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Butterflies of family Pieridae reported from Jammu region (Jammu and Kashmir) of India

Anu Bala*, J. S. Tara and Madhvi Gupta

Department of Zoology, University of Jammu

Jammu-180,006, India

*Corresponding author: Anu Bala

Abstract

The present article incorporates detailed field observations of family Pieridae in Jammu region at different altitudes during spring, summer and autumn seasons of 2012-2013. The study revealed that 13 species of butterflies belonging to 10 genera of family Pieridae exist in the study area. Most members of Family Pieridae are white or yellow. Pieridae is a large family of butterflies with about 76 genera containing approximately 1,100 species mostly from tropical Africa and Asia.

Keywords : Butterflies, India, Jammu, Pieridae.

Introduction

Jammu and Kashmir is the northernmost state of India. It consists of the district of Baderwah, Doda, Jammu, Kathua, Kishtwar, Poonch, Rajouri, Ramban, Reasi, Samba and Udhampur. Most of the area of the region is hilly and Pir Panjal range separates it from the Kashmir valley and part of the great Himalayas in the eastern districts of Doda and Kishtwar. The main river is Chenab. Jammu borders Kashmir to the north, Ladakh to the east and Himachal Pradesh and Punjab to the south. In east west, the line of control separates Jammu from the Pakistan region called POK. The climate of the region varies with altitude.

The order Lepidoptera contains over 19,000 species of butterflies and 100,000 species of moths worldwide. Their immense diversity and ability to adapt to virtually any climate has made them some of the most successful creatures on earth as their swarms have been reported as far as from coldest part of the world above the snow lines. Although the majority of them act as important pollinators but some are destructive pests in many forestry and agro-ecosystems. The economic damage caused by Lepidopteron pests in field crops and on stored grain exacerbates the problem of food security and malnutrition in many developing countries.

Lepidopteran species are characterized as being covered with pigmented scales all over the wings, having two large compound eyes and siphoning type of mouth parts with an elongated proboscis. The scales are modified flattened hairs and give butterflies and moth their extraordinary variety of colours and patterns. Almost all species have some form of membranous wings, except for a few that have reduced wings or wingless. Like most other insects, butterflies and moth are holometabolous, i.e., they undergo complete metamorphosis. Mating and the laying of eggs are carried out by the adults, normally near or on host plants. The larvae are called caterpillars and are completely different in form, having a cylindrical body with a well-developed head and biting and chewing type of mouth parts with three thoracic and five abdominal pair of legs. As they grow, these larvae will change in appearance, going through a series of stages called instars.

Once fully matured, the larva develops into a pupa, referred to as a chrysalis in the case of butterflies. A few butterflies and many moth species spin a silk case or cocoon prior to pupating, while others do not, instead going underground.

Therefore, it was proposed to conduct a detailed survey on the butterflies of Jammu region which has a rich diversity of cropping systems, forest zones and other economically important plants at different habitats/elevations. The present study was conducted to document the butterflies of family Pieridae for the first time in Jammu region. The objectives of this study were to study the diversity in family Pieridae, distribution of family Pieridae in different climatic areas of north-west Himalayas and to prepare a checklist of the family Pieridae of Jammu region. The Pieridae are a large family of butterflies with about 76 genera containing approximately 1,100 species, mostly from tropical Africa and Asia. Most pierid butterflies are white, yellow or orange, often with black spots. Sexes usually differ, often in the pattern or number of the black markings. The larvae (caterpillars) of a few of these species, such as *Pieris brassicae* and *Pieris rapae*, commonly seen in gardens, feed on brassicas, and are notorious agricultural pests. Males of many species exhibit gregarious mud-puddling behavior when they may imbibe salts from moist soils.

