

Range Expansion of *Papilio machaon* (Linnaeus, 1758) (Lepidoptera: Papilionidae) in Punjab, India

Gagandeep Thapa¹, Arshdeep Singh², and Taslima Sheikh^{3*}

¹ Independent Researcher, #1249, VPO Gharuan, Tehsil Kharar, District Mohali, Punjab, 140413, India.
Email: dgagan989@gmail.com | ORCID: 0009-0005-8785-7465

² Independent Researcher, #62, Phase-4, Mohali, District Sahibzada Ajit Singh Nagar, Punjab, 160059, India.
Email: arshramgarhia01@gmail.com | ORCID: 0009-0008-0401-764X

^{3*} Citizen Science Expert, Inspire Foundation Trust, Baraura Hussain, Bari Balaganj, Lucknow, Uttar Pradesh, 226003, India.

Email: sheikhtass@gmail.com | ORCID: 0000-0002-8112-1562

*Corresponding author: sheikhtass@gmail.com

Received 01 January 2025 | Accepted 20 February 2025 | Published 01 March 2025

Abstract

The Common Yellow Swallowtail (*Papilio machaon*), a widely distributed butterfly species, is reported for the first time in Punjab, India. Caterpillars were observed in Gharuan, Mohali District, in March 2023, feeding on dill (*Anethum graveolens*) at an altitude of 293 meters. The species' presence at this low elevation highlights its ecological adaptability and expands its known distribution. This paper documents its occurrence in Punjab and provides details about its identification.

Key words: *Papilio machaon*, Common Yellow Swallowtail, Punjab, dill, butterfly distribution, subspecies, biodiversity

1. Introduction

Butterflies are crucial indicators of environmental health and biodiversity. Among them, the Common Yellow Swallowtail (*Papilio machaon*), a member of the family Papilionidae, is known for its striking appearance and adaptability to various ecological habitats. Globally distributed, *P. machaon* has been documented across diverse elevations and regions, with notable subspecies variation.

Seven subspecies have been described in South Asia (Gasse, 2018):

1. *P.m.centralis*: Northern Baluchistan (1950–2400 m) and southern NWFP (Waziristan, 1200 m), Pakistan.

2. *P.m.asiaticus*: Himalayan foothills up to 3700 m, extending from northwestern Pakistan to Uttarakhand, India. Synonyms: *chitralensis*, *pendjabensis*, *sculda*.

3. *P.m.ladakensis*: High-altitude regions (2700–4350 m) in the Trans-Himalayas, from Pakistan to Ladakh and Himachal Pradesh.

4. *P.m.emihippocrates*: Nepal, 950–1950 m, related to *asiaticus*.

5. *P.m.rinpoche*: Nepal, 1750–4550 m, related to *ladakensis*.

6. *P.m.hookeri*: High elevations (2500–4800 m) in eastern Himalayas, from Sikkim to Arunachal Pradesh.

7. *P.m.suroia*: Northeastern India (Nagaland, Manipur) and southeastern Arunachal Pradesh.

These subspecies are predominantly documented in mountainous and high-altitude regions, while occurrences in lowland ecosystems remain largely unexplored. This study records *P. machaon* for the first time in Punjab, India, expanding its known distribution and highlighting its adaptability to lowland agricultural landscapes.

2. Materials and methods

1. Study Area

Gharuan is located in the Mohali District of Punjab, India, with geographical coordinates of 30.771252° N and 76.561224° E (Fig.4). The area lies at an altitude of approximately 293 meters and features a subtropical climate. Gharuan's landscape is primarily agricultural, dominated by crops like wheat, mustard, and dill (*Anethum graveolens*), interspersed with patches of natural vegetation. The region's agroecosystem provides a suitable habitat for various butterfly species.

