Atalanta **49** (1-4): 139-142, Marktleuthen (1. September 2018), ISSN 0171-0079

A new subspecies of the little known *Lethe tengchongensis* Lang, 2016 from Central Yunnan, West China

(Lepidoptera, Nymphalidae)

by

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received 1.XI.2017

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Abstract: A new subspecies of *Lethe tengchongensis* Lang, 2016 from Kunming, Central Yunnan Province, China is described, illustrated, and compared with the nominotypical subspecies from Tengchong, West Yunnan, China.

Introduction: The genus *Lethe* Hübner, [1819] is the largest genus of subfamily Satyrinae in the Palearctic and Oriental Regions, with 150 species described to date. The distribution range of *Lethe* extends from Siberia to Australia, including Japan, Bhutan, Nepal, India, China, and Indochina (Bozano, 1999).

China proper, especially the western part of it, along with Indochina, is the diversity centre of *Lethe*. The known species in this region alone comprise 75% of the total account of *Lethe*, featuring many endemic species. During the past two decades, at least 30 new taxa (new species and new subspecies) were described in this region (Bozano, 1999; Lang & Bozano, 2016; Lang & Duan, 2016; Lang & Monastyrskii, 2016). In 2016, *Lethe tengchongensis* Lang, 2016 was discovered from W. Yunnan, China, adding a distinct species to this genus (Lang & Duan, 2016). Apart from the original description, many aspects of *L. tengchongensis* Lang are still little known to date.

In 2016 and 2017, two strange looking ♂♂ specimens resembling *L. tengchongensis* Lang were collected by the authors from Kunming, C. Yunnan. After a careful examination of the two ♂♂ and comparison with *L. tengchongensis* Lang and its allies, we believe that the two specimens represent a new subspecies of *L. tengchongensis* Lang.

Descriptions of morphological characters, ♂ genital structures, and comparisons with allied taxa are given.

Materials and methods

Taxon sampling: Specimens of the new subspecies, *L. camilla* Leech. 1891 and *L. privigna* Leech. 1892 were examined and sampled from the authors' private collection. As the authors did not obtain any specimens of the nominotypical *L. tengchongensis* Lang, morphological and genital characters were compared with those reported by Lang & Duan (2016).

Morphological comparison: Specimens were set for examination. Set specimens were photographed using a Fujifilm S8600 digital camera (Fujifilm, Japan) with medium grey background. Photos were adjusted using Adobe Photoshop CS (Adobe, USA). The lengths of forewing were measured to 0.5 mm precision.

To study the ♂ genitalia, the abdomen was taken from the specimen and placed into a 1.5 ml Eppendorf tube, and 1 ml water was added to the abdomen to rehydrate the tissue at 50°C for 30 min, then 1 ml 10% sodium hydroxide solution was used to digest soft tissue at 70°C for 1 h. The treated abdomen was neutralized with 2% acetic acid and then dissected in a water-filled Petri dish under the stereoscope to remove residual tissues, scales, and hair. The genitalia were then transferred to 80% glycerol for 12 h to render them transparent. Photographs were taken with a Nikon DMX1200 digital camera (Nikon, Japan) mounted on a Nikon SMZ1500 stereoscope (Nikon, Japan) and automatically stacked using Helicon Focus 3.2 (Helicon Software, USA).

Lethe tengchongensis p i n g p i n g a e subspec. nov.

Diagnosis: The general appearance is similar to that of the nominotypical subspecies, but can be distinguished by the following characters. 1) The ochreous postdiscal band on the forewing is narrower, only approximately 2.0 mm (approximately 4.2 mm in nominotypical *L. t. tengchongensis* Lang referred from the original description). 2) The discal and postdiscal bands on the underside of hindwing separated from each other near the tornal area (connected to each other in nominotypical *L. t. tengchongensis* Lang).