Materials and Methods

The butterfly fauna of family Pieridae in Jammu region was surveyed from March 2012 to November 2013. Sampling was conducted at sites dominated by the most representative vegetation types of the region. The butterflies were collected through insect collection net with telescopic handle consisting of strong wire ring (diameter 30 cm). These specimens were killed by pinching their thorax by taking proper care or by killing the small specimen using ethyl acetate and finally placed in paper envelop. The collected specimens were placed in hot air oven for about 1 hour at 40 °C and later on transferred in relaxing chamber for 24 hrs containing moist absorbent cotton and few drops of phenol to avoid any fungal growth. Later on the specimens were pinned by entomological pins of different sizes according to the size of specimen. The pinned specimens were put on the stretching board after relaxing their wings, abdomen and legs. Stretched specimens were transferred to the insect cabinets with proper labels. The storage boxes were poisoned with ethyl acetate soaked cotton and naphthalene powder filled the side grooves of boxes or naphthalene balls. The specimen were preserved in the insect cabinets by using standard preservation techniques. The specimens were identified with the help of available literature (Bhaskaran and Eswaran, 2005; Biswas et al, 2012; Braby, 2012; Feltwell, 2001; Gay et al., 1992; Gunathilagaraj et al., 1998; Haribal, 1992; kanerica et al., 2013; Khan et al, 2011; Kir'Yanov and Balcazer 2007; Kunte, 2000; Kunte, 2006; Liseki and Vane-wright, 2013; Pathania and kumari, 2009; Qureshi and Bhagat, 2013; Qureshi et al., 2013; Rose and Sidhu, 2001; Rose and Walia, 2003; Singh and Koshta, 1997; Thakur, Mattu and Mehta, 2006 and Uniyal, 2007). The eggs and larvae observed during the surveys were collected and reared on their respective host plant under the laboratory conditions up to adult emergence. Species identification was done by dissecting the male/female genitalia. Regions of Bhandarwah, Doda, Jammu, Kathua, Kishtwar, Poonch, Ramban, Reasi, Samba and Udhampur districts located at different habitats and elevations ranging from 400 to 5500m above sea level having dense vegetation and rich diversity in floral wealth and variety of agricultural crops were selected for the collection of butterflies. All the identified specimens have been deposited in the Department of Zoology, University of Jammu for future references.

Results and Discussion

During the study period 13 species of butterflies belonging to 1 family under 10 genera were found (Table.1) The present communication is preliminary and generalized report on the common butterflies of family Pieridae in Jammu region with an aim to appraise the reader about the diversity and richness of butterfly fauna in this region. It is likely that many more species could be added to the list on further exploration of the remote areas of Jammu region.

1. *Anaphaeis aurota* (Fabricius, 1793)

(i) **Common Name:** The Pioneer White or African Caper White butterfly.

(ii) **Distribution:** India, Nepal, Myanmar, Bhutan, Burma, Africa.

(iii) **Host Plant:** Food plants of the larvae include *Capparis zeylanica*. In Africa, the host plants are almost exclusively from the family Capparaceae and in particular the genera *Boscia*, *Maerua* and *Capparis*.

(iv) **Field Observations:** Its flight period was from June to August. Both sexes tend to fly quite close to the ground, fluttering around bushes. This species is usually found either singly or in two's and three's, flying in open glades, field edges, gardens, or along riverbanks.

2. *Aporia leucodice* (Eversmann, 1843)

(i) **Common Name:** The Himalayan Blackvein butterfly.

(ii) **Distribution:** India, Pakistan, Nepal.

(iii) **Host Plant:** *Berberis baluchistanica*, *Blyceum*, *Calamintha umbrosa*, *Cedrus deodara*, *Origanium vulgare*, *Thymus serpyllum*, *Trifolium reopens*, *Viola tricolor*.

(iv) **Field Observations:** Remained active from April to October and was found usually a moderate to fast flier. It was usually active during mid-days and preferred to fly when there was enough sun light. It may arrive immediately after a mild or moderate or heavy rainfall or when there was fall in the sunlight, a phenomenon mostly noticeable during summer days. Found flying singly and in groups, both very nearer the ground as well as higher.

It was mostly found at places having a mixed type of vegetation, having different types of grasses, forest, small as well as large trees, herbs, shrubs, etc. Their flights were seen fast and are difficult to be collected.

3. *Catopsilia pomana* (Fabricius, 1775)

(i) **Common Name:** The Common Emigrant or Lemon Emigrant butterfly.

