

A new species of the *Euthalia* subgenus *Limbusa* from the Yarlung Tsangpo Grand Canyon, South-Eastern Tibet

(Lepidoptera, Nymphalidae)

by

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received 16.III.2016

Abstract: *Euthalia* (*Limbusa*) *caili* spec. nov. (Nymphalidae: Limenitidinae, Adoliadini) is described from the Yarlung Tsangpo Grand Canyon, South-Eastern Tibet, China. The new species possesses transitional morphological characters from *E. pulchella* (LEE, 1979) to *E. hebe* LEECH, 1891, suggesting a close relationship between these three species.

Introduction: Three specimens of a peculiar species, looking like *Euthalia* (*Limbusa*) *pulchella* (LEE, 1979), were unexpectedly collected by the two junior authors from a subalpine broadleaf forest in the Yarlung Tsangpo Grand Canyon, South-Eastern Tibet, belonging to an undescribed species.

The subgenus *Limbusa* MOORE, [1897] of the genus *Euthalia* HÜBNER, 1819 is a group of Limenitidinae butterflies restricted to the Sino-Himalayan area (ELIOT, 1969) of the Oriental Region, with 80 valid species described (YOKOCHI, 2010, 2011, 2012; LANG, 2012b; SAITO & INAYOSHI, 2014), externally characterized by the presence of structural color and the creamy yellow to pure white discal spots on both wings upperside. This group was recently revised by YOKOCHI (2010, 2011, and 2012), with nearly all type materials examined, so that a comprehensive comparison between the new species here-described and the old species is possible. This new taxon seems to form a transition from *E. pulchella* (LEE, 1979) to *E. hebe* LEECH, 1891 in external characters, and is supported to be an independent species by an analysis on morphological characters. This discovery adds the total number of *Limbusa* MOORE species in the Yarlung Tsangpo Grand Canyon, previously known as the Namjagbarwa area (HUANG, 2000) up to eight, identifying this area a biodiversity hotspot.

Material: A good number of specimens covering nearly all Chinese *Limbusa* MOORE species mainly preserved in the senior author's private collection are studied, among which the following specimens of *E. pulchella* (LEE) and *E. hebe* LEECH were particularly observed or dissected for a comparison: *Euthalia pulchella* (LEE): holotype ♀, China, SE Tibet, Chayu area, Tiyu, 2070 m, F.-S. HUANG leg., 26.VII.1973, deposited in Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS); 2 ♂♂, 1 ♀, China, SE Tibet, Chayu area, Tiyu, 4.VIII.2000, H. HUANG leg., deposited in H. HUANG's private collection (CHH); 1 ♂, 1 ♀, China, NW Yunnan, Gongshan County, Bingzhongluo, 1780-1840 m, 17.VIII.1979, IZCAS. *Euthalia hebe* LEECH: 2 ♂♂, China, Sichuan, Omeishan, 1900 m, 14.VII.2015, H. HUANG leg., CHH; 1 ♂, China, Sichuan, Dujiangyan, Qingchenghoushan, 1600 m, 25.VIII.2011, H. HUANG leg., CHH; 1 ♂, China, Sichuan: Dayi County, Dafeishui, 1700m, VIII.2014, S.-Y. HUANG leg., deposited in S.-Y. HUANG's private collection (CHSY).

Euthalia caili HUANG, WANG & CHEN spec. nov. (figs. 2-7, 23, 24)

Type material: Holotype ♂ (Figs. 3, 6), China, Tibet Autonomous Region, Linzhi Division, Linzhi County, Pailong, N 30°02' 30.4", E 95°00' 43.05", 2031m, 27.VII.2015, J.-Y. WANG & Z. CHEN leg., to be deposited in SNUC. Paratypes 1 ♂, 1 ♀ (Figs. 2, 4, 5, 7), China, same data as holotype, CHH.

Holotype ♂ description: Length of forewing: 38 mm. Antennal club nearly as long as that of *E. hebe* LEECH, markedly longer than that of *E. pulchella* (LEE), black above, mostly black below but with basal part reddish brown as in *E. hebe* LEECH. Both wings same shaped as in *E. hebe* LEECH.

