



Original Research Article

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An Updated Systematic Checklist and Biodiversity of Caterpillars of Butterfly-Fauna (Insecta) on Food/ Host Plant Species in Jammu and Kashmir State (India) - Papilionoidea: Papilionidae, Nymphalidae

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Abstract

This paper deals with 38 species under 25 genera of butterfly caterpillars, belonging to family Papilionidae and Nymphalidae, feeding on more than 35 host plant species, under 28 genera of 18 families. The food / host plants of caterpillars include agricultural crops and other economically important plant and tree species. The Papilionid caterpillars covered a total of 9 species, associated with 9 species of food/ host species. The 30 species of Nymphalid caterpillars, were found to be having 25 species as their food plants. The highest number of Nymphalid caterpillar species *i.e.* 9, are associated with family Poaceae (grasses, cereal). This is followed by Papilionids (6 spp.), feeding on aromatic and ornamental plants, and fruit crops (Rutaceae). The highest number of caterpillar species *i.e.*, 15 Nymphalids, Papilionids), is found to be feeding on medicinal plants (18 spp.). An up-to-date systematic checklist, with host plants, has been provided. Besides, species diversity of caterpillar-fauna on food / host plant species has been studied.

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Introduction

The adult butterfly can obtain nectar from suitable flowers of the plant species as their food material. The adult butterfly lays eggs on the host /food plant species on which the larval stages, known as caterpillars feed. The survival of butterfly population actually depends on food for its caterpillar stages by feeding on specific plant species, referred to as butterfly food / host plant. Most species of caterpillars accept one or few species of plants that provide necessary food for caterpillars.

The caterpillar stages are voracious herbivores and cause

much harm to the host plants and some species are pests of agricultural crops and other economically important plants. Now-a-days, there is growing interest in creating butterfly garden. The success of this type of venture depends on native food plants that caterpillars eat and in this connection, local / site specific information on food plant is very important.

The caterpillars of the family Nymphalidae show wide variations in their appearance and behaviour. These are mostly hairy or spiny with projection on head. They feed alone or in community on the food plant and also overwinter as young caterpillars. In case of family

Papilionidae, the caterpillars are stout, smooth or with fleshy spines or tubercles and have repugnatorial organ, called osmeterium. This is a forked defensive scent gland on their thorax, emits an offensive secretion.

Materials and methods

The database provided in this paper pertains to 38 species of butterfly caterpillars of two families, feeding on diverse food / host plant species (more than 35), including agricultural crops and economically important plant species, occurring in vast areas and localities of Jammu and Kashmir State. This State is located in the northern part of Indian sub-continent, in the vicinity of Karakorum and the Western Himalayan ranges. J & K State is divided into three geographically and climatically different Provinces, viz. Ladakh (cold desert), Kashmir (temperate) and Jammu (sub-tropical). This State is of paramount zoo-geographical significance as well as rich in biodiversity.

In the present paper, a first attempt has been made to consolidate the scattered data on butterfly caterpillar species (Nymphalids, Papilionids), with reference to their host/ food plant species and is being provided in the form of updated annotated checklist, besides information on caterpillar biodiversity. Recently, Bhagat (2017) has dealt with food / host plants of caterpillars and their biodiversity of J & K State, belonging to families, viz., Hesperidae, Lycaenidae and Pieridae. The data pertaining to taxa in this communication, has been updated in the light of latest nomenclatural / systematic changes. For the purpose of updating of faunal taxa and their diversity, relevant published works (national and international), besides online information on taxonomic surveys and recent checklists and catalogues of the world, have been consulted. For changes in the systematics of taxa, the important monographs and online databases followed are: Anon (2017a, 2017b), Beccaloni et al. (2016), Hauser et al. (2005), Varshney and Smetacek (2015) and Ziegler (2017).

The faunal records of valid butterfly caterpillar species, with their host/ food plant species are given in the Systematic Checklist. The synonymies of the taxa are listed under the valid species, given in the parentheses. The Checklist provides the references pertaining to authors recording and describing taxa from different regions and localities of J & K State, are in the form of code numbers, given in the long brackets in front of each

listed species. The key to the code numbers, are cited at the end of Systematic Checklist.

