

## THE GENUS *CELAENORRHINUS* HÜBNER IN TAIWAN: A REVISIONAL WORK (LEPIDOPTERA: HESPERIIDAE)

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**Yu-Feng Hsu** (1990) The genus *Celaenorrhinus* Hübner in Taiwan: a revisional work (Lepidoptera: HesperIIDae). *Bull. Inst. Zool., Academia Sinica* 29(3): 141-152. Seven species of *Celaenorrhinus* including two new taxa are here confirmed from Taiwan. A revised key and a check list are also proposed in this study.

**Key words:** *Celaenorrhinus*, Taiwan, New taxa.

Skippers of the genus *Celaenorrhinus* Hübner are forest inhabitants. They often fly in shady places and extend their wings at rest. The genus is amazingly widespread throughout the tropical and subtropical zones in Oriental, Neotropical and Afrotropical regions. Taiwan, as the eastern limit of the Asian members in the genus, has seven representatives.

Species of Taiwanese *Celaenorrhinus* are difficult to identify due to remarkable interspecific similarities and intraspecific variations. There have been many errors on identification in the literatures. Shirôzu (1960) made a revision for Taiwanese species in the genus and concluded that six species ought to be recognized. He illustrated the six species, including diagrams of male genital structure, and also provided a key based upon external features. Subsequent workers have followed his treatment; however, a better understanding of intraspecific variations based on recent materials and the discovery of an undescribed species

warrant a review of the Taiwanese *Celaenorrhinus*.

Here I give a revised key and describe two newly recognized taxa.

### MATERIALS AND METHODS

Specimens from various regions of Taiwan were examined. The male genitalia were left in 10% KOH solution for 24 hrs and then dissected in 75% ethanol for observation. The dissected genital specimens are preserved in 75% ethanol.

The type specimens for new taxa described here will be placed in the following collections:

British Museum (Natural History), London, England (BMNH).

California Academy of Sciences, San Francisco, California (CAS).

Insect Museum, Department of Plant Pathology and Entomology, National Taiwan University, Taipei, Taiwan (NTUIM).

Essig Museum of Entomology, University of California, Berkeley, California (UCB).

Senckenberg Museum, Frankfurt/  
Main, W. Germany (SM).

## TAXONOMIC CHARACTERS

### Genus *Celaenorrhinus* Hübner, 1819

Type species: *Papilio eligius* Stoll (subsequent designation by Scudder, 1875.)

*Ancistrocampta* C. & R. Felder, 1862

TS: *Ancistrocampta syllius* C. & R. Felder, 1862.

*Hantana* Moore, [1881]

TS: *Eudamus spilothyrsus* Felder, 1868  
(= *Eudamus infernus* Felder, 1868)

*Gehlota* Doherty, 1889

TS: *Plesioneura sumitra* Moore, 1866

*Narga* Mabille, 1891

TS: *Tagiades monartus* Plötz, 1884  
(= *Narga chiriguensis* Mabille, 1891)

*Charmion* De Niceville, 1894

TS: *Hesperia ficulnea* Hewitson, 1868.

*Orneatus* Godman and Salvin, 1894

TS: *Eudamus aegiochus* Hewitson, 1876.

*Apallaga* Strand, 1911

TS: *Pterygospidea mokeezi* Wallengren, 1875 (= *Apallaga separata* Strand, 1911)

**Head:** Antenna pointed with a recurved apiculus. Labial palpus densely hairy; segment II robust, segment III minute. Compound eyes smooth. **Thorax:** Covered with yellowish brown long hairs; male possessing enlarged and curved scales on the third epimeron. Legs hairy slender; Metatibia bearing an erect long hair tuft in male. **Abdomen:** Covered with dark brown hairs mixed with a few yellow and yellowish brown hairs; in some species yellow or orange hairs forming an obvious ring at the hind edge of each segment; males possessing two pouches of scent organ at each side of the anterior part of sternite of segment II. **Forewing:** Upperside ground color brown with yellow or orange basal hairs. A median white band composed of one or two small  $Cu_2$  spots, one  $Cu_1$

spot, one  $M_3$  spot and one discoidal spot. A series of small white subapical spots arranged from cell  $R_3$  to  $R_5$ . Additional minute white spots usually present in cell  $M_1$  and  $M_2$ . A dash of orange just above the discal spot in some species. Under-side similar to upperside in color and pattern but distinct yellow basal streaks present in some species,  $Cu_2$  spots often different from upperside by an additional spot or switching color of spots. Cilia brown, white or yellow at cell  $Cu_1$ . **Hindwing:** Upperside brown with scattered yellowish orange spots. Basal hairs extending to tornus. Underside color and pattern similar to upperside but markings more distinct, and basal streaks present in some species as in forewing. Cilia checkered by brown and white or yellow.

I suggest researchers read de Jong (1982) for detailed discussions about the morphology of secondary sexual characters.

Several characters were used for determining species and defining species groups as listed below.

1. Inner  $Cu_2$  spot on forewing upperside: white or orange.
2. Relative sizes of  $M_3$  spot and  $Cu_2$  spot: the former larger or the latter larger.
3. Basal streaks of wing underside: present or absent.
4. White scales at the base of antennal club: distinct or obscure.
5. A dash of orange above discoidal spot: present or absent.
6. Distal part of valva: simple, bilobed or dichotomous.
7. Sclerite on manica: present or absent.
8. Cochlea on gnathos: present or absent.
9. Cornuti in phallus: single or double.
10. Uncus: broadened without emargination, deeply emarginated (bifurcated)

or bifurcated with forked tips.

