

Filling the distributional gap of *Celaenorrhinus pyrrha* de Nicéville, 1889 (Lepidoptera: HesperIIDae: Tagiadinae) in the Himalayas

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Abstract: *Celaenorrhinus pyrrha* de Nicéville, 1889 is recorded for the first time from central Nepal. Three individuals were recorded in March and November, 2021 from 800–930 meters elevation in Pokhara, Kaski District. The species was recorded previously from Uttarakhand in the West Himalayas and Sikkim to Yunnan in the East Himalayas. Its distribution record, however, was missing from the central Himalayas. This new record is proposed to fill the distributional gap for this species in the central Himalayas. The identification is based on external morphology and the morphology of male genitalia.

Key words: Double Spotted Flat; Main Spotted Flat; Nepal butterflies; new distribution; spread winged skipper.

INTRODUCTION

The genus *Celaenorrhinus* Hübner, [1819] is distributed across Asia, Africa, and North and South America (Watson, 1893; Evans, 1952) with the occurrence of over 100 species (Evans, 1949; Yuan *et al.*, 2015), out of which 25 have been recorded on the Indian subcontinent (Gasse, 2018), wherein *Celaenorrhinus pyrrha* de Nicéville, 1889 is recorded from East Uttarakhand (India) in the West Himalayas to Arunachal Pradesh through Sikkim, NW Bengal and Bhutan, and also in other parts of NE India such as Meghalaya, Nagaland, and Manipur from 1200–2700 meters elevation (Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018). *Celaenorrhinus pyrrha* is also recorded from China, Myanmar, Thailand, Laos, Vietnam, and Malaysia (Evans, 1949; Eliot, 1959; Osada *et al.*, 1999; Kimura *et al.*, 2011; Xue *et al.*, 2020; Inayoshi, 2022). Smith (2010, 2011a) made no mentioning of this taxon from Nepal. While stating the distributional range of *C. pyrrha* on the Indian subcontinent, Gasse (2013) reported that it occurs from Kumaon to NE India. Kehimkar (2016) listed Nepal under the distribution range of this species. Gasse (2018) did not include Nepal under the distribution range of *C. pyrrha*, but mentioned that it “doubtless” occurs in Nepal. Sondhi & Kunte (2018) mentioned that there were no recent published records of this taxon from Nepal. KC & Sapkota (2022) reported *C. pyrrha* for the first time from Dhankuta, Nepal, in the East Himalayas.

Pokhara is a popular town in Kaski District of Nepal (Fig. 1). The elevation ranges from about 700–1,700 meters. Lakeside, the discovery area, is a popular lake town in Pokhara with an average elevation of 850 meters, with evergreen forests flanking the town; Raniban Forest lies across the lake and Methlang Forest lies in the proximal part of the downtown.

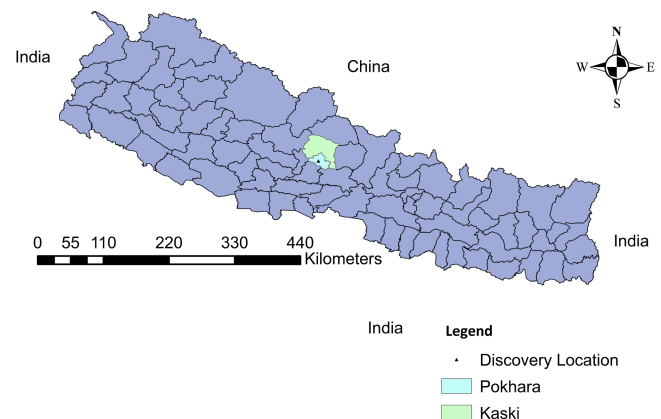


Figure 1. Map of Nepal with the study area.



Figure 2. Fewa Lake from Methlang Forest, Lakeside, Pokhara.

Both forests overlook the beautiful Fewa Lake below (Fig. 2) and the giant Himalayas toward the north. The discovery of *C. pyrrha* was made in the latter forest, i.e., Methlang. Both are community forests and thus well protected despite the growing urbanization in Lakeside. The Methlang Forest reaches an elevation of 1,000 meters and ends up near Sarangkot, a popular hill station of about 1,700 meters. This forest is home to many species of butterflies including some seldom seen species such as *Aeromachus dubius* Elwes & Edwards, 1897, *A. jhora* (de Nicéville, 1885), *A. pygmaeus* (Fabricius, 1775), *Burara anadi* (de Nicéville, [1884]), *B. jaina* (Moore, [1866]), *B. oedipodea* (Swainson, 1820), *Coladenia agnioides* Elwes & Edwards, 1897, *Liphyra brassolis* Westwood, 1864, *Matapa purpurascens* Elwes & Edwards, 1897, *Pithauria murdava* (Moore, [1866]), etc.; the forest also shelters some other *Celaenorrhinus* species such as *C. dhanada* (Moore, [1866]), *C. leucocera* (Kollar, [1844]), *C. nigricans* (de Nicéville, 1885), and *C. patula* de Nicéville, 1889 (Smith, 2011b; KC, 2020; Smith, C., 2020, personal communication; KC & Sapkota, 2022; KC, 2022).