Wing-pattern (figs. 3, 6). Both wings upperside. Ground color as in *E. hebe* LEECH, more black than in *E. pulchella* (LEE), with green suffusions at basal third of wings and submarginal areas of wings. Forewing upperside. All markings placed like in *E. hebe* LEECH, but different from those of *E. hebe* LEECH in size and shape, especially the pale suffusion at bases of spaces 4-6 and the subapical spot in space 5 ill-defined. Pale yellow patch in cell markedly wider than that of *E. hebe* LEECH. Discal spots contiguous, larger than in both *E. hebe* LEECH and *E. pulchella* (LEE), with both inner and outer margins more irregular than in *E. pulchella* (LEE). Submarginal area with clear pale suffusion as in *E. hebe* LEECH. Hindwing upperside. Discal band like in *E. pulchella* (LEE) but with costal half more than 1.5 times wider than that of *E. pulchella* (LEE), and with inner margin almost reaching discocellular bar. Green suffusion outside of discal band more clearly marked than that of *E. pulchella* (LEE). Submarginal pale suffusion well marked as in *E. hebe* LEECH. Both wings underside. Ground color and suffusions like in *E. hebe* LEECH. All markings as on upperside. Hindwing underside. Discal band with inner margin broadly outlined by black.

♂ **genitalia** (fig. 23): Generally like in *E. pulchella* (LEE) and *E. hebe* LEECH, but with basal part of valva narrower than that of *E. pulchella* (LEE), apical part of valva narrower than that of *E. hebe* LEECH, and with ventral portion of valva more produced beyond the ventral margin of basal part of valva than in *E. pulchella* (LEE).

Description of ♂ paratype (figs. 2, 5): Length of forewing: 36.5 mm. Wing-pattern as in holotype. ♂ genitalia (fig. 24) as in holotype, but with apex of valva different in number of teeth.

Description of ♀ paratype (figs. 4, 7). Length of forewing: 43 mm. Antennal club slightly longer than that of *E. pulchella* (LEE). Forewing apex more acutely produced than in ♂. Forewing with a smaller ratio of termen-length to dorsum-length than that of ♂. Hindwing with a smaller ratio of termen-length to costa-length than that of ♂. Wing-pattern like in ♂ but with the following differences: forewing discal spots in spaces 1a-1b narrower; forewing upperside with subapical smudge in space 5 absent and with pale cell spot obsolete into a smudge; hindwing discal band narrower, with outer margin broadly outlined by black; submarginal pale suffusions on both sides of both wings less apparent; postdiscal blackish suffusion on hindwing underside of ♂ replaced by a clearly defined black postdiscal line.

Etymology: This new species is named in honor of Prof. WAN-ZHI CAI, the supervisor of the second author.

Diagnosis: This new species is similar to *E. pulchella* (LEE), but can be distinguished from the latter by the following combination of characters (fig. 1).

I-1. Antennal club in both sexes markedly longer than in *E. pulchella* (LEE) (I-2).

II-1. Forewing upperside with black circular marking in cell remoter from discocellular bar, causing the pale patch between them markedly wider than in *E. pulchella* (LEE) (II-2).

III-1. Upperside ground color more black, with more greenish and less brownish suffusions than in *E. pulchella* (LEE) (III-2).

IV-1. Forewing upperside of ♂ with a pale subapical smudge in space 5, which is absent in *E. pulchella* (LEE) (IV-2).

V-1. Forewing upperside of ♂ with a pale subbasal smudge in cell, which is absent in *E. pulchella* (LEE) (V-2).

VI-1. Hindwing discal band in both sexes broader at costal half than in *E. pulchella* (LEE) (VI-2).

VII-1. Underside ground color in both sexes greener and less yellowish than in *E. pulchella* (LEE) (VII-2).

VIII-1. Discal band on hindwing underside in both sexes with inner margin outlined by broader black line than in *E. pulchella* (LEE) (VIII-2).

IX-1. Postdiscal black line or band on hindwing underside in both sexes more clearly defined and in more contrast with submarginal pale suffusion than in *E. pulchella* (LEE) (IX-2).