♂ (fig. 1): Forewing length 30-32 mm. Body black with short brown-hair, antennae light brown with a black spot on the top, labial palpi brown with dark brown hair, legs brown. Forewing: broad triangular, termen straight, the base of dorsum slightly convex; upperside dark brown with a narrow (approximately 2.0 mm) ochreous postdiscal band obliquely running from the costa towards the tornus, a pair of neighbouring ochreous spots in the subapical area of the wing; underside pale brown, two curved reddish lines in the cell, a reddish line in the middle of Cu2, postdiscal band narrow and yellow, a yellow spot on the subapical, three eyespots in spaces m3-m1. Hindwing: oval with obvious zigzag termen, upperside dark brown, a black androconial brand between the middle of veins Cu2 and Cu1, one to two black subterminal spots; underside pale brown, two curved reddish discal and postdiscal lines starting in the termen and ending in space Cu2, a red band at the end of the cell, a series of six eyespots near the termen, the eyespots are black with yellow outer rings and white pupils, termen reddish.

The ♀ is unknown.

♂ genitalia (fig. 2): Tegumen simple. Uncus long and humped dorsally with the tip slightly bent downwards; gnathos approximately half length of the uncus, with straight, acute tip, and lightly serrated dorsal edge (a). Saccus robust, approximately the same length as the uncus. Valva simple, the basal half broad while the remaining portion narrow, elongated, and only slightly bent up- and inwards; the tip pointed with a single sclerotized tooth (b). Aedoeagus short, slightly bent upwards, the median portion slightly

narrowed, the tip pointed but only partially sclerotized in dorsal view.

Type material: Holotype (HT): Shuanglong, 2100-2300 m, Kunming, Central Yunnan, 2017-VII-30, S. J. Hu, leg. Paratype (PT): Douzui Waterfall, 1900-2000 m, Kunming Central Yunnan, 2016-VII-10, H. H. Zhang leg.
The HT and PT are deposited in the Kunming Institute of Zoology (KIZ), Chinese Academy of Sciences.
Voltinism: Univoltine. The adults fly from late June to mid August in type locality.
Derivatio nominis: This new taxon is dedicated to the beloved girlfriend of the first author, Ms. Ping Hu (Peking University, Beijing, China). The subspecies name is a noun in apposition.

Discussion: The new subspecies is similar to *L. t. tengchongensis* Lang in general appearance, especially the ochreous postdiscal band on the upperside of forewing as a distinct character of this particular species (sensu Lang & Duan, 2016). Our analysis found a few differences between *L. t. tengchongensis* Lang and *L. t.* ***pingpingae*** **subsepc. nov.**, such as the much narrower forewing band and the separate subbasal and postdiscal band on the underside of hindwing. We also noticed some differences between the ♂ genitalia of the two taxa, especially the tip of the valva. However, as the authors did not have any chance to dissect a ♂ of the nominotypical subspecies, it is difficult to decide the extent of stability of such genitalic difference. Based on the limited materials and comparison to the description in Lang & Duan (2016), we currently treat the new taxon as a subspecies of *L. engchongensis* Lang. *Lethe camilla* Leech and *L. privigna* Leech are the other two species sharing many common characters with *L. engchongensis* Lang. The three allying species mostly occur in the southern to eastern margin of the Hengduan Mountains (fig. 3), which extend from the northwest of Central Yunnan Altiplano (Dali) to E. Tibet in the west, to southern margin of Tsinling Mountains to Daba Shan in the north, and along the edge of Sichuan Basin in the east (Lang & Duan, 2016).
The current occurrence of *L. t.* ***pingpingae*** **subsepc. nov.** is further east of the type locality of *L. t. tengchongensis* Lang. Nonetheless, a subspecies of *L. camilla rufa* Mell, 1939 in Fujian, is also widely separated from the nominotypical subspecies in W. Sichuan by the vast C. China territory. Such distant separation of subspecies often indicates two aspects: 1) insufficient survey causing missing distribution records in the large separating zone, hence the geographic delimitation is still unclear; 2) the currently recognised subspecies may represent distinct species due to such isolation, but morphological resemblance caused difficulties in establishing the specific status.
According to available literature, our new subspecies of *L. tengchongensis* Lang and *L. camilla rufa* Mell, both exhibit a certain extent of morphological differences from the nominotypical subspecies, respectively. Based on the above mentioned speculation, the authors of this study believe it would be necessary to carry out more in-depth analysis on this complex group with more material and molecular tools, to eventually solve the identities of these distant separated subspecies.

