

Notes on the *Lopinga achine* (SCOPOLI, 1763)-complex and its sibling, the *Lopinga catena* (LEECH, 1890)-complex, with description of a new species from China

(Lepidoptera, Nymphalidae, Satyrinae)

by

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Abstract: In this paper, the *Lopinga achine* (SCOPOLI, 1763)-complex is proposed, and *L. achine tshikolovetsi* LANG, LIU, YU & ZHANG, 2018 is raised to specific status, viz. *L. tshikolovetsi* LANG, LIU, YU & ZHANG **stat. nov.** A new species of the *Lopinga catena* (LEECH, 1890)-complex, viz. *L. siyaoi* LANG **spec. nov.**, is described from China. *Lopinga microcatena* LANG, 2018 is sunk to a junior synonym of *L. catena* (LEECH). A checklist of the *Lopinga achine* (SCOP.)-complex and the *L. catena* (LEECH)-complex is provided.

Lopinga MOORE, 1893 is a small Palearctic genus, and except *L. achine* (SCOPOLI, 1763), which is a Eurasian distributed species known from the temperate forest belt from France eastwards to S. Kamchatka Peninsula (with latitude approximately between N40° to 60°, and the southern border expanding further north in arid C. Asia and further south in moist N.E. Asian namely South Korea and Japanese Honshu), all other species in the genus are endemism in the fauna of China (GÖRGNER, 1990; BOZANO, 1999; LANG, 2017, 2022). Synthesized from BRYK (1951a, 1951b, 1953), OKANO & PAK (1968), KAWAZOE & WAKABAYASHI (1979), LUKHTANOV & LUKHTANOV (1994), TUZOV et al. (1997), SHIRÔZU (2006), TSHIKOLOVETS et al. (2009, 2016) and TSHIKOLOVETS & STRELTZOV (2019), the following subspecies of *L. achine* (SCOP.) are known from the Eurasian temperate forest belt: the nominate subspec. *achine* SCOP. (figs: 11a, 12a, 14b, 15b, 15d) from Europe, Caucasus Major, S. Siberia, N.E. Kazakhstan, N. Mongolia, Transbaikalia, Amur, Kamchatka, N.E. China (west) and N. China; subspec. *eximia* STAUDINGER, 1892 (fig: 15e) from Ussuri, N.E. China (east) and Korea; subspec. *hanlaensis* OKANO & PAK, 1968 from Cheju Is.; subspec. *karafutonis* MATSUMURA, 1928 from Karafuto/Sakhalin; subspec. *achinoides* BUTLER, 1878 (figs: 14a, 15c) from Honshu; subspec. *jezoensis* MATSUM., 1929 from Hokkaido and Minamichishima/South Kuriles; subspec. *oniwakiensis* YAZAKI & HIRAMOTO, 1981 from Rishiri Is. However, among them, the status of two mini-insular subspecies, viz. subspec. *hanlaensis* OKANO & PAK and subspec. *oniwakiensis* YAZAKI & HIRAMOTO, is controversial. LANG et al. (2018) described *L. achine tshikolovetsi* LANG, LIU, YU & ZHANG, 2018 from Dabie-shan (latitude N31°, Anhui, E. China), a locality which is well separated in a long distance from the above-mentioned temperate belt inhabited by *L. achine* (SCOP.). In this research, especially basing upon ♂ genitalia differences, *L. tshikolovetsi* LANG, LIU, YU & ZHANG **stat. nov.** is raised to a distinct species against *L. achine* (SCOP.), and the two species compose the *L. achine* (SCOP.)-complex. The *Lopinga catena* (LEECH, 1890)-complex is the sibling of the *L. achine* (SCOP.)-complex, and both complexes form a clade which can be easily separated from other congeners. According to LANG (2022), the following species have been recognised from this species complex, including *L. catena* (LEECH), *L. stax* SUGIYAMA, 1999 (figs: 11c, 12c), *L. shaana* LANG & TSHIKOLOVETS, 2017 (figs: 11e, 12e), *L. microcatena* LANG, 2018 and *L. youluni* LANG & SONG, 2021 (figs: 11d, 12d). Though a series of works (BOZANO, 1999; LANG, 2017, 2018, 2022; LANG & SONG, 2021) dealing with or involving this species complex had been published, a problem is still left. It is that *L. catena* (LEECH) in those works might possibly be misidentified. When described *L. microcatena* LANG, two quite different species were in front of its author (LANG, 2018), and both of them have some similarities with the syntype of *Pararge catena* LEECH illustrated in LEECH (1890: Plate XI: 9). At that time, the present author (LANG, 2018) preferred features, such as widths of the yellowish discal band on forewing underside and the whitish discal band on hindwing underside, as key characters to define *Lopinga catena* (LEECH). However, latter, it was realised that several other features might be key diagnostic characters for a definition of the true *L. catena* (LEECH), such as morphology of the discal cell bar on forewing underside and the whitish basal and subbasal markings on hindwing underside. Recent trips (in summers of 2018 and 2022) for seeking *L. catena* (LEECH) from its type locality (TL), i.e. Changyang area (it is on the south bank of Yangtse), were fully failed. Basing upon the known collecting data, butterflies in this species complex often fly in forests at an elevation higher than 1900 meters, but in Changyang area, mountainous habitats above 1900 meters are limited and often deforested and not primitive again. Nevertheless, in the 2022 trip in W. Hubei, a pair of *L. microcatena* LANG were collected again from Shennongjia (TL of *microcatena* LANG, on the north bank of Yangtse), and the newly obtained ♂ specimen (figs: 4-5) has a wider whitish discal band on hindwing underside and is akin to the illustrated syntype of *Pararge catena* LEECH (fig: 6). Therefore, now, it can be confirmed that *Lopinga microcatena* LANG should be a junior synonym of *L. catena* (LEECH), and the so called “*L. catena* (LEECH)” in recent publications including BOZANO (1999: 12, fig.: ♂ uns, Wolong, N. Sichuan), LANG (2018: 167, figs: 1-9, 24-29), LANG & SONG (2021: 622, fig. 9-10) and LANG (2022: 22, pl. XXXII: 15, 16) should be an unnamed species which is described as *Lopinga siyaoi* LANG **spec. nov.** below.