X-1. Valva of ♂ genitalia with basal part narrower and with ventral portion more produced beyond the ventral margin of basal part than in *E. pulchella* (LEE) (X-2).

Euthalia caii **spec. nov.** shares more ♂ characters with *E. hebe* LEECH than with *E. pulchella* (LEE), though it is closer to *E. pulchella* (LEE) than to *E. hebe* LEECH in distribution. For the above mentioned 9 external characters (fig. 1), *E. hebe* LEECH shares 6 characters with *E. caii* **spec. nov.** but only 2 with *E. pulchella* (LEE). *Euthalia caii* **spec. nov.** can be distinguished from *E. hebe* LEECH in ♂ by having forewing pale cell spot larger, forewing discal spots larger, hindwing discal band straighter and broader at costal half, and valva of ♂ genitalia narrower near apex. The ♀ of *E. hebe* LEECH is extremely rare in the collection and only one specimen has been reported by YOKOCHI (2011); it differs from the ♀ of *E. caii* **spec. nov.** by having no discal spots in spaces 1a-1b of forewing and spaces 1-5 of hindwing.

Discussion: The new species belongs to a small species group in YOKOCHI's (2011) "patala group - Type A - Subtype A1", composed of *E. hebe* LEECH, *E. pulchella* (LEE) and *E. tsuchiya* YOKOCHI, 2005, defined by the extreme similarity in antennal club, wing-pattern and ♂ genitalic morphology. *Euthalia guangdongensis* WU, 1994, though very similar to *E. hebe* LEECH in wing-pattern, possesses an entirely reddish brown antennal club on underside and the markedly longer valva and uncus in ♂ genitalia than in all the foregoing species, thus is excluded from this group and not worthy being discussed in details.

Euthalia pulchella (LEE) was originally described based upon a single ♀ from Chayu, SE Tibet, with a subspecies, *E. pulchella ebbe* YOSHINO, 2002 described from Zhongdian area, NW Yunnan, and with a synonym, *E. hebe niwai* YOKOCHI, 2005 described on a ♀ specimen from northern Kachin, Myanmar. Further specimens including 3 ♂♂ and 1 ♀ were collected by the first author (HUANG, 2001) from the type locality, some of which are illustrated herein for the first time. Moreover there is a pair of specimens deposited in IZCAS collected from Nujiang valley, NW Yunnan (Figs. 15, 16, 18, 19), being a transitional population. A careful comparison between these specimens and those of *E. pulchella ebbe* YOSHINO from Zhongdian, NW Yunnan does not support a subspecific division within *E. pulchella* (LEE). The ♂ of *E. pulchella ebbe* YOSHINO differs from that of *E. pulchella pulchella* (LEE) only by having the clear pale cell spot on forewing upperside of *E. p. pulchella* (LEE) replaced by an obscure pale suffusion; the ♀ of *E. pulchella ebbe* YOSHINO is not separable from that of *E. p. pulchella* (LEE) at all. Moreover, the population from Nujiang valley shows an intermediate form in such cell spot between *E. pulchella ebbe* YOSHINO and *E. pulchella pulchella* (LEE). It is more reasonable to treat all these populations of *E. pulchella* (LEE) as a single taxon, but a formal revision will wait for further material from NW Yunnan in the future. The ♀ holotype of *E. hebe niwai* YOKOCHI lacks the contiguous hindwing discal band as in *E. hebe hebe* LEECH, thus was described as a subspecies of the latter; however, more ♀♀ collected from the type locality of *E. hebe niwai* YOKOCHI are not separable from those of *E. pulchella* (LEE), thus *E. hebe niwai* YOKOCHI was reconsidered by its author (YOKOCHI, 2011) as a synonym of *E. pulchella* (LEE); this reflects that *E. hebe* LEECH and *E. pulchella* (LEE) are very closely related.