Acknowledgements: We express our sincere thanks Dr. Song-Yun Lang (Chongqing Museum of Natural History, Chongqing, China) for thoughtful suggestions for this study; Dr. Rong-Jiang Wang (Peking University, Beijing, China), Zheng-Jun Wu (Fuzhou, China), Chun-Hao Wang (Beijing, China), Jian-Qing Zhu (Shanghai, China), Wei-Wei Mao (Shanghai, China), Ping Hu (Peking University, Beijing, China), Kuang Duan (Yunnan University, Kunming, China), Xin Zhang (Kunming, China), Zhou Chang (Kunming, China), Zhen-Li Shen (Kunming, China), Rong Xu (Southwest Forest University, Kunming, China), Lin Yan (Peking University, Beijing, China), Hao-Wen Liu (Peking University, Beijing, China), Liu-Run-Xuan Chen (Fuzhou University, Fuzhou, China), Zhuo-Heng Jiang (Shanghai, China) for providing material, and Adam M. Cotton (Chiang Mai, Thailand) for improving earlier drafts of this article. This study was funded by the China Butterfly Monitoring (CNBM) Programme of the Ministry of Environment Protection (SDZXWJZ01013).

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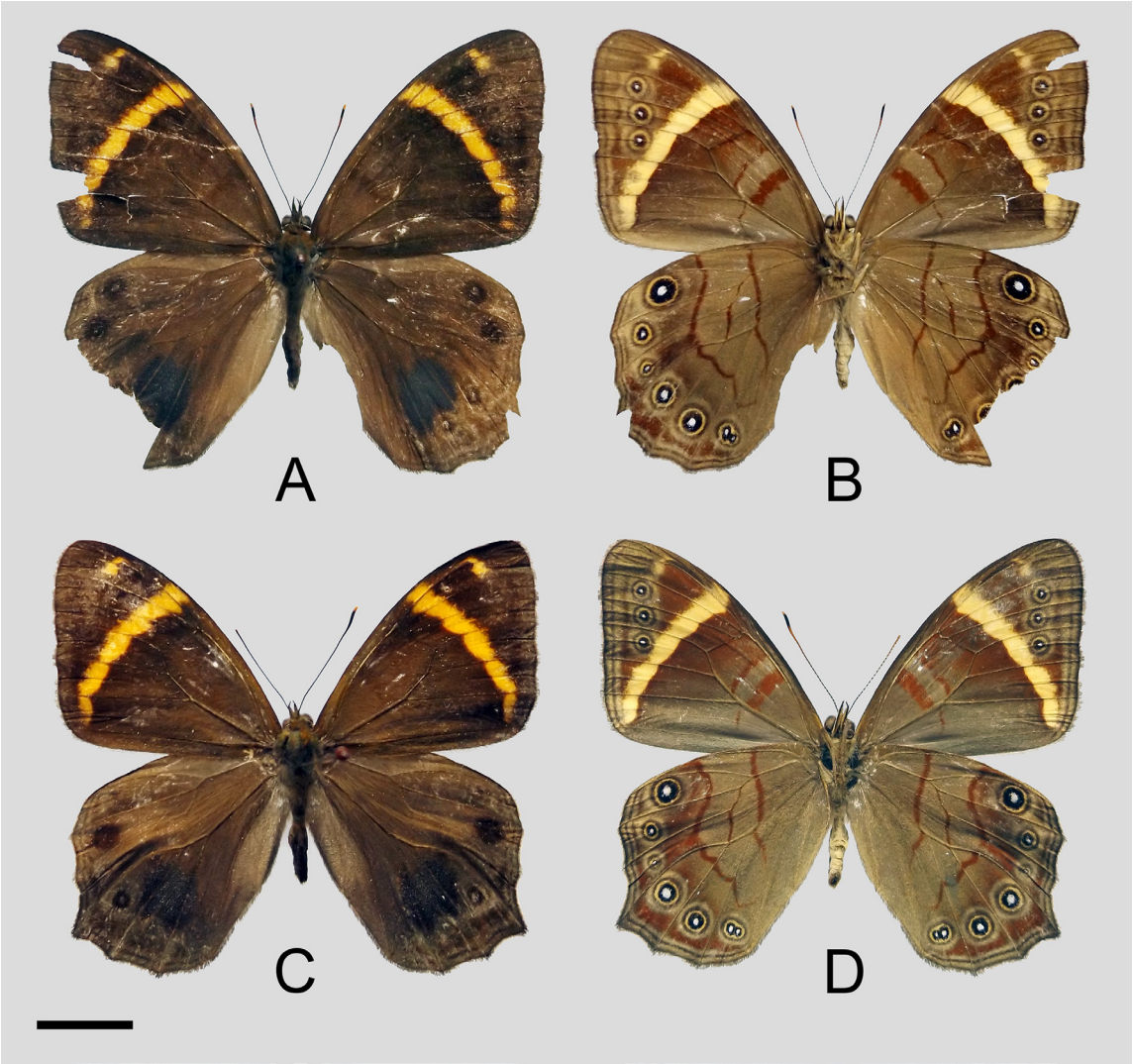

