SHILAP Revista de lepidopterología, 54 (213) 30 marzo 2026: 107-114 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.1123 https://shilap.org
https://zoobank.org/54004053-7010-4166-9288-2FFCFBB5CD8E

A new species of the genus *Comostola* Meyrick, 1888 from Xizang, China (Lepidoptera: Geometridae)

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Abstract

Comostola rectiuscula Wen, Pan & Han, sp. nov., described as a new species from Xizang, China. Additionally, *C. caerulea* Warren, 1893 recorded as new for the fauna of China. Description and diagnoses for both species are provided, and their external characters and genitalia are illustrated.
Keywords: Lepidoptera, Geometridae, *Comostola*, diagnosis, morphology, taxonomy, new record, China.

Una nueva especie del género *Comostola* Meyrick, 1888, procedente de Xizang, China (Lepidoptera: Geometridae)

Resumen

Comostola rectiuscula Wen, Pan & Han, sp. nov., descrita como una nueva especie de Xizang, China. Además, *C. caerulea* Warren, 1893, registrada como nueva para la fauna de China. Se proporcionan la descripción y el diagnóstico de ambas especies, así como ilustraciones de sus caracteres externos y genitalia.
Palabras clave: Lepidoptera, Geometridae, *Comostola*, diagnóstico, morfología, taxonomía, nuevo registro, China.

Introduction

The genus *Comostola* Meyrick, 1888, a member of the tribe Hemitheini within the subfamily Geometrinae, was established based on the type species *Eucrostis perlepidaria* Walker, 1866. In Parsons et al. (1999), 45 species were listed, and over the past two decades, five additional species have been described. As a result, total of 50 species are currently listed within the genus *Comostola* (Rajaei et al. 2022), which are primarily distributed across the Oriental and Australian regions. The main contributions to the taxonomy of this genus are as follows: Walker (1861, 1866) described seven species from south-east Asia and Australia; Warren (1893, 1896a, 1896b, 1899, 1903, 1906, 1909) and Prout (1912, 1913, 1917, 1920, 1925, 1926, 1928, 1934) described nine and eighteen species, respectively, from Indo-Australia region; Holloway (1977, 1979, 1997) added five species from New Caledonia, Borneo and Norfolk Island. More recently, Yazaki and Wang (2003) described a new species from Nanling, China; Smetacek (2004) established a new species from India; and Tautel (2015), as well as Tautel and Barrion-Dupo (2017) reported three species from Philippines. To date, 18 species of *Comostola* have been recorded in China (Han & Xue, 2011).

Through examination of newly collected specimens of *Comostola* and comparison with many other specimens from different sources, a new species and one new record species were discovered from Xizang, China. In this work, we describe the new species *Comostola rectiuscula* Wen, Pan & Han, sp. nov., and redescribe the new record species *Comostola caerulea* Warren, 1893. For all taxa, comparative figures and illustrations of external features and genitalia of males and females are presented.

Material and methods

All studied specimens, including the types of the new species, are deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS) and the Xizang Agricultural and Animal Husbandry University (XAAHU). Terminology for wing venation follows the Comstock-Needham System (Comstock,1918) as adopted for Geometridae by Scoble (1992) and Hausmann (2001); that for genitalia follows Pierce (1914, reprinted 1976), Klots (1970), and Nichols (1989). Photographs of moths were taken with a digital camera. Composite images were generated using Auto-Montage software version 5.03.0061 (Synoptics Ltd). The plates were compiled using Adobe Photoshop software 2020.

