

Checklist of butterflies (*Insecta: Lepidoptera*) in Pauri city of Garhwal Himalaya, Uttarakhand, India

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Abstract

This study deals with the checklist of order Lepidoptera (Rhopalocera) from, Pauri Garhwal, Himalaya Uttarakhand India. The study was carried out during this pandemic lockdown, to understand the butterfly status in Pauri City from October 2019 to May 2020. 32 species belonging to 27 genera containing 5 families were recorded from 2 sites viz. Kandoliya Road and Gadoli site in Pauri City. The Nymphalidae family was the most dominant among the 5 families, with 16 species, followed by Pieridae comprising of 7 species, Lycaenidae with 6 species, Papilionidae with 2 species and Riodinidae with 1 species. Maximum numbers of butterflies were observed in Gadoli site as compared to Kandoliya.

Keywords: butterfly, checklist, Pauri city, Garhwal Himalaya

Introduction

Lepidoptera is one of the insect orders that have received sufficient attention and quiet many studies have been made on the taxonomy of this group. Butterfly is one of the most fascinating and conspicuous creatures on this Earth belongs to order Lepidoptera and class Insecta. There are around 2,55,000-2,65,000 documented species of order Lepidoptera worldwide and 7.5% species of which are butterflies (Regina, 2009; Jaret and Doug, 2014) [16, 8] and almost 1,800 species and subspecies of butterflies are found in India (Kunte *et al.*, 2012) [10]. These butterflies are used for symbolizing freedom, beauty, peace, and act as the indicators of the environment. They are extremely responsive to any change in their environment. Viz: light, temperature, humidity. The butterflies fly happily only when their body temperature is within a given range between 28°-38°C (Dennis, 1993) [4].

The studies on Indian butterflies were initiated by Fabricius and Cramer as early as in 1775 and subsequent workers like Horsfield (1828-29) [7], Moore and Swinhoe (1890-1913) [12], Bingham (1905), Bell (1909-1927) [2]. Evans (1932) and Yates (1935 & 1946) [18, 19] have contributed much to our knowledge of these insects. Rajasekhar (1995) [15] studied the butterfly populations at Guindy National Park, Madras. Kunte (2001) [11] reported on butterfly diversity of Pune city along the human impact gradient and Arun and Rajiv (2004) [1] have demonstrated a model for estimating butterfly species richness of area across Indian subcontinent with family Papilionidae being used as an indicator. Recently the Paul and Sultana (2020) [14] study the butterfly diversity across different urban landscapes of Delhi, India.

Butterflies are used as model organisms in the study of evolution, genetics, and mimicry and in conservation biology. The research work carried out on butterfly in Uttarakhand was in early stage and little work has been done by different workers in different regions of the state. But no such work of butterfly study was conducted in the Pauri city till date. Hitherto this study was designed to

update the status of butterfly in Pauri city. Different species of butterfly were seen and photographed in the morning hour of this study from the selected two sites and the checklist of collected butterflies were embedded in this paper.

Methodology

Study area

The present study was carried out in Pauri Garhwal, district of Uttarakhand, encompasses an area of 5,230sq. km and situated between 29°45' to 30°15' N and 78°24' to 79°23' E in the Northern part of India, during October 2019 to May 2020. But due to COVID-19 lockdown it was limited up to two locations i.e. Kandoliya Road and Gadoli, an area about 6km away from main Pauri city.

Present study was completely digital and virtual by using visual encounter methods for the observation of butterfly nearby the locality up to the extent of selected site we reach during lockdown in the morning hours of the day. The photographs of butterflies were taken during the observation hour and were used for the identification of the species of butterfly's with the help of Mr. Rajeev Lochan, Research Scholar Department of Zoology, H.N.B Garhwal University Srinagar and finally identified by entomologist expert Dr. Gaurav Sharma Scientist-D ZSI Dehradun and with the help of relevant literature as well as photographs described by (Kumar, 2008; Sunil, *et al.*, 2016; Kumar, *et al.*, 2016) [9, 13, 17]. Colour pattern, sizes and shape as well as their designs were considered in identification of the species of butterfly.

Observation

During this study a total of 32 species belong to 27 genera containing 5 families were recorded from 2 different sites (Figure 1-32). The diagnostic characters, distribution and ecology of butterflies' species observed and description of each species has been organized with the help of Handbook on Common Butterflies of Uttarakhand Published by ZSI Kolkata, India, by Kumar, 2008 [13].