Fig. 1: *Lethe tengchongensis* ***pingpingae*** **subspec. nov.**, HT ♂- A: upperside, B: underside. PT ♂ - C: upperside, D: underside. Scale bar = 1 cm.

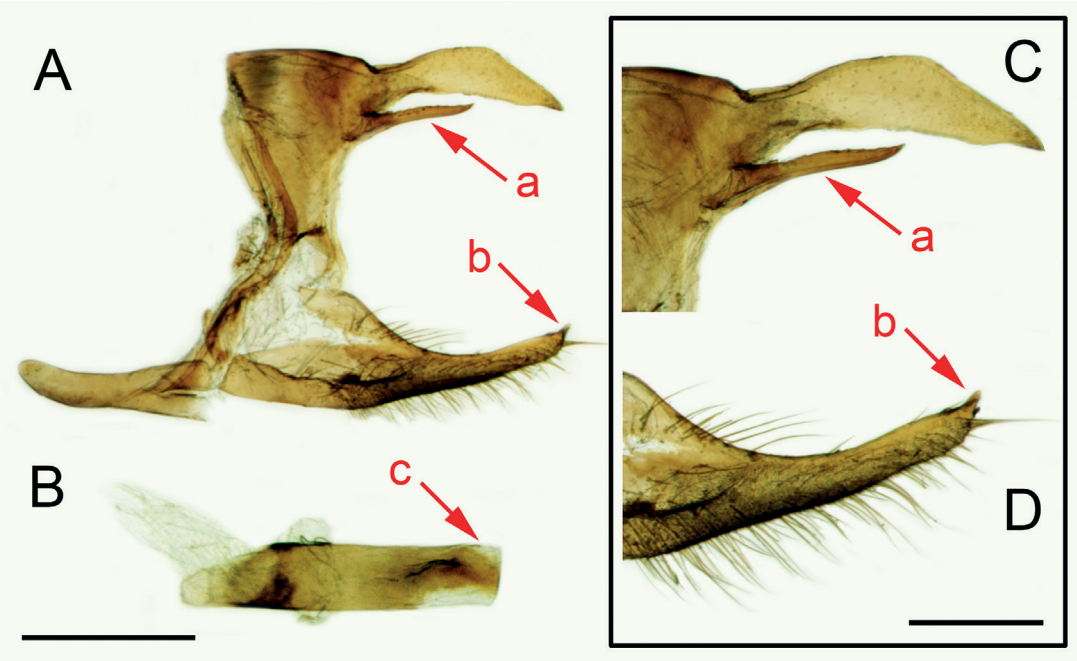

Fig. 2: ♂ genitalia of *Lethe tengchongensis* ***pingpingae*** **subspec. nov.**, A: lateral view of genitalia with aedoeagus and left valva removed, B: lateral view of aedoeagus, C: dorsal view of aedoeagus, scale bar (A-C) = 1 mm; D: close-up lateral view of uncus and gnathos, E: close-up lateral view of the tip of valva, scale bar (D and E) = 0.5 mm.

