated 1.4 million species of life forms on the earth planet, more than 53% are insects. Coleoptera, Lepidoptera and Diptera are the most speciose insect Orders while the recent estimates suggest that the Order Lepidoptera may have more species than earlier believed and is also among the most species-rich Orders (Powell, 2009). It is one of the most widespread and widely recognized insect orders in the world. Linnaeus (1758) recognized three divisions of the Lepidoptera, i.e., *Papilio*, *Sphinx* and *Phalaena*, with seven subgroups in *Phalaena*. These persist today as 46 super families of Lepidoptera. Recently, an estimated 174,250 species are recorded under 46 super families (Mallet, 2007), which are further divided in 126 families. Among 174,250 described species of Lepidopteran in 2007, butterflies and skippers are estimated to comprise approximately 17,950 (Capinera, 2008).

Butterflies are commonly referred to as "insects of the sun" with their eye catching colour and delicate charisma. They have been admired for centuries for their physical beauty and behavioral display. Among the insects, butterflies occupy a vital position in the ecosystem and their occurrence and diversity are considered as good indicators of the health of any given terrestrial biotope. Butterflies are also good indicators of environmental changes as they are sensitive to habitat degradation and climate change. Some workers have subsequently worked on the species composition, richness, diversity and distribution of butterflies in different parts of the world.

Butterflies and moths offer good opportunities for studies on population and community ecology (Pollard 1991). Many species are strictly seasonal, preferring only a particular set of habitats. In spite of this, butterflies have been generally neglected by community ecologists and there are very few studies available on their community structures, population dynamics and the eco climatic factors which affect them. Being good indicators of climatic conditions as well as seasonal and ecological changes, they can serve in formulating strategies for conservation. However, they have largely been ignored by conservation biologists and policy-makers as well. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programmes (Gadgil 1996). The present study was carried out in order to assess the species richness and diversity of butterflies in and around the three different elevations of Kumaon region.

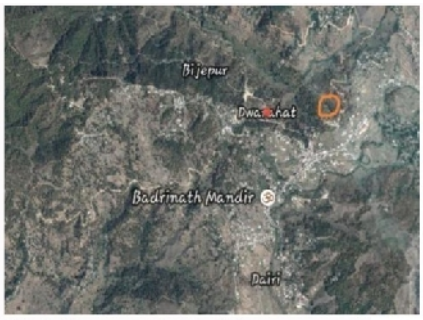
MATERIAL AND METHODS

A. Study sites

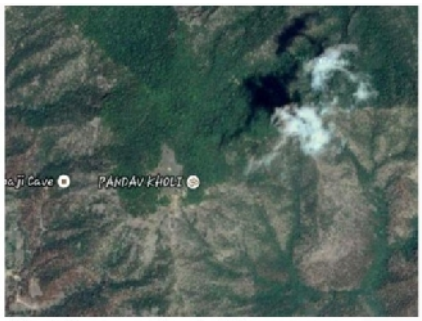
Progressing from east to west, the Himalayan range west of Nepal is divided into the Kumaon Himalaya with Nainital as the principal town; the Garhwal Himalaya, with Mussoorie and Dehradun as the principal towns; Himachal Pradesh with Shimla and Kulu as the principal towns; Kashmir, with Jammu the principal town in the outer ranges, and the Pakistan Himalaya, with the hill station of Musoorree. This area is known as the Western Himalaya. Butterflies of different species were caught using the insect collecting net during the months May to June in two years 2013 and 2014 from 3 different elevations viz. Dwarahat, Pandav kholi and Bageshwar of Kumaon region.

Site-1 (Bhenar, Dwarahat): Dwarahat is a popular town of district Almora. It is situated at an altitude of 1510m (4950ft.) above mean sea level and lies between 29.78^{o}N latitude and 79.43^{o}E longitude. Bhenar the collection site in Dwarahat is situated just 5km away from main town and is densely packed with oak (*Quercus robur*) trees, Kafal (*Myrica esculenta*) and Pine (*Pinus sabiniana*).

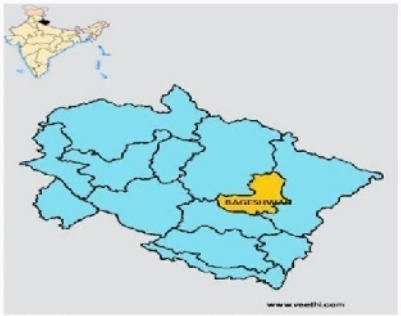
Site-2 (Pandav kholi): Second collection site Pandav kholi is situated at an altitude of 2920m above mean sea level and lies between 29.9230^{o}N latitude and 79.4492^{o}E longitude. Collection was mainly done in the dense forest of Oak tree.



Site-1, Source : Google Map



Site-2 Source : Google Map



Site-3 Source : www.veethl.com

Site-3 (Bageshwar): Bageshwar town is situated at the basin of river Saryu and Gomati at an altitude of 1004m (3294ft.) above mean sea level and lies between 29.85^{o}N latitude and 79.77^{o}E longitude. The vegetation includes Pine dominated forest with other types of shrubs and herbs. Study site receives a high level of disturbance due to the population.