Fig 1: Check list of butterfly collected from Pauri City

1. *Callerebia scanda* (Kollar, 1844)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic character: Male and female are similar. Upper side: Wings brown with shade of black, becoming paler over discal areas. Forewing with a very pale fulvous-ringed, oval, black sub-apical ocellus ringed with orange and under side faint-darker brown band. Hind wing dusted with white over two small sub-basal ringed white pupilled black ocelli present.

Wingspan: 50-60mm.

Distribution: The subspecies is common from Chitral to Sikkim and Himalaya's up to an altitude of 8000 feet. This species is found in different districts of Uttarakhand like Dehradun, Bageshwar, Tehri, Pauri etc.

Ecology: It is a common butterfly found along forest edges roadside and has a typical brown flight found at elevation of 1200 to 2800m. When disturbed, it flies dodging out of the

reach of collector.

2. *Callerebia nirmala* (Moore, 1865)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male upper side: wings dark-brown: Forewing with a sub-apical black ocellus having 2 white pupils and a dark ferruginous ring with broader pale border. Hind wing with a subternal single white pupilled black ocellus. Under side- very light brown to greyish. Hind wing with marginal series of white dots usually a small tornal ocellus. Females are similar as male but generally larger and paler.

Wingspan: 45-55 mm.

Distribution: This species is mostly found in Asia and ranges from Himalayas at an altitude of 8000 feet and in different districts of Uttarakhand in Nainital, Almora, and Pauri etc.

Ecology: This butterfly is found in hilly regions at elevations of 1500-3050m. It has a characteristic slow flight and hopping and prefer to fly in shady, damp or forest localities.

3. *Dilipa morgiana* (Westwood, 1850)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and Female: Similar in appearance upper side wings brown to black with golden orange markings and forewing with central cell spot. Male under side, Pale orange brown and forewing with similar markings as on upper side and in case of female under side same as male but with white markings, faintly suffused with violet.

Wingspan: 70-80mm.

Distribution: This species is generally distributed in Indian and found in different districts of Uttarakhand like Bageshwar, Tehri, and Chamoli etc.

Ecology: The butterfly prefers to fly at altitude between 1400-2300m and the smell of fermenting fruits is the best way to attract emperors. It has three annual broods Spring, Summer and Monsoon.

4. *Kaniska canace* (Linnaeus, 1763)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female are similar

Upper side: Wings black. Forewings have a blue band at the wavy outer edge and a blue or white spot at the wing leading edge. Hind wing with wide blue transversal band and with series of small black spots. Under side of the butterfly is brownish-black and covered with thick and short transverse jet-like striae.

Wingspan: 60-70mm.

Distribution: This species is found in different parts of Uttarakhand like Champawat, Pauri, and Pithoragarh etc. It can be found as far north as Siberia, west to Japan and Korea, east to India and Taiwan and south to Srilanka and Myanmar.

Ecology: This butterfly is highly territorial, forest loving but also visits grasslands. It is hardly found by its predators when it hides in woodlands because of the colour and pattern of its under sides same as tree bark.

5. *Melanitis leda* (Linnaeus, 1758)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Upper side: The wings are dark brown with a large sub-apical patch which have black spots with two small white spots embedded or shaded with orange-brown. Hindwing with dark, white centred, fulvous ringed ocellus. Under side: Both wings differ markedly in the wet season form and dry season form.

Wingspan: 38-42mm.

Distribution: This species found across most of Africa extending to part of Australia. This species is distributed in different regions of Uttarakhand like Dehradun, Uttarkashi, and Pauri etc.

Ecology: This butterfly is found flying at early dawn and dusk and found along or near the dense vegetation. When disturbed, it flies away but not too much greater distance.

6. *Lethe confusa* (Aurivillius, 1897)

This species belongs to the family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female both similar in size and colour. Upper side: Wings brown and forewings slightly curve, discal white band and crossed with oblique. Beyond this band are two obliquely placed preapical white spots. Hind wing uniform, ocelli of under side showing through. Under side: Wings uniform brown. Forewing and hind wing with white line. Forewing with discal white colored bar as on upper side.

Wingspan

53-60mm.

