



## A new species of the genus *Eucyclodes* (Lepidoptera, Geometridae, Geometrinae) from China

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The genus *Eucyclodes* was originally established by Warren (1894) on the basis of *Phorodesma buprestaria* Guenée, 1858. *Eucyclodes* is a large genus, which contains more than 90 species (Scoble 1999; Scoble & Hausmann 2007), mainly distributed in the Indo-Australian tropics, and more than 50% of all species are found in New Guinea. More than 90% of all *Eucyclodes* species were described before the 1950s. The most recent additions were made by Inoue (1978, 1986), Holloway & Sommerer (1984), Holloway (1996), and Tautel (2016), who each erected one new species per publication. The tribal position of *Eucyclodes* is still uncertain, for example, Pitkin (1996), Holloway (1996) and Ban *et al.* (2018) placed it in the tribe Nemoriini (or Nemoriiti), and the most recent research by Murillo-Ramos *et al.* (2019) found that *Eucyclodes* is sister to other Nemoriini and the authors did not assign it to any tribe.

Most species of *Eucyclodes* can be recognized by the following characters, as summarized by Holloway (1996): deep emerald green wings are usually decorated with white blotches and lines; many species are sexually dimorphic, that is, females tend to have the white areas of the respective males suffused with red or blackish scales; the uncus of the male genitalia is usually long, apically spatulate and often bilobed.

Through examination of recently collected specimens of IZCAS, one undescribed species was discovered, which will be described here. This results in 16 species of *Eucyclodes* for the fauna of China after Han & Xue (2011). Specimens used in this study are deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), the Natural History Museum, London, United Kingdom (BMNH), and Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK). Genitalia were prepared following the standard procedure published by Robinson (1976). Terminology of wing venation is based on the Comstock-Needham System (Comstock 1918), but modified in detail, according to recent works (Hausmann 2001), and that of the genitalia follows Pierce (1914), Klots (1970) and Nichols (1989). Photographs of the moths were taken with digital cameras (Canon Power Shot Pro 1). Composite images were generated using Auto-Montage software version 5.03.0061 (Synoptics Ltd). The plates were compiled using Adobe Photoshop software.

### *Eucyclodes insolita* Han & Zhang sp. nov. (Figs 1, 5–7)

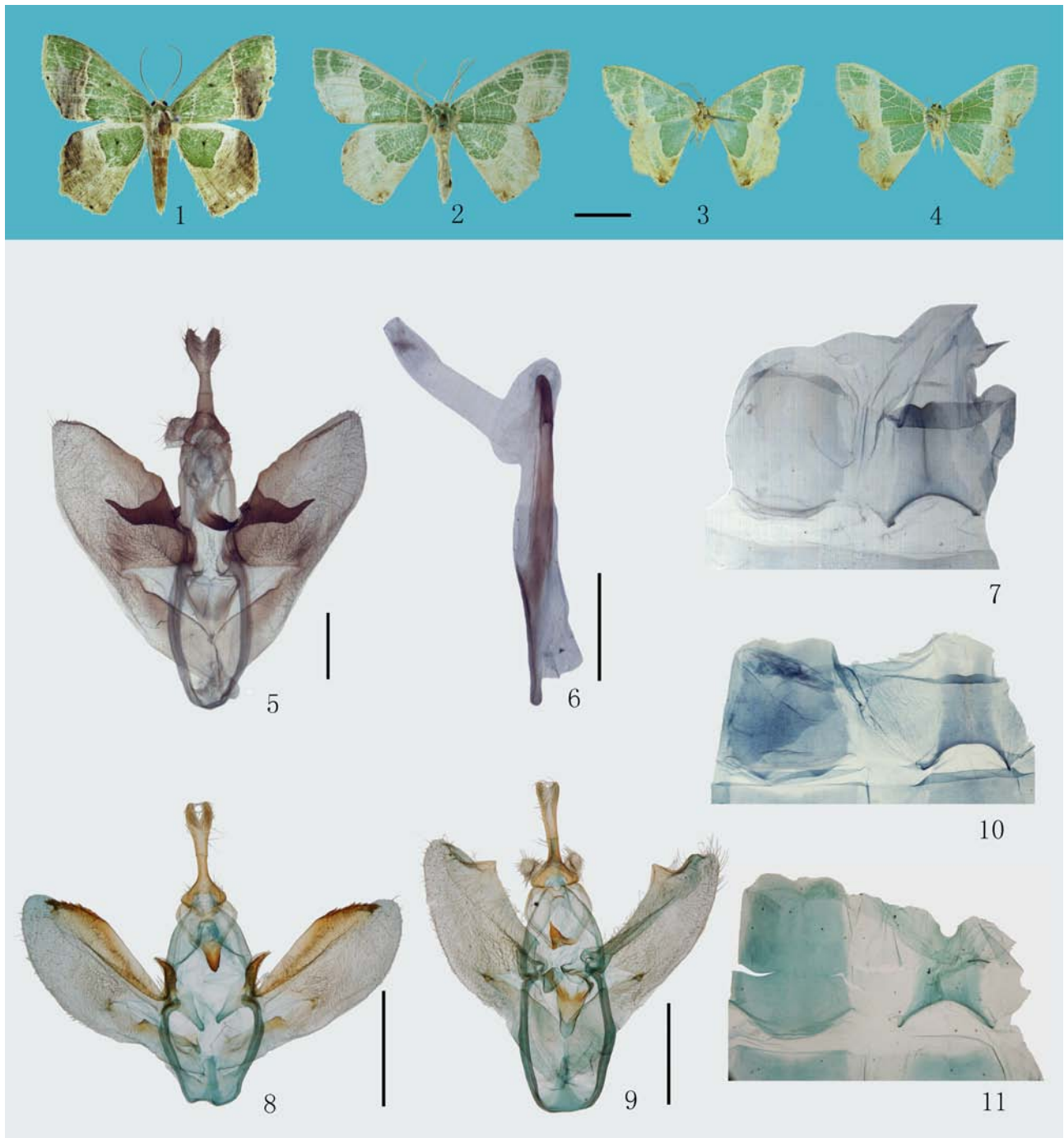
**Description.** *Head.* Antennae shortly serrate in male. Frons green. Vertex white mixed with a little green. Labial palpus white, with tip extending beyond frons.