11. Juxta: a broad plate or narrowly U-shaped or V-shaped.

## SYSTEMATIC ACCOUNTS

### Key to the species of *Celaenorrhinus* in Taiwan

1. Yellow basal streaks present on underside of fore- and hind-wing, manica with a distinct sclerite .....2
  - No basal streaks on underside, manica membranous throughout.....3
2. Sclerite of manica bifurcated, valva tapering distally with one or two processes at tip,  $M_3$  spot on forewing larger than  $Cu_2$  spots.....
  - ..... *osculus major* ssp. nov.
  - Sclerite of manica tetrafurcated, valva rectangular with two minute processes at the tip,  $M_3$  spot on forewing smaller than  $Cu_2$  spots .....
    - ..... *maculosus taiwanus* Matsumura
3. Inner  $Cu_2$  spot absent or yellow if present, uncus not divided, gnathos without cochlea.....
  - ..... *pulumaya formosanus* Fruhstorfer
  - Inner  $Cu_2$  spot white, uncus divided, gnathos with a long cochlea.....4
4. A faint yellow dash present above the discal spot of forewing upperside, valva dichotomous, harpe nearly straight and ampulla bent.....5
  - No yellow dash as above, valva bilobed; harpe and ampulla similar to each other .....6
5. Outer  $Cu_2$  spot located beneath the center of  $Cu_1$  spot, ampulla bent downward with a blunt tip.....
  - ..... *horishanus* Shirôzu
  - Outer  $Cu_2$  spot located distally to  $Cu_1$  spot, ampulla bent inward with a sharp tip.....
    - ..... *chihhsiao* sp. nov.
6. Yellow markings on upperside weak, hindwing cilia white to pale yellow, phallus much longer than valva.....
  - ..... *kurosawai* Shirôzu

- Yellow markings on upperside prominent, hindwing cilia yellow to orange, phallus as long as valva .....
  - ..... *ratna ratna* Fruhstorfer

## DESCRIPTIONS OF THE SPECIES

### Group 1: *OSCULA*, *MACULOSUS*

Inner  $Cu_2$  spot on forewing upperside white. Yellow basal streaks of wing underside present. White scales on the base of antennal club obscure. Distal part of valva simple. Sclerite on manica present. Cornuti single. Cochlea present. Uncus bifurcated without forked tips. Juxta narrow, V-shaped.

#### *Celaenorrhinus osculus major* subsp. nov.

(Figs. 1, ♂; 2, ♀; 3, valva of male genitalia)

*Celaenorrhinus oscula*: Shirôzu, 1960: 382-383, pl. 73, figs. 902-904; Hamano, 1986: 254, pl. 53, fig. 4a-4b.

A medium-sized species; forewing 20-22 mm in length. Wing pattern similar to *maculosus*, but yellow marking and basal streaks paler, and  $M_3$  spot on forewing upperside larger than  $Cu_2$  spot. Male genitalia: Distal part of valva variable (fig. 3). Sclerite on manica bifurcated with several minute spines along outside of the distal area.

The population of *osculus*, ssp. *major*, in Taiwan is quite different from the nominated subspecies in W. China and is separated from the following aspects.

- 1) Yellow basal streaks on wing underside much weaker in *major*.
- 2) Yellow mid-point in cell  $Cu_2$  smaller or absent in *major*.
- 3) Size is larger in *major*; ♂ forewing length 21.1 mm on average ( $n=25$ ) versus 19 mm (Evans, 1949) in *osculus*.
- 4) White spot in cell  $R_5$  oblongate in *osculus* but square in *major*.

*Distribution:* Taiwan; the nominotypical subspecies ranges in W. China.

*Flight Period:* mainly in June and July.

*Etymology:* The subspecific name "major" refers to its distinctly larger size compared with the nominotypical subspecies.

*Holotype:* ♂, ILAN, Nanshan (Abb. N). 24. VI. 1988; Y. F. Hsu leg. (NTUIM 2158)

*Paratypes* ( $n=30$ ): ♀, TAOYUAN, Mt. Lala (Abb. L). 12. VII. 1986 (NTUIM 2159); 2♂♂, (L), 10. VII. 1982 (NTUIM 2160-2161); 1♂, (L), 1. VII. 1983 (CAS); 4♂♂, TAIPEI, Mt. Kuai (Abb. K), 26. VI. 1984 (NTUIM 2162-2165); 1♂1♀, (L), 12. VII. 1986 (NTUIM 2166-2167); 1♂, TAOYUAN, Taman to Hsuanyuan, 16. VI. 1987 (NTUIM 2168); 1♂, (K), 24. VI. 1987 (CAS); 4♀♀, (L), 6. VII. 1987 (NTUIM 2169-2172); 3♂♂, (L) 7. VII. 1987 (UCB); 4♂♂, (L), 17. VII. 1987 (BMNH); 2♂♂, (L), 24-25. VII. 1987 (SM); 4♂♂, (N), 24. VI. 1988 (NTUIM 2173-2176); 1♂, (L), 25. VI. 1988 (CAS). (all Y. F. Hsu leg.)