(ii) **Distribution:** China, India, Pakistan, Sri Lanka, Burma

(iii) **Host Plant:** The caterpillars feed on various species of *Cassia*: *C. fistula*, *C. siamea* and *C. tora* (Caesalpinaceae); the first two are more frequently used. Other recorded host plants include *Butea frondosa* and *Bauhinia racemosa* (Fabaceae and Caesalpinaceae, respectively).

(iv) **Field observations:** The Lemon Emigrant has various color from fresh yellow to dark (in the female). The lemon color is at the base of the wings. Two basic types exist: one with pink antennae, the other with black antennae. Tips of the wings are usually dark. This butterfly is a migrant and a strong flier. It visits open areas, clearings in the forest and villages in search of nectar sources. Found as a fast flying species which flies both at high and low heights. It closes its wings while resting on flowers. It was seen flying from June to September. It is more abundant during the monsoon and post-monsoon months progressively becoming less common in the winter and early summer, again becoming numerous just before the onset of the

monsoon. In the pre-monsoon months, most of its larval host plant produce fresh shoots, which boosts the larval as well as adult population.

In the morning, this butterfly can be seen basking with its wings closed over the back and slightly tilted to face the sun. It flies in a powerful manner with erratic ups and downs and unpredictable jerks.

4. *Ceporia nerissa* (Fabricius, 1775)

(i) **Common Name:** The Common Gull butterfly.

(ii) **Distribution:** The North-West Himalayas up to 4000 ft., Nepal, Sikkim, Bhutan, Bengal, Central, Western and Southern India, Ceylon.

(iii) **Host Plant:** *Capparis sp.*

(iv) **Field Observation:** The common gull butterfly *Cepora nerissa* is splendid and showy with beautiful wing colours and wing span of 50-70 mm. Both sexes look alike. It is often reported to be very common in the plains of India (Kunte, 2000). Both sexes tend to fly quite close to the ground, fluttering around bushes.

5. *Colias electo fieldi* (Ménétriés, 1855)

(i) **Common Name:** The Dark Clouded yellow butterfly.

(ii) **Distribution:** South America and Africa, Bhutan, China, India, Nepal and Pakistan.

(iii) **Host Plant:** Their caterpillars feed on certain Fabaceae, for example vetches (*Vicia*). While most are thus beneficial by keeping weeds at bay, some occasionally become nuisance pests on crops like alfalfa.

(iv) **Field Observations:** The butterfly remained active in the field from April to November. It was usually seen flying nearer the ground but can be seen flying higher when chasing each other or when singly or when disturbed or during hot mid days. It was found usually a moderate to fast flier but moved slowly especially when present in groups or when newly emerged or during the early morning. It was noticed as active during very hot and sweltering mid days, however preferred to fly before noon and afternoon when there was a moderate decrease/fall in the temperature.

It did not arrive immediately after a mild, moderate or heavy rainfall or when there was fall in the sunlight even if the temperature was favorable for flight. It was found flying both singly as well in groups but prefer to fly in groups. It was found to be a slower flier than *Colias erate*.

It was found present in different types of habitats like vegetable gardens, orchids, gardens, parks, lawns, open places, rice fields, forests, muddy places and along the roads. *Colias electo fieldi* was very much attracted to damp places, animal excreta and rotten fruits, and showed a prominent mud puddling behavior. It was seen highly attracted to flowers of *Tagetes petula*. Among Pieridae family, *Colias electo fieldi* comes next to *Pieris brassicae* in distribution and dominance in Jammu and Kashmir.

6. *Colias philodice* (Godart, 1819)

(i) **Common Name:** The Common or Clouded Sulphur butterfly.

(ii) **Distribution:** *Colias philodice* is distributed from Alaska and western Canada, to Guatemala. All of North America except Arctic, part of California, and tropical Florida. But it is a permanent resident in Sierra Valley and other irrigated alfalfa-growing areas.

(iii) Host Plants: Clouded Sulphurs nectar at flowers such as Milkweed (*Asclepias sp.*), Butterfly Bush (*Buddleja sp.*), Coneflower (*Dracopis, Echinacea, and Rudbeckia*), Alfalfa (*Medicago sativa*), Dandelion (*Taraxacum sp.*), Clover (*Trifolium sp.*), and Tall verbena (*Verbena bonariensis*) and many more.