Results and discussion

Systematic Checklist

Superfamily: Papilionoidea

Family: Papilionidae (Swallowtail Butterflies)

Subfamily: Papilioninae

Tribe 1. Papilionini

1. *Chilasa chilasa agestor* Gray (Tawny Mine)

(= *Chilasa gestor* Gray) [27]

Caterpillar food / host plant: *Melilotus*

2. *Papilio demoleus demoleus* (Linnaeus) (Lime or Citrus Swallowtail) [15, 16, 19]

Caterpillar food / host plant: *Citrus aurantifolia*, *C. reticulata* var. *kinnow*

3. *Papilio glaucus* Linnaeus (Eastern Tiger Swallowtail) [15, 16]

Caterpillar food / host plant: *Citrus aurantifolia*

4. *Papilio machaon* (Linnaeus) (Common Yellow Swallowtail) [11, 12, 17]

Caterpillar food / host plants; *Anethum graveolens*, *Heracleum candicans*, *Ruta graveolens*

5. *Papilio polyctor* Boisduval (Common Peacock Swallowtail) [3, 22]

Caterpillar food / host plant: *Zanthoxylum armatum*

6. *Papilio polytes* Linnaeus (Common Mormon) [22, 16]

Caterpillar food / host plant: *Zanthoxylum armatum*, *Citrus aurantifolia*

7. *Papilio polytes romulus* Cramer (Swallowtail) [21]

Caterpillar food / host plant: *Murray koenigii*

Tribe 2. Troidini

8. *Byasa dasarada dasarada* (Moore) (Black Swallowtail)

(= *Atrophaeura dasarada* (Moore) [27]

(= *Tros dasarada* (Moore) [30]

Caterpillar food / host plant: *Aristolochia* sp.

9. *Byasa polyeuctes* (Doubleday) (Common Windmill)

(= *Polydorus philoxenus* Gray) [10]

(= *Tros philoxenus* Gray) [23]

(= *Atrophaeura polyeuctes* Doubleday) [4]

Caterpillar food / host plant: *Nepenthes*

Family 2: Nymphalidae (Brush-footed, including Monarch butterflies)

Subfamily 1: Apaturinae

Tribe: Apaturini

10. *Mimathyma ambica* (Kollar) (Indian Purple Emperor)

(= *Apatura ambica* (Kollar) [7])

(= *Apatura ambica ambica* (Kollar) [6, 28])

Caterpillar host food / plants: *Ulmus wallichiana*, *Celtis tetrandra* (= *C. australis*)

Subfamily 2. Biblidinae

Tribe 1. Biblidini

11. *Ariadne merionemerione* (Crammer) (Dakhan Common Castor) [1]

Caterpillar food / host plant: *Ricinus communis*

Subfamily 3. Cyrestinae

Tribe: Cyrestini

12. *Cyrestis thyodamas thyodamas* Boisduval (Indian Map Butterfly)[4,30]

Caterpillar food / host plant: *Debregeasia* sp.

Subfamily 4. Danainae

Tribe Danaini

13. *Danaus chrysippus* (Linnaeus) (Oriental Plain Tiger) [15]

(= *Anosia (Danaus) chrysippus* (L.) [18])

(= *Dania schrysippus* Linnaeus) [3, 5, 30]

Caterpillar food / host plants: *Calotropis procera*, *C. gigantea*

14. *Danaus genutia genutia* (Cramer) (Common Indian Tiger, Monarch butterfly)

(= *Danaus plexippus* Bringham) [3]

(= *Danaus plexippus* Linnaeus) [2, 4]

Caterpillar food / host plants: *Asclepias curassavica*, *Marsdenia tenacissima*, *Tylophora tenuis*

15. *Parantica aglea* (Stroll) (Glassy Tiger)

(= *Danaus aglea* (Cramer) [25, 30])

Caterpillar food / host plants: *Calotropis* sp., *Tylophora carnosa*

Subfamily 5. Heliconiinae

Tribe: Argynnini

16. *Argynnis aglaja* (Linnaeus) (Silverstreak)

(= *Argynnis aglaja vitatha* Moore) [10]

(= *Mesoacidalia aglaja vitatha* Moore) [28]

Caterpillar food / host plant: *Viola*

17. *Childrena childreni* (Gray) (Large Silverstripe) [28]

Caterpillar food/ host plant: *Viola* sp.