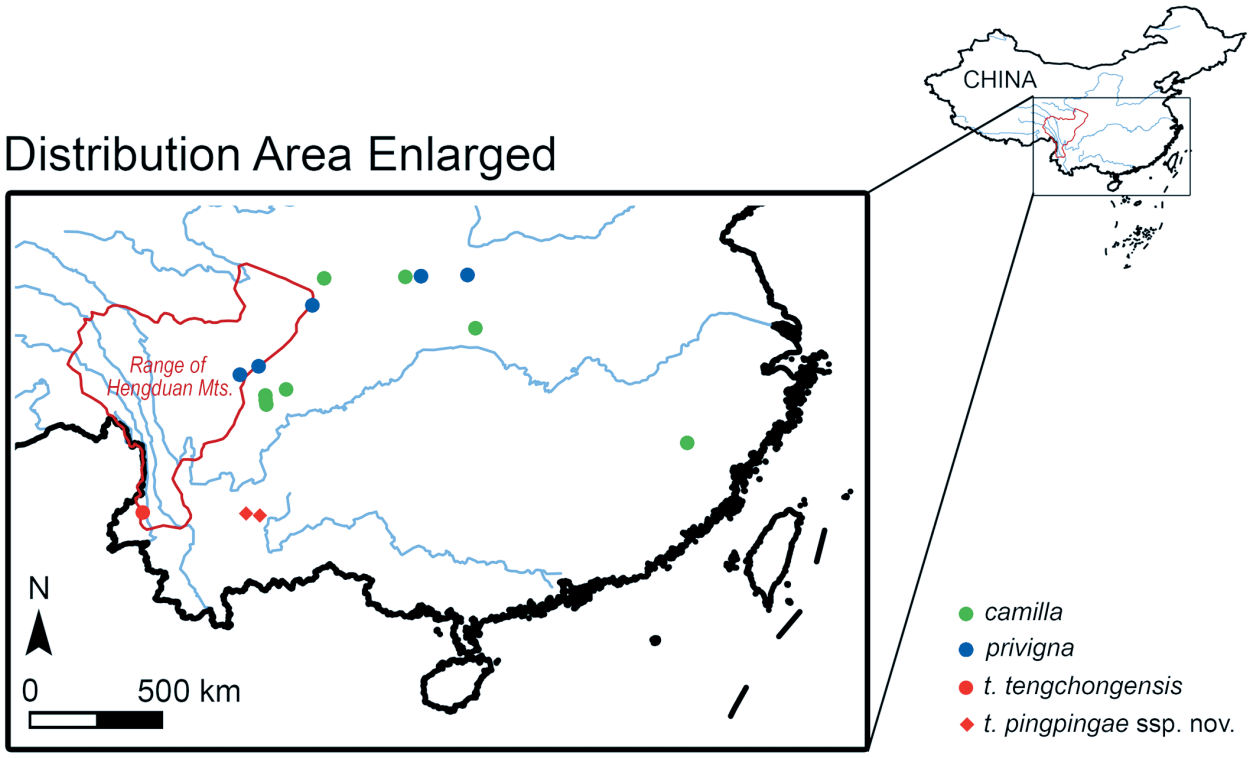

Figure 3: Distribution of *Lethe camilla* Leech, 1891 (green circle), *L. privigna* Leech, 1892 (blue circle), *L. t. tengchongensis* Lang (red circle), and *L. t.* ***pingpingae*** **subsepc. nov.** (red square) in China.