(iv) Field Observation: Clouded Sulphurs can be seen from March to October. There are several broods (batches) each year. During courtship, females respond to the male's pheromone, which is released when the male buffets her with his wings, causing the female to extend the abdomen out from the hind wings such that the male can join. Males of this and other sulphur species congregate at puddles and other moist ground possibly to take nutrients from the wet soil.

The Clouded Sulphur is one of our most common butterflies. They are most often seen flying low over lawns and fields. They are a medium-sized butterfly, with a wingspan of up to two inches wide. Males and females are slightly different. Males are yellow with a sharp black border on the wings. Females are duller yellow with yellow spots inside the black border. Both sexes have single black spots on the forewings, and dull orange spots on the hind wings. Underneath, there is no black border, but there is a silver spot, outlined in pink, on each hind wing. This can be seen when the butterfly is resting with its wings folded.

Adult Clouded Sulphurs take nectar from many different flowers, including: clovers, milkweeds, goldenrods, asters, dandelions, thistles, and sunflowers. Clouded Sulphurs are usually seen in open areas. Besides lawns and fields, they can be seen in parks, gardens, stream banks, and roadsides. They fly close to the ground and are very fast.

Predators of Clouded Sulphurs include birds, dragonflies, mantids, frogs and animals that eat caterpillars, such as beetles, squirrels, and shrews. If they fall in the water, they cannot get out, so they will probably be eaten by fish, crayfish, or aquatic insects. They also get moisture from puddles of water, mud, and animal poop. You will often see many sulphurs together collecting moisture. This is called "puddling."

7. *Eurema hecabe* (Linnaeus, 1758)

(i) Common Name: The Large Grass Yellow or Common Grass Yellow butterfly.

(ii) Distribution: Kashmir, India, Pakistan Sri Lanka,

(iii) Host Plant: The early stages of Common Grass Yellow are polyphagous with most of its host plants belonging to the Fabaceae family. The caterpillars feed on the young and tender leaves of the host plants. Eggs are laid on *Abrus precatorius*, *Acacia spp.*, *Aeschynomene spp.*, *Albizia spp.* and numerous other Leguminosae, Euphorbiaceae and Cucurbitaceae species.

(iv) Field Observations: It flies close to ground or bushes and closes its wings at rest. It was seen flying from March to November. Common Grass Yellow is one of the most common butterflies. This is likely due to its many host plants being common in the wild or widely cultivated in parks and other public areas. The adults can be seen fluttering tirelessly in parks, wastelands and even urbanized areas. They regularly visit flowers for nectar and puddle on wet grounds for minerals. The female is slightly larger with similar markings.

8. *Pontia daplidice* (Linnaeus, 1758)

(i) Common Name: The Bath White butterfly.

(ii) Distribution: Africa, China, Europe, India, Pakistan, Tibet, Turkey.

(iii) Host Plant: The host plants of the larvae are in the Brassicaceae family and vary according to locality. They include tower mustard (*Arabis glabra*) and sea rocket (*Cakile maritima*), *Diplotaxis harra*, *Zilla spinosa* (Cruciferae), *Reseda spp* (Resedaceae).

(iv) Field Observations: *Pontia dapilice* population reached highest during the months of June, July and August. It usually and mostly showed flight activity nearer the ground but could be seen flying higher when chasing each other. It was found usually a moderate to fast flier but could move slowly especially when present in groups or when newly emerged or during the early morning. It was not very active during very hot and sweltering mid days but preferred to fly before noon and afternoon when there was a moderate decrease/fall in the temperature. It did not arrive immediately after a mild or moderate or heavy rainfall or when there was fall in the sunlight even if the temperature was favorable for flight. This phenomenon was mostly found during summer. Its flying was seen mostly singly but at rare occasions, flight found in groups.

It was also seen present in almost every type of habitat like vegetable gardens, orchids, gardens and parks, house lawns, open places, rice fields, forests and along the roads. Its flight activity was seen from April to November. It was seen highly attracted to flowers of *Tagetes petula*. The males and females chased each other during mating period for 3-5 minutes duration.