E. hebe LEECH has been recorded from Hubei (type locality), Sichuan (YOKOCHI, 2011), Yunnan (YOKOCHI, 2011),

Chongqing (LANG, 2012a) and Fujian (JIANG et al., 1998). YOKOCHI 's (2011) record from Yunnan, without further information on collecting data, needs to be confirmed in the future, and is not adopted here as a reliable record in distribution, since no specimen has ever been found in Chinese collections collected from Yunnan. The division between *E. hebe* LEECH and *E. pulchella* (LEE) in specific rank has been well accepted because of the significant external differences in both sexes and the stability of wing-pattern of *E. hebe* LEECH in a rather vast distributional range from Sichuan to Fujian.

Euthalia caii **spec. nov.** is considered as independent specie, because of the following points: 1) *Euthalia caii* **spec. nov.** is closer to *E. hebe* LEECH than to *E. pulchella* (LEE) in morphological distance, and forms an intermediate form in most of wing characters, thus to treat *E. caii* **spec. nov.** as a subspecies of *E. hebe* LEECH or *E. pulchella* (LEE) will cause no specific delimitation between these three taxa. 2) If we treat all these three taxa as a single species, there will be no good diagnostic characters for identifying such a very variable super species. 3) There are slight but recognizable differences in antenna and ♂ genitalia between these three taxa, which have been considered as good evidence to accept specific ranks in other species groups of *Limbusa* MOORE, such as in case of the *E. nara* group (YOKOCHI, 2011).

Within the above-mentioned species group, *E. tsuchiyai* YOKOCHI from Laos and *E. pulchella* (LEE) seem to be the closest pair than to others. Therefore, to treat *E. caii* **spec. nov.** as a subspecies of *E. pulchella* (LEE) or *E. hebe* LEECH will make all taxa of this species group fall into a single super species. *Euthalia tsuchiyai* YOKOCHI is slightly different from *E. pulchella* (LEE) by having hindwing discal band markedly narrower.

Acknowledgements: Mr. LIANG DING (Beijing) suggested the second author to collect butterflies in his collecting trip to Tibet in 2015 that made this work possible, and gave up his priority in preserving the *Euthalia* specimens collected in this expedition and kindly transferred the specimens to the first author for a study. Dr. SONG-YUN LANG (Chongqing) helped in taking photos of some *Euthalia* specimens preserved in IZCAS. Dr. CHUN-SHENG WU (Beijing) allowed the senior author to examine the holotype of *Euthalia pulchella* (LEE) and to dissect another ♂ of *Euthalia pulchella* (LEE) from NW Yunnan, preserved in IZCAS. Dr. Takashi YOKOCHI (Japan) kindly sent the reprints of his papers to the senior author. Mr. SI-YAO HUANG (Beijing) allowed the first author to examine his private collection.