Taxonomy

Comostola Meyrick, 1888
Comostola Meyrick, 1888. *Proc. Linn. Soc. N.S. Wales,* (2)*2*, 836, 869. Type species: *Eucrostis perlepidaria* Walker, 1866
Pyrrhorachis Warren, 1896. *Novit. zool., 3*, 292. Type species: *Pyrrhorachis cornuta* Warren, 1896
Leucodesmia Warren, 1899. *Novit. zool., 6*, 25. Type species: *Comibaena dispansa* Walker, 1861
Chloeres Turner, 1910. *Proc. Linn. Soc. N.S. Wales, 35*, 561 (key), 570. Type species: *Chlorochroma citrolimbaria* Guenée, [1858] 1857

Han & Xue (2011) already provided a number of characters defining the genus *Comostola*. They are summarized here as follows:

Adults: Antenna of male bipectinate, pectination gradually shorter towards tip, filiform, ciliate or serrate in female. Frons not protruding. Labial palpus small and weak. Thorax and abdomen without dorsal crests. Hind tibia of male usually not dilated, few species dilated and with hair-pencil and short terminal process, with two pairs of spurs.

Wing pattern: Body small. Apex of fore- and hind wings rounded, or slightly protruding on hind wing. Forewing with costa straight or slightly protruding. Outer margin of forewing straight or shallowly curved, that of hind wing shallowly curved or slightly angled, without tail process. Wings bluish green or green. Antemedial and postmedial lines often composed of dots on veins (linear in *C. rectiuscula* sp. nov. and *C. christinaria* (Oberthür, 1916), pale yellow or reddish brown, usually with both colours simultaneously, dots of postmedial line usually absent above M_1; occasionally antemedial line present on hind wing; terminal line red alternated with black, with inner margin wavy, serrate or smooth, colourful terminal line absent in few species. Discal spot absent or present, usually with three layers, pale-centered, darker ring in the middle and pale ring outside. Underside: paler than upperside, usually without streaks. Some species usually bluish green or fresh green, only with red costa and outer margin, without other streaks.

Male genitalia: Uncus bifid posteriorly less than one third, mostly pointed, few blunt, quite few species not bifid. Socii tapered, of even width, or long narrow, slightly sclerotized basally and strongly sclerotized terminally, or membranous, some species with small to large, sclerotized tooth. Gnathos with median process long narrow, usually pointed. Valva broad or long narrow; costa usually expanded basally; harpe usually present, some species with valva asymmetry, fish bone-like, setae cluster, tooth-like, with several long setae terminally or not; area joined two sacculus pocket-like; sometimes with process or setae hair on ventral margin of valva. Saccus broad. Coremata present or absent. Cornutus one to three dense sclerotized spines on vesica, or absent.

Female genitalia: Lamella antevaginalis usually slightly sclerotized process; lamella postvaginalis slightly sclerotized, broad, tongue-like, sometimes concave. Ductus bursae short, weakly sclerotized. Corpus bursae round or long narrow, sometimes slightly sclerotized posteriorly; signum present or absent.

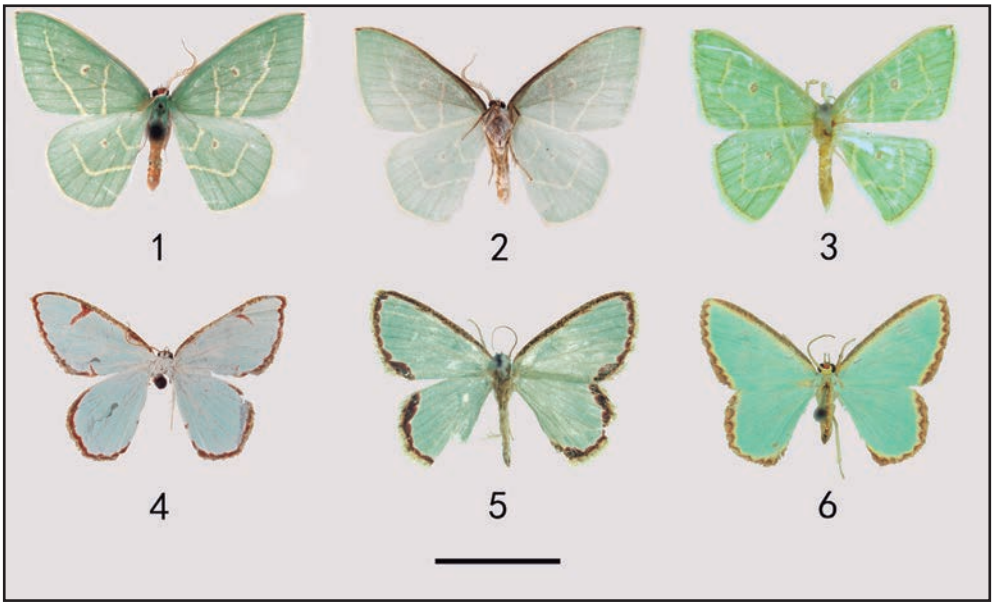
Diagnosis: *Comostola* can usually be recognized by a combination of the following characters (not necessarily all present in each species): antemedial and postmedial lines often composed of dots on veins; discal spot usually with three layers, pale-centered, darker ring in the middle and pale ring outside. In the male genitalia, most species of *Comostola* have bifid uncus. Another genus in the Hemitheini that also has bifid uncus is *Hemistola*. But these two genera are very different on the wing pattern, such as: if postmedial line is present in *Comostola*, then it is composed of spots on veins *C. christinaria* and *C. rectiuscula* sp. nov. and the colour of which is pale yellow alternated with white, while the postmedial line of *Hemistola* is dentate or linear.