Distribution: This species ranges from Pakistan to Sikkim and Assam and also occurs in Myanmar. This species is found in different districts of Uttarakhand like Bageshwar, Pauri, Almora etc.

Ecology: This butterfly is mostly found in pines and deodar forest or along roadsides. It has a territorial habit, very aggressive towards intruders.

7. *Aglaia Caschmirensis* (Kollar, 1844)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female are similar in appearance: Upper side wings colored and forewing with black and yellow bar alternatively with white patch before apex. Hind wing dusky brown covered with long brown hairs. Under side: both wings brown with transverse black striae.

Wingspan: 50-60mm.

Distribution: This species is found in different districts of Uttarakhand like Chamoli, Bageshwar, Pauri etc. It ranges from Kashmir to Sikkim at elevations of 1000 to 4000m.

Ecology: This species is most common in cold season on flowery slopes, forest edges, on roadside at an altitude between 1000-4000m. The flight is rapid and sits on the ground by wings half open.

8. *Neptis hylas* (Linnaeus, 1758)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female are similar and upper side wings black with white marking. Forewing club-shaped with white streaks, triangular spots. Under side of butterfly chocolate- red with white markings but broader

and defined in black.

Wingspan: 48-60mm.

Distribution: This species is found in different districts of Uttarakhand like Almora, Pithoragarh, and Pauri etc. It ranges from Kashmir to Myanmar ascending to about 9000 feet in Himalayas.

Ecology: This butterfly is very common in hilly and wooded regions. Mostly found in watery places and densely vegetated nallahs. They are sun loving and fly in a slow sailing fashion.

9. *Symbrenthia lilaea* (Hewitson, 1864)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male: Upper side wings black with orange markings and forewing has a discoidal streak clavate and short oblique band from middle of dorsum. Hind wing with a broad subbasal transverse band. Under side: wings ochraceous orange with numerous spots and lines of ferruginous.

Female similar to male with broader orange markings and paler on upper side.

Wingspan: 45-55mm

Distribution: This species occurs in the ranges from Himalayas to Western Ghats and also found in China, Borneo, Taiwan and Malaysia. This species is found in different districts of Uttarakhand like Rudraprayag, Pauri, and Champawat etc.

Ecology: This is a beautiful butterfly of wooded and hilly regions. It is very alert and skittish and ascends to the tree top when alarmed.

10. *Vanessa indica* (Herbst, 1794)

This species belongs to family Nymphalidae of order Lepidoptera

Diagnostic characters: Male and female similar with upper side forewing black or brown with irregular red band having three large black spots. Hind wings much narrower and shorter and is golden-brown in colour. Under side: paler than the upper side, forewing with three small transversely placed blue spots beyond the cell.

Wingspan: 56-68mm

Distribution: This species occurs in higher altitude regions of India and ranges from Kashmir to Myanmar and found in different districts of Uttarakhand like Nainital, Pauri, Chamoli etc.

Ecology: This species is found in open areas and inhabits wooded regions, forests and jungles. It flies rapidly and settles to gain strength by warmth of sun.

11. *Vanessa cardui* (Linnaeus, 1758)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female similar in upper side the forewing with an outwardly black irregular shaped broken band. Before the apex is a short white oblique streak hind wing with a black patch and there is a row of five round black spots. Under side: forewing brighter reddish-ochraceous, and the apex being ochraceous brown. Hindwing ochraceous brown and speckled with black scales.

Wingspan: 45-75mm

Distribution: This species can be found on all continents except Australia and Antarctica; usually at lower elevations and found in different districts of Uttarakhand like Nainital, Uttarkashi, Pauri etc, and

Ecology: This species is found in wide open areas of vegetation such as fields, Meadows. It mostly feeds on red cover and aphid honeydew. This migration pattern of this butterfly is highly erratic and does not migrate every year.

12. *Ypthima asterope* (Klug, 1832)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female: upper side wings brown with margins much darker on both fore and hindwing with orange yellow markings. Forewing with single, oval, black and yellow ring. Hind wing is provided with 2 smaller ocelli or rings. Under side: wings brownish- white with pale orange markings, but generally larger.

Wingspan: 30- 40mm

Distribution: This species is found in different districts of Uttarakhand like Mussoorie, Rudraprayag, and Pauri etc. This species is of low intermediate altitude, from sea- level upto maximum of 400-500m.