18. *Clossiana hegemone* Standinger (Fritillary Silverspot) [10, 28]

Caterpillar food/ host plant: *Viola* sp.

19. *Clossiana jerdoni* Lang (Jerdon's Silverspot) [26]

(= *Argynnis jerdoni* Lang) [3, 5, 8, 30]

Caterpillar food / host plant: *Viola* sp.

Subfamily 6: Libytheinae

20. *Libythea lepita* (Moore) (Common Beak) [6, 28, 30]

Caterpillar food / host plant: *Celtis tetrandra* (= *C. australis*)

Subfamily 7: Limenitidinae

Tribe 1: Adoliadini

21. *Euthalia aconthea* (Cramer) (Common Baron) [20]

Caterpillar food/ host plant: *Mangifera indica*

Tribe 2. Limenitidini

22. *Limentis trivena hydaspes* Moore (Indian White Admiral) [30]

(= *Limentis trivena* Moore) [28]

Caterpillar host / food plant: *Lonicera* sp.

Tribe 3. Neptini

23. *Pantoporia opaline* (Kollar) (Sailor Butterfly) [30]

(= *Athyma opaline* (Kollar) [4, 7])

Caterpillar food/ host plant: *Berberis lycium*, *Berberis* sp.

Subfamily 8 Nymphalinae

Tribe 1:Nymphalini

24. *Aglais kashmirensis* (Kollar) (Common Tortoise Shell) [9, 13, 14]

(= *Aglais cashmirensis cashmirensis* Hugel) [7]

(= *Vanessa cashmirensis* Kollar) [7]

Caterpillar food / host plant: *Urtica dioica*

25 *Aglais ladakensis* (Moore) (Ladakh Tortoise Shell)

(= *Vanessa ladakensis* Moore) [28, 29]

Caterpillar food / host plants: *Urtica* spp.

26. *Cynthia cardui* (Linnaeus) (Painted Lady) [2, 28, 30]

(= *Vanessa cardui* Linnaeus) [12]

Caterpillar food / host plants: *Blumea lacera*, *Sonchus* sp. and *Brassica* spp.

27. *Vanessa indica indica* (Herbst.) (The Himalayan Red admiral) [6, 28]

(= *Vanessa indica* (Herbst) [5, 30])

Caterpillar food / host plants: *Urtica* spp.

Tribe 2: Junoniini

28. *Junonia hierta hierta* Linnaeus (Yellow Pansy) [12]

Caterpillar food / host plant: *Barleria cristata* Linnaeus

Subfamily 9: Satyrinae

Tribe 1: Melanitini

29. *Melanitis phedima* Stroll (Dark Evening Brown) [28]

Caterpillar food / host plants: Grasses, *Oryza* sp.
30. *Melanitis zitenius* Herbst. (Great Evening Brown) [28]
Caterpillar food / host plant; *Oryza* sp.

Tribe 2. Satyrini

31. *Aulocera swaha* (Kollar) (Banded Satyr) [7, 28]
(= *Aulocera swaha garuna* Furshstofer) [9, 24]
Caterpillar food/ host plants: *Iris* and grasses
32. *Aulocera saraswati* (Kollar) (Banded or Striated Satyr) [7, 28]
Caterpillar food/ host plants: Grasses, *Iris*
33. *Callerebia annada annada* Moore (Bhutan Ringed Argus) [28]
Caterpillar food/ host plant: Grasses
34. *Callerebia scanda scanda* (Kollar) (Pallid Argus)
(= *Erebia (Callerebia) scanda scanda* Kollar) [9]
(= *Erebia scanda* Kollar) [7, 24]
(= *Erebia scanda scanda* Evans) [5]
Caterpillar food/ host plants: Grasses
35. *Lethe rohria rohria* (Fabricius) (Common Tree Brown) [28]
(= *Lethe rohria* Fabricius) [4, 24, 30]
Caterpillar food / host plants: Grasses
36. *Lethe verma verma* (Kollar) West Himalayan Straight Banded) [28]
(= *Satyrus verma* Kollar) [7]
(= *Lethe verma* (Kollar) [30]
Caterpillar food / host plants: grasses