Materials in this study are kept in Chongqing Museum of Natural History, Beibei, CHINA (CMNH), SONG-YUN LANG's private collection, Beibei, CHINA (LSY), GIAN C. BOZANO's private collection, Milano, ITALY (GCB) and ZI-HAO LIU's private collection, Huainan, CHINA (LZH).

Checklist

I. *Lopinga achine* (SCOP., 1763)-complex

1. *Lopinga achine* (SCOP., 1763)

1a. subspec. *achine* SCOP. (= *deianira* L., 1764; f. *mimarcania* BRYK, 1953; *suecica* BRYK, 1951; f. *linnaei* BRYK, 1951; *rambringi* BRYK, 1951; *öller* BRYK, 1951; *amata* BRYK, 1951; *uralensis* BRYK, 1953; *kenteiana* BRYK, 1953; *kinganna* MATSUMURA, 1939).

1b. subspec. *eximia* Stdg., 1892 (= *chosensis* MATSUMURA, 1929; *pusilla* KURENTZOV, 1966)

- 1c. subspec. *hanlaensis* OKANO & PAK, 1968
- 1d. subspec. *karafutonis* MATSUMURA, 1928
- 1e. subspec. *achinoides* BUTLER, 1878
- 1f. subspec. *jezoensis* MATSUMURA, 1929 (= *kurilensis* MATSUMURA, 1928)
- 1g. subspec. *oniwakiensis* YAZAKI & HIRAMOTO, 1981
- 2. *Lopinga tshikolovetsi* LANG, LIU, YU & ZHANG, 2018 **stat. nov.**

