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Butterfly Diversity in Agroecosystem of Low Hills in District Sirmaur of Himachal Pradesh

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ABSTRACT: The present studies assess the butterfly species diversity in agroecosystem of low hills of district Sirmaur (Himachal Pradesh) based on surveys carried out from 2022 to 2024. The study area lies in Shiwalik hills, covering five sites with altitudinal range from 384m to 964m. A total of 40 butterfly species belonging 30 genera and to families of order Lepidoptera were recorded during the study period. The family Nymphalidae, was the most dominant (23 species), followed by Pieridae (10 species), Lycaenidae (5 species), Papilionidae (1 species) and Hesperiidae (1 species). *Pieris canidia* (Sparrman, 1768) has been observed to be the most dominant species of Butterfly in terms of number of individuals. Other dominant species observed in the agroecosystem of the low hills in Sirmaur district are *Pseudozizeeria maha* (Kollar, 1848), *Eurema hecabe* (Linnaeus, 1758), *Pontia daplidice* (Linnaeus, 1758) and *Heliophorus sena* (Kollar, 1848). It has been observed that the agriculture fields which were flanked by forests or dense wild vegetation have higher diversity than the others.

Keywords : Butterfly diversity, agroecosystem, low hills, Sirmaur.

INTRODUCTION

The agroecosystems harbours unique biodiversity, the conservation of which is a global challenge due to monoculture, excessive use of pesticides, clearing of forests and conversion into agroecosystem. Among others, butterflies are most vulnerable taxa because of their sensitivity to habitat changes and climate changes. Thus, Butterflies play a crucial role in agroecosystems as pollinators and indicators of environmental health. Butterflies are sensitive towards changes in the environment. They are often used as bioindicators on the status and health of the environment (Chung *et al.*, 2018). The district Sirmaur of mountainous state of Himachal Pradesh is situated between 30º22′30″ to 31º01′20″ north latitude and 77º01′12″ to 77º49′40″ east longitude and is located in its southern part. The total area of the district is 2,825 sq. km. which cover only 5.07 per cent area of the Himachal Pradesh. Most part of the district Sirmaur is located in outer Himalayas which is also called as Shivalik range. Sirmaur is mainly an agricultural district where 90% of the population is dependent on agriculture. Maize and wheat as the major cereal crops. Tomato, ginger, Garlic and capsicum in green houses are the major commercial crops in the district. About 83.28% of land holdings are with small and marginal farmers and the average size of the holdings is less than one Ha (0.99 ha). The butterflies of Agroecosystem of Himachal Pradesh have been worked out by very few authors. Several studies have been undertaken to study the butterfly diversity in general from Himachal Pradesh but not much work has been done on Agro-ecosystems in particular. Some workers have studied distribution of butterflies in various habitats which included agricultural fields also. The studies include: Kumar and Mattu (2014) reported 40 butterfly species from various areas including agricultural areas of Balh Valley, Mandi, H.P; Sharma & Kumar (2015) reported 49 species of butterflies from Renuka lake and its surrounding areas including agricultural fields; Kumar *et al.* (2016) reported 29 species of butterflies from Chanshal valley, Shimla, H.P. which includes collection from agricultural fields along with other habitats; Kaundil and Mattu (2017) published checklist of 35 species of Mandi Hills; Kumar *et. al.* (2023) enlisted 77 butterfly species from agroecosystem of Himachal Pradesh Agricultural University, Palampur, H.P. In present studies, the butterfly diversity of agroecosystem in low hills of district Simour has been assessed for the first time.

MATERIAL AND METHODS

Extensive surveys have been carried out from 2022 to 2024 in the agroecosystem of low hills of district Sirmaur of Himachal Pradesh to assess the butterfly diversity by selected 05 sites ranging between an altitude of 348 m to 964 m asl. The details of the sites, their location and the agriculture crops present in them are given below:

Table 1.