*Discussion:* Shirôzu (1960) selected "prior cilia of hindwing not checkered" as a diagnostic character for both of *C. osculus* and *C. maculosus*, but some individuals of *osculus* have hindwing cilia completely checkered.

***Celaenorrhinus maculosus taiwanus*  
Matsumura, 1919**

*Celaenorrhinus maculosus* Mabille, 1914: 42; Esaki, 1932: 1007, fig. 1985.

*Celaenorrhinus maculosa*: Sonan, 1936: 210-211.

*Celaenorrhinus maculosus* var. *taiwanus* Matsumura, 1919: 686, pl. L; fig. 22.

*Celaenorrhinus maculosus* f. *taiwanus*: Matsumura, 1931: 580, fig. ♀.

*Celaenorrhinus maculosus taiwanus*: Hirayama, 1939, pl. 60, fig. 7; Evans, 1949: 93; Shirôzu, 1960: 383-384, pl. 73, figs. 905-907; Hamano, 1986: 254, pl. 53, fig. 5a-5b.

The largest *Celaenorrhinus* species occurs in Taiwan; forewing 23-26 mm in length. The pattern resembles *osculus* but yellow markings and basal streaks

darker, and  $M_3$  spot of forewing smaller than  $Cu_2$  spot. Male genitalia: Distal part of valva simple with two small processes at the tip. Sclerite on manica tetrafurcated without spines.

*Distribution:* Taiwan; the nominotypical subspecies ranges from W. China to Mongolia.

*Flight period:* mainly in mid-July to August.

*Type-locality:* Puli, [NANTOU], Taiwan.

*Specimen examined:* 1♂ from N. Taiwan (coll. in August).

**Group 2: *PULOMAYA***

Inner  $Cu_2$  spot on forewing orange, sometimes absent. No basal streaks present on wing underside. White scales at the base of antennal club distinct. Distal part of valva simple; with a prominent penultimate process. Sclerite on manica absent. Cornuti single; forming a cone with minute spines. Cochlea absent. Uncus broadened without emargination. Juxta narrow, U-shaped.

The male genitalia is very different from the other *Celaenorrhinus* groups in Taiwan. The fact implies group 2 is apart from the other three groups of Taiwanese *Celaenorrhinus* in their phylogeny even though there is a high degree of similarity in appearance among them.

***Celaenorrhinus pulomaya formosanus*  
Fruhstorfer, 1909**

(Figs. 4, ♂; 5, ♀)

*Celaenorrhinus maculiconis formosanus* Fruhstorfer, 1909: 135; Fruhstorfer, 1910: 61; Seitz, 1927: 1036; Evans, 1932: 326.

*Celaenorrhinus pulomaya formosana* Evans, 1949: 96; Shirôzu, 1960: 376-377, pl. 73, figs. 888-890; Hamano, 1986: 253, pl. 53, fig. 1a-1b.

A small to medium-sized species; forewing 18-21 mm in length. Markings on hindwing frequently reduced to

nearly absent. Male genitalia: peculiar in Taiwanese *Celaenorrhinus* (see characters of group 2).

*Distribution*: Taiwan; the nominotypical subspecies ranges in W. China, Sikkim, Bhutan, Manipur and N.W. Himalayas.

*Flight period*: mainly in July and August.

*Type-locality*: Polisha (=Puli), [NANTOU], Taiwan.

*Specimens examined*: 4♂♂1♀ from C. and N. Taiwan (coll. in June and July)

*Discussion*: 1) Matsumura's (1931) illustration is obviously not this insect but only a duplicate of Seitz's (1908-1928) illustration of *C. maculiconis* on pl. 164. 2) Shirôzu (1960) selected "forewing length <20.5 mm" as a criteria in his key to group this insect and *C. kurosawai* together, but individuals of this species range 18-21 mm forewing length.

### Group 3: *HORISHANUS, CHIHHSIAOI*

Inner Cu<sub>2</sub> spot of forewing upperside distinct white. No basal streaks on underside. White scales at the antennal club obscure. An orange dash above discal spot present. Distal part of valva dichotomous. Sclerite on manica absent. Cornuti double. Long cochlea present. Uncus bifurcated with fork-like tips. Juxta forming a broad plate.

#### *Celaenorrhinus horishanus* Shirôzu, 1960

*Celaenorrhinus horishanus* Shirôzu, 1960: 380-382, pl. 73, figs. 898-899; Hamano, 1986: 254-255, pl. 53, fig. 5a-5b.

A medium-sized species; forewing 21-24 mm in length. Wing pattern very similar to *chihhsiaoi*. Male genitalia: Ampulla of valva bent downward with a blunt tip; harpe serrated below.

*Distribution*: Taiwan.

*Flight period*: April.

*Type-locality*: Baibara, TAICHU (=Meiyuan, TAICHUNG), Taiwan.

*Specimen examined*: Unfortunately no specimen was available; however Shirôzu (1960) supplied good illustration and detailed diagram of male genitalia, which are sufficient for recognition diagnostic characters of the taxon.

#### *Celaenorrhinus chihhsiaoi* sp. nov.

(Figs. 6, ♂; 7, ♀; 8, male genitalia)

*Celaenorrhinus consanguinea ratna* Esaki, 1932: 1007, fig. 1986; Hirayama, 1939: pl. 59, fig. 12.