II. *Lopinga catena* (LEECH, 1890)-complex

- 1. *Lopinga catena* (LEECH, 1890) (= *microcatena* LANG, 2018)
- 2. *Lopinga stax* SUGIYAMA, 1999
 - 2a. subspec. *stax* SUGIYAMA, 1999 (= *zhaoi* LANG, 2018)
 - 2b. subspec. *reducta* TSHIKOLOVETS, 2021
 - 2c. subspec. *bozanoi* TSHIKOLOVETS, 2021
 - 2d. subspec. *qinlingica* TSHIKOLOVETS, 2021
- 3. *Lopinga youluni* LANG & SONG, 2021
- 4. *Lopinga shaana* LANG & TSHIKOLOVETS, 2017
- 5. *Lopinga siyaoi* **spec. nov.**

Taxonomy

Lopinga tshikolovetsi LANG, LIU, YU & ZHANG, 2018 **stat. nov.** (figs: 13, 15a)

Lopinga achine tshikolovetsi LANG, LIU, YU & ZHANG (2018: 128, figs: 1, 2, 13. TL: Yaoluoping, Anhui); LANG (2022: 22, 26, pl. XXXII: 9, 10).

Material: HT ♂, CHINA: Anhui, Yuexi, Yaoluoping, 1200 m, 8.VI.2017, leg. SHI-QI ZHANG (CMNH); 1 ♂, CHINA: Anhui, Yuexi, Yaoluoping, 1.VI.2018, leg. ZI-HAO LIU (LSY); 1 ♂, PT, CHINA: Anhui, Yuexi, Yaoluoping, 1100 m, 8.VI.2017, leg. LEI YU (LZH); 2 ♂♂, PTs, CHINA, Dabie Shan Park, trail to Baimajian peak starting at 31°07'30"N 116°10'00"E m. 1300-1750 NE Hubei Prov. [accurately in Anhui Prov.] 27.VI.2011 leg. G. C. BOZANO (GCB).

Diagnosis: On hindwing underside, the whitish discal band of *Lopinga tshikolovetsi* LANG, LIU, YU & ZHANG **stat. nov.** is obviously wider than that of *L. achine achine* (SCOP.) and *L. achine achinoides* (BUTLER), is as wide as that of typical *L. achine eximia* (STDG.), and is somewhat narrower than that of typical *L. achine jezoensis* (MATSUM.). Judging from a series of specimens from different localities in Honshu and Hokkaido illustrated by SHIRÔZU (2006: pl. 101), the widths of the white band in both *L. achine achinoides* (BUTLER) and *L. achine jezoensis* (MATSUM.) are not stable, and the width is from narrow to moderate in the former from Honshu and is from moderate to wide in the latter from Hokkaido. However, usually, the band of *L. achine achinoides* (BUTLER) is rather narrower than that of *L. achine jezoensis* (MATSUM.). Therefore, the width of the white discal band on hindwing underside can be used as a character to define different geographical subspecies, but it can hardly separate *L. tshikolovetsi* LANG, LIU, YU & ZHANG **stat. nov.** from *L. achine* (SCOP.) on specific level. In fact, the ♂ genitalia structure of *L. tshikolovetsi* LANG, LIU, YU & ZHANG **stat. nov.** is the essence to separate it from each subspecies of *L. achine* (SCOP.): 1) its uncus is strongly thickened and about 1.5 times thicker than that in *L. achine* (SCOP.); 2) its apical hook of valva is more robust than that in *L. achine* (SCOP.); 3) its coarse spines on caudal half of the aedeagus are denser and more developed than those in *L. achine* (SCOP.).

Distribution: China (S.W. Anhui, ?N.E. Hubei).

Lopinga catena (LEECH, 1890) (figs: 4-7, 9, 11b, 12b)

Pararge catena LEECH (1890: 30. TL: Chang-yang, [Hubei]).

Lopinga microcatena LANG (2018: 167, figs: 10-17, 32-35. TL: Yanziya, Shennongjia, Hubei) **syn. nov.**; LANG & SONG (2021: 622, fig. 11-12); LANG (2022: 22, 26, pl. XXXII: 15, 16).