The prominent vegetation in the forest includes *Castanopsis indica* (Fagaceae), *Schima wallichii* (Theaceae), *Senegalia catechu* (Fabaceae), *Ageratina adenophora* (Asteraceae), *Lantana camara* (Verbenaceae), *Rubus* spp. (Rosaceae), and several species of undergrowth most of which might act as larval host plants to various species of butterflies. The dicotyledon weeds, for example, host the larvae of several pyrgine/tagiadine species (Evans, 1952; Cock, 1983; Janzen *et al.*, 1998).

MATERIALS AND METHODS

Butterflies were observed during opportunistic surveys by the author in 2021. They were photographed using a “Canon 7D Mark II” camera coupled with a “100 mm f/2.8L Macro IS USM” lens (Figs. 3A-3D) and captured using an aerial net whenever required or possible (Figs. 3E-3F). The captured specimens were euthanized in killing jars charged with ethyl acetate. The specimens were spread and mounted. The length of the forewing was measured using the method used by Evans (1932), i.e., measurement was taken from the center of the thorax to the tip of forewing apex. If genitalia examination was deemed necessary, the abdomen of the specimen was cut off and relaxed using 10% KOH solution while leaving it as such overnight. Dissection was performed in glycerin using a “LEICA MZ9.5” stereoscope. Photographs of the genital parts were taken by placing them in glycerin and using an “Axiocam 105 color” camera attached to a “ZEISS SteREO Discovery V20” stereoscope. Multiple images were taken using Zeiss “ZEN” software and stacked with “CombineZP” software. The contrast was adjusted using “IrfanView 64” software. The map of the study area (Fig. 1) was made by using “ArcMap 10.8.2” software. Evans (1949), Kehimkar (2016), Smetacek (2016), Xue *et al.* (2020), and Inayoshi (2022) were used as references for the identification. The morphological traits, such as wing venation and genitalia, are described based on the terminologies used by Evans (1949).

RESULTS

Hesperiidae Latreille, 1809
 Tagiadinae Mabilie, 1878
 Celaenorrhini Swinhoe, 1912
 Genus *Celaenorrhinus* Hübner, [1819]

Celaenorrhinus pyrrha de Nicéville, 1889

Material Examined: 1♂; Central Nepal, Gandaki Province, Kaski District, Pokhara, Lakeside, Methlang Forest, 28°12'59" N, 83°57'49" E, 800 m a.s.l., 5.xi.2021, 14:23 hrs. (GMT +5:45), coll. Sajan KC.

Forewing length: 25 mm

Diagnosis: *Celaenorrhinus pyrrha* can be distinguished from the other congeners due to the presence of double pale spots in space 1b on the underside of forewing beyond double discal spots, except two species i.e., *C. ambareesa* (Moore, 1865) which is found in the Western Ghats and the Eastern Ghats of India (Gasse, 2018), and *C. consaguinea* Leech, 1891 which is found in China (Sichuan, Tali) (Evans, 1949) and Taiwan (Huang, 2003). *Celaenorrhinus pyrrha* has checkered cilia on hindwing, while *C. ambareesa* and *C. consaguinea* have checkered cilia on both wings (Evans, 1949). Evans (1949) also mentioned that *C. pyrrha* has the basal spot of forewing upper side space 1b very small or obsolete, and the antennae in both sexes are white only at the club bases and not at the shafts or the apiculi. This basal spot on forewing upper side space 1b is, however, variable as evident in Sondhi & Kunte (2016) and Inayoshi (2022).