Ecology: This species is found in the open grassy areas, forest edges or roadside. The butterfly has a feeble flight. There is one generation per year, from March until June and again from September up to November.

13. *Ypthima baldus* (Fabricius, 1775)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male and female: upper side wings brown with the margins much darker on both fore wings and hind wing. Forewing single oval black and yellow ring, while hind wing is provided with 2 small post discal ocelli and minute tornal ocelli. Under side: wings brownish white with margins much darker.

Wingspan: 30-45mm

Distribution: This species occurs in Korea, Japan, Myanmar, China, Nepal, etc. This species is found in different districts of Uttarakhand like Pauri in month of April-May, Mussoorie in month of March- April etc.

Ecology: This species is found along grassy forest edges and in secondary outgrowth at elevations between 300-1200m. It has seasonal variation and is fond of small herbs

and shrubs. The butterfly has weak flight and stays close to ground.

14. *Acraea issoria* (Hubner, 1819)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Male upper side wings yellow-brown. And forewing with the veined and the outer margin narrowly black. Hind wing with black lines and bearing spots of ground colour. Under side: Forewing ground colour yellow getting paler towards apex. Hind wing with ground colour delicate pinkish-white, veins black and female having ground color is paler than male.

Wingspan: 58-64mm.

Distribution: This species found in India, Myanmar, China and ranges from Kulu to Kumaon between 3000-8000 feet. This species is found in different districts of Uttarakhand like Mussoorie, Almora, and Nainital etc.

Ecology: It is a leathery winged butterfly with weak but persistent flight. It inhabits open, scrubby country and hot mountain valleys at elevations between 500-1400m. They are sun loving and can be seen basking early morning.

15. *Junonia iphita* (Cramer, 1779)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic characters: Female can be distinguished from male by white marking on the under side of hind wing. Male and female: upper side: Forewing brown with some dark brown bands and whitish spots. Hind wing with slender loop near the apex. Under side: both wings are paler. The apex of forewing is produced and angulated.

Wingspan: 50-78mm

Distribution: This species occurred from Kashmir to Kumaon and also found in Srilanka and Myanmar and found in different districts of Uttarakhand like Tehri, Pauri, and Rudraprayag etc.

Ecology: This butterfly is found in wetter and well-wooded hilly regions and is fond of settling in wet and shady places. It has a bold flight but not to a greater distance and exhibits seasonal variations.

16. *Libythea myrrha* (Godart, 1819)

This species belongs to family Nymphalidae of order Lepidoptera.

Diagnostic character: Male upper side, wings ground colour brown and black with tawny marking. Forewing with a streak from the base, 2 sub-apical orange yellow spots placed obliquely or sometimes joined into a band, giving a club like appearance. Hind wing uniform with an orange yellow broad discal and slightly oblique narrow medial band; with outer margin wavy. Under side: Paler, ground colour brown with orange -yellow markings as on the upper side but broader, more diffuse and apex irrorated with purplish. Female: pale throughout with larger tawny markings.

Wingspan: 46-58mm

Distribution: This species is found in different districts of Uttarakhand like Pauri, Bageshwar, Haridwar, Tehri etc. and along the Himalayas from Kulu to Sikkim.

Ecology: This species prefers wet forests gravel roads or gardens and found near streams in forests. If disturbed, they fly up and settle on twigs and disguised as dead leaves, but return to feed on ground as the danger has passed.

17. *Colias erate* (Esper, 1805)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male individual upper side: forewing yellow coloured with unspotted black band broadest at the apex. Hind wing orange- yellow discocellular spot with black spot covering the margin. Female upper side: yellow or white forewings with broader band then in male hind wing darker. Male and Female - under side: Lemon, Yellow and White; forewing with discocellular spot as on uppers ide.

Wingspan: 42-53mm.

Distribution: This species occurred from South-eastern Europe through Turkey over central Asia and Japan. This species is found in different districts of Uttarakhand like Nainital, Pauri, Bhimtal, Almora etc.

Ecology: This butterfly is found mostly in gardens and sits very few otherwise keeps on fluttering within a meter. It visits on low growing flowers to feed.