Material: HT ♂ of *L. microcatena* LANG, CHINA: Hubei, Shennongjia, Yanziya, 2150 m, 14.VII.2018, leg. SONG-YUN LANG (CMNH); PTs 5 ♂♂ of *L. microcatena* LANG, CHINA: Shaanxi, Lan'gao, Shenheyuan, 2200 m, 30.VI.-1.VII. 2018, legs. SONG-YUN LANG & JIANG HOU (LSY); PT 11 ♂♂, 3 ♀♀, of *L. microcatena* LANG, CHINA: Hubei, Shennongjia, Yanziya, 2150 m, 14.-19. VII.2018, legs. SONG-YUN LANG & JIANG HOU (LSY); PT ♀ of *L. microcatena* LANG, ditto, 1.VIII.2013, leg. GUO-XI XUE (LSY); PT ♂ of *L. microcatena* LANG, CHINA: Hubei, Shennongjia, Hongping, 1850 m, 13.VII.2018, leg. SONG-YUN LANG (LSY); PT 1 ♂, 1 ♀ of *L. microcatena* LANG, CHINA: Hubei, Shennongjia, Motianling, 1950 m, 18.VII.2018, leg. SONG-YUN LANG (LSY); 1 ♀, CHINA: Hubei, Shennongjia, Yanziya, 2150 m, 4.VII.2022, leg. JIANG HOU (LSY); 1 ♂, CHINA: Hubei, Shennongjia, Motianling, 1950 m, 5.VII.2022, leg. JIANG HOU (LSY).

Diagnosis: *Lopinga catena* (LEECH) can be defined by the combination of the following characters: 1) On forewing upperside, the yellowish discal bar beyond the cell is clear in both sexes; 2) On forewing underside, upper end of the cell bar is obliquing towards the termen; 3) On hindwing underside, the white tooth-marking sprouting from the discal band in space 4 is prominent; 4) On hindwing underside, the whitish subbasal bar is slender and continuous; 5) The uncus is dagger-shaped with its curved apical half tapering and not thickened.

Distribution: China (W. Hubei, S.E. Shaanxi, ?N.E. Chongqing).

Lopinga siyaoi **spec. nov.** (figs: 1-3, 8, 11f, 12f)

Lopinga catena (Partim): BOZANO (1999: 12, fig.: ♂ uns, Wolong, N. Sichuan); LANG (2018: 167, figs: 1-9, 24-29); LANG & SONG (2021: 622, fig. 9-10); LANG (2022: 22, 26, pl. XXXII: 11, 12).

Holotype (HT) ♂, CHINA: Shaanxi, Lan'gao, Shenheyuan, 2200 m, 30.VI.2018, leg. SONG-YUN LANG (CMNH). Paratypes (PT): 9 ♂♂, CHINA: Shaanxi, Pingli, Hualongshan, 2100 m, 29.VI.2018, legs. SONG-YUN LANG & JIANG HOU (LSY); 68 ♂♂, CHINA: Shaanxi, Lan'gao, Shenheyuan, 2200 m, 30.VI.-1.VII.2018, legs. SONG-YUN LANG & JIANG HOU (LSY); 8 ♂♂, CHINA: Hubei,

Shennongjia, Shennongding, 2900 m, 17.VII.2018, leg. JIANG HOU (LSY); 1 ♀, CHINA: Sichuan, Nanjiang, Mt. Micangshan, Daba, 1850 m, 1.VIII.2016, leg. SONG-YUN LANG (LSY); 6 ♀♀, CHINA: Sichuan, Jiuzhaigou, Wujiao, 2450-2550 m, 28.VII.2018, leg. SONG-YUN LANG & JIANG HOU (LSY).