Distribution: Oriental and Australasian regions.

***Comostola rectiuscula* Wen, Pan & Han, sp. nov.** (Figures 1-2, 7-8, 13, 15-16**)**
https://zoobank.org/C05FA579-AB64-4B60-ABB4-15A9DE2E0CB2

Material examined: Holotype ♂, CHINA: Xizang (XAAHU): Sejila Mountains, 3780 m, 18-VII-2020, leg. Xian Chunlan. Paratypes: Xizang (XAAHU): 2 ♂, 2 ♀, Sejila Mountains, 3780 m, 18-VII-2020, leg. Xian Chunlan; 5 ♂, Xizang, Sejila Mountains, 3350 m, 22-VII-2020, leg. Xian Chunlan, Pan Zhaohui; Xizang (IZ-CAS): 1 ♂, 10 ♀, Xizang, Mêdog, Lage, 3213 m, 7-8-VIII-2006, leg. Lang Songyun; 1 ♀, Xizang, Bomi, Baibung, 3300-3450 m, 3-IX-1973, leg. Huang Fusheng; 2 ♂, 2 ♀, Sejila Mountains, 3780 m, 18-VII-2020, leg. Xian Chunlan.

Figures 1-6. Adults. **1-2.** *C. rectiuscula* sp. nov., holotype, upperside. **2.** ibidem, underside. **3.** *C. christinaria* Oberthür. **4.** *C. caerulea* Warren. **5.** *C. turgescens* Prout. 6. *C. pyrrhogona* Walker (Scale bar = 1 cm).



Description: Head (Figures 1-2). Antenna in male bipectinate for about basal two-thirds, filiform terminally; rami protruding from first 1/4 of each segment, and the longest rami about 4 times diameter of antennal shaft. Antenna filiform in female. Frons flat, upper half reddish brown, lower half gray. Labial palpus with tip projecting out of frons. Vertex white.