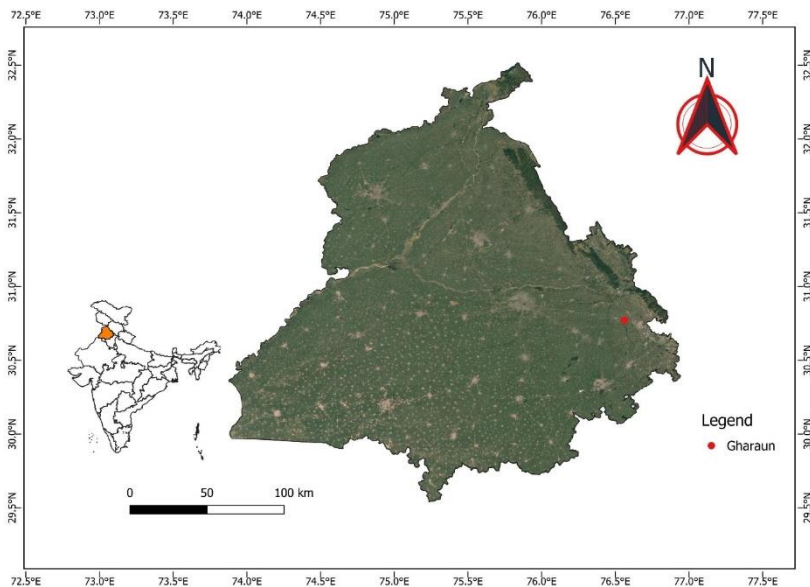


Figure 1. Map showing the location of species recorded

Methodology

Caterpillars were observed in March 2023 feeding on dill plants in the home garden of the first author, and their behavior was documented through photographs. The plants were cultivated from seeds, and the caterpillars appeared when the plants started blooming, indicating a natural range expansion of this species in Punjab. Identification was carried out based on morphological characteristics, which were compared with diagnostic features described in Kunte et al.,(2025), Parey & Sheikh (2021), Evans (1932), and Wynter-Blyth (1957). The map (Figure 4) was created using QGIS version 3.40.1.

3. Results

Papilio machaon (Common Yellow Swallowtail) caterpillars were observed and photographed in Gharuan, Punjab, India, in March 2023. Four to five caterpillars were feeding on dill (*Anethum graveolens*).



Figure 2. *Papilio machaon* Linnaeus, 1758 caterpillar feeding on *Anethum graveolens*

Systematic Position:

Class: Insecta Linnaeus, 1758

Order: Lepidoptera Linnaeus, 1758

Family: Papilionidae Latreille, 1802

Species: *Papilio machaon* Linnaeus, 1758 (Fig. 2)

Identification Features:

In last instar caterpillar becomes green with black and orange markings.

4. Discussion

The sighting of *Papilio machaon* in Gharuan marks a significant range extension into lowland agricultural ecosystems. While this species is well-documented in high altitude Himalayan regions (Sheikh et al., 2021; Parey & Sheikh, 2021; Garlani, 2024), this observation underscores its ecological adaptability. Additionally, it has been reported from Sikkim and Uttarakhand (Anonymous, 2025). A review of the latest checklists on Indian butterflies (Varshney & Smetacek, 2015; Gasse, 2018) revealed no prior records of this species in Punjab. Thus, this sighting is claimed as a new record for the state.

P. machaon is typically found in higher altitudes, its presence in Punjab at 293 meters suggests possible ecological drivers. Some factors to discuss:

Climate change: Rising temperatures may be facilitating range expansion.

Agricultural expansion: Availability of cultivated host plants (e.g., dill, fennel) in farmlands provides a suitable habitat.

Urbanization and habitat modification: Butterflies may be adapting to human modified landscapes.

Seasonal movements: This could be a temporary migration linked to favorable conditions during certain months.

Acknowledgements

The authors are also thankful to Mr. Tabarik Ali for his assistance in creating the map. The authors would like to thank the reviewers for their valuable comments and suggestions to improve the paper's quality.

Conflict of interests

The authors declare that they have no competing interests.

References

- Evans, W.H. (1932). *The identification of Indian Butterflies*. 2nd edn., Journal of the Bombay Natural History Society.
- Garlani, L. (2024). *Butterflies of Himachal Pradesh: Annotated Checklist*. Published by the Author, pp. vi + 66.
- Gasse, P. V. (2018). Butterflies of The Indian Subcontinent - Annotated Checklist. http://www.Biodiversityofindia.Org/Images/2/2c/Butterflies_of_India.Pdf.

- Kunte, K., Sondhi, S., and Roy, P. (eds.) (2025). *Butterflies of India*, v. 4.12. Published by the Indian Foundation for Butterflies. Available at: <https://www.ifoundbutterflies.org/papilio-machaon> (Accessed: 2 January 2025).
- Parey, S.H. and Sheikh, T. (2021). *Butterflies of Pirpanjal Range of Kashmir Himalaya*. Corvette Press.
- Sheikh, T., Awan, M.A., and Parey, S.H. (2021). Checklist of Butterflies (Lepidoptera: Rhopalocera) of Union Territory Jammu and Kashmir, India. *Records of Zoological Survey of India*, 121(1), pp. 127-171.
- Varshney, R.K. and Smetacek, P. (2015). *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Bhiwani & Indian Publication.
- Wynter-Blyth, M.A. (1957). *Butterflies of the Indian Region*. Bombay Natural History Society.