Diagnosis: A) The new species was misidentified as *Lopinga catena* (LEECH) before, and it can be distinguished from the latter by the combination of the following characters: 1) On ♂ forewing upperside, the pale discal bar beyond the cell is blur, whereas it is clear in *L. catena* (LEECH); 2) On forewing underside, the cell bar is not oblique, whereas it is obliquing towards the termen in *L. catena* (LEECH); 3) On hindwing underside, the whitish subbasal bar is interrupted, whereas it is continuous in *L. catena* (LEECH); 4) The uncus apical half is moderately thickened dorsally, whereas it is sharp and not thickened in *L. catena* (LEECH).

B) In the *Lopinga catena* (LEECH)-complex, the most close relative of the new species is *L. shaana* LANG & TSHIKOLOVETS. They are allopatric and distinguishable basing upon the combination of the following characters: 1) The new species is somewhat smaller than *L. shaana* LANG & TSHIKOLOVETS; 2) On hindwing underside, the white tooth-marking of the new species is sprouting from the discal band in space 4, whereas it is absent in *L. shaana* LANG & TSHIKOLOVETS; 3) On hindwing underside, the whitish subbasal bar of the new species is interrupted, whereas it is more or less continuous in *L. shaana* LANG & TSHIKOLOVETS; 4) The uncus of the new species is somewhat thinner than that of *L. shaana* LANG & TSHIKOLOVETS.

C) The new species can be distinguished from the rest components in the *Lopinga catena* (LEECH)-complex, viz. *L. stax* SUGIYAMA and *L. youluni* LANG & SONG, by the combination of the following characters: 1) On ♂ forewing upperside, the yellowish discal bar beyond the cell is blur as in *L. stax* SUGIYAMA, whereas it is clear in *L. youluni* LANG & SONG; 2) On forewing underside, the discal band and cell bar are yellowish as in *L. stax* SUGIYAMA, whereas they are creamy white in *L. youluni* LANG & SONG; 3) On hindwing underside, the white tooth-marking in space 4 is shorter than that of *L. stax* SUGIYAMA and *L. youluni* LANG & SONG; 4) On hindwing underside, the whitish basal and subbasal markings are well developed as in *L. youluni* LANG & SONG, whereas they are often weakly present in *L. stax* SUGIYAMA; 5) The uncus apical half is thickened, whereas it is thin and sharply pointed in *L. stax* SUGIYAMA and *L. youluni* LANG & SONG.

Etymology: The specific name *siyaoi* is named after my friend Mr. SI-YAO HUANG (Bonn).

Distribution: China (S. Shaanxi, S. Gansu, W. Hubei, N.E. Sichuan, N.E. Chongqing).

Postscript: Some readers maybe have a question that in this situation why you do not check the typical specimens of *Pararge catena* LEECH kept in NHM, London? Sure, if I can, why not. Nevertheless, for me, a Chinese, it can hardly be fulfilled. In 2016, I planned to visit NHM for 3 months, and had already made an agreement with the NHM staffs. Unfortunately, my UK visa was denied by the embassy with some strange reasons which I can hardly understand even until now. Huge amounts of historical specimens are kept in various different European museums, for example, the type of *Pararge catena* LEECH in NHM (SOUTH, 1902; RILEY & GABRIEL, 1924). It is the sole old species in the *Lopinga catena* (LEECH)-complex [the taxon *stax* SUGIYAMA, which was considered as a subspecies of *L. catena* (LEECH) before my research on this topic and promoted to specific status in LANG (2018)]. But in my hand, I have successively recognised 5 species from this species complex. What should I do? Of course, firstly, I should find out the true "*L. catena* (LEECH)" as well as "*L. catena stax* SUGIYAMA" (HT with fine photos in original description which can be easily distinguished), and the next, describe others as new species. Unlucky, in this case, I made a wrong identification of the true "*L. catena* (LEECH)" at first, and it caused the description of a junior synonym, viz. "*L. microcatena* LANG". Thus, as a Chinese taxonomist, my main work within my power is to recognise how many taxa are there in this fauna. Undoubtedly, I must try to rightly recognise the named old species, but revisions of the potential mistakes caused by can-not-examining typical materials will be left to those scholars who can study in European museums.