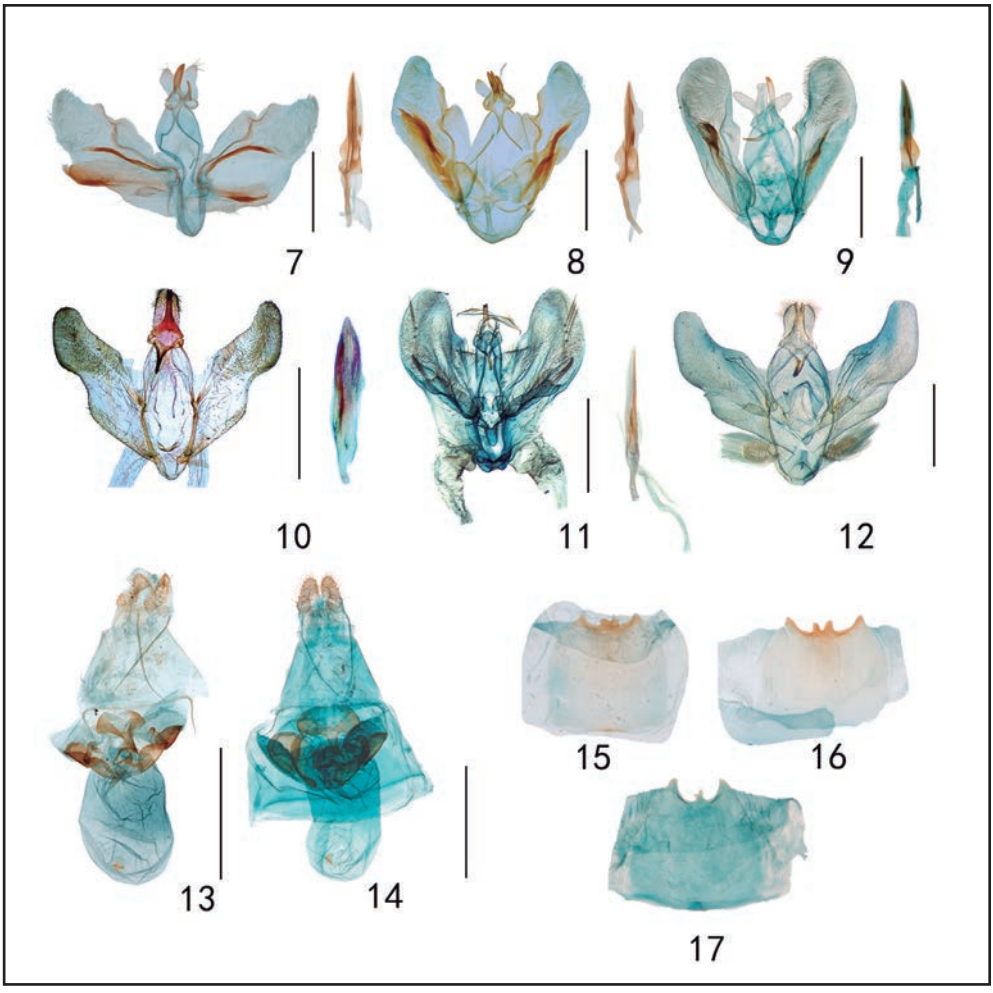
Thorax: Dorsal and ventral sides of thorax bluish green. Femora of legs covered with whitish hair-scales, remaining parts of legs yellow-white. Hind tibia in male not dilated, without hair-pencil, both sexes with two pairs of spurs. Forewing length. male 21~26 mm, female 20~25 mm. Wing bluish green. Apex pointed; termen almost straight, slightly bulging outward; tornus round. Forewing with costa fulvous; antemedial line white and straight, slightly convex outwards at middle, tapering from basal 1/3 of inner margin towards costa, terminated at upper edge of discal cell; postmedial line white and straight, not reaching costa, bended at vein M_3 and slant to middle of inner margin; submarginal line absent; terminal line not obvious, in some specimens terminal line appearing as sparse black scales; discal spot elliptical and brown, with a yellow-white ring around it. Fringes often white, sometimes pale yellow, as a small black dot at apex; fringes on inner margin green. Hind wing with rounded apex; outer margin bulged at vein M_3. Antemedial line white and shallow arced, sometimes curved in an elbow shape at the anal fold; postmedial line white, straight from Rs to M_3, forming a blunt angle between M_3 and CuA_1, then straight to middle of anal margin; discal spot as on forewing, but rounder; fringes as on forewing.

Underside similar to upperside, markings on upperside faintly discernible; brown scales scattered at forewing base; costal base brown, gradually yellowish towards apex.

Abdomen (Figures 15-16): Dorsal side of abdomen blue-green and ventral sides gray. Third sternite of male without setal patch. Eighth sternite of male sclerotized, shallowly concaved, with lateral blunt process and a middle process with shallow or deep concavity at posterior margin.

