

Article

A new subspecies of *Chrysozephyrus paona* (Tytler, 1915) from southern Yunnan, China (Lepidoptera, Lycaenidae)¹⁾

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Abstract

A new subspecies of *Chrysozephyrus paona* (Tytler, 1915) (Lepidoptera, Lycaenidae) is described from Mt. Daweishan (2000m), southern Yunnan, China. The new subspecies is almost identical to the nominotypical subspecies in the markings on the underside of the wings, and in the male genitalia. But it is easily distinguished from the latter by the whitish discal areas of the upperside of both wings in the male, an extremely unique feature in the green Theclini. The habitat of the subspecies is primary evergreen broad-leaved forest. Male of this butterfly was found perching on leaves at the tops or tips of twigs of trees surrounding a gap in the forest during evening sunshine, protecting his territory against other males of the same species.

Key words: *Chrysozephyrus*, *Chrysozephyrus paona*, new subspecies, Yunnan, China, territorial behavior.

Introduction

The *syla*-group (*birupa*-group of Howarth, 1957) of the genus *Chrysozephyrus* Shirôzu et Yamamoto, 1956, was known from 9 species treated by Howarth (1957), until Chou and Li (1944) recently described *Chrysozephyrus leigongshanensis* Chou et Li from Guizhou, China. Koiwaya (1996) described a new subspecies of *C. leigongshanensis* from Sichuan. Most species of the *syla*-group except for *leigongshanensis* have been known from the narrow mountainous area along the southern slope of the Himalayas from Kashmir to Manipur through Nepal, Sikkim, Bhutan and Assam.

During our survey of the insect fauna of Yunnan in 1996, we collected three male specimens of a species of *Chrysozephyrus* belonging to the *syla*-group at Mt. Daweishan (2000m alt.) near Pingbian, southern Yunnan. The specimens are extremely peculiar in having broad white discal areas surrounded by a metallic green ground on the upperside of both wings, a character state hitherto unknown for any male of

green "Zephyrus" species. Notwithstanding this peculiarity, they are almost identical with those of the male of *Chrysozephyrus paona* (Tytler, 1915) known from Manipur, in the markings on the underside of both wings. In addition, the detailed structure of the male genitalia of the specimens is also extremely similar to that of *paona* illustrated by Howarth (1957). Therefore, we identified the specimens as *paona*, and describe a new subspecies of this species based on the specimens as follows.

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Chrysozephyrus paona albidus, subsp. nov.

(Figs. 1-9, males; 13, ♂ genitalia)