9. *Gonepteryx ramni* (Linnaeus, 1758)

(i) Common Name: The Common Brimstone butterfly.

(ii) Distribution: India, Myanmar, Pakistan *G. rhamni* lives in Europe, North Africa and Asia as far east as Mongolia. It is widely distributed across the southern half of the United Kingdom, and has been steadily increasing its range in the north of England but is limited by the distribution of its larval food plants and is quite possibly close to its maximum possible distribution now unless their food plants' range also increases. In Ireland, it has a much more localised in distribution.

(iii) Host Plant: Common Buckthorn (*Rhamnus cathartica*) or Alder Buckthorn (*Rhamnus frangula*)

(iv) Field Observations: *Gonepteryx rhamni* was found active from April to November, mostly singly and observed siting on moist soil or sand, dull and dusty places and animal droppings. Puddling behavior was also noticed. The sexes of the common Brimstone are different colors. The male is bright lemon-yellow, the female lime-green. Each sex has a single small orange spot in the centre of the wings. The wings are strongly curved.

10. *Ixias Marianne* (Cramer, 1779)

(i) Common Name: The White orange tip butterfly.

(ii) Distribution: *Ixias marianne* is confined to India and Sri Lanka.

(iii) Host Plant: The food plant for the larvae is *Capparis grandis*, a caper shrub in the Capparaceae family.

(iv) Field Observation: Both sexes tend to fly quite close to the ground, fluttering around bushes. Early in the morning they often bask on low foliage, with the wings half open. If disturbed by humans or birds they react by flying into long grasses or tangled undergrowth, where they hide low down, keeping their wings tightly closed. Further disturbance causes them to retreat deeper into the undergrowth, where they are almost impossible to flush out.

11. *Ixias pyrene* (Linnaeus 1764)

(i) Common Name: The Yellow Orange Tip butterfly.

(ii) Distribution: *Ixias pyrene* is the commonest and most widespread member of the genus. It is distributed in India, Pakistan to Taiwan, Malaysia, Borneo and the Philippines.

(iii) Host Plant: The larval food plant is *Capparis* (Capparidaceae).

(iv) Field observations: Early in the morning and late in the afternoon the adults often bask on foliage, with the wings half open or fully outspread. If disturbed they react by flying into long grasses or up into trees. During the heat of the day males imbibe moisture from damp ground, and both sexes nectar from a wide range of herbaceous flowers.

12. *Pieris brassicae* (Linnaeus, 1758)

(i) Common Name: The Large Cabbage White butterfly.

(ii) Distribution: America, Africa, Britain, Burma, China, Nepal, Jordon, India, Pakistan, Russia, Sri Lanka, Turkey, Malaysia.

(iii) Host Plant: Plants with mustard-oil glucosides are important for this butterfly because it dictates their eating behaviors, and resultant survival rates, as specified in the section regarding oviposition. This is so beneficial for Large Whites because their large consumption of plants containing mustard oils is the specific reason they are so distasteful to predators, such as birds. Thus, caterpillars are protected from attack, despite them being brightly colored; in fact, the bright coloration is to signal to predators that they taste bad.

(iii) Field observations: *Pieris brassicae*'s flight was observed very nearer to ground as well very higher, with slow, fast and very fast flight. When both sexes chased each other or when distributed or when flying singly, they showed very fast and take a zigzag type of flight, sometimes even go very high in the air. At places like Samba, Kathua, Jammu, Reasi and Udhampur it was seen continuously for 10- 15 minutes without taking any rest, flight activity witnessed from early morning upto dusk. In forest areas, it usually showed flight activity very high in the air, both in groups as well as singly, from March to November.

