International Journal of Ecology and Environmental Sciences 50: 361-365, 2024
ISSN: 2320-5199 (Online); https://doi.org/10.55863/ijees.2024.0071

First Record of Large Branded Swift and Pale Small Branded Swift (Lepidoptera: Hesperiidae) from Uttar Pradesh, India and their Identification with Reference to Genitalia

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ABSTRACT
The present study reports a new state record of butterfly Pale Small Branded Swift, *Pelopidas thrax* (Heubner 1821) and a notable range extension record of butterfly Large Branded swift, *Pelopidas subochracea* (Moore 1878). Here, we provide a brief differential identification of the both species based on their morphology of male genitalia along with its previous physical descriptions. The present study also clarifies why the genitalia is required for the identification of skippers.

Key words: Lepidoptera, Hesperiidae, Genitalia, *Pelopidas*, Range extension, New record

INTRODUCTION

Family Hesperiidae is one of the most rich and diverse family in India. Out of the seven subfamilies of the mentioned family four are found in India, consists of 277 species of 74 genera. Hesperids are notoriously difficult to identify in the field, and accurate identification may necessitate dissection and examination of the genitalia. The genitalia of male butterflies have been the subject of numerous comprehensive studies because their morphology can serve as the foundation for taxonomic, systematic, and phylogenetic investigation (Bonfantti et al. 2013). Male butterfly genitalia have extensively modified sclerites on the 9th and 10th body segments. Most taxonomic investigations of Lepidoptera use genital morphology, particularly of the male, as one of the key features, and in some cases it is the only feature used (Goulson 1993). Several researches were conducted on the comparative morphology of male genitalia, genital muscles and intra-specific structural differences (Bonfantti et al. 2013).

New approaches to old issues provide unexpected results. Initially, butterfly species were defined based on wing patterns and shapes (Linnaeus 1758), because it was how they could be easily distinguished. Godman and Salvin (1893-1899) species determination in the Hesperiidae (Lepidoptera) has relied mainly on genitalia variations. W. H. Evans established this strategy, which has been employed by all (Evans 1937, 1949, 1951, 1952, 1953, 1955). Consistent differences in genitalia of either sex are considered the best evidence of speciation, and populations that differ in wing patterns but are comparable in genitalia are considered subspecies. Some species can only be recognised by genitalia rather than facies (Burns 2000), which is no longer unusual today. Species delineation in the Hesperiidae is currently based on genitalia identification.

The genus *Pelopidas* belonging to the tribe Baorini of the subfamily Hesperiinae, was established by Walker (1870) with the type species *Pelopidas midea* Walker. Later, *P. midea* was synonymised with *P. thrax* by Evans (1937). Currently the genus *Pelopidas* consist 11 known species/sub-species in the world out of which eight occur in India.

Large Branded Swift (*P. subochracea*) prefers dense moist forest at the lower elevation with heavy rainfall (Bhakare and Ogale 2018) and in Himalayan region upto 2400m and are confined to forested hills in regions of heavy rainfall (Khemikar 2016). They were found to be active at the grasslands, forest edges and forest clearings often near forest streams (Bhakare and Ogale 2018). In India, *P. subochracea* is reported from Maharashtra to Kerala, Jharkhand to Bengal, Sikkim to N.E India (Varshney and

Smetacek 2015) and recently from Gujarat (Bhatt et al. 2022). The presence of this butterfly in Uttar Pradesh shows the notable range extension of approximately 1000 km westwards.

Pale Small Branded Swift (*P. thrax*) is a pale brown skipper, confined to open grasslands and thorn forest in the dry desert like habitat (Bhakare and Ogale 2018). This species is currently recorded from Jammu & Kashmir to Delhi and Gujarat (Varshney and Smetacek 2015). This butterfly is a confirmatory record for Uttar Pradesh.

MATERIAL AND METHODS

As it is known that, identification of many skippers by the pattern of wings and wing spots is quite difficult, to ensure accurate identification, it is important as well as valuable to examine their genitalia. For proper study of diversity and identification, we first tried the capture and release method. Still, with a few skippers, it didn't work out, so we started collecting specimens from different localities of the district Barabanki (Tehsil Ram Sanehi Ghat and Ram Nagar). The collection was made with a butterfly-catching net. After netting, the thorax was pinched between the thumb and forefinger, and this method quickly stunned the specimen and prevented it from damaging itself. Details of samples collected are given Box 1. All specimens were deposited in Butterfly Research Centre, Bhimtal, and Uttarakhand, India.