18. *Pieris canidia* (Sparrman, 1768)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male and female are similar Upper side wings are white to pale cream with black spot at the apex of the forewing which are prominently three in number. Under side: Forewing is white in colour without any black margin and the apex is broadly tinged with ochraceous yellow. Hind wing is greenish yellow with black scales. Antennae are black with minute white specks; thorax is greenish-grey and the abdomen is black.

Wingspan: 45-60mm

Distribution: The species is widely distributed in India and ranges from Pakistan to Myanmar. This species is found in different districts of Uttarakhand like Almora, Pauri, Chamoli etc.

Ecology: This species is common at forest edges, meadows on roads. Species of this genus mostly feed on cabbage.

19. *Leptosia nina* (Fabricius, 1793)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male and Female are similar in upper side the wings white in colour and the base of wings is slightly provided with black scales and a black sub-apical spot on the forewing and the black border is wider at the apex. Hind wings are uniformly white. Under side: forewing without black apex and outer black margin, with a discal spot as on upper side.

Wingspan: 28-50mm

Distribution: This species is found in different districts of Uttarakhand like, Pithoragarh, Pauri, and Uttarkashi etc. It ranges from Peninsular India and ascends to an elevation of about 6,500 in Himalayas

Ecology: This is a butterfly of open but sheltered grassy places. They are pretty restless during day light hours. The flight is feeble and erratic, bobbing up and down as they flutter over the grasses.

20. *Catopsilia pyranthe* (Linnaeus, 1758)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male upper side is chalky white slightly tinted with green. Forewing is with black spot, an outer black marginal border wide at apex. Hind wing immaculate, under side - ground colour similar, suffused on anterior half of forewing and the hind wing is greenish with reddish brown strigae and small discocellular black spot and black broader markings at apex. Under side with discocellular spots better defined, with an outer red ring encircling silvery spots.

Wingspan: 50-70mm.

Distribution: This species occurred from India and Srilanka to Malaysia, Java, and Sulawesi etc. This species is found in different districts of UK like, Pauri, Rudraprayag, Chamoli, etc.

Ecology: This species is migratory in behaviour found in forests, gardens. It flies in a zig-zag way and rests along the leaf.

21. *Delias belladonna* (Fabricius, 1798)

This species belongs to family Pieridae of order Lepidoptera

Diagnostic characters: Male upper side dusky brownish-black with white to pale cream coloured spots and forewings with sub-marginal series of white spots. Hind wing is basal half whitish and the apical half is strongly tinged with yellow. Under side: ground colour similar but more brownish with larger markings and more sharply defined than upper side. On hind wing, the dorsal margin and cell streak are yellow with basal spot. Female are similar as male, but ground colour always paler and duller, markings on the upper side are less distinct.

Wingspan: 70-95mm.

Distribution: The species ranges from Kulu to Sikkim at altitude from 2000 to 7000 feet and found in different districts of Uttarakhand like Haridwar, Pauri, and Dehradun etc.

Ecology: This species is common in lower valleys and is found in gardens and disturbed human habitations. Its flight is slow and lazy and can be rapid and irregular on disturbance.

22. *Catopsilia pomona* (Fabricius, 1775)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male upper side of both wings is chalky white, with more clearly defined basal sulphur-yellow area and forewing with costal margin black at apex and hind wing generally uniform. On under side, the ground colour is variable greenish white or sulfur yellow and both wings with discocellular silvery spot ringed with reddish brown. Female upper side the ground colour varies from chalky white to sulfur yellow. Hindwing with a series of blackish marginal vein spots. Under side varies from being white to slight yellowish or reddish brown with prominent marking.

Wingspan: 50-70mm

Distribution: The species occurred found in Asia, Cambodia, and Australia this species is found in different districts of Uttarakhand like, Pithoragarh, Pauri, and Uttarkashi etc.

Ecology: This butterfly has a rapid bouncy, irregular flight and proceeds in a series of up and down curves. It is fond of settling on flowers, tree tops, damp patches etc, at an elevation of 2450m in hills.

23. *Heliophorus sena* (Kollar, 1844)

This species belongs to family Lycaenidae of order Lepidoptera.

Diagnostic Characters: Upper side forewings violet in colour with dark border and hind wing with broad black outer margin under side dull brownish- yellow with a fine black line.

