



## First photographic evidence of *Flos asoka* (de Nicéville, [1884]) (Lycaenidae: Theclinae: Arhopalini) in Uttar Pradesh, India: Recent confirmation and ecological insights

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### Abstract

This study presents the first photographic evidence of *Flos asoka* (de Nicéville, [1884]) in Uttar Pradesh, India, marking a recent confirmation of its presence in this region. Additionally, ecological insights derived from the study provide a deeper understanding of the ecology and natural habitat of *Flos asoka* in the region. This finding represents a significant contribution to the knowledge of the distribution and ecology of *Flos asoka* and highlights the importance of photographic documentation in species presence and distribution research.

**Keywords:** Distribution, Dudhwa National Park, habitat, Rhopalocera, taxonomy

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### *Flos asoka*'nın (de Nicéville, [1884]) (Lycaenidae: Theclinae: Arhopalini) Uttar Pradesh, Hindistan'da ilk fotoğraf kanıtı: Son doğrulama ve ekolojik içgörüler

### Özet

Bu çalışma, Uttar Pradesh, Hindistan'da *Flos asoka*'nın (de Nicéville, [1884]) ilk fotografik kanıtlarını sunmaktadır, bu da bu bölgedeki varlığının son onayını işaretlemektedir. Ek olarak, çalışmadan elde edilen ekolojik içgörüler, bölgedeki *Flos asoka*'nın ekolojisi ve doğal yaşam alanı hakkında daha derin bir anlayış sağlamaktadır. Bu bulgu, *Flos asoka*'nın dağılımı ve ekolojisi hakkındaki bilgiye önemli bir katkı sağlamakta ve tür varlığı ve dağılım araştırmalarında fotografik belgelerin önemini vurgulamaktadır.

**Anahtar kelimeler:** Dağılım, Dudhwa Ulusal Parkı, Habitat, Rhopalocera, taksonomi

### 1. Introduction

The butterfly genus *Flos* (Doherty, 1889) belongs to the family Lycaenidae with eight known species in India (Appendix I) [11]. The species belonging to this genus are commonly known as plushblues. The discovery of *Flos asoka* (de Nicéville, [1884]) in Uttar Pradesh, India, marks a significant milestone in butterfly research, as this species had eluded photographic documentation in the region until now. The paper also presents the first photographic evidence of *Flos asoka* within the Dudhwa National Park, situated in the Lakimpur-Kheri district of Uttar Pradesh. Through meticulous analysis of the newly captured photograph, the taxonomic identity of *Flos asoka* is verified, providing concrete confirmation of its presence in the region. The study not only fills a notable gap in previous literature but also offers valuable ecological insights into the habitat and natural environment of *Flos asoka* within Dudhwa National Park, the habitat was a dense forest and four individuals were seen in a week from the observed date. This finding contributes

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to our understanding of the distribution and ecology of *Flos asoka*, emphasizing the importance of photographic documentation in species presence and distribution research in India.

## 2. Materials and methods

On 17.vii.2023, researchers conducted a survey within the accessible areas of Dudhwa National Park (28°29'24.7"N 80°38'44.5"E), located in the Lakhimpur-Kheri district of Uttar Pradesh, India (Figure 2), at an elevation of 150 meters. During the survey focused on Rhopalocera species, they encountered and photographed a species identified as *Flos asoka* (de Nicéville, [1884]) based on available source of literature [14], [16]. The species is observed or sighted during the months of March through July exclusively, furthermore, *Flos asoka* may have specific host plants or breeding requirements that are available or optimal during the months of March to July. These host plants may provide essential resources for egg-laying, larval development, and adult feeding, influencing the timing of the species' presence in the area. Overall, the seasonal presence of *Flos asoka* from March to July likely reflects its adaptation to the environmental conditions and availability of resources during this period, highlighting the importance of understanding the species' life cycle and ecological requirements for conservation efforts.

This suggests a specific seasonal pattern in the species' appearance or activity, with sightings occurring within this particular time frame. Outside of this timeframe, sightings of the species are not reported yet. Following this initial discovery, the researchers revisited the area on 18.vii.2023 and 19.vii.2023, where they spotted and photographed three more specimens of the same species. To aid in the identification process, available literature sources such as [16], [10], [21], [19], [20] and [9] were consulted. The Rhopalocera specimens were photographed using either a DSLR Nikon D750. It's important to emphasize that no specimens were collected or harmed during the survey.