According to established protocol, collected specimens were pinned (Dickson 1976). Male specimens' abdomens were immersed in 20% KOH solution overnight and then dissected the next morning in 20% ethanol under a binocular microscope for genitalia examination. 3.5X - 90X zoom trinocular stereo microscope was used to photograph genitalia. The technical terms describing the reproductive parts were reproduced in Box 2.

RESULTS

Large Banded Swift (*Pelopidas subochracea*): In 1891, Edward Yerbury Watson described it as: (same as Moore described in 1878).
Pamphila subochracea, Upperside glory luteous olive-brown; cilia yellowish cinereous.
Male: Forewing with two pale semi diaphanous spots at the end of the cell, three contiguous spots obliquely before the apex, three upper discal spots, below which is a narrow white oblique streak or brand; hind

Box 1. Details of specimens collected and used in the present study

GENUS: *Pelopidas* Walker 1870; TS: *Pelopidas midea* Entomologist, 5(76), 56 no. 58
Pelopidas subochracea Moore1878; *Proc. Zool. Soc. Lond.*1878 (3); 691, pl. 45, f. 8; **TL** Calcutta, India. Pelopidas subochracea; [MRS]. 729

***Material examined*:**
1♂: India, Uttar Pradesh, Dist. Barabanki, Village, Dara Pur, Tehsil Nawabganj, N 26º 54' 15.8'' E 081º 10' 54.8'', 122m ASL, 09.X.2021;
1♂: India, Uttar Pradesh, Dist. Barabanki, Village, Malinpur, Tehsil Ramsanehi Ghat, N 26º 51' 20.2'' E081º 31' 43.8'', 110m ASL, 06.X.2021;
1♂: India, Uttar Pradesh, Dist. Barabanki, Village, Bani Konder, Tehsil Ramsanehi Ghat, N 26º 47' 14.0'' E 081º 32' 05.1'', 110m ASL, 10.X.2021;
1♂: India, Uttar Pradesh, Dist. Barabanki, Near Nursery of Forest Department in Lalpur Guman, Range Ramnagar, N 26º 51' 20.1'' E 081º 31' 43.9'' , 123m ASL, 23.X.2021.

GENUS: *Pelopidas* Walker 1870; TS: *Pelopidas midea* Entomologist, 5(76), 56 no. 58
Pelopidas thrax; **Gegenes thrax** Heubner [1821]; *Samml. exot. Schmett.* 2: pl. [150]

Material examined: 1♂: India, Uttar Pradesh, Dist. Barabanki, Village, Ramnagar, Tehsil, Ramnagar, N 26º 51' 20.2'' E 081º 31' 43.8'', 123m ASL, 22.X.2021.

Box 2. General Terms used to describe genitalia (Evans 1949)

Tegumen: is the tergum of the ninth segment and is attached to the **Vinculum** (2), a ring reaching across the abdomen between the eighth and ninth segments.
Uncus: The Uncus is the tergum of the tenth segment and is hinged to the tegumen. Seen ventrally it is often divided and may be modified in a variety of ways.
Gnathos: The gnathos is the sternum to the tenth segment and is attached to the tegumen or the uncus or to both. It seems more liable to modification than any other part of the genitalia. Sometimes it is absent. Often it is bifid and the two limbs may be bent parallel to the vinculum, or they may be bent back behind the uncus. On the ventral side the gnathos may be furnished with velvet-like pads (*Erionota*) or spined and hollowed (*Pyrgus alveus*), perhaps to guide the aedeagus.
It is often impossible to follow the homology of the dorsal part of the genitalia due to distortion and fusion of the various components. The **Anal tube** (5) passes between the uncus and the gnathos. Through a **Sheath** (6), occasionally modified, in the middle of the vinculum passes the **Aedeagus** (7), the end of which is sometimes highly complex.
Hinged at the ventral end of either side of the vinculum are the two clasps, which with the uncus form the limbs wherewith the male holds the female during copulation. The outside lamina of the clasp is the **Valva** (8), whereon on the inside are usually to be found portions of an inner lamina, called the **Cuiller** (9) and the **Harpe** (10). Sometimes (Pyrgus) the harpe is produced to form a **Style** (11) and an Antistyle (12): or the harpe may be absent and the valva produced to style. Sometimes (Halpe) the basal end of the harpe is furnished with a **Footstalk** (13) wound round the aedeagus. The end of the vinculum is produced into the abdomen as the **Saccus** (14) an anchor for the genitalia as a whole.