In the present study it was observed that among all the butterfly species, this pierid was the first to emerge after a long and very cold winter. The active flight of *Pieris brassicae* was also seen during the very hot mid days of summer. It aside showed occurrence in almost all types of habitats like vegetable gardens, orchids, gardens, parks, houselawns, open places, rice fields, forests, muddy places, animal excreta and rotten fruits and prominent mud puddling behavior was also observed. It was found to be a very serious pest of many Bracicacious vegetables like cabbage, Knolkhol. The adult butterflies laid yellowish/lemonish yellow eggs in groups of 30-155, usually on the underside of the plant. The eggs hatched in 4-9 days. The catterpillars feed gregariously during the early instars and disperse as they approach maturity. They passed through five stages and were full grown in 15-21 days. The larvae pupated at some distance from the food-plant and remained attached with a firm whitish/lemonish white cremaster. The pupal stage lasted for 8-15 days. The adults of this butterfly lived for 3-11 days. The total life cycle was completed in 30-56 days. The adults of this butterfly keep their wings either closed or spread during rain. The adults were seen very much attracted to flowers, basking in the sun light, or taking shelter in the shadows or during rain. The adults were seen very much attracted to flowers of *Tagetus petula*.

It was widely distributed in all the districts surveyed in the Jammu region. It was seen to be very common butterfly in Jammu region. Among Pieridae family and also in other butterfly families this species was the highly dominant and widely distributed species in Jammu. It may be due to its migratory nature, large number of both larval and adult host plants and also being a polyphagous pest.

13. *Pieris canidia* (Sparrman, 1768)

(i) Common Name: The Indian Cabbage White butterfly.

(ii) Distribution: *Pieris canidia* is found in India, Bhutan, Myanmar, Pakistan, Tibet, Laos, Cambodia, Thailand, China, Taiwan, Sikkim, Japan and Malaysia.

(iii) Host Plant: The larval food plants include *Cardamine*, *Lepidium*, *Raphanus*, *Brassica*, *Cleome*, *Alstonia*, *Arabis* and *Rorippa* (Brassicaceae).

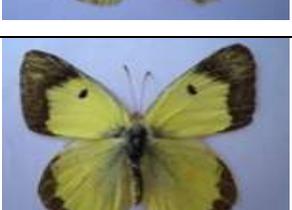
(iv) Field Observations: This species is usually found either singly or in two's and three's, flying in open glades, field edges, gardens, or along riverbanks. Both the sexes visit a wide range of herbaceous flowers, fluttering from plant to plant and rarely settling for long. During overcast conditions they roost openly on herbage.

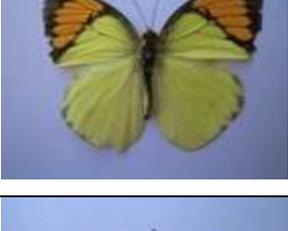
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Table1:- List of butterfly species of family Pieridae in Jammu region.

S.NO.	Family/Scientific Name	Flight Period	Visuals
	Pieridae		
1	<i>Anapheis aurota</i> (Fabricius, 1793)	June-August	
2	<i>Aporia leucodice</i> (Eversmann, 1843)	April-October	
3 Male	<i>Catopsila pomana</i> (Fabricius, 1775)	June-September	

Female	<i>Catopsila pomana</i> (Fabricius, 1775)	June-September	
4	<i>Ceporia nerissa</i> (Fabricius, 1775)	April-October	
5 Male	<i>Colias electo fieldi</i> (Ménétriés, 1855)	April-November	
Female	<i>Colias electo fieldi</i> (Ménétriés, 1855)	April-November	
6 Male	<i>Colias phiolodice</i> (Godart, 1819)	March-October`	
Female	<i>Colias phiolodice</i> (Godart, 1819)	April-November	
7	<i>Eurema hecabe</i> (Linnaeus, 1758)	March-November	

8	<i>Pontia daplidice</i> (Linnaeus, 1758)	April-November	
9	<i>Gonepteryx ramni</i> (Linnaeus, 1758)	April-November	
10	<i>Ixias marianne</i> (Cramer, 1779)	April-October	
11 Male	<i>Ixias pyrene</i> (Linnaeus, 1764)	April-October	
Female	<i>Ixias pyrene</i> (Linnaeus, 1764)	April-October	
12 Male	<i>Pieris brassica</i> (Linnaeus, 1758)	March-November	
Female	<i>Pieris brassica</i> (Linnaeus, 1758)	March-November	

13	<i>Pieris canidia</i> (Sparman, 1768)	May-October	
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