*Celaenorrhinus horishanus* Shirôzu, 1960: pl. 73, figs. 900-901; (in part) "allotype" of *C. horishanus*; Hamano, 1986: pl. 53, fig. 6b.

A medium-sized species; forewing 20-23 mm in length. This new species is very closely allied to *horishanus* in appearance, but can be separated as follows:

1) Harpe of valva not serrated as in *horishanus*.

2) Ampulla of valva bent inward and with a sharp tip in *chihhsiaoi*; whereas bent downward with a blunt tip in *horishanus*.

3) Outer Cu<sub>2</sub> spot located outward in *chihhsiaoi* versus located beneath the center of Cu<sub>1</sub> spot in *horishanus*.

*Distribution*: Taiwan.

*Flight period*: June to July.

*Etymology*: The specific name "*chihhsiaoi*" is derived from a kind of mountain ghost in Chinese legends.

*Holotype*: ♂, TAIPEI, Mt. Kuai (Abb. K), 4 VI 1988, Y.F. Hsu leg. (NTUIM 2177).

*Paratypes* (n=7); ♀, TAOYUAN, Mt. Lala. 12. VI. 1988. (NTUIM 2178); 1♂, TAOYUAN, Palin to ILAN, Chihtuan, 11. VI. 1985 (NTUIM 2179); 1♂, NANTOU, Shanlinshi, 20. VI. 1987 (NTUIM 2180); 1♂2♀♀, (K), 4. VI. 1988 (BMNH & UCB); 2♀♀, (K), 11. VI. 1988 (CAS & SM); 1♂, TAIPEI, Mt. Peichatien, 25. VI. 1989 (NTUIM 2181). (all Y.F. Hsu leg. except NTUIM 2180 by C.L. Li).

**Discussion:** This new species evidently lives only at higher elevations and flies only in summer by contrast with *horishanus* inhabits lower elevations and flies in spring.

#### Group 4: *KUROSAWAI, RATNA*

Inner Cu<sub>2</sub> spot on forewing upperside white. No basal streaks on wing underside. White scales at the base of antennal club distinct. Distal part of valva bilobed. sclerite on manica absent. Cornuti double. Cochlea present. Uncus bifurcate with fork-like tips. Juxta narrow, U-shaped.

#### *Celaenorrhinus kurosawai* Shirôzu, 1960

(Figs. 9, ♂; 10, ♀)

*Celaenorrhinus maculiconis formosanus* Sonan (not Fruhstorfer), 1936: 211-212, Tab. 4, fig. 10.  
*Celaenorrhinus kurosawai* Shirôzu, 1960: 377-379, pl. 73, figs. 892-893; Hamano, 1986: 254, pl. 53, fig. 2a-2b.

The smallest *Celaenorrhinus* species of Taiwan; forewing 17-19 mm in length. Wing pattern like *C. pulomaya* in appearance, but the presence of inner white Cu<sub>2</sub> spot on forewing upperside is a diagnostic character for this species. Male genitalia: Very similar to that of *C. ratna*, but phallus much longer and processes on distal part of valva shorter in this species.

**Distribution:** Taiwan.

**Flight period:** mainly in July and August.

**Type-locality:** Taiheizan, TAIHOKU (=Mt. Taiping, ILAN), Taiwan.

**Specimens examined:** 8♂♂2♀♀ from N. Taiwan (coll. in July and August).

**Discussion:** Shirôzu (1960) reported that the white scales at club are much more distinct in *kurosawai* than in *pulomaya*. But I have examined some individuals of *pulomaya* with white scales at club that are as distinct as those of *kurosawai*.

#### *Celaenorrhinus ratna ratna*

Fruhstorfer, 1908

(Figs. 11, ♂, 12, ♀)

*Celaenorrhinus sumitra* Wileman (not Moore), 1906-1908: 333-334.

*Celaenorrhinus sumitra ratna* Fruhstorfer, 1908: 49.

*Celaenorrhinus consanguinea ratna* Fruhstorfer, 1909: 135; Seitz, 1927: 1036; Esaki, 1931: 107, tab. viii, fig. 4; Evans, 1932: 324.

*Celaenorrhinus consanguineus ratna*: Fruhstorfer, 1910: 61.

*Celaenorrhinus consanguinea* var. *ratna*: Matsumura, 1919: 685-686.

*Celaenorrhinus consanguinea* f. *ratna*: Matsumura, 1931: 580, fig. ♀.

*Ceraenorrhinus* [sic] *consanguineus ratna* [sic]: Sonan, 1936: 211.

*Celaenorrhinus ratna ratna* Evans, 1949: 95; Shirôzu, 1960: 380, pl. 73, figs. 894-898; Hamano, 1986: 254, pl. 53, fig. 3.

*Celaenorrhinus clio* Mabille, 1914: 41-42.

*Celaenorrhinus pulomaya clio* Evans, 1932: 325.

A medium-sized species; forewing 21-23 mm in length. This species with the most distinct white scales at the base of

Figs. 1-3. *Celaenorrhinus osculus major* subsp. nov., 1: Holotype ♂ (NTUIM 2158), A, upperside, B, underside; 2: Paratype ♀ (NTUIM 2159), A, upperside; B, underside; 3a-c: left valva of male genitalia. Notice the variation of the distal part.