wing with three small yellow upper discal spots, the two lowest small. **Female:** Forewing with a lower or fourth discal spot and a small dot below the third spot; the spots angled outward: hind wing as in male. Underside greenish-ochreous, brown on hind border of forewing and anal lobe; marginal line brown and prominent: forewing with the lower spot diffused and white: hind wing with the upper discal white spot large and quadrate, four spots below in a slightly linear position, the upper spot indistinct; a white spot also at upper end of cell, and a smaller indistinct spot above it.
Male genitalia description: Uncus ends curved away from gnathos, but not bent back.

Figure 1. *Pelopidas subochracea*: wing upper side of male imago

Pale Small Branded Swift (*Pelopidas thrax*) Walker 1870, described as *Pelopidas midea*.
P. midea, n. Expands. 1 in. 8 *lin*. **Female**: Brown. Head, pectus and underside of abdomen white. **Forewing:** ten silvery white hyaline marks in the disk; seven of them in two groups, nearer the costa and smaller than the others; first group composed of

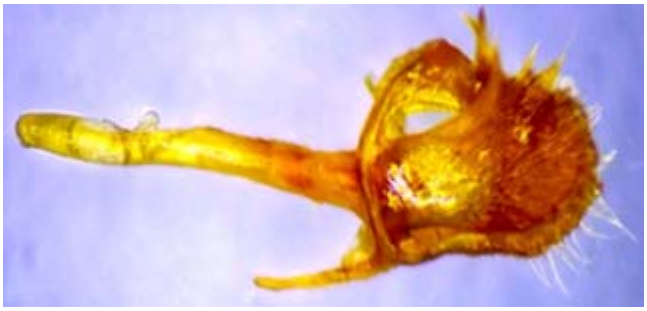

Figure 2. Male genitalia of *Pelopidas subochracea*

Figure 3. *Pelopidas thrax*: wing upperside of male imago

three elongated spots, nearer the base than the second group, which is composed of four dots arranged in a transverse streak; the three other spots elongated and forming an oblique transverse streak. **Male:** Male UPF narrow but prominent white brand from middle of vein 1 to lower inner edge of spot 2. Lower end of the male brand nearer termen than the base of the wing and a line joining the cell spots is directed to the lower end of the brand or just anterior [basal] to it.

Male genitalia description: Ends of Uncus bent back at tip.

DISCUSSION

The district Barabanki reserve forests support a diverse range of butterflies and their host plants, resulting in an adequate breeding habitat. Skippers are typically small, brown, complicated to spread, and challenging to identify; therefore compared to most other butterflies, skippers have been neglected by butterfly enthusiasts or researchers. Some males may have a blackish streak or patch of scent scales on their forewings due to sexual dichromatism. Skipper butterfly species have a distressing amount of physical similarity. For instance, even experts are currently unable to tell several species apart in the wild from each other in the genera *Amblyscirtes*, *Erynnis* (dusky wings), and *Hesperia* (branded skippers). Dissection and microscopic analysis of the

Figure 4. Male genitalia of *Pelopidas thrax*

genitalia, which feature distinctive characteristics that inhibit mating except between conspecifics, are the only effective study methods for differentiating them (Ackery et al. 1999, Khyade and Jagtap 2017). Therefore, for correct identification of species in Hesperiidae, male genitalia are required.

ACKNOWLEDGEMENTS

Authors are grateful to the Peter Smetacek (Butterfly Research Centre, Bhimtal, Uttarakhand) for his great support and mentorship during the study period. We are also thankful to the Dr. V. Elangovan (Professor at Baba Bhimrao Ambedkar University, Lucknow) for providing the necessary equipment for the genitalia photography.

Authors' contributions: All authors contributed equally

Conflict of interest: Authors declare no conflict of interest

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Received:19th December 2023
Accepted: 15th January 2024