### 2.1 Study area

The study area encompassing a total of 490.29 square kilometers, which represents a significant portion of the once expansive Terai region, which stretches alongside the Himalayan foothills in Uttar Pradesh. This area is characterized by a diverse landscape comprising Sal forests, tall grasslands, and swamps that are sustained by periodic flooding. However, it faces substantial threats due to anthropogenic activities, with much of the Terai region having already been altered by agriculture and human settlements, leading to the depletion of its natural vegetation.

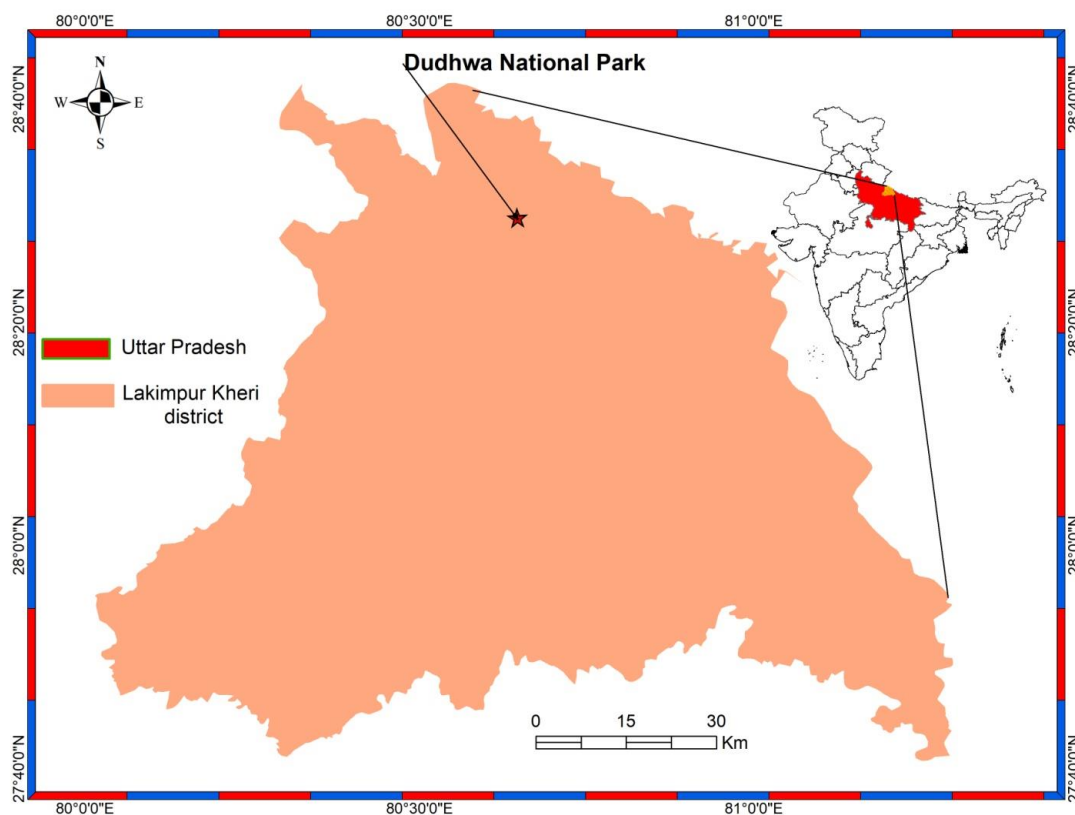


Figure 2. Map showing study area of *Flos asoka* (de Nicéville, [1884])

Dudhwa National Park is an integral part of the Dudhwa Tiger Reserve, which serves as the primary Protected Area Complex within the Terai region of India. As the sole National Park and Tiger Reserve representing the Terai-Bhabhar Biogeographic subdivision of the Upper Gangetic Plains Biogeographic province (7a), Dudhwa National Park holds significant ecological importance. The vegetation within the park falls under the category of North Indian Moist Deciduous type as classified by [5], boasting some of the most pristine Sal forests in the country. Ongoing documentation efforts have identified a wide variety of plant species and communities within the park, many of which hold conservation significance.