Study on butterfly biodiversity collected from three different study sites

Each site was sampled from May to June in 2013 and at same time in 2014 using an insect net. Butterflies were put in a killing jar charged with ethyl acetate. Then they were placed on a spreading board for setting the specimen. When their bodies dried, they were arranged in the wooden collection boxes, in different rows with the naphthalene balls for protection and long term preservation. Specimens were identified with help of the Smetacek reference collection in Bhimtal, literature available (Sabir *et al.,* 2000; Wynter-Blyth MA. 1957), identification keys (Abbas *et al.,* 2002; Munir *et al.,* 2007). All specimens were then properly labeled and photographed. Major help in identification of specimen was taken from Mr. Peter Smetacek, Butterfly Research Centre, Bhimtal, Nainital.

RESULTS AND DISCUSSION

This study was done to identify the various species of butterflies of family Pieridae and Lycaenidae in three different elevations of Kumaon region. The result of present investigation presented and discussed as follows.

Study on butterfly biodiversity of family Pieridae and Lycaenidae collected from three different study sites:

A total of 208 individuals of 6 species of butterflies belonging to 2 families namely Pieridae (Plate A) and Lycaenidae (Plate B) were captured during the surveys in two years 2013 and 2014 in the months of May and June, carried out in 3 different sites situated at three different elevations i.e. Dwarahat, Pandav kholi and Bageshwar.

The Perusal of Table 1 depicted that out of 6 species, 4 species viz. *Pieris brassicae*, *P. caniaidia*, *Gonepteryx rhamni* and *Colias erate* belonging to family Pieridae and 1 species viz. *Lampides sp.* belonging to Lycaenidae were collected from first study site (Dwarahat). Whereas, 5 species of family Pieridae viz. *Pieris brassicae*, *P. caniaidia*, *Gonepteryx rhamni*,*Colias erate* and *Colias fieldii* were collected from second study site (Pandav kholi).

One species of Pieridae *Colias fieldii* was restricted to this site only. Arya *et al*. (2014) have also reported 8 species of Pieridae in Nainital from which *Colias erate, Gonepteryx rhamini, Pieris brassicae and P. canidia* were recorded from the present study sites also.

Table 1: Number of individuals and species of butterflies captured from three study sites during May-June 2013-2014.

Total number of individuals collected in 2013-2014								
S. No.	**Species Composition**	**Site-1**		**Site -2**		**Site-3**		**Total specimens collected**
Family: Pieridae								
		2013	**2014**	**2013**	**2014**	**2013**	**2014**	
1.	*Pieris brassicae*	10	14	8	10	3	7	42
2.	*P. caniaidia*	4	9	3	6	1	3	26
3.	*Gonepteryx rhamni*	12	15	11	12	5	8	63
4.	*Colias fieldii*	-	-	12	16	-	-	28
5.	*C. erate*	4	10	4	7	2	5	32
Family: Lycaenidae								
6.	*Lampides sp.*	5	8	-	-	2	2	17
	Total	**35**	**56**	**38**	**51**	**13**	**25**	**208**

Man is continuously destroying the natural habitat and making this mother earth into concrete jungles, this so called development of mankind has also effected the distribution and richness of butterflies in Bageshwar town area. Out of 5 species found in Bageshwar, 4 species viz. *Pieris brassicae*, *P. caniaidia*, *Gonepteryx rhamni* and *Colias erate* belonging to family Pieridae and 1 species viz. *Lampides sp.* belonging to Lycaenidae.

Family Pieridae was found to be distributed in approximately all environmental conditions. This family was collected from all the three study sites with a higher population in Dwarahat and Pandav kholi, whereas with a lower concentration in Bageshwar, where human population is high. One specific species of family Pieridae- *Colias fieldii* was only found in a higher humidity and lower temperature region of Pandav kholi. This concluded that this species is highly adapted for lower temperature. Smetacek (2011) have studied on the effects of lower atmospheric humidity and forest fire on the distribution of butterflies in Maheshkhan Reserve Forest, Nainital, Uttarakhand. The study site was situated at an elevation of 2600m above the mean sea level. He found in his study that *Colias fieldii* of family Pieridae was present in good numbers at a higher elevation whereas, Lycaenids were less abundant in higher elevation. The present study site Pandav kholi is situated at 2920m above the mean sea level and *Colias fieldii* was present in this study site also.

Singh (2009) recorded 147 species of butterflies from Kedarnath musk deer Reserve, Garhwal at altitudinal range of 1500-3400m above mean sea level. According to this study family Pieridae was distributed at a range of 1500-3400m but *Colias fieldii* was restricted to an elevation of 2400-3400m. He also found that Lycaenidae were present in a range of 1500-2200m. The present study showed some similar results as 4 species of family Pieridae were distributed in all three study sites and *Colias fieldii* was found only at Pandav kholi which is situated at 2910m above mean sea level and no Lycaenids were found at this elevation.

CONCLUSION

In present study, family Lycaenidae was found less in numbers in a higher elevation region of collection site Pandav Kholi, whereas family Pieridae were found to be distributed in approximately all regions. Distribution of butterfly species was found low in a Bageshwar where human population is high. One species of family Pieridae, *Colias fieldii* was found only in higher elevations. Due to high anthropogenic impact in Bageshwar, there is a low population of butterflies were recorded, which is a matter of concern.

Since there is a huge destruction of butterfly natural habitat due to excessive growth in human population, some decision has to be taken for protection of this beautiful and ecologically important creature in this area.

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