*Thorax.* White. Tegula with base green and terminal part white. Hind tibia in male dilated, with two spurs, with hair-pencil and terminal process, the latter similar in length to the first tarsus.

Forewing length: ♂ 19–19.5 mm. Apex of forewing slightly pointed; outer margin of both wings slightly wavy. Wings green, with most veins white. Forewing with costa green, slightly paler than wing colour; antemedial line white, strongly angled in discal cell, with anterior half curved and posterior half almost straight; postmedial line white, thicker than antemedial line, slightly wavy and almost straight, slightly concave below vein CuA<sub>2</sub>; brown scales present outside postmedial line, forming a small patch above vein M<sub>2</sub>, and a broad patch extending from M<sub>2</sub> to anal vein, reaching outer and inner margins below vein CuA<sub>2</sub>; most brown scales short, bar-like; white submarginal line distinct above vein M<sub>2</sub>; terminal line appearing as tiny green dots between veins, and as larger distinct black dots below M<sub>3</sub>, especially between M<sub>3</sub> and CuA<sub>1</sub>, and below CuA<sub>2</sub>. Hind wing with outer margin slightly protruding at vein M<sub>3</sub> end; wing base green, large terminal part as a broad brown band, with apex much deeper, and scales also as transverse short lines as on forewing; postmedial and submarginal lines indistinct; terminal line only retained at the end of anal fold as a black dot. Discal spots

on both wings appearing as black dots. Fringes pale brown, darker on hind wing. Underside: dull white, background on forewing discernible; forewing anal patch and the hind wing apical patch much deeper and more distinct than that of upper side; terminal line a row of small black dots between veins on both wings.

*Abdomen.* Dorsal and ventral sides whitish. Sternite 3 of male abdomen with a pair of sparse setal patches. Sternite 8 in male with posterior margin concave.



**FIGURES 1–11.** 1–4. Adults of *Eucyclodes*. 1, *E. insolita* sp. nov., male, holotype, IZCAS; 2, *E. monbeigaria* (Oberthür, 1916), male, syntype, ZFMK; 3, *E. lalashana* (Inoue, 1986), male, holotype, BMNH; 4, *E. albiradiata* (Warren, 1893), male, holotype, BMNH. Scale bar = 1 cm. 5–11. Male genitalia, aedeagus and 8<sup>th</sup> sternite of male. 5–7, *E. insolita* sp. nov., paratype, IZCAS; 8, 10, *E. lalashana*, IZCAS; 9, 11, *E. albiradiata*, IZCAS. Scale bars = 1 mm.

*Male genitalia.* Uncus long, apex roundly inflated, spatulate and with tip bilobed. Socii small, weakly sclerotized, much shorter than uncus. Gnathos with median process pointed, ventral side with irregular small teeth. Valva broad, apex narrower, base with a groove at middle part; costal base with a strongly sclerotized, hooked process, base of which

has a small irregular sclerite; a sclerotized ridge present near apex on costa. Transtilla a pair of small slightly sclerotized processes. Juxta slightly sclerotized, with base narrow and posterior part broad. Saccus blunt. Aedeagus slender, with tip blunt. *Female genitalia*. Unknown.

**Diagnosis.** On the wing pattern, *E. insolita* is similar to *E. monbeigaria* (Oberthür, 1916) (Fig. 2), *E. lalashana* (Inoue, 1986) (Fig. 3) and *E. albiradiata* (Warren, 1893) (Fig. 4). *Eucyclodes insolita* can be distinguished by the presence of the distinct black discal spots on both fore- and hind wings, which are absent on the other three species; and the green scales are absent on the hind wing's broad terminal brown band, but more or less present in other three species. In addition, *E. insolita* is larger (forewing length 19–19.5 mm) than *E. albiradiata* and *E. lalashana* (forewing length 15–17 mm), and the forewing anal patch is much larger than in the other three species. The male genitalia of *E. insolita* are characterized by the large hooked basal costal process, which is quite smaller in *E. lalashana* (Fig. 8) and absent in *E. albiradiata* (Fig. 9). The sclerotized costa near the apex is also different: appearing as a ridge in *E. insolita*, several teeth in *E. lalashana*, and a triangular process in *E. albiradiata*. The eighth sternite in the male is moderately concave in *E. insolita*, shallowly concave in *E. lalashana* (Fig. 10), and deeply concave and appearing as a semicircle in *E. albiradiata* (Fig. 11).

**Type material.** Holotype, ♂ (IZCAS), CHINA: Guangdong, Shixing, Chebaling, 330 m, 1–2.VIII.2013, leg. Yang Chao. Paratypes: 3♂ (IZCAS), the same data as holotype, leg. Yang Chao and Pan Xiaodan (slide no.Geom-6048).

**Distribution.** China (Guangdong).

**Etymology.** The specific name is derived from the Latin word “*insolitus*”, which means uncommon.

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