Sr. No.	Name of Site	Latitude	Longitude	Altitude	Crops
1.	Daduwala	30.5258	77.2829	348 m	Mostly agricultural fields of cash crops are near the water resources either near khad or water
2.	Jarag	30.6427	77.457	864 m	Agriculture fields of turmeric, lemon orchards
3.	Kodewala	30.4786	77.4025	398 m	Agriculture fields of wheat, sides full of wild vegetation with water stream flowing from them
4.	Peripul	30.89283	77.23531	964 m	Beans, Pumpkin, Cucumber, Tomato, Grapes, Maize and Capsicum
5.	Sheetla	30.605	77.3946	852 m	Agriculture fields of wheat, with sides dry wild vegetation

Identification of adults was done using identification keys given by de Niceville (1886, 1890); Bingham (1905, 1907); Evans (1932); Talbot (1939, 1947); Wynter-Blyth (1957); Cantlie (1962); Haribla (1998). The nomenclature is followed from Varshney (1993, 1994, 1997).

RESULTS AND DISCUSSION

In the present studies, 40 butterfly species belonging to 30 genera and 5 families of order Lepidoptera were recorded from agroecosystem of low hills of district Sirmaur of Himachal Pradesh. The family Nymphalidae was the most dominant (23 species), followed by Pieridae (10 species), Lycaenidae (5 species), Papilionidae (1 species) and Hesperiidae (1 species). *Pieris canidia* (Sparrman, 1768) (128 inviduals)has been observed to be the most dominant species of Butterfly in terms of number of individuals. Other dominant species observed in the agroecosystem of the low hills in Sirmaur district are *Pseudozizeeria maha* (Kollar, 1848) (73 indviduals), *Eurema hecabe* (Linnaeus, 1758) (64 individulas), *Pontia daplidice* (Linnaeus, 1758) (27 indviduals) and *Heliophorus sena* (Kollar,1848) (21 individuals). Site-1 at Daduwala is represented by 11 species and 11 genera, site 2 Jarag 13 species and 10 genera, site 3 Kodewala by 12 species and 12 genera, site 04 Peripul by 12 species and 11 genera, site 05 Sheetla by 11 species and 09 genera as given in Table 2 below.

Table 2.

Sr. No.	Family	Genus/species	Common name	site 1 Daduwala (348m)	site 2 Jarag (864 m)	site 3 Kodewala (362m)	site 4 Peripul (964m)	site 5 Sheetla (852m)
1.	Papilionidae	*Papilio polytes* (Linnaeus, 1758)	Common Mormon	+	–	+	–	–
2.	Nymphalidae	*Acraea issoria* (Hubner, 1818)	Himalayan Yellow Coster	–	–	–	+	–
3.	Nymphalidae	*Argyreus hyperbius* Linnaeus,1763	Indian Fritillary	–	+	–	–	–
4.	Nymphalidae	*Ariadne merione* (Cramer, 1777)	Common Castor butterfly	+	–	+	–	–
5.	Nymphalidae	*Athyma opalina* (Kollar, 1844)	Himalayan Hill Sergeant	–	+	–	–	–
6.	Nymphalidae	*Symphedra nais* (Forster, 1771)	The Baronet	–	–	+	–	–
7.	Nymphalidae	*Vanessa cardui* (Linnaeus, 1758)	Painted Lady	–	–	–	+	–
8.	Nymphalidae	*Vanessa cashmirensis* (Kollar, 1844)	Indian Tortoiseshell	–	+	–	–	+
9.	Nymphalidae	*Ypthima inica* (Hewitson, 1865)	Lesser Three-ring	–	+	–	–	–
10.	Nymphalidae	*Ypthima sakra* (Moore, 1857)	Himalayan five-ring	+	+	–	–	–
11.	Nymphalidae	*Ypthima nareda* (Kollar, 1844)	Large Three-Ring	–	–	–	+	–
12.	Nymphalidae	*Mycalasis mineus* (Linnaeus, 1767)	Dark-branded bushbrown	–	–	–	–	+
13.	Nymphalidae	*Neptis hylas* (Linnaeus, 1758)	Common Sailer	–	+	–	–	+
14.	Nymphalidae	*Neptis sankara* (Kollar, 1844)	Broad-banded sailer	–	+	–	–	+
15.	Nymphalidae	*Danaus chrysippus* (Linnaeus, 1758)	Plain Tiger	+	–	–	–	–
16.	Nymphalidae	*Elymnias hypermnestra* (Linnaeus, 1763)	Common Palmfly	–	–	+	–	–
17.	Nymphalidae	*Euploea mulciber* (Cramer, 1777)	Striped Blue Crow	+	–	–	–	–