Subtribe 1: Maniolina

37. *Maniola davendra davendra* (Moore) [28]
Caterpillar food / host plants: Unknown plant species of Umbelliferae

Subtribe 2. Ypthimina

38. *Ypthima akbar* Talbot [24, 28]
Caterpillar food / host plant: Grasses

Key to numerical in the long brackets, cited in the above Checklist

1= Bala et al. (2014); 2= Bhat (1987); 3= Bringham (1907); 4= Dar et al. (2002); 5= Evans (1932); 6= Gupta and Shukla (1988); 7= Kollar (1844); 8=Lang (1868); 9= Mandal (1984); 10 = Mani and Singh (1962); 11= Mathur and Anand (1964); 12= Mathur and Srivastava (1967); 13 = Qureshi and Bhagat (2015); 14= Qureshi et al. (2013); 15= Sadhotra and Tripathi (2009); 16= Sadhotra and Tripathi (2010); 17= Srivastava (1982); 18 =Sudan et al. (2015); 19 = Tara

(2008); 20 = Tara and Gupta (2016); 21= Tara and Sharma (2010); 22= Tara et al. (2011); 23= Talbot (1939); 24= Talbot (1947); 25= Varshney (1980); 26 =Varshney (1990); 27 = Varshney (1993); 28= Varshney (1994); 29 = Vis and Coene (1987); 30= Wynter-Blyth (1957).

The above given Systematic Checklist indicates that a total of 38 species, under 25 genera of butterfly caterpillar, belonging to family Papilionidae and Nymphalidae of superfamily Papilionoidea, is occurring in vast areas and localities of Jammu and Kashmir State. The various caterpillar species belonging to these families, feed on more than 35 species of 28 genera, belonging to 18 families of host plants, including agricultural crops and other economically important plant species.

The Papilionids included a total of 9 species, under 3 genera, viz. *Chilasa* (1sp.), *Papilio* (6 spp.) and *Byasa* (2 spp.), associated with 10 species of 9 genera of food plants belonging to 5 families as: Apiaceae (Parsely family), Aristolochiaceae (Piper vine), Fabaceae (Legume), Nepenthaceae (Pitcher) and Rutaceae (Citrus).

The Nymphalid caterpillars included 29 spp., belonging to 22 genera, found to be having more than 25 species, under more than 19 genera of diverse kinds as their food/ host plants. These food plants are belonging to 14 diverse families as: Acanthaceae (Acanthus family), Anacardiaceae (Mango), Apiaceae, Apocynaceae (Milkweed), Asteraceae (Sunflower), Berberidaceae (Barberry), Brassicaceae (Mustard), Caprifoliaceae (Honey suckle), Euphorbiaceae (Spurge), Iridaceae (Iris), Poaceae (Grasses), Ulmaceae (Elms), Urticaceae (Nettle) and Violaceae (Violet) (*see* Checklist and Table 1).

Diversity and species richness of food plants of caterpillars

An examination of food plant families of butterfly caterpillars shows the highest number of Nymphalid species i.e. 9 are associated with family Poaceae, including a number undetermined grass species and *Oryza* (cereal). This is followed by Papilionids, covering as many as 6 spp., feeding on food plants such as fruit crops (*Citrus*), ornamental plant (*Ruta*) and aromatic plants (*Murray*, *Zanthoxylum*), belonging to family Rutaceae (Table 1).

Four species each of caterpillar (Nymphalidae), are associated with food/ host plant families- Urticaceae and Violaceae (ornamental plants). This is followed by 3 species of Nymphalids feeding on the host plants (medicinal plants), belonging to Apocynaceae. Two species of caterpillars, under Nymphalidae and Papilionidae, have been found to be having affiliation with plant families, viz., Apiaceae, besides 2 species each feed on plants under family Iridaceae (medicinal plants) and Ulmaceae (forest tree). Single species, belonging to either Nymphalidae or Papilionidae, each had one species of food / host plant, belonging to rest of ten families of host plants (Table 1).