The Dudhwa Tiger Reserve harbors a unique and potentially viable population of the nominate sub-species of Swamp deer (*Rucervus duvaucelii duvaucelii* syn *Cervus duvaucelii duvaucelii*), making it the only location in the country where this species is found. Additionally, the reserve is home to five species of deer and supports a substantial tiger population. Several critically endangered species, including the Bengal Florican (*Hubaropsis bengalensis*) and Hispid Hare (*Caprolagus hispidus*), find sanctuary within Dudhwa National Park. Notably, the park has successfully reintroduced the Great Indian One Horned Rhinoceros. Furthermore, Dudhwa is home to numerous endangered species, with thirteen mammal species, nine bird species, and eleven reptile and amphibian species listed in Schedule-1 of the Wild Life (Protection) Act, 1972 [1].

### 3. Results

This study presents key findings regarding the confirmation of *Flos asoka* identity and its distribution in Uttar Pradesh, focusing on observations within Dudhwa National Park.

#### SYSTEMATIC POSTION

**Class Insecta Linnaeus, 1758**

**Order Lepidoptera Linnaeus, 1758**

**Family Lyacenidae Leach, 1815**

**Subfamily Theclinae Swainson, 1831**

**Tribe Arhopalini**

***Flos asoka* (de Nicéville, [1884]) (Figure 1)**

*Nilasera asoka* Nicéville, [1884]

*Satadra chola* Moore, 1884

*Arhopala asoka* vava Fruhstorfer, 1914

*Amblypodia asoka* Evans, 1932

#### Identification features

The identification features include a short tail and a distinct lobe, along with metallic scales positioned at the lower tip on the underside of the hindwing. Additionally, this species exhibits a dark basal band extending up to the inner margin, a curved pale streak inside the wing, and a pale bar located at the end of the forewing cell on the underside. These specific traits are instrumental in accurately identifying and classifying this butterfly within its taxonomic group.

#### Confirmation of *Flos asoka* Identity

Taxonomic verification confirmed the identity of *Flos asoka* in Dudhwa National Park, establishing its presence in the region based on other available evidence such as field observations and literature references.

#### Distribution and Habitat Analysis

*Flos asoka* was observed in diverse habitats within Dudhwa National Park, characterized by the unique ecosystem of the Terai region. The park features a mosaic of tropical moist deciduous forests, grasslands (known as 'chaurs'), wetlands, and riverine ecosystems. Dominant tree species include sal (*Shorea robusta*), teak (*Tectona grandis*), and khair (*Acacia catechu*), providing dense canopies that support a rich diversity of wildlife. The park is traversed by several rivers, including the Suheli and Mohana, and is home to numerous oxbow lakes, marshes, and wetlands. These water bodies serve as vital habitats for aquatic species such as gharials, mugger crocodiles, and freshwater turtles, as well as breeding grounds for waterfowl and migratory bird species. Dudhwa National Park experiences distinct seasonal variations, with hot summers, cool winters, and a monsoon season. The park's climate, topography, and vegetation create a unique habitat mosaic that supports a diverse array of wildlife species, including *Flos asoka*. The findings provide conclusive evidence of *Flos asoka* presence within Dudhwa National Park, contributing to our understanding of its distribution and ecology in Uttar Pradesh.



Figure 1. *Flos asoka* (de Nicéville, [1884]) (Underwing)

### Distribution in India

The species is rare in the Himalayas and is typically found at elevations of up to 900 meters. Its distribution ranges from Uttarakhand through northern Uttar Pradesh (Dudhwa National Park), Sikkim, northern West Bengal, Arunachal Pradesh, and northwestern Assam north of the Brahmaputra River (Chakrashila Wildlife Sanctuary), to northeastern India south of the Brahmaputra River (Meghalaya) [11]. Recorded from Manipur also [14].

### Global distribution

India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam, Hong Kong, South China [13].

## 4. Conclusions and discussion

Previous literature and checklists on butterflies of India [11] were thoroughly reviewed to verify the absence of published photographs of this species in Uttar Pradesh. The current research aligns with previous studies conducted in the state and neighboring regions, following similar methodologies and formats.