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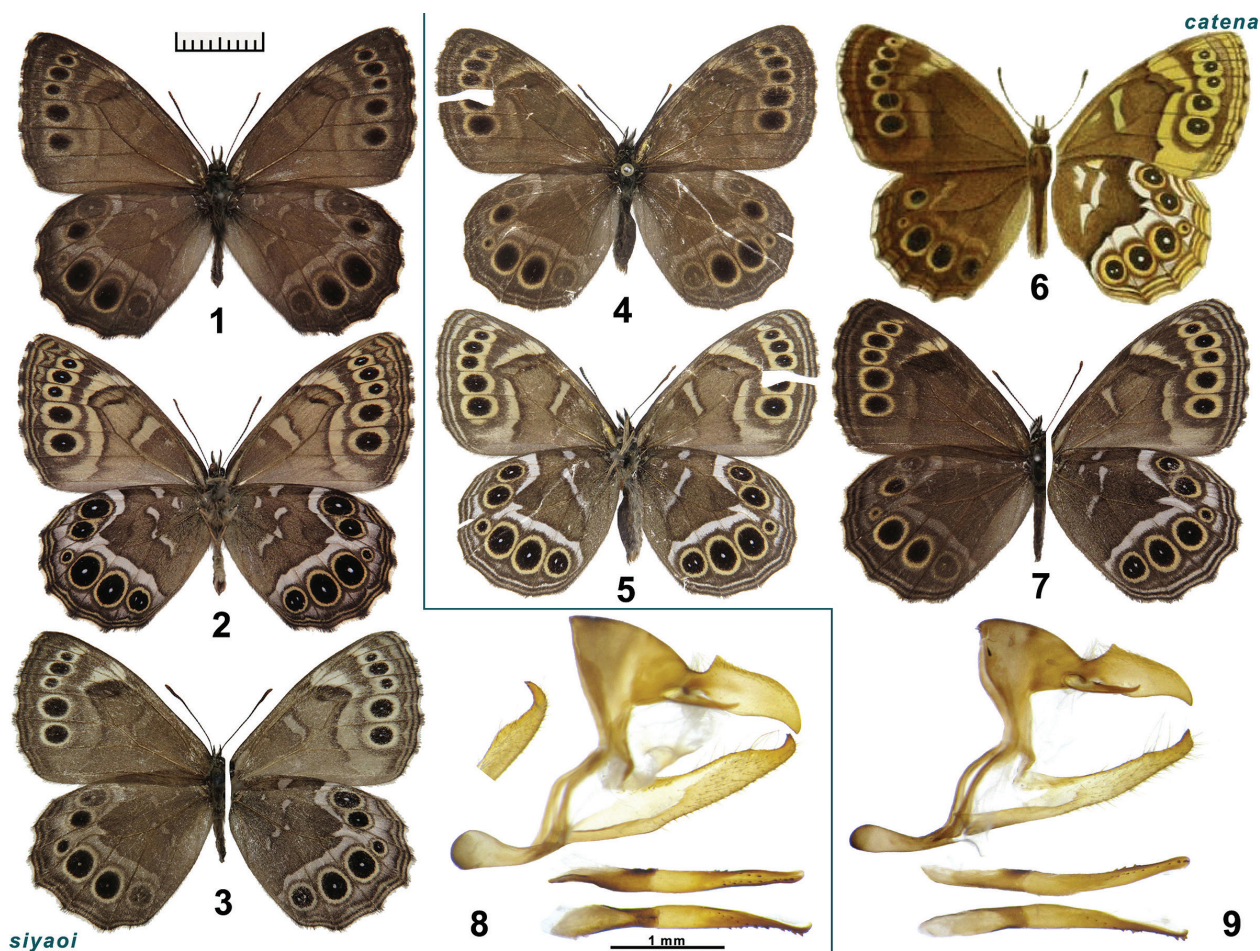
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C. CHINA