Observation and taxonomic notes: The first individual was seen by the author in the Methlang Forest (28°13'2.32" N, 83°57'52.63" E, 930 meters) on 10.v.2021 at 14:17 hrs. (GMT +5:45 hrs.) (Fig. 3A). It was feeding on nectar from the flowers of *Lantana camara* (Verbenaceae) on a hilltop. Only the upper side was photographed, the specimen was not captured. Although the underside is also required to identify *C. pyrrha* conclusively, the author was convinced from the photographs of the upper side alone regarding its identification and continued to look around for it in the following months as well. Another sighting was made on 04.xi.2021 at 15:47 hrs. (GMT +5:45 hrs.) (28°12'59" N, 83°57'49" E, 800 meters) when the author was on an opportunistic survey in the same forest. The individual (Figs. 3B-3C) was sipping nectar from a wild flower by a forest stream. However, the author was unable to capture the specimen and only took some photographs, including underside. The next day, on 05.xi.2021, at 14:23 hrs. (GMT +5:45 hrs.), near the same place, the author came upon a partly worn individual which was sitting under a leaf of an unknown plant next to the same water source (Fig. 3D). This individual was photographed and then successfully collected.

The collected individual was thought to be a species new to science for three reasons: 1. The basal spot in space 1b of forewing upper side was prominent and white, while that of *C. pyrrha* is typically obscure (Evans, 1949). 2. The hind tibia of the collected individual had a prominent tuft of yellow scales



Figure 3. *Celaenorrhinus pyrrha* de Nicéville, 1889 from Nepal. **A:** Live individual, upper side; 10.v.2021, from Pokhara (930 m). **B:** Live individual, upper side; 04.xi.2021, from Pokhara (800 m). **C:** Ditto, showing underside. **D:** Live individual, upper side; 05.xi.2021, from Pokhara (800 m). **E:** Specimen, upper side; collected on 05.xi.2021, from Pokhara (800 m). **F:** Ditto, underside.

which the author had never noticed before in *Celaenorrhinus* of the Indian subcontinent. This tibial tuft acts as secondary sexual character of this group (Austin & Steinhauser, 1996). 3. The male genitalia (Fig. 4), especially the distal end of the valva (cuiller) (Fig. 4A) and cornutus of the aedeagus (Figs. 4D-4F), were different from those shown in Evans (1949) and Xue *et al.* (2020).

Regarding the above confusion, the author contacted Hao Huang (China) and asked him if he had come across any such

specimens of *C. pyrrha*. Upon request, Huang dissected a specimen from Hekou, Yunnan-Vietnam border (Fig. 5). The genitalia were similar to that of the author’s specimen, but there was still some variation among them, i.e., the specimen examined by the author, the specimen examined by Huang, and the photographs of Xue *et al.* (2020). The shapes of the tegumen, uncus, and gnathos were the same while the shapes of the cuiller of valva, and cornutus of the aedeagus, showed some prominent variation. The cuiller is short and blunt in Xue *et al.*