References to prior articles from Uttar Pradesh and adjacent states, such as those by [3], [4], [6], [6], [20], [8], [7], [21], [22], were consulted to contextualize the findings. Additionally, this study correlates with similar works on new butterfly records from adjacent areas, including studies by [12], [18], [23], [24] and [25]. Interestingly, *Flos asoka* is not listed under the Wildlife (Protection) Act, 1972 (Anonymous, 2006), or its amendment in 2022 [2], highlighting the need for continued research and conservation efforts for this species and others in its genus. This research contributes to the understanding of butterfly distribution in Uttar Pradesh and underscores the importance of photographic documentation in biodiversity research. This research presents the first photographic evidence of *Flos asoka* in Uttar Pradesh, India, confirming its presence in the region. Through detailed analysis and ecological insights, the study enhances understanding of the species' distribution and ecology. The findings underscore the importance of photographic documentation in species research and highlight the significance of visual evidence in validating occurrences. This research sets a precedent for future studies and emphasizes the value of interdisciplinary approaches in biodiversity research.

### Acknowledgements

The authors extend their heartfelt appreciation to the Forest Department of Uttar Pradesh, notably Mr. Renga Raju T., I.F.S., Deputy Director of Dudhwa National Park, and the diligent staff of the National Park, for their invaluable cooperation and assistance throughout the research process. Authors are thankful to Mr. Wasim Sajad Malik for the help in making of study area map.

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## Appendix I

Checklist on Flos species in India as per updated checklist of (Gasse, 2018), (Kumar et.al., 2020), (Pandey et.al., 2024).

1. *Flos apidanus* (Cramer, 1773) - Identified as the Plain Plushblue

Subspecies: *F. a. ahamus* Doherty, 1891

Occurrence: Scarce at lower altitudes in northeastern India below the Brahmaputra River, with no records in Tripura or Mizoram [11].

2. *Flos adriana* (de Niceville, 1883) - Variegated Plushblue

Occurrence: Infrequent in the Himalayas, found up to 1100m altitude, spanning from Uttarakhand towards the east, Uttar Pradesh, Sikkim, North West Bengal, Arunachal Pradesh, and northeastern India below the Brahmaputra (Eastern Assam and Manipur) [11], [21].

3. *Flos areste* (Hewitson, 1862) - Tailless Plushblue

Subspecies: *F. a. areste* (Hewitson, 1862)

Occurrence: Uncommon in the Himalayas, between 600 to 1800m altitude, distributed across Sikkim, North West Bengal, and the hilly regions of northeastern India below the Brahmaputra (Meghalaya, Nagaland, and Manipur) [11].

4. *Flos asoka* (de Niceville, 1883) - Spangled Plushblue

Occurrence: Uncommon in the Himalayas, found up to 900m altitude, spanning from Uttarakhand towards the east through North Uttar Pradesh, Sikkim, North West Bengal, Arunachal Pradesh, and northwestern Assam above the Brahmaputra, as well as in northeastern India below the Brahmaputra (Meghalaya) [11].

5. *Flos chinensis* (C. & R. Felder, 1865) - Chinese Plushblue

Occurrence: Uncommon in the Himalayas, up to 1700m altitude, found in Uttarakhand, also seen in Sikkim, North West Bengal, and northeastern India below the Brahmaputra (not documented in Tripura or Mizoram) [11], [17].

6. *Flos diardi* (Hewitson, 1862) - Bifid Plushblue

Subspecies: *F. d. diardi* (Hewitson, 1862)

Occurrence: Rarely observed in the Himalayas, with limited sightings in Sikkim and Arunachal Pradesh at altitudes up to 1500m, and in northeastern India below the Brahmaputra (not documented in Tripura or Mizoram) [11].

7. *Flos fulgida* (Hewitson, 1863) - Shining Plushblue

Subspecies: *F. f. fulgida* (Hewitson, 1863)

Occurrence: Uncommon in the Himalayas up to 1700m altitude, observed from Central Nepal eastwards through Sikkim and North West Bengal to Bhutan, and in the hilly regions of northeastern India below the Brahmaputra (Meghalaya and Nagaland) [11].

8. *Flos anniella* (Hewitson, 1862) - Brilliant Plushblue

Subspecies: *F. a. artegai* Doherty, 1889

Occurrence: Extremely rare at lower elevations in northeastern India below the Brahmaputra (Meghalaya and Nagaland) [11].