Male genitalia (Figures 7-8): Uncus in even width, terminal 1/5 bifurcated. Socii broader and slightly longer than uncus. Gnathos with median process slender and pointed. Valva broad, apex narrow and blunt; costa with two blunt protuberances, between which costa deeply concave; harpe a ribbon-like bundle of bristles. Sacculus asymmetrical, left part with a long strongly sclerotized zone, decorated with long setae, right part with a short one and with setae. Juxta unmodified. Saccus round. Aedeagus with coecum slender, enlarged at middle, posterior part tapering; cornutus with two setal patches.

Figures 7-12. Male genitalia. 7-8. *C. rectiuscula* sp. nov. **7.** Holotype. **8.** Paratype. **9.** *C. christinaria* Oberthür. **10.** *C. caerulea* Warren. **11.** *C. pyrrhogona* Walker. **12.** *Hemistola euethes* Prout. **13-14.** Female genitalia.**13.** *C. rectiuscula* sp. nov., paratype. **14.** *C. christinaria* Oberthür. **15-17.** Eighth sternite. **15-16.** *C. rectiuscula* sp. nov. **15.** Holotype. **16.** Paratype. **17.** *C. christinaria* Oberthür (Scale bars = 1 mm).



Female genitalia (Figure 13): Apophyses posteriores about twice as long as the apophyses anteriores, tip elongated. Lamella postvaginalis sclerotized, nearly two-petaled sclerites, joined and spiky at middle. Lamella antevaginalis flap-shaped, extending posteriorly as a band; adjacent to lamella antevaginalis, another flap-shaped, fold, spinulose sclerite present. Corpus bursae elliptical. Signum round and located in lower left side of ventral surface, center with a sclerotized ridge. adjacent to the outer side.

Diagnosis: On the wing pattern, *C. rectiuscula* is similar to *Comostola christinaria* (Oberthür, 1916) (Figure 3), a species transferred from the genus *Hemistola* Warren (Han and Xue, 2009), for sharing distinct linear antemedial and postmedial lines on both fore- and hind wings. In *C. rectiuscula*, the antemedial and postmedial lines on both wings are less protruding, and both transverse lines are closer to each other on the forewing and separated on the hind wing. However, in *C. christinaria*, the transverse lines are more protruding, further from each other, and connected on the anal angle of the hind wing. The male genitalia are also different: the apex of the valva is more sharper and the edge of valva is more strongly curved than *C. christinaria* (Figure 9), distinctly, *C. rectiuscula* bears larger sacculus and *C. christinaria* possesses smaller one; costa has two protuberances in *C. rectiuscula*, but only one in *C. christinaria*. In addition, the male eight sternite of *C. rectiuscula* is more shallowly concaved than in *C. christinaria* (Figure 17). The female genitalia of the two species are very similar (Figure 14).

Distribution: China (Xizang).

Etymology: The specific name is based on the Latin word *rectiusculus*, referring to the straight postmedial line of the forewing.

Remarks. The middle process of the male eighth sternite is more or less variable in different specimens. For example, the process appears as one broad process with posterior margin very shallowly concave in the holotype (Figure 15), and almost two separate small middle processes (Figure 16) in one paratype.

Comostola caerulea Warren, 1893, **new record to China (**Figures 4, 10**)**
Comosota caerulea Warren, 1893, *Proc. Zool. Soc. Lond., 1893*(2), 354, pl. 31, Fig. 1 Syntype(s) ♂: INDIA, Sikkim. (BMNH)

Material examined: CHINA, Xizang (IZCAS), Mêdog, Zhamo, 2073 m, 1 ♂, 17-IX-2020, leg. Xian Chunlan; Xizang (XAAHU), Hanmi, 2123 m, 2 ♂, 17-IX-2021, leg. Pan Zhaohui; Xizang, Lalu, 3645 m, 1 ♂, 6-VIII-2021, leg. Pan Zhaohui; Xizang, Sejila Mountains, 3330 m, 1 ♂, 9-IX-2020, leg. Chen Enyong.

Description: Head (Figure 4). Antenna brownish in male, bipectinate for about basal two-thirds, rami protruding from first 1/4 of each segment, and the longest rami about 3 times diameter of antennal shaft; filiform terminally; antenna filiform in female. Frons reddish brown and flat. Labial palpus greyish-white and tip sticking out of the frons. Vertex white.