18.	Nymphalidae	*Junonia almana* (Linnaeus, 1758)	Peacock Pansy	–	–	+	–	–
19.	Nymphalidae	*Junonia iphita* (Cramer, 1779)	Chocolate Pansy	–	+	–	+	+
20.	Nymphalidae	*Junonia lemonias* (Linnaeus, 1758)	Lemon Pansy	–	–	–	+	+
21.	Nymphalidae	*Junonia orithya* (Linnaeus, 1758)	Blue Pansy	–	–	–	–	+
22.	Nymphalidae	*Pantoporia hordonia* (Stoll, 1779)	Common Lascar	+	–	–	–	–
23.	Nymphalidae	*Limenitis procris* (Cramer, 1777)	Brush-footed butterfly	–	–	+	–	–
24.	Nymphalidae	*Phalanta phalantha* (Drury, 1770)	Common Leopard	–	+	–	+	+
25.	Pieridae	*Catopsilia pomona* (Fabricius, 1775)	Common Emigrant	–	–	+	–	–
26.	Pieridae	*Catopsilia pyranthe* (Linnaeus, 1758)	Mottled Emigrant	–	–	+	–	–
27.	Pieridae	*Colias erate* (Esper,1805)	Eastern Pale Clouded Yellow	–	–	–	+	–
28.	Pieridae	*Pareronia valeria* (Cramer, 1777)	Common Wanderer	+	–	–	–	–
29.	Pieridae	*Pieris canidia* (Sparrman, 1768)	Indian cabbage white	–	–	+	+	+
30.	Pieridae	*Pontia daplidice* (Linnaeus, 1758)	Bath White	–	–	+	+	–
31.	Pieridae	*Eurema hecabe* (Linnaeus, 1758)	Common Grass Yellow	+	–	–	+	+
32.	Pieridae	*Eurema brigitta* (Cramer, 1780)	Small Grass Yellow	–	+	+	–	–
33.	Pieridae	*Eurema laeta* (Boisduval, 1836)	Spotless Grass Yellow	–	+	–	–	–
34.	Pieridae	*Ixias pyrene* (Linnaeus, 1758)	Yellow Orange-Tip	+	–	–	–	–
35.	Lycaenidae	*Heliophorus sena* (Kollar, 1848)	Sorrel Sapphire	–	–	–	–	+
36.	Lycaenidae	*Megisba malaya* (Horsfield, 1828)	The Malayan	+	–	+	–	–
37.	Lycaenidae	*Celastrina huegelii* (Moore, 1882)	Large Hedge Blue	–	–	–	+	–
38.	Lycaenidae	*Pseudozizeeria maha* (Kollar,1848)	Pale Grass Blue	–	+	–	+	+
39.	Lycaenidae	*Castalius rosimon* (Fabricius, 1775)	Common Pierrot	+	–	–	–	–
40.	Hesperiidae	*Potanthus confucius* (Felder, 1862)	Chinese dart	–	+	–	–	–
Total	5	40		11/11	10/13	12/12	11/12	9/11

+ = Species present; - = Species absent

Pollinators are important for reproduction of many plants (Arun and Azeez 2003; Caldas and Robbins 2003). Pollination is one of the most important types of interaction between plants and animals in ecosystems because it is a key process in the sexual reproduction of most angiosperms and can affect directly the plant reproduction success (Arun, 2002). During present studies, the butterfly pollinating in agriculture fields has been assessed. It has been observed that the butterfly diversity is more along edges of agriculture fields that in the core area due to excessive chemical sprays in the fields. As per interaction with farmers, it has been told that they are spraying in the fields after every 15 days, causing the less diversity in the fields. The agriculture fields which are surrounded by forests / wild vegetation have been observed to have more butterfly diversity than the others. As butterflies are sensitive to any change in their environment, their diversity in the fields depicts good health of agricultural fields. From this study it can be concluded that health of the agriculture fields of this district is less in respect of butterfly diversity due to monoculture and various insecticides and pesticides practices because these insects are very good pollution indicators of whole environment.

CONCLUSIONS

The butterfly fauna of Aroecosystem of Himachal Pradesh remain to be poorly studied. The present attempt provides the baseline data to give future researchers a list on butterfly diversity in district Sirmour. In conclusion, endemicity is very low in the study site because of anthropogenic disturbances.

FUTURE SCOPE

Future attempts to measure the butterfly diversity in other districts of Himachal Pradesh planned. Extensive study of butterfly in reference to the different agro-ecosystems is recommended.

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