Wingspan: 30-35 mm

Distribution: This species is found in different districts of Uttarakhand like Chamoli, Pauri, and Tehri etc. The species ranges from Pakistan to Kumaon and ascends to 9000 feet in Himalayas

Ecology: It is a small butterfly active throughout the year. It is fond of shrubs and small flowers. It files very quickly but not to a greater distance and sits with wings closed, but opens the wings to bask in the warmth of sun.

24. *Pseudozizeeria maha* (Kollar, 1844)

This species belongs to family Lycaenidae of order Lepidoptera.

Diagnostic characters: Male: Upper side both wings silvery light blue with narrow border and under side brownish - grey with a series of large black spots
Female: Upper side wings brownish - black suffused with light blue under side dark with clear markings.

Wingspan: 22-30mm

Distribution: The species occurs throughout India and also in Nepal, Bangladesh, Myanmar, and Pakistan. This species is found in different districts of Uttarakhand like Dehradun, Pauri, Bageshwar, Haridwar etc.

Ecology: This is a common butterfly in hilly region and always flies close to the ground and visits weeds, low growing flowers. The host plant of this species is *Oxalis Corniculata* and settles with wings closed but partly open the wings to bask in the warmth of the sun.

25. *Zizina otis* (Fabricius, 1787)

This species belongs to family Lycaenidae of order Lepidoptera.

Diagnostic characters: Male: Upper side violet blue with a silvery sheen and forewing with broad brown edging along the termen. Under side brownish- grey with a series of seven-minute black spots.

Female: Upper side brown with suffusion of violet blue at the bases of wings and under side brown colour lighter than in male.

Wingspan: 22-27 mm

Distribution: This species generally occurs in South- Asia, everywhere in India, also in Srilanka. This species is found in different districts of Uttarakhand like, Mussoorie, Pauri, Uttarkashi districts etc.

Ecology: It is found flying close to the ground mostly where its host plant, *Desmodium Triflorum* is found. It keeps on flying around the weeds and sits very often.

26. *Aricia agestis* (Denis and Schiffermuller, 1775)

This species belongs to family Lycaenidae of order Lepidoptera.

Diagnostic characters: Male and Female bronzy brown in colour. Upper side: Forewing and Hind wing with an orange band of spots across the edge of wings and outer white margin. Under side: with numerous ocelli

Wingspan: 30-35mm.

Distribution: This species is found in different districts of Uttarakhand like Nainital, Chamoli, and Pauri etc. It is found through the Palearctic Eco zone north to northern Jutland and east to Siberia and Tian Shan.

Ecology: This species occurs in small, compact colonies and is not a great wanderer. It is quite local in lowlands but more common in mountains. They fly everywhere in fields, rocky hills and gardens.

27. *Udara dilecta* (Moore, 1879)

This species belongs to family Lycaenidae of order Lepidoptera

Diagnostic characters: Male and Female individual of this species have white under wings with small and indistinct markings. Male upper side both wings very pale silvery blue with thread - like blackish margins, Female upper side

wings faint bluish - white with broader brown-blackish margins, mainly along costa and apex with white patches on both wings.

Wingspan: 28-33mm

Distribution: This species occurred in China, Japan, and Malaysia etc. This species is found in different districts of Uttarakhand like Rudraprayag, Chamoli, and Pauri etc.

Ecology: This species can be seen in forested areas and is common in hills of northeast between 610 to 3900m.

28. *Talicauda nyseus* (Guerin, 1843)

This species belongs to family Lycaenidae of order Lepidoptera.

Diagnostic characters: Upper side: Black or brownish-Black, in certain lights with a dull purplish flush. Forewing with very thin thread-like edging of white costa, hind wing with a large orange -red patch on the posterior terminal half of the wing narrow edging of black colour. Under side: forewing is white with black spots more towards the margin has a wide band of orange with white spots.

Wingspan: 30-35mm.

Distribution: This butterfly occurred from India and Srilanka to Burma and also found in Punjab, Odisha, Maharashtra etc. This species is found in different districts of Uttarakhand like Rudraprayag, Champawat, and Tehri etc.

Ecology: This is a small striking butterfly and is a weak flier and flutters about close to the ground in short bursts. It basks with wings half open.

29. *Papilio polyctor* (Boisduval, 1836)

This species belongs to family Papilionidae of order Lepidoptera.