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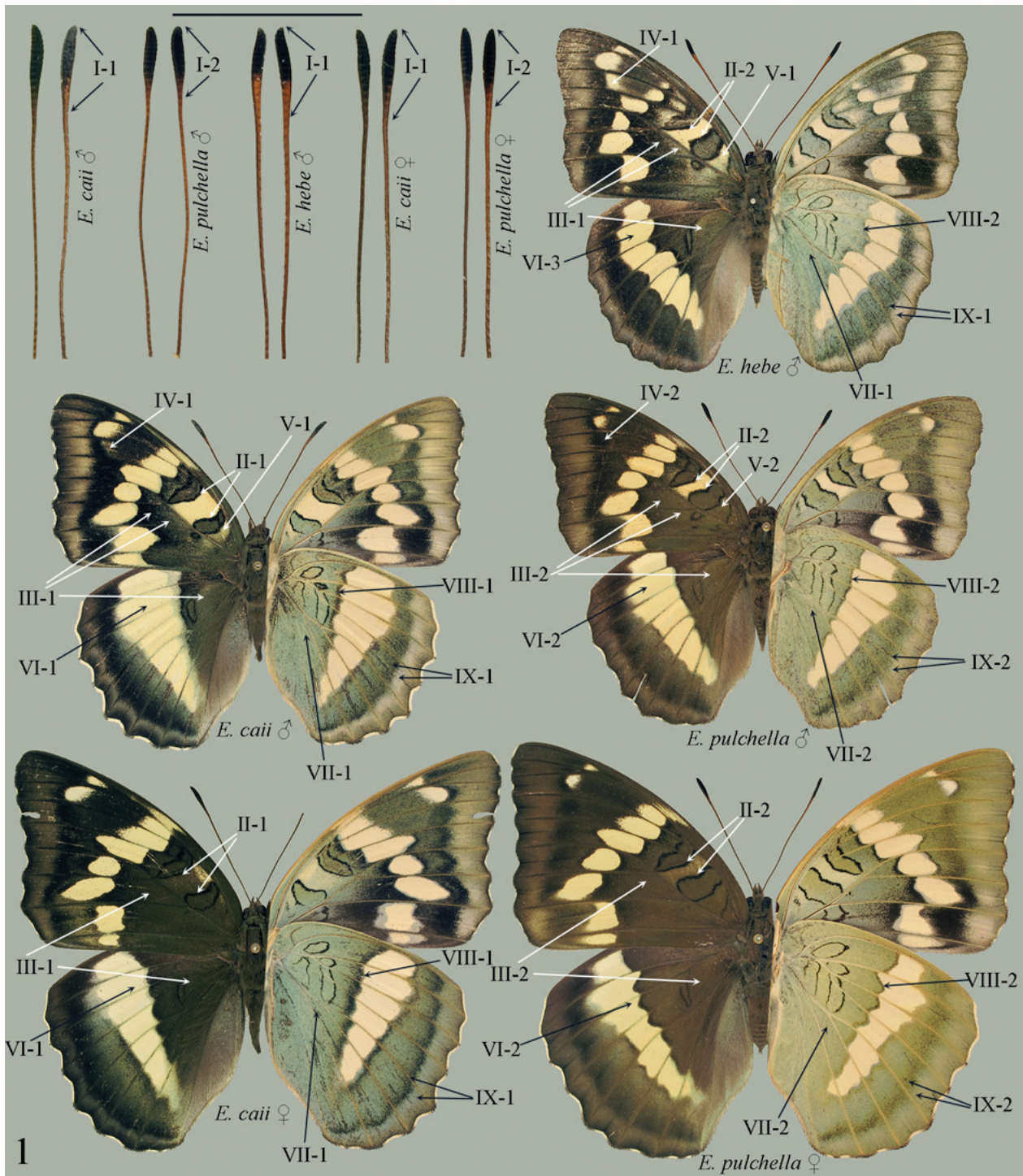
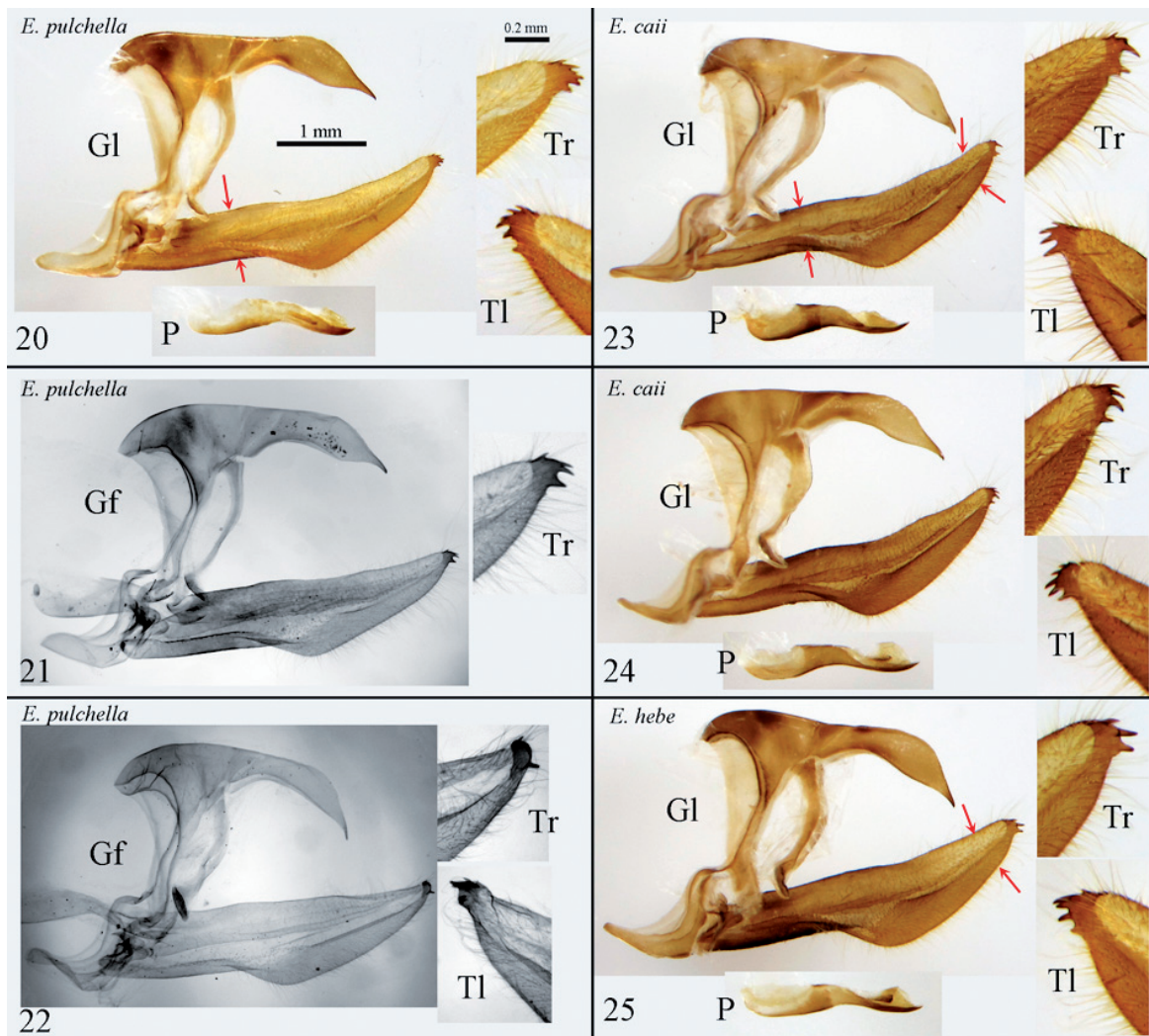