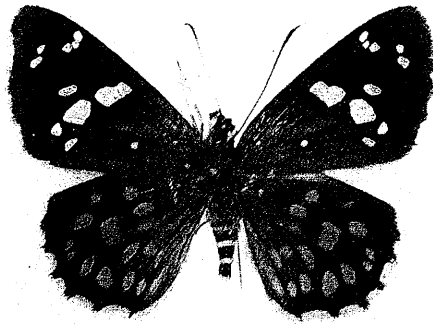
Figs. 4-5. *Celaenorrhinus pulomaya formosanus* Fruhstorfer, 4: ♂, A, upperside; B, underside; 5: ♀, A, upperside; B, underside.

Figs. 6-8. *Celaenorrhinus chihhsiaoi* sp. nov., 6: Holotype ♂ (NTUIM 2177), A, upperside; B, underside; 7: Paratype ♀ (NTUIM 2178), A, upperside; B, underside; 8a-d, male genitalia: a, ring; b, left valva; b', dorsal view of ampulla; c, phallus; d, juxta.

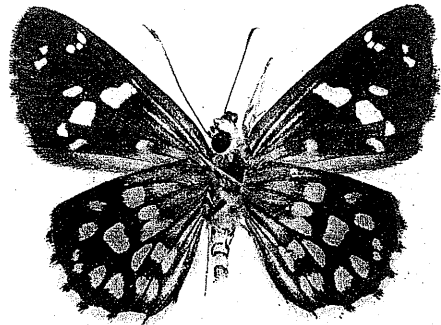
Figs. 9-10. *Celaenorrhinus kurosawai* Shirôzu, 9: ♂, A, upperside; B, underside; 10: ♀, A, upperside; B, underside.

Figs. 11-12. *Celaenorrhinus ratna ratna* Fruhstorfer, 11: ♂, A, upperside; B, underside; 12: ♀, A, upperside; B, underside.

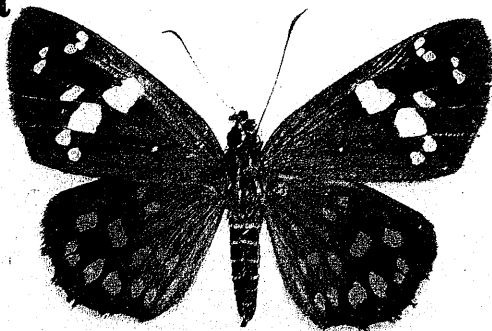
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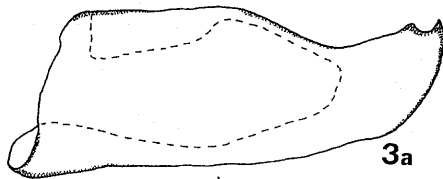
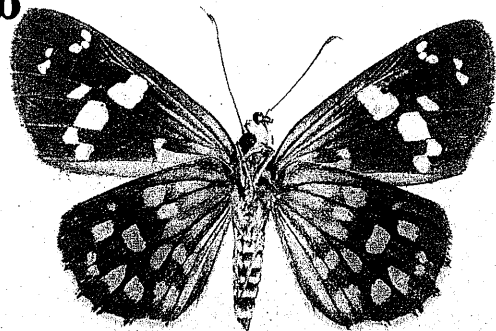
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2a

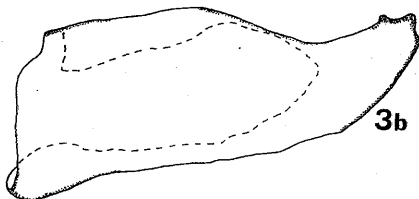
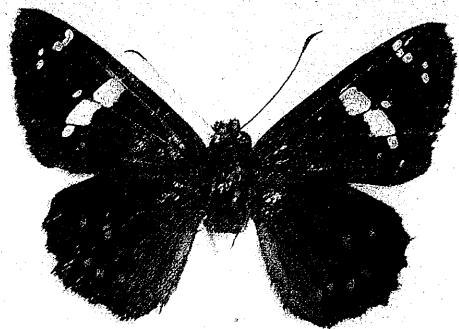


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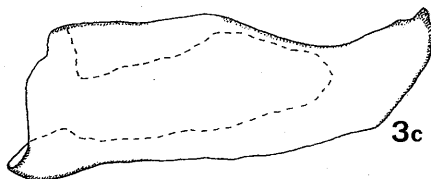
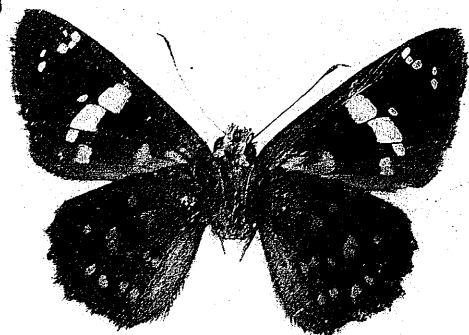
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4a



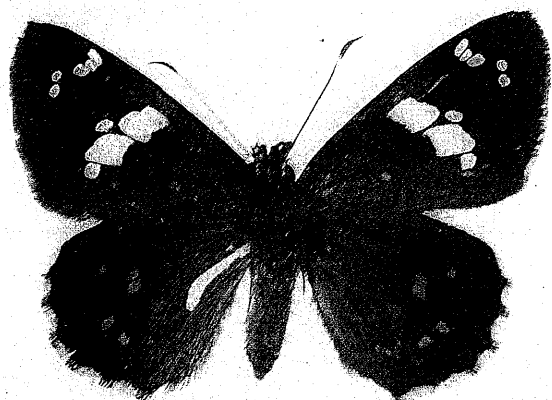
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4b

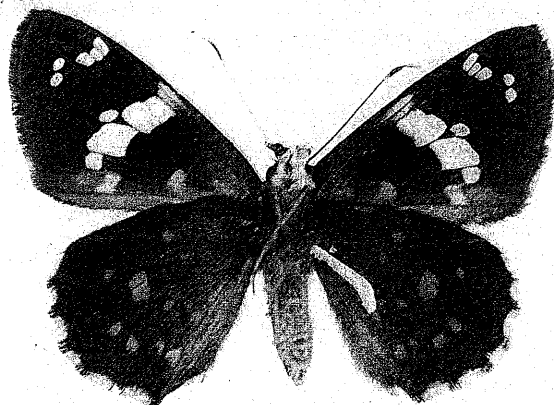


3c

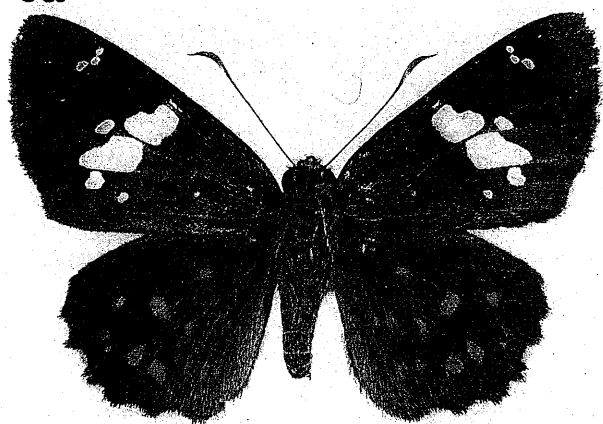
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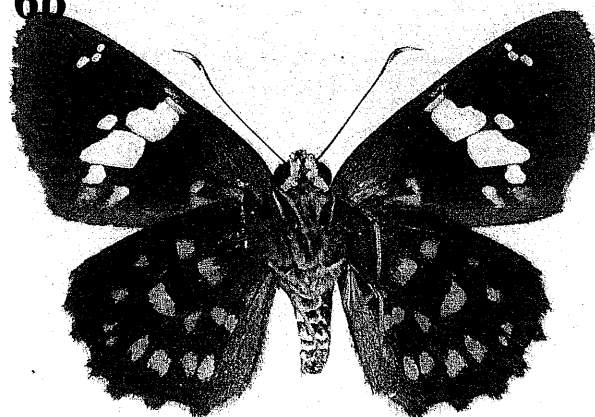
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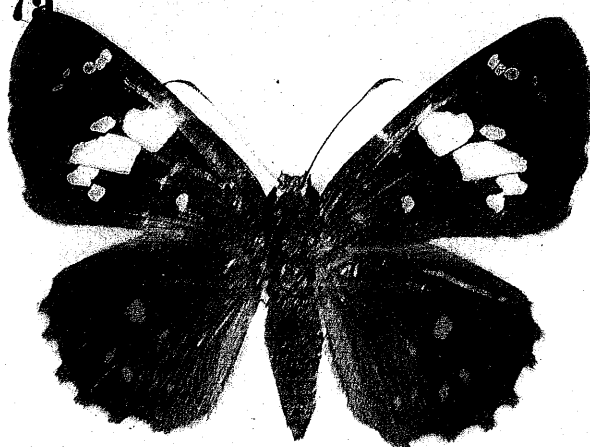
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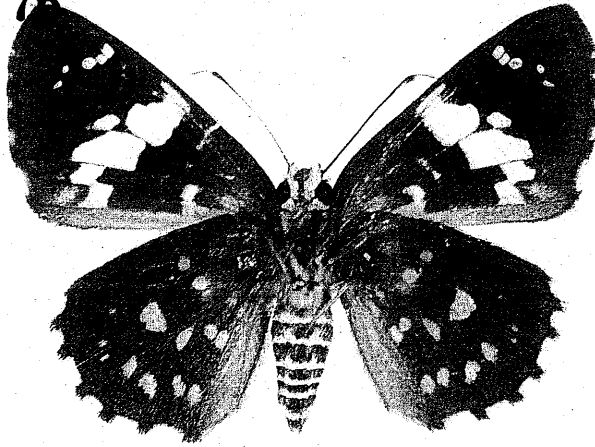
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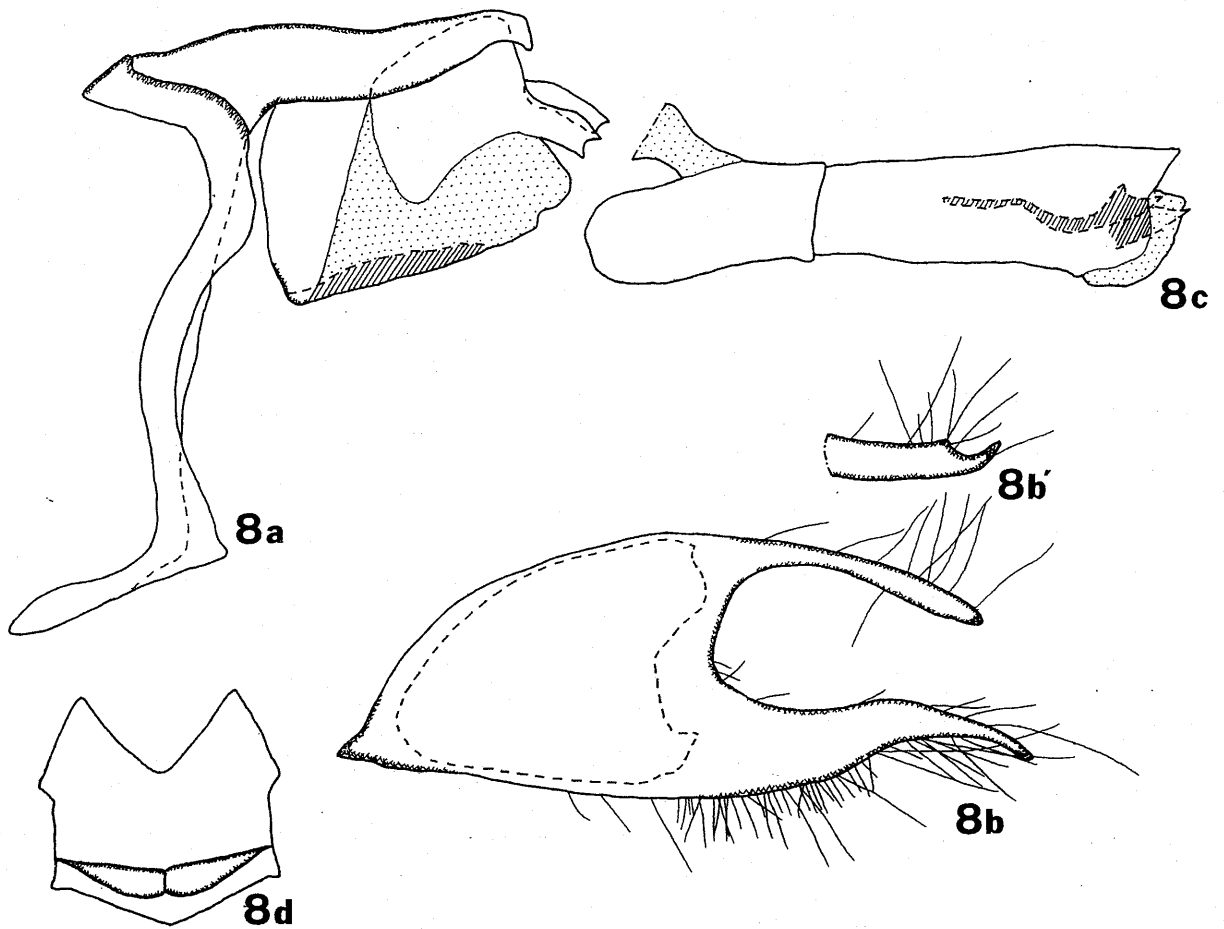
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7b



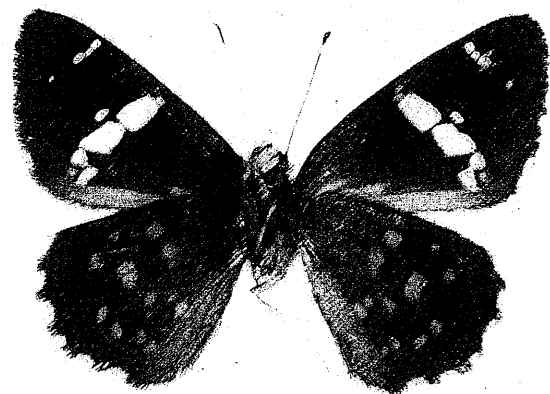




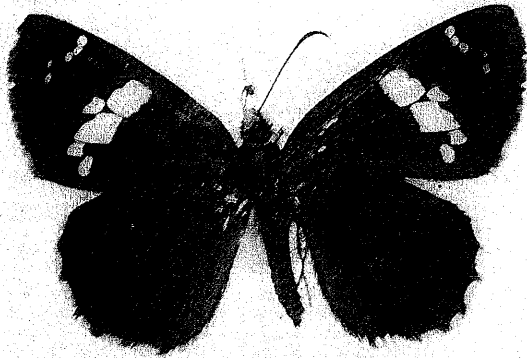
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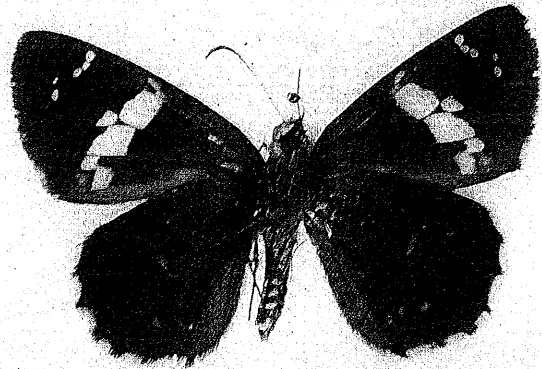
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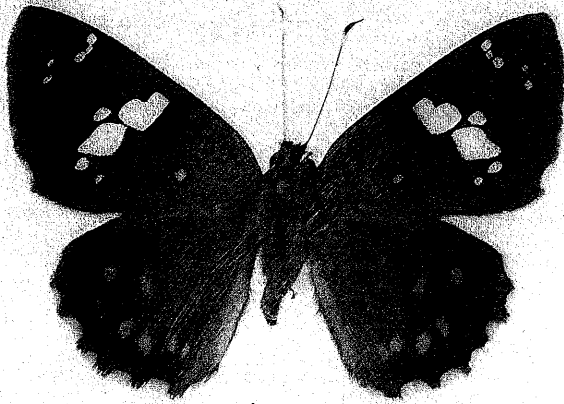
10a



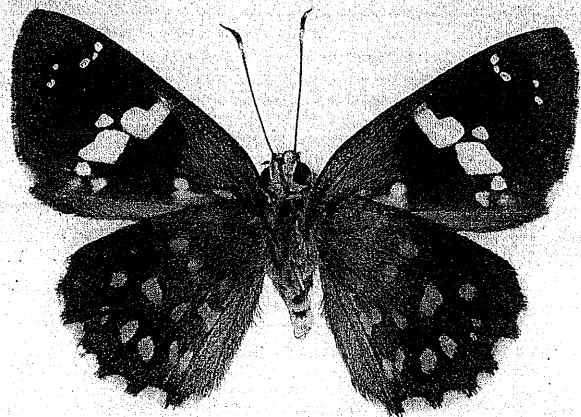
10b



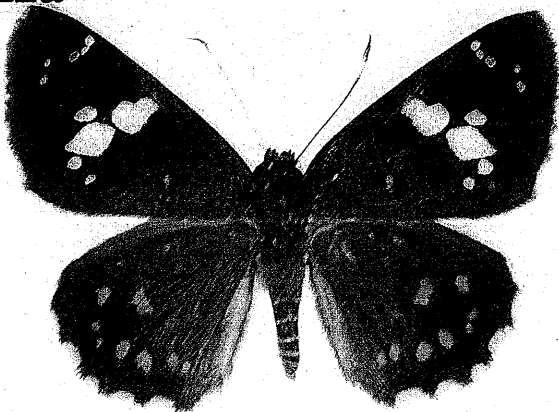
11a



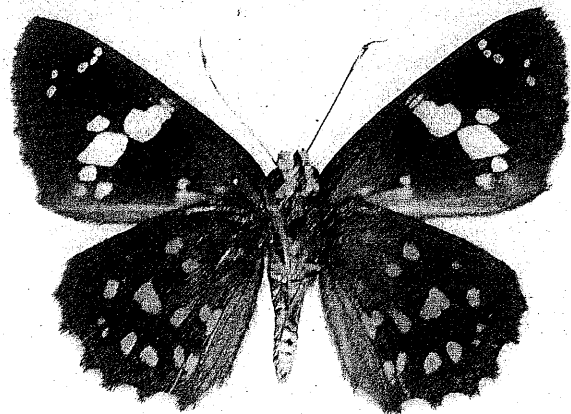
11b



12a



12b



antennal club in Taiwanese *Celaenorrhinus* species. Male genitalia: similar to *kurosawai* as mentioned above.

*Distribution*: Taiwan; two additional subspecies present in Sikkim, Assam and N.W. Himalayas.

*Flight period*: mainly in July and August.

*Type-locality*: KAGI (=CHIAYI), Taiwan.

*Specimens examined*: 14♂♂4♀♀ from C. and N. Taiwan (coll. in June, July and August).

### CHECK LIST

*Celaenorrhinus* Hübner, 1819

1. *C. oscula* Evans, 1949, *major* Hsu, 1990
2. *C. maculosus* Felder, 1867, *taiwanus* Matsumura, 1919
3. *C. pulomaya* Moore, 1965, *formosanus* Fruhstorfer, 1909
4. *C. horishanus* Shirôzu, 1960
5. *C. chihhsiao* Hsu, 1990
6. *C. kurosawai* Shirôzu, 1960
7. *C. ratna* Fruhstorfer, 1908

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## 臺灣產黃紋弄蝶之檢討

徐 堉 峰

黃紋弄蝶屬 *Celaenorrhinus* Hübner 呈特異的泛熱帶性分布；美洲、非洲及亞洲之熱帶及亞熱帶地區均可見其踪跡。在臺灣，它是弄蝶科中最大的一屬，而因種間相似程度高及種內變異大，它也是最易生混淆的屬之一。

臺灣過去已記載六種黃紋弄蝶，現追加一種並將六種中之一種訂為新亞種，同時附上修訂後之檢索。

臺灣產之七種黃紋弄蝶如下：華西黃紋弄蝶 *C. osculus major* ssp. nov.，大型黃紋弄蝶 *C. maculosus taiwanus* Matsumura，小黃紋弄蝶 *C. pulomaya formosanus* Fruhstorfer，埔里黃紋弄蝶 *C. horishanus* Shirôzu，魑魅黃紋蝶 *C. chihhsiao* sp. nov.，姬黃紋弄蝶 *C. kurosawai* Shirôzu 及白鬚黃紋弄蝶 *C. ratna ratna* Fruhstorfer。