Diagnostic characters: Male and female: upper side -wings dark black, tailed and thickly irrorated with golden-green becoming bluish anteriorly. Male with woolly scent stripes on forewing. On hind wing, the irroration of golden green scales is less dense, turning to blue on the anterior portions of the wings, under side: wings chocolate-brown irrorated with yellowish scales. Forewing with grey stripes between veins and hind wing contain series of claret-red lunules transverse with purple blue line.

Wingspan: 90-130mm

Distribution: This species occurred in Nepal, Bhutan, and Myanmar etc. This species is found in different districts of Uttarakhand like Nainital, Pauri, and Champawat etc. The subspecies is common from Pakistan to Kumaon at elevation of about 7500 feet.

Ecology

It is one of the most beautiful large tailed butterflies of India. It is most striking in flight. The depth and shades of green and blue change with angle of light falling on it wings.

30. *Papilio protenor* (Cramer, 1775)

This species belongs to family Papilionidae of order Lepidoptera.

Diagnostic characters: Male upper side wings velvety indigo-blue black, which is dull on the forewing than on hind wing and forewing with pale adnervular streaks. Hind wing with broad pale yellowish-white subcostal streak irrorated with bluish scales; under side: The forewing dull black and with broader adnervular streaks, hind wing ground colour as on upper side.

Female upper side is ground color deep brownish-black, adnervular streaks on forewing yellowish, red patch at tornal angle large with an oval medial black spot and in under side same as in male.

Wingspan: 100-120mm

Distribution: The species occurred found in Nepal, Assam, and Japan etc. This species is found in different districts of Uttarakhand like Pithoragarh, Pauri, Almora etc and ranges from Kashmir to Kumaon.

Ecology: The species of butterfly is black in color and tail-less. It is a very alert butterfly and flies to a long distance. If disturbed, it flies in a leisurely manner and display remarkable powers of flight.

31. *Aporia agathon* (Gray, 1832)

This species belongs to family Pieridae of order Lepidoptera.

Diagnostic characters: Male and female are similar in appearance, in upper side the forewings and hind wings black with white or grain-white streaks with spot in discoidal cells and interspaces. Under side: Similar as upper side with more clearly defined markings and the hind wing at the base of costa is bright-yellow.

Wingspan: 80-90mm.

Distribution: This species occurs in the sub-Himalayan region from Assam, Bhutan, and Nepal to Mussoorie and Kumaon in the west. This species is found in different districts of Uttarakhand like Rudraprayag, Almora, and Chamoli etc.

Ecology: It is a mid-sized butterfly and is common in Garhwal above 5,000 feet. It has a heavy floating flight and is mostly found near watery places.

32. *Dodona durga* (Kollar and Redtenbacher, 1844)

This species belongs to family Riodinidae of order Lepidoptera.

Diagnostic characters: Male upper side: Wings dark brown with numerous dark yellow spots. Under side: Wings with large and pale yellow spots. Hind wing with ochraceous markings, with two small black spots near the apex. Female individual are same as male but larger and with broader Wings.

Wingspan: 30-42mm.

Distribution: This species is found in different districts of Uttarakhand like Dehradun, Haridwar, and Tehri etc. It is very common all over the range of western Himalayas and ascends to about 9,000 feet. It also occurs in Pakistan.

Ecology: It is common seen at altitude between 760-2400m. It is not very fond of flowers and flies in sunshine and mostly found near water streams. It is a quick flier but frequently settles on sand at water.

Conclusion

The present study was completed during the lockdown period from two sites viz., Kandoliya road and Gadoli in district Pauri by taking photographs of butterflies individually to note the distribution and availability of butterfly. Colour of the wings on both upper side and under side, pattern on the wings, presence or absence of tail, shape of wings and wingspan help us to identify different butterfly species, a total of 32 species of butterflies belongs to 5 families and 27 genera were recorded during the study. Butterflies are the wild indicators of the environment and tell us everything about the healthier ecosystem. The fauna of these butterfly was threatened because of their habitat change and anthropogenic activities. They are mostly found in gardens, flowers and on the bank of streams etc. The recorded butterflies are mostly found along the forest edges, roadsides, nallahs etc. and in few cases butterflies also feed upon rotten fruits. But the population of these insects is declining rapidly due to urbanization and the unawareness of people about the importance of flying flowers (butterflies).

Therefore, it was concluded that the study area taken in this study was rich in butterfly and further research could be conducted to obtain more details on butterflies' population structure.

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