The analysis of number of caterpillars of butterfly

species, feeding on different kinds of agricultural crops and host plants, has shown highest number of caterpillar species, i.e., 15 (Nymphalidae, Papilionidae), feeding on medicinal plants (18 spp.). This is followed by grasses and ornamental plants, more than 4 spp. serving as food material for 7 species of Nymphalids and 7 species of Nymphalids / Papilionids respectively. Papilionids (2 spp.) and Nymphalid (1 sp.), have been found to feed on 3 spp. of fruit crops (Citrus, Mango). Rest of the crop and plant kinds like aromatic plants, cereal crop, carnivore plant, fibre crop, forest trees, oil seed crop, vegetable crop, serve as food material for either two or one species of butterfly caterpillars pertaining to family Nymphalidae or Papilionidae (Table 2).

Table 1. Food Plant Families, with different genera and number of species of various kinds associated with total number of butterfly caterpillar species, belonging to family Nymphalidae and Papilionidae in Jammu and Kashmir State.

Plant family (no. of species)	Food plant genera (kind)	Total no. of caterpillar species	Caterpillar families
Acanthaceae (1)	<i>Barleria</i> (ME)	01	Nym.
Anacardiaceae (1)	<i>Mangifera</i> (FR)	01	Nym.
Apiaceae (2) (=Umbelliferae)	<i>Anethum</i> (ME, OR), <i>Heracleum</i> (ME) NA	01 01	Pap Nym.
Apocynaceae (7)	<i>Asclepias</i> (ME), <i>Calotropis</i> (ME) <i>Marsdenia</i> (ME), <i>Tylophora</i> (ME, OR)	03	Nym.
Aristolochiaceae (1)	<i>Aristolochia</i> (ME),	01	Pap.
Asteraceae (2)	<i>Blumea</i> (ME), <i>Sonchus</i> (ME)	01	Nym.
Berberidaceae (2)	<i>Berberis</i> (ME)	01	Nym.
Brassicaceae (2)	<i>Brassica</i> (OL, VE)	01	Nym.
Caprifoliaceae (1)	<i>Lonicera</i> (OR)	01	Nym.
Euphorbiaceae (1)	<i>Ricinus</i> (ME)	01	Nym.
Fabaceae (1)	<i>Melilotus</i> (ME)	01	Pap.
Iridaceae (1)	<i>Iris</i> (ME)	02	Nym.
Nepenthaceae (1)	<i>Nepenthes</i> (CP)	01	Pap.
Poaceae (2)	Grasses (GR), <i>Oryza</i> (CE)	09	Nym.
Rutaceae (5)	<i>Citrus</i> (FR), <i>Murraya</i> (AR) <i>Ruta</i> (OR), <i>Zanthoxylum</i> (AR)	06	Pap.
Ulmaceae (2)	<i>Celtis</i> (FO), <i>Ulmus</i> (FO)	02	Nym.
Urticaceae (2)	<i>Debregeasia</i> (FC), <i>Urtica</i> (ME)	04	Nym.
Violaceae (1)	<i>Viola</i> (OR)	04	Nym.

AR= Aromatic Plants; CE= Cereal Plants; CP = Carnivorous Plant; FC = Fibre crop; FO = Forest Tree; FR = Fruit Crops; GR = Grasses; ME = Medicinal Plants; NA= Not available; OL; Oil seed Crop; OR = Ornamental Plants; VE= Vegetable Crops.

Table 2. Diversity and the number of species of different kinds of crops and plants of various families, serving as food for number of butterfly caterpillar species, belonging to family Nymphalidae and Papilionidae in Jammu and Kashmir State.

Type of crop/plants	No. of crop/ plant species	No. of plant family	No. of caterpillar family	Caterpillar family
Aromatic plants	02	01	02	Pap.
Cereal crops (rice)	01	01	02	Nym.
Carnivorous plants	01	01	01	Pap.
Fibre crops	01	01	01	Nym.
Forest trees	02	01	02	Nym.
Fruit crops	01	01	01	Nym.
	02	01	03	Pap.
Grasses	NA	-	07	Nym.
Medicinal plants	14	07	12	Nym.
	04	03	03	Pap.
Oil Seed crop	01	01	01	Nym.
Ornamental Plants	03	03	06	Nym.
	01	01	01	Pap.
Vegetable Crop	01	01	01	Nym.

Nym=Nymphalidae; Pap=Papilionidae; NA=Not available.

Conflict of interest statement

Author declares that there is no conflict of interest.

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