Fig. 1: Morphological differences between *Euthalia caii* spec. nov., *Euthalia pulchella* (LEE, 1979) and *Euthalia hebe* LEECH, 1891, the numbers of arrows corresponding to those of the characters and character states under the Diagnosis heading in the text. All antennae at same scale (Scale bar = 1cm). All habitus (left half = upperside; right half = underside) at same scale.



Figs. 2-19: Habitus of *Euthalia* species at same scale. (2-7) *Euthalia caii* spec. nov.; (2, 5) ♂ paratype; (3, 6) ♂ holotype; (4, 7) ♀ paratype. (8, 11) *Euthalia hebe* LEECH, 1891, ♂, Omeishan, Sichuan. (9-10, 12-19) *Euthalia pulchella* (LEE, 1979); (9, 12) ♂ topotype, Chayu, SE Tibet; (10, 13) ♀ topotype, Chayu; (14, 17) ♀ holotype, Chayu; (15, 18) ♂, Gongshan, Yunnan; (16, 19) ♀, Gongshan. (2-4, 8-10, 14-16) upperside, (5-7, 11-13, 17-19) underside.



Figs. 20-25: ♂ genitalia in lateral view, with Gl (genitalia in left lateral view with left valva and aedoeagus removed), Gf (genitalia in left lateral view, flattened, with left valva removed) and P (aedoeagus in left lateral view) at same scale (Scale bar = 1 mm), and with Tr (tip of right valva in inner lateral view) and Tl (tip of left valva in inner lateral view) at same scale (Scale bar = 0.2 mm). Red arrows indicating the differences between species. (20-22) *Euthalia pulchella* (LEE, 1979); (20) topotype (fig. 9); (21) topotype (specimen illustrated in HUANG, 2001: 145, fig. 41); (22) specimen from Gongshan, NW Yunnan (fig. 15). (23-24) *Euthalia caii* spec. nov.; (23) holotype (fig. 3); (24) paratype (fig. 2). (25) *Euthalia hebe* LEECH, 1891, Omeishan (fig. 8).