Thorax: Dorsal and ventral sides of thorax bluish-green. Hind tibia not dilated, without hair-pencil, both sexes with two pairs of spurs. Forewing length. Male 22 mm. Wing overall blue-green. Forewing with rounded apex. Costa yellowish-brown, mixed with black spots. Antemedial line reddish-brown, only retain a small protrusion, at most reaching 1/2 of the discal cell. Postmedial line reddish-brown, incomplete, only visible at 3/4 of costa, terminated around M_2 and tapering; at inner margin only appearing as a protrusion extending to above vein 2A. Terminal line reddish-brown, concaved on veins, extending to inner margin and very close to postmedial line protrusion. Hind wing with rounded apex and tornus. Postmedial line only retain as a little reddish-brown protrusion around vein 2A. Terminal line similar as on forewing, extending inwards along anal margin to its middle. Fringes tawny. Discal spot absent on both fore- and hind wings. Underside no maculation, only forewing base decorated with brownish scales.

Abdomen: With dorsal side reddish-brown, ventral sides gray.

Male genitalia (Figure 10): Uncus in even width, tip slightly bifurcated. Socii with equal length as uncus. Gnathos sclerotized, with median process thin and pointed. Valva with rounded apex; ventral margin deeply concave near middle; costa with triangular bulge at middle. Saccus round. Aedeagus stout, large middle part broad, apical part tapering and with large sclerotized process, coecum very short; cornutus present, tapering with blunt tip.

Female genitalia: Unknown.

Diagnosis: On the wing pattern, *Comostola caerulea* is similar to *Comostola turgescens* (Prout, 1917) (Figure 5) and *Comostola pyrrhogona* (Walker, 1866) (Figure 6) for sharing bluish wings, reddish brown costa

and termen, and the absence of the discal spot. *C. caerulea* can be distinguished by the distinctive postmedial line one the forewing, which is only retained as long tapering stick on costa and a very short one on inner margin. The terminal line on *C. caerulea* is concave on the veins but concaved between veins in *C. turgescens* and *C. pyrrhogona*. In addition, the terminal line is normal in *C. caerulea* and *C. pyrrhogona*, but broadened on anal angle in *C. turgescens*. The male genitalia are very different, for example, *C. caerulea* lacks a harpe on the valva but *C. pyrrhogona* possesses a harpe (Figure 11). The male genitalia of *C. caerulea* are also close to some species of *Hemistola* for sharing similar uncus, socii, gnathos and the shape of the valva, for example *H. euethes* (Figure 12), however, a sclerite is present on the base of the valva in *H. euethes* but absent in *C. caerulea*.

Distribution: China (Xizang); India.

Acknowledgements

We express our sincere thanks to Sir Manpreet Singh, Punjabi University, for kindly providing an important literature to confirm the new species. This work was supported by Biological Resources Programme, Chinese Academy of Sciences, the Xizang Autonomous Region Science and Technology Program (Grant No. XZ202501ZY0053), the 2025 Annual Linzhi Science and Technology Plan Project (Grant No. XDHZ-2025-10), the 7th Flexible Talent Introduction Project of Xizang Agricultural and Animal Husbandry University (Research on the Diversity of Ennominae in Linzhi Region), Xizang Agricultural and Animal Husbandry University Doctora Program in Forestry (Phase I) (Grant No. 533325001), and special investigation and monitoring of the Yarlung Zangbo Grand Canyon National Nature Reserve in Xizang, the Survey of Wildlife Resources in Key Areas of Tibet (Phase II, ZL202303601), and the Second Tibetan Plateau Scientific Expedition and Research Program (STEP, #2024QZKK0200).

Conflict of Interest

The authors declare that there is no financial interest or personal relationship that could have influence the work presented in this article.

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(Recibido para publicación / *Received for publication* 10-I-2025)
(Revisado y aceptado / *Revised and accepted* 20-V-2025)
(Publicado / *Published* 30-III-2026)