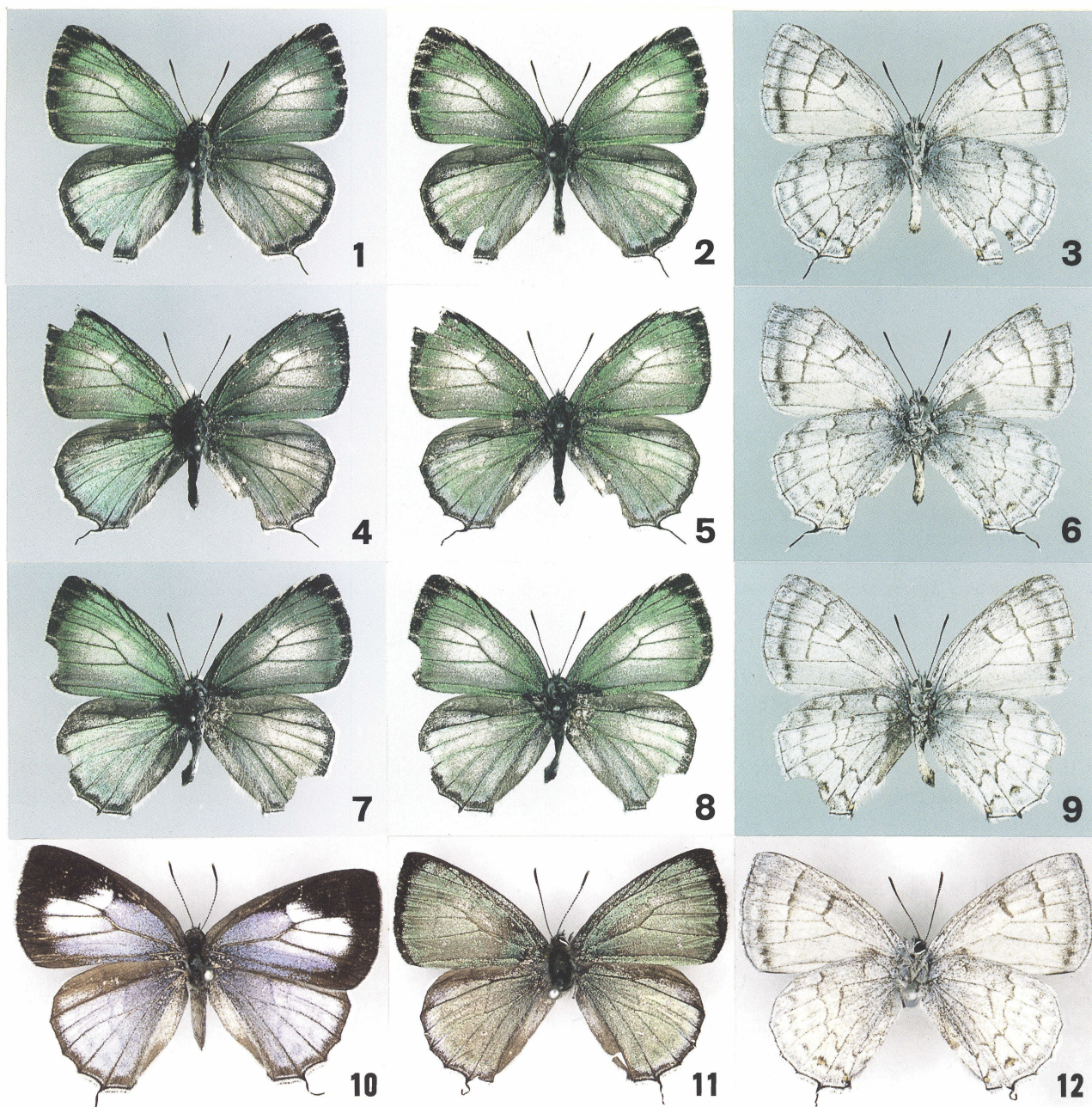
Description: Male. *Wing shape.* Moderate short and rounded. Forewing costa moderately arched, most strongly so at the level of the middle of discoidal cell; distance from wing base to wing apex 1.32-1.33

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Figs. 1-12. *Chrysozephyrus paona*. 1-3: Holotype male of *Chrysozephyrus paona albidus*, subsp. nov. 4-9: Paratype males of *C. paona albidus*, subsp. nov. 11-12: Holotype male of *Chrysozephyrus paona paona*. 10: Paratype female of *C. paona paona*. Figs. 1, 4, 7, upperside lighted at low angle from right; 2, 5, 8, 10, 11, upperside lighted from both right and left; 3, 6, 9, 12, underside.

× as long as hind margin of the wing; apex obtusely pointed, not produced outwards, situated slightly proximal to the extent of tornus, so that an angle made by vein 1b and a line connecting veins 1b tip and wing apex is slightly less than 90°; outer margin considerably and evenly rounded throughout its length; distance between tornus and apex 0.88–0.90 × as long as hind margin. Hindwing rather short and rounded; outer and inner margins rather short; the former considerably and evenly rounded and weakly undulated as the margin weakly produced at tips of veins 2–4; distance between wing base and vein 1b tip 0.98–1.01 × as long as distance between wing base and vein 7 tip, or 1.03–1.06 × as long as distance between tips of veins 1b and 7; tornus only very slightly lobate; tail long, nearly 1/4 (0.24–0.27 times) as long as distance between wing base and tail base or 1.25–1.43 × as long as cell 2 width at outer margin.

Upperside of wings. Yellowish green with a weak metallic lustre. Forewing distinctly whitened on discal area covering posterodistal portion of discoidal cell, triangular basal portion of cell 4, basal 3/5 of each cell 2 and cell 3, anterior portion of middle 1/3 of cell 1b + c; this discal whitish portion rather sparsely covered with metallic green scales and the basal scales on this area faded to white. Forewing with the broad black outer marginal border, which is distinctly widened towards apex, and narrowly extends along costa to the level of discocellular; width of the black border and its relative width to cell 1b + c width at outer margin 1.0–1.1 mm and 0.35–0.39 in cell 1b + c, 1.2–1.4 mm wide and 0.43–0.46 in cell 2, 2.1–2.3 mm wide, and 0.71–0.85 in cell 5, and 2.9 mm and 1.0–1.1 X at apex. Fringe white, mixed with a few black scales in space 1b + c, gradually blackened towards apex anterior to vein 2, and almost entirely black between vein 3 and wing apex. Hindwing with a slight pale purplish tinge on the ground colour along black outer marginal border, particularly in cells 1b + c, 2 and 6, and also along vein 1b; postdiscal area from the extent of discocellular to submarginal area widely whitened as the discal area of forewing; this pale area various in size by individuals (in the most widely whitened specimen white basal scales distributed from cell 1b + c to cell 6, and cells 4 and 5 almost entirely white); cell 6 with metallic green scales arranged narrowly along vein 6 on basal 1/2; cell 7 with metallic green scales also narrowly arranged along anterior margin of discoidal cell; veins 2 to 5 finely blackened distally in postdiscal area; tail black, its fringe on basal 1/2 of posterior margin and at tip white; fringe of outer margin white, in cells 1b + c and 2 a few blackish scales intermixed.