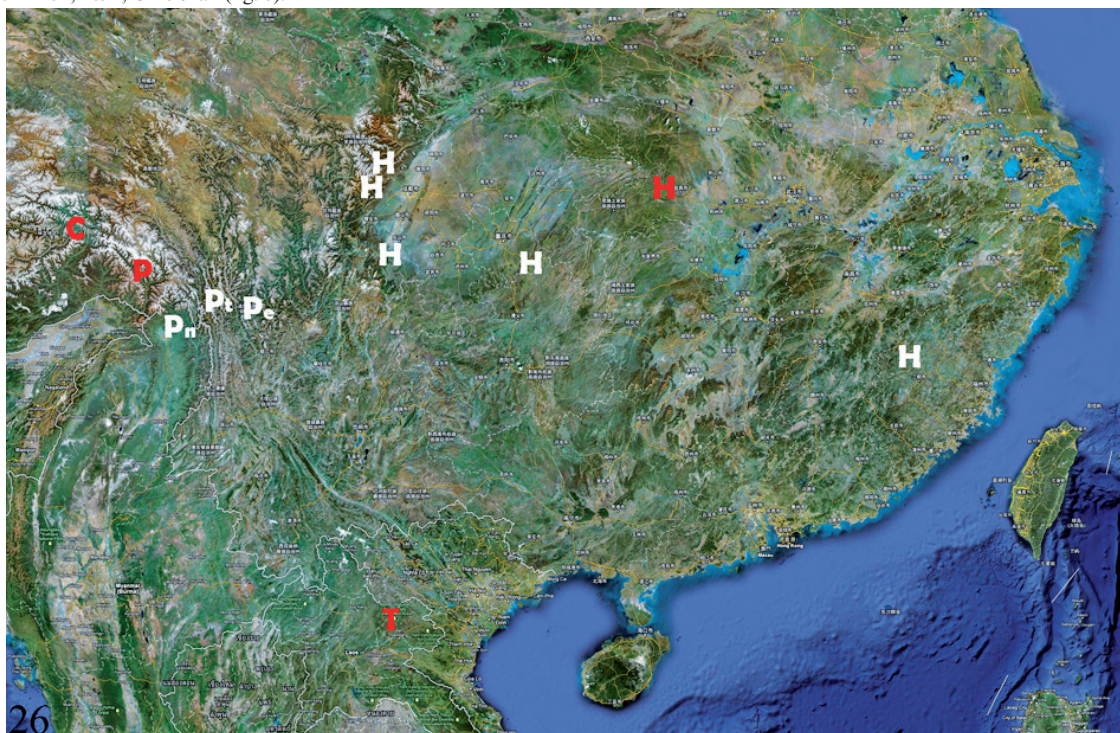


Fig. 26: Distribution of *Euthalia caii* spec. nov., *Euthalia pulchella* (LEE, 1979) and *Euthalia hebe* LEECH, 1891 (red letter = type locality; white letter = other localities). (C) *Euthalia caii* spec. nov.; (P) *Euthalia pulchella* (LEE, 1979); (Pn) *Euthalia hebe niwai* YOKOCHI, 2005, synonym of *Euthalia pulchella* (LEE, 1979); (Pt) *Euthalia pulchella* (LEE, 1979), transitional population; (Pe) *Euthalia pulchella ebbe* YOSHINO, 2002; (H) *Euthalia hebe* LEECH, 1891; (T) *Euthalia tsuchiyai* YOKOCHI, 2005.

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Jahr/Year: 2016

Band/Volume: [47](#)

Autor(en)/Author(s): Huang Hao, Wang Jian-Yun, Chen Zhuo

Artikel/Article: [A new species of the Euthalia subgenus Limbasa from the Yarlung Tsangpo Grand Canyon, South-Eastern Tibet \(Lepidoptera, Nymphalidae\) 205-210](#)