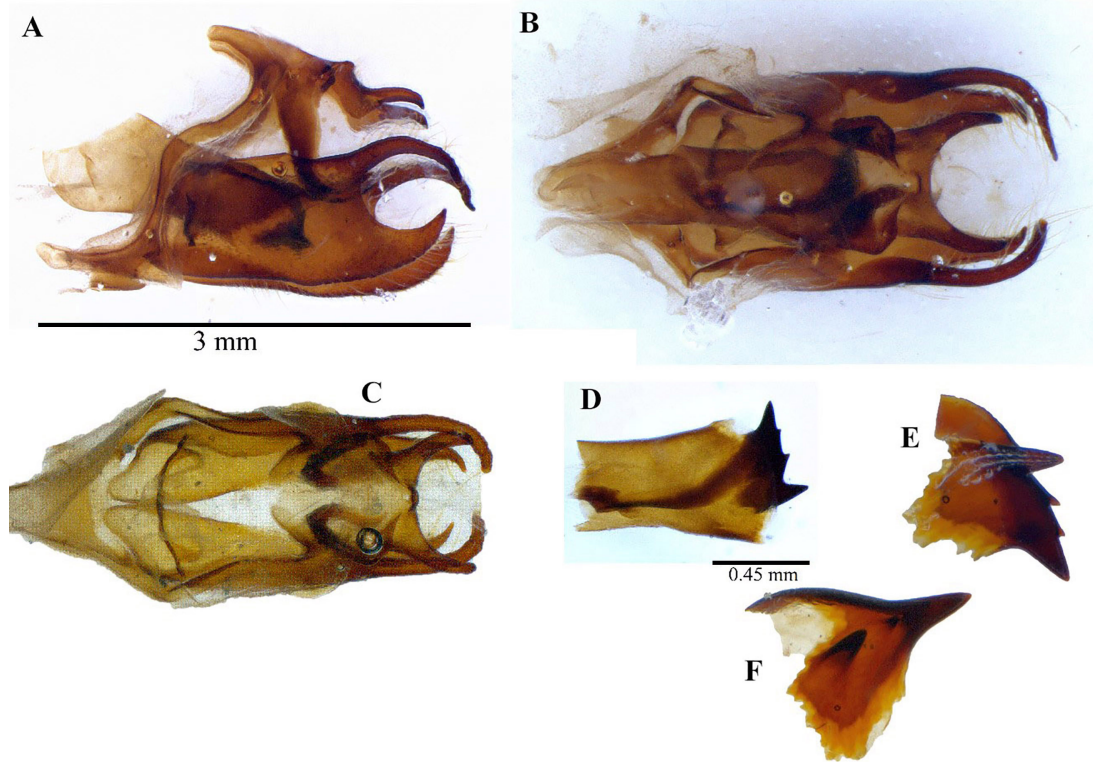


Figure 4. *Celaenorrhinus pyrrha* de Nicéville, 1889 male genitalia of Figure 1D individual. **A:** Genitalia capsule, lateral view. **B:** Genitalia capsule, dorsal view. **C:** Genitalia capsule, dorsal view with aedeagus removed. **D:** Aedeagus portion dorsal view with cornutus **E:** Cornutus lateral view. **F:** Cornutus ridge view.

(2020) while it is longer in the examined specimen (Fig. 4A), and its tip is straight after the curve in Huang's specimen (Fig. 5C). The cornutus is anchor-shaped in Xue *et al.* (2020), while it is serrated in the examined specimen (Fig. 4D) and Huang's specimen (Fig. 5D), although the pattern of serration is different. This could also represent subspecific variation, while Xue *et al.* (2020) considered such anomalies as individual variations. For now, the author considers this to be intraspecific variation in male genitalia, which does not seem unusual in skippers. In terms of external morphology, the examined specimen and the specimen examined by Huang had the first discal spot in space 1b missing on the upper side of the forewing and present on the underside of the forewing. The prominent yellow hair pencil on the hind tibia (Fig. 3F) is assumed to be present in all individuals, but it is probably often overlooked by taxonomists. Huang's specimen also seemed to have some tuft, but not as exposed as in the author's specimen (Huang, H., 2022, personal communication). The examined specimen is deposited at the Annapurna Natural History Museum (ANHM), Pokhara.

DISCUSSION

Gasse (2018) was correct about his prediction on the occurrence of *C. pyrrha* in Nepal. Herein, it is recorded from East as well as central Nepal, it is only a matter of time before someone will record it from West Nepal as well. In the Himalayas, it has now been recorded from the West to East Himalayas. A similar result was obtained regarding the record

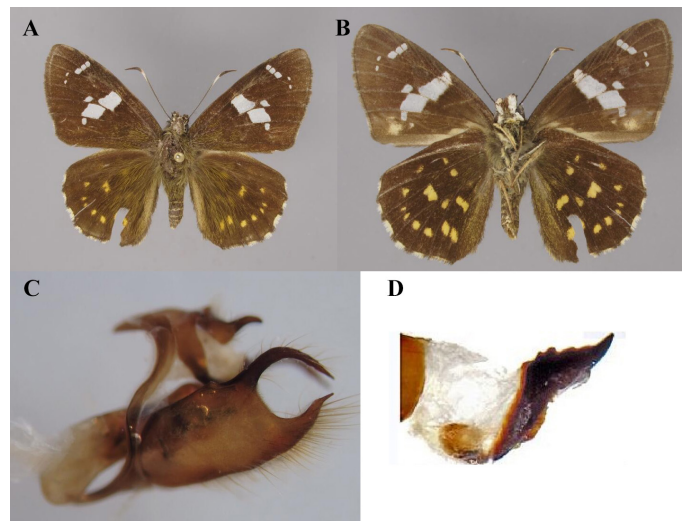


Figure 5 (Images copyright: Hao Huang). *Celaenorrhinus pyrrha* de Nicéville, 1889 from Hekou (Yunnan-Vietnam border). **A:** Spread specimen, upper side **B:** Ditto, underside. **C:** Ditto, Male genitalia capsule, lateral view **D:** Cornutus lateral view.

of *Burara anadi* which Gasse (2018) predicted would occur in Nepal and was recorded by KC (2020) from central Nepal, and *Seseria sambara* (Moore, [1866]) which was recorded by KC & Sapkota (2022) from East Nepal. Gasse (2018) made such predictions for other species such as *Celaenorrhinus pulomaya* (Moore, 1865) and *Pyrgus cashmirensis* Moore, 1874 which

are found in the West and the East Himalayas and are yet to be recorded from Nepal or the central Himalayas. They should eventually be recorded from these neighboring places if their habitats and host plants are available.

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