Underside of wings. White in ground colour, partly with a slight greyish tinge probably caused by

wear; and with blackish brown to dark brown markings on both fore- and hindwings and pale orange yellow submarginal markings in the cells 1a, 1b + c and 2 in hindwing. Forewing with discocellular bar fine, 0.5–0.6 mm wide near anterior portion, distinctly narrowed posteriorly and 0.1–0.2 mm wide at posterior end, 2.5–2.9 mm long; postdiscal stripe fine, 0.2–0.4 mm wide, extending from costa to vein 2, arranged in a continuous line, running almost parallel to outer margin of wing, tending to be only slightly convergent to it posteriorly; components of the postdiscal stripe having a tendency to be arched inwardly, so that the stripe as a whole is weakly undulated; inner submarginal stripe represented by a dark band, diffusely demarcated, 0.8 mm wide in cell 2, tapering anteriorly, indistinctly separated into 2 dots in cell 1b + c; outer submarginal stripe recognizable as a greyish white band. Hindwing with discocellular bar very fine, 0.4 mm at anterior tip, more or less incurved along cell 5 base, then almost straight and much tapered to 0.1–0.2 mm; cell 7 with distinct subbasal bar extending from vein 8 to anterior margin of discoidal cell, 0.3–0.4 mm in width, tapering posteriorly, and distinctly arched outwardly. Postdiscal stripe of hindwing 0.1–0.3 mm wide, running almost parallel to outer margin of the wing, characteristically undulated as each component arched inwardly; the stripe as a whole produced outwardly in cell 6, incurved in cells 4 and 5, arched outwardly again in cell 3, transverse to the middle of cell 2, then strongly bent outwardly and extending to the middle of vein 2, dislocated inwardly at the vein, similarly curved in cell 1b + c as in cell 2, and ending in a straight, proximally directing oblique line in cell 1a. Hindwing with inner submarginal markings consisting of inwardly arched dark grey lunules indistinctly united into a band; a small orange yellow spot distal to the inner submarginal marking in space 2; tornus also with a small orange yellow spot finely bordered blackish inwardly, more broadly on outer margin; outer submarginal marking represented by indistinct greyish white band; outer margin of wing finely bordered with black.

Antenna. 0.42–0.44 × as long as forewing, black scaled, annulated with white scales on shaft; integument black except for brownish posterior portions of nudum (unscaled) area of apical 3–4 segments. Compound eye densely covered with greyish white hairs; vertex and frons black scaled, eye margin bordered with decumbent white scales and clothed with long black hair-like scales submarginally; vertex and frons with a median row of white hair-like scales; vertex with a transverse row of pale scales posteriorly. Labial palpus white, dorsal surface and lower

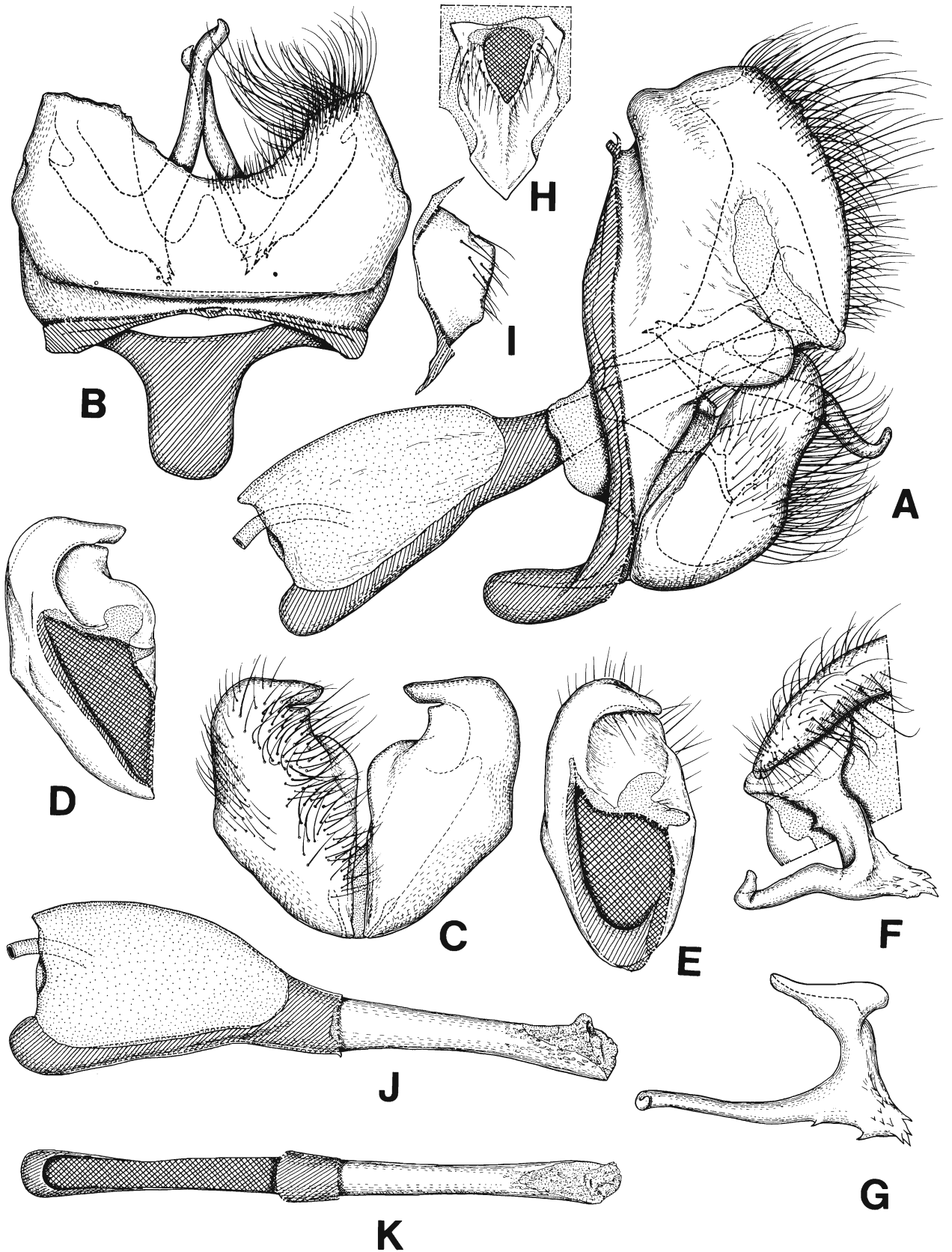


Fig. 13. Male genitalia of *Chrysozephyrus paona albidus*, subsp. nov. A: Genitalia as a whole, lateral aspect. B: Ring, dorsal aspect. C: Valvae, ventral aspect. D: Right valva, inner side of dorsal aspect. E: Ditto, dorsolateral aspect. F: Left falx with basal portion of socius, posterior aspect. G: Left falx, dorsal aspect. H: Juxta, posterior aspect. I: Ditto, lateral aspect. J: Phallus, lateral aspect. K: Ditto, bulbous ejaculatorius omitted, dorsal aspect.

outer surface black striped longitudinally; 2nd and 3rd segments ventrally clothed with long black hair-like scales. Thoracic nota and abdominal terga covered with olivaceous brown scales and hairs with greenish lustre; thoracic pleura and legs white scaled; black scales mixed on tibiae; tarsi annulated with black.

Genitalia. Dorsum large, in lateral aspect $1.25 \times$ as high as long and $1.5 \times$ as high as vinculum; tegumen strongly raised dorsally just posterior to the anterior margin; posterior margin of dorsum deeply emarginate, without any posteromedian projection in dorsal aspect; saccus short, $0.2 \times$ as long as anterior height of ring; falx rather long, produced at elbow into a distinct lamellate process furnished with many spine-like processes and also with a weak spine-like process on basal portion. Valva small and oval, $0.6 \times$ as long as anterior height of ring, with apical portion not exceeding base of falx; in lateral aspect, dorsal margin of valva almost straight, and ventral margin of valva rounded at both basal and apical portions; ampullar process short and rather slender, close to apical blade of harpe and slightly exceeding it; apical blade of harpe longish; inner surface of ampulla flattened; middle portion of inner surface of valva strongly concaved; ventroproximal margin of harpe rather strongly expanded. Phallus moderately long and almost straight, $1.3 \times$ as long as anterior height of ring, subzonal portion $1.2 \times$ as long as suprazonal portion; coecum penis very short; suprazonal portion moderately slender and straight, with a dorsal perivesical area; vesica with many minute slender cornuti; juxta as illustrated, with its dorsal extremities continuous to weakly sclerotized dorsal margin of manica.

Length of forewing: 20.0–20.5 mm.

Type materials. *Holotype* ♂. Mt. Daweishan (大圍山, 2000 m), Pinbian, Yunnan, China, 24 May 1996, col. T. Saigusa & A. Nakanishi (Kunming Institute of Zoology, Academia Sinica, Kunming, China).

Paratypes: 2 ♂, same data as holotype (Museum of Nature and Human Activities, Hyogo, Sanda, Japan [B1-345711] and Biosystematics Laboratory, Graduate School of Social and Cultural Studies, Kyushu University, Fukuoka, Japan).

Distribution. Yunnan, China.

Taxonomic affinity. As stated in the introduction, the whitened discal areas on the metallic green ground of the male of this subspecies is quite unique in higher "Zephyrus". However, the detailed comparison of each component of markings on the underside of the wings shows that this new subspecies and the nominotypical *paona* (Figs. 11–12) are almost identical

with each other. The following are character states shared by the two taxa: Inwardly arched state of each component of postdiscal stripes; curved discocellular bar of forewing; peculiarly undulated postdiscal stripe; lunule-like inner submarginal markings; and weakly developed orange-yellow markings in cells 1a, 1b, and 2 in hindwing. The nominotypical *paona* male also has slightly whitened areas at the base of cell 4 of the forewing upperside, and somewhat pale submarginal portions of the hindwing upperside. The structures of the male genitalia of these two taxa are also similar to each other as follows: The tegumen is strongly produced dorsally; the falx is long and weakly bisinuate in lateral aspect; the ampullar process is slender and the apical blade of harpe is rather long. Based on the above-mentioned character states we consider that the new taxon belongs to *C. paona*.

The new subspecies can be easily distinguished from the nominotypical subspecies by the white discal area of both wings.

Bionomics. The habitat of the new subspecies at Mt. Daweishan (大圍山) is covered with primary, evergreen broad-leaved forest dominated by *Lithocarpus* spp. All three type specimens were collected at around 16:00 p.m., when the sunlight obliquely entered the perching spot of the butterfly. We could not find any male butterfly of this species at the perching place at around noon. Therefore, mating activity of the male of this species seems to begin in the late afternoon.

Each of the type males was collected when he perched on a leaf of *Rubus* sp. climbing up and covering the top of a small tree ca. 7 m high situated in the middle of a small gap (20–30 m in diameter) on a steep slope surrounded by high trees. The top of the tree and tips of some branches of trees surrounding the gap were preferred by the males of this subspecies as perching spots. The male butterfly perched there opening his wings, and pursued other males of the same species entering the protected space around the perching spot. After we had collected a male individual occupying the territory, another male soon occupied the vacant space for his territory.

This species seems to be rather common at Mt. Daweishan, as we observed several individuals perching there within 1 hour. All the collected specimens were rather worn in condition, suggesting that the male of this species may appear from early May in the type locality.

Zoogeography. The known distributional range of *C. paona* was confined to the Manipur area along the India–Myanmar border²⁾. As the new subspecies was found at Mt. Daweishan, the known range now

2) Smith (1989) mentioned that *C. paona* occurs in Nepal, but we could not examine the Nepalese material.

extends some 1000 km east to the middle of southern Yunnan. *C. paona* almost certainly occurs in the mountainous region in the vast area between the two localities. Before the discovery of *C. leigongshanensis*, the *syla*-group was considered to be confined to the Himalaya area, with the centre of distribution around Assam including Manipur. The present discovery of *paone* in southern Yunnan together with the distribution of *leigongshanensis* (Guizhou and Sichuan) suggests the occurrence of other species of the *syla*-group in the mountain areas along the border between Yunnan and Indochina, one of the least surveyed areas of butterflies in Eastern Asia.

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