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ORIGINAL ARTICLE

The Role of Butterfly as Flower Visitors and Pollinators In Shiwalik Hills of Western Himalayas

M.S.Thakur and V.K.Mattu
Department of Biosciences H.P.University Summer Hill Shimla (H.P.)-171005. India

ABSTRACT

Present studies were conducted regarding the different flowering plants (garden, cultivated, semi wild & wild) visited by butterflies, foraging activity and abundance at different elevations of Shiwalik hills. Shiwalik hills symbolize one of the most fragile ecosystems (29°-33° N latitude to 74°-80.5° E longitude), these hills represent the Southern most zone of about 8-40 km width stretching for about 800 km length in the Himalaya. During the present study, 87 species of butterflies were collected as flower visitors on 51 species of flowering plants (garden, cultivated, semiwild and wild) in Shiwalik hills. Of these, Nymphalids visited to 18 species of plants; Pierids to 18 species; Lycaenids to 13 species; studied, flowers of the family Asteraceae were most attracted to different butterflies' species. Hesperids to 08 species and Papilionids & Danaids visited to 04 species each. Among all the flowering plants

KEYWORDS: *Butterfly, Flower Visitors, Pollinators, Shiwalik Hills*

INTRODUCTION

Insects are the most dominant creatures on this earth. They occur everywhere from the frozen Antarctica to scorching sun of the tropics, in water, land, air, dry deserts and high mountains. Insects are believed to have appeared on this planet in the Devonian period, some 200 million years ago and since then survived the glacial periods and evolved into myriad forms. The total number of species of class Insecta, so far described from the whole world are, more than one and a half million, representing nearly 80% of the total species of the Kingdom Animalia. It is estimated that there may be 9, 50,000 described species of insects, although lower figures of around 7, 50, 00 and 7, 90,000 are generally quoted. There is still a large percentage of insects which is yet to be discovered and reported. The amount of diversity in the living world is still staggering, therefore, it would have been impossible to deal with the enormous diversity, if such significant data was not timely documented and classified [1].

Butterflies have always been a matter of fascination to mankind and these are considered as, one of the best known species of insects on the earth. Among insects, butterflies are suitable for ecological studies, as the taxonomy, geographic distribution and status of many species is relatively well known. Butterflies show distinct pattern of habitat utilization. The nature of vegetation is an important factor, which determines the dependence and survival of a species on a particular habitat. Being highly sensitive to environmental changes, they are easily affected by even relatively minor disturbances in the habitat so much that they have been considered as indicators of environmental quality [2] and are also treated as indicators of the health of an ecosystem. The presence of butterflies emphasizes availability of larval food plants in great abundance. As stated earlier, most of the butterflies have specific habitat requirements, as females usually tend to lay eggs only on selective food plants occurring in the area.

Many investigators have studied the diversity, distribution and relative abundance of insects from different parts of the country. But a very few studies have been conducted on role of butterflies as flower visitors and pollinators from the

Himalayan region. However, a little has been done to survey the insect or Rhopalocera fauna from the Shiwalik Hills and adjoining areas. Therefore present investigations were undertaken in order to study the role of butterflies as flower visitors and pollinators in Shiwalik Hills.

MATERIALS AND METHOD

Present studies were conducted regarding the different flowering plants (garden, cultivated, semi wild & wild) visited by butterflies, their foraging activity and abundance at different elevations of Shiwalik hills. Insect collections were made at regular weekly intervals in 59 localities of this area. Regular marked trails in 59 localities were transversed after regular intervals of fifteen days in the mornings and evenings. All butterflies sighted on different flowers of different plant species were collected and identified. Different plants species visited by butterflies during surveys were also collected and the herbarium was made on scientific lines. All the plant samples were identified and got authenticated at Forest Research Institute (F.R.I.) and Botanical Survey of India (B.S.I.) Dehradun.

RESULTS AND DISCUSSION

Present studies were conducted regarding the different flowering plants (garden, cultivated, semi wild & wild) visited by butterflies, their foraging activity and abundance at different elevations of Shiwalik hills. Shiwalik hills symbolize one of the most fragile ecosystems. During the present study, 87 species of butterflies were collected as flower visitors on 51 species of flowering plants (garden, cultivated, semiwild and wild) in Shiwalik hills. Of these, Nymphalids visited to 18 species of plants; Pierids to 18 species; Lycaenids to 13 species; Hesperids to 08 species and Papilionids & Danaids visited to 04 species each. Among all the flowering plants studied, flowers of the family Asteraceae were most attracted to different butterfly's species (Table 1).

Table 6 List of Flower Visiting Butterflies of Shiwalik Hills

FAUNA		FLORA			
Species	**Family**	**Species**	**Family**	**Flower**	**Remarks**
Papilio polytes romulus Cramer	Papilionidae	*Cirsium wallichil*	Asteraceae	White	Wild
Papilio demoleus demoleus Linn.	Papilionidae	*Citrus* spp. *Murraya koenigii* *Raphanus* sp.	Rutaceae Rutaceae Brassicaceae	White White White/Yellow	Cultivated Wild Cultivated
Graphium sarpedon luctatius Fruhst.	Papilionidae	*Cirsium wallichil*	Asteraceae	White	Wild
Pathysa nomius (Esper)	Papilionidae	*Brassica* spp.	Brassicaceae	White/Yellow	Cultivated
Leptosia nina (Fabricious)	Pieridae	*Capparis* sp.	Capparidaceae	White/yellow	Wild
Delias eucharis (Drury)	Pieridae	*Brassica campestris*	Brassicaceae	Yellow	Cultivated
Cepora nerissa phryne (Fabr.)	Pieridae	*Lantana camara*	Verbenaceae	Yellow	Semiwild
Pontia daplidice moorei (Rober)	Pieridae	*Ancardium sp.* *Coriander aestivum* *Brassica oleraceae*	- Apiaceae Brassicaceae	Pink Yellow Yellow White	Cultivated Cultivated Cultivated
Belenois aurota aurtota (Fabr.)	Pieridae	*Lantana camara*	Verbenaceae	Yellow	Semiwild
Appias libythea (Fabr.)	Pieridae	*Capparis* sp.	Capparidaceae	White/yellow	Wild
Pieris canidia indica Evans	Pieridae	*Lantana camara* *Althea rosa*	Verbenaceae Malvaceae	Yellow Pink, Red,white	Semiwild Ornamental
Pieris brassicae nepalensis Doubleday	Pieridae	*Lantana camara* *Brassica oleracea* *Brassica campestris*	Verbenaceae Brassicaceae Brassicaceae	Yellow White Yellow	Semiwild Cultivated Cultivated
Ixias marianne (Cramer)	Pieridae	*Lantana camara* *Tridax procumbens*	Verbenaceae Asteraceae	Yellow White	Semiwild Ornamental
Ixias pyrene kausala (Moore)	Pieridae	*Lantana camara* *Tridax procumbens*	Verbenaceae Asteraceae	Yellow White	Semiwild Ornamental
Catopsilia crocale Cramer	Pieridae	*Lantana camara* *Althea rosea*	Verbenaceae Malvaceae	Yellow Pink,Red,white	Semiwild Ornamental
Catopsilia pyranthe (Linn.)	Pieridae	*Luffa acutaangula*	Cucurbitaceae	Yellow	Cultivared
Terias laeta laeta (Boisduval)	Pieridae	*Cassia fistula*	Fabaceae	Yellow	Wild
Terias hecabe fimbriata (Wallace)	Pieridae	*Glarida* sp.	Asteraceae	Yellow	Ornamental

Colias erate erate (Esper)	Pieridae	*Taraxacum officinale*	Asteraceae	Yellow	Wild
Colias electo fieldi Menetries	Pieridae	*Senecio nudicaulis* *Taraxacum officinale* *Trifolium repens* *Anthemis cotula* *Geranium* sp.	Asteraceae Asteraceae Fabaceae Asteraceae Rananculaceae	Yellow Yellow White/Pink White Violet	Wild Wild Wild Wild Wild
Parantica aglea melanoides Moore	Danaidae	*Tylophora carnosa*	Asclepiadaceae	-	Wild
Tirumala limniace leopardus (Butler)	Danaidae	*Asclepias* sp.	Asclepiadaceae	Yellow	Wild
Danaus genutia Cramer	Danaidae	*Crotolaria* sp. *Tridax procumbens*	 Asteraceae	Yellow White	Wild Ornamental
Danaus chrysippus chrysippus (Linn.)	Danaidae	*Crotolaria* sp. *Tridax procumbens*	 Asteraceae	Yellow White	Wild Ornamental
Euploea core core (Cramer)	Danaidae	*Crotolaria* sp. *Tridax procumbens*	 Asteraceae	Yellow White	Wild Ornamental
Mycalesis mineus mineus (Linn.)	Satyridae	Grasses	Poaceae	Greyish-brown	Wild
Lethe rohria rohria (Fabr.)	Satyridae	*Lantana camara*	Verbenaceae	Yellow	Wild
Ypthima inica Hewitson	Satyridae	Grasses	Poaceae	Greyish-brown	Wild
Ypthima nareda nareda (Kollar)	Satyridae	Grasses	Poaceae	Greyish-brown	Wild
Ypthima asterope mahratta Moore	Satyridae	Grasses	Poaceae	Greyish-brown	Wild
Ypthima ceylonica hubneri Kirby	Satyridae	*Althea* sp.	Malvaceae	Red	Ornamental
Ypthima baldus Fabr	Satyridae	Grasses	Poaceae	Greyish-brown	Wild
Ypthima sakra nikaea Moore	Satyridae	*Oryza* sp *Sorghum vulgare*	Poaceae Poaceae	Creamish Creamish	Cultivated Cultivated
Melanitis leda ismene (Cramer)	Satyridae	*Oryza* sp *Sorghum vulgare*	Poaceae Poaceae	Creamish Creamish	Cultivated Cultivated
Charaxes solon (Fabr.)	Nymphalidae	*Tamarindus* sp.	Fabaceae	Violet	-
Athyma perius (Linn.)	Nymphalidae	*Glochidon* sp. *Phyllanthus* sp.	-	-	Wild Wild
Neptis mahendra Moore	Nymphalidae	*Lantana camara*	Verbenaceae	Yellow	Wild
Neptis hylas astola (Moore)	Nymphalidae	*Lantana camara* *Vigna catjang*	Verbenaceae Fabaceae	Yellow -	Wild Semiwild
Hypolimnas bolina (Linn.)	Nymphalidae	*Elatostemma* sp.	Urtiaceae	-	Wild
Hypolimnas misippus (Linn.)	Nymphalidae	*Hibiscus* sp.	Malvaceae	Red	Cultivated
Junonia hierta (Fabr.)	Nymphalidae	*Tagetes erecta*	Asteraceae	Yellow	Semiwild
Junonia orithyia (Linn.)	Nymphalidae	*Tagetes erecta* *Lantana camara* *Tridax procumbens* *Cirsium wallichil*	Asteraceae Verbenaceae Asteraceae Asteraceae	Yellow Yellow White Dull White	Ornamental Semiwild Wild Wild
Junonia lemonias (Linn.)	Nymphalidae	*Tagetes erecta* *Lantana camara*	Asteraceae Verbenaceae	Yellow Yellow	Ornamental Semiwild
Junonia almana (Linn.)	Nymphalidae	*Tagetes erecta* *Lantana camara*	Asteraceae Verbenaceae	Yellow Yellow	Ornamental Semiwild
Junonia atlites (Johanssen)	Nymphalidae	*Tagetes erecta* *Lantana camara* *Hydrophila spinosa*	Asteraceae Verbenaceae -	Yellow Yellow -	Ornamental Semiwild -
Precis iphita (Cramer)	Nymphalidae	*Lantana camara* *Cirsium wallichil*	Verbenaceae Asteraceae	Yellow Dull White	Semiwild Wild
Cynthia cardui (Linn.)	Nymphalidae	*Senecio nudicaulis* *Taraxacum officinale* *Trifolium repens* *Anthemis cotula*	Asteraceae Asteraceae Leguminosae Asteraceae	Yellow Yellow Dull White/Pink White	Wild Wild Wild Wild
Symbrenthia hippoclus (Cramer)	Nymphalidae	*Buddelia blossoms*	-	-	-
Phalanta phalantha (Drury	Nymphalidae	*Lantana camara* *Duranta repens* *Thistles*	Verbenaceae -	Yellow -	Semiwild -
Ariadne merione (Cramer)	Nymphalidae	*Ricinus communis*	Euphorbiaceae	Yellow	Wild
Acraea violae (Fabr.)	Acraeidae	*Hibiscus cannabinus*	Malvaceae	Red	Wild
Libythea myrrha Godart	Erycinidae	*Celtis tetrandra*	Urticaea Urticaceae	- -	Wild
Dodona durga (Kollar)	Riodinidae	*Sonchus oleracea* *Taraxum officinale*	Asteraceae Asteraceae	Yellow Yellow	Wild Wild
Castalius rosimon (Fabr.)	Lycaenidae	*Zizyphus* spp.	Rhamnaceae	No Flower	Wild
Tarucus nara (Kollar)	Lycaenidae	*Tridax procumbens*	Asteraceae	white	Ornamental
Syntarucus plinius (Fabr.)	Lycaenidae	*Tridax procumbens*	Asteraceae	white	Ornamental
Chilades laius (Cramer)	Lycaenidae	*Citrus*	Rutaceae	White	Cultavated
Freyeria putli (Kollar)	Lycaenidae	*Tridax procumbens*	Asteraceae	white	Ornamental

Studies on food plants visited by butterflies showed that among lycaenids, *Pseudozizeeria maha* (Kollar) visited maximum number of plant species (04) followed by *Lampides boeticus* (Linn.), *Rapala manea schistacea* Moore and *Rapala tara* de Niciville (02 each). On the other hand, *Taracus nara* (Kollar), *Nacaduba nora* Felder, *Freyeria putli* (Kollar), *Syntaracus plinius* (Fabr.) foraged only on *procumbens,* a wild herb of low altitude. Similarly, *Pseudozizeeria maha* (Kollar) butterfly was also attracted to the white flowers of the same plant. Other two species namely *Tarucus extricates* (Kollar) and *Heliophorous sena* Kollar were more abundant on plants with yellow and reddish pink flowers. Foraging studies on butterflies showed that among 18 species of lycaenids, *Pseudozizeeria maha* (Kollar) and *Tarucus extricates* (Kollar) were the most common and highly active species throughout the day. It was also observed that *Lampides boeticus* (Linn.) and *Euchrysops pandava* (Kollar) were the most common flower visitors of the high altitude plants.

Among the pierids, *Colias electo fieldei* Menetries visted maximum number of plant species (05 species) followed by *Pontia daplidice moorei* (Fabr.) (03), *Pieris brassicae nepalensis* Doubleday (03) and *Pieris canidia indica* Evans, *Ixias Marianne* (Cramer), *Ixias pyrene kausala* (Linn.) (02 each). All the other species namely *Colias erate* (Esper), *Eurema hecabe fimbriata* (Wallace), *Catopsilia pyranthe* (Linn.) etc. were also observed to visit on single plant species. In relation to altitude, the 5 species namely; *lxias marianne* (Cramer), *Eurema hecabe fimbriata* (Wallace), *Catopsilia pyranthe*(Linn.), *Catopsilia crocale*(Cramer), *Pieris canidia indica* Evans were widely observed on the flowers of lower altitudes whereas *Colias electo fieldi* Menetries, and *Colias erate* (Esper) were observed mostly on the flowering plants of higher altitudes.

Other than *Cynthia cardui* (Linn.) all the nymphalids were collected from lower altitude of hills. Of these, *Junonia orithyia* (Linn.) (04) and *Cynthia cardui* (Linn.) (04) were found to visit maximum number of plant species. Observations were also made that *Cynthia cardui* (Linn.) mostly visited herbs of shorter heights whereas *Junonia orithya* (Linn.) visited plants of different heights.

The papilionids were found to be very common in the low altitude areas of Shiwalik hills as flower visitors. Only one species, *Papilio polytes romulus*Cramer was collected from the plants of Murraya *koenigii* at the elevation of 700 m.

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Correspondence to Author : M.S.Thakur, Department of Biosciences H.P.University Summer Hill Shimla (H.P.) - 171005. India. E-mail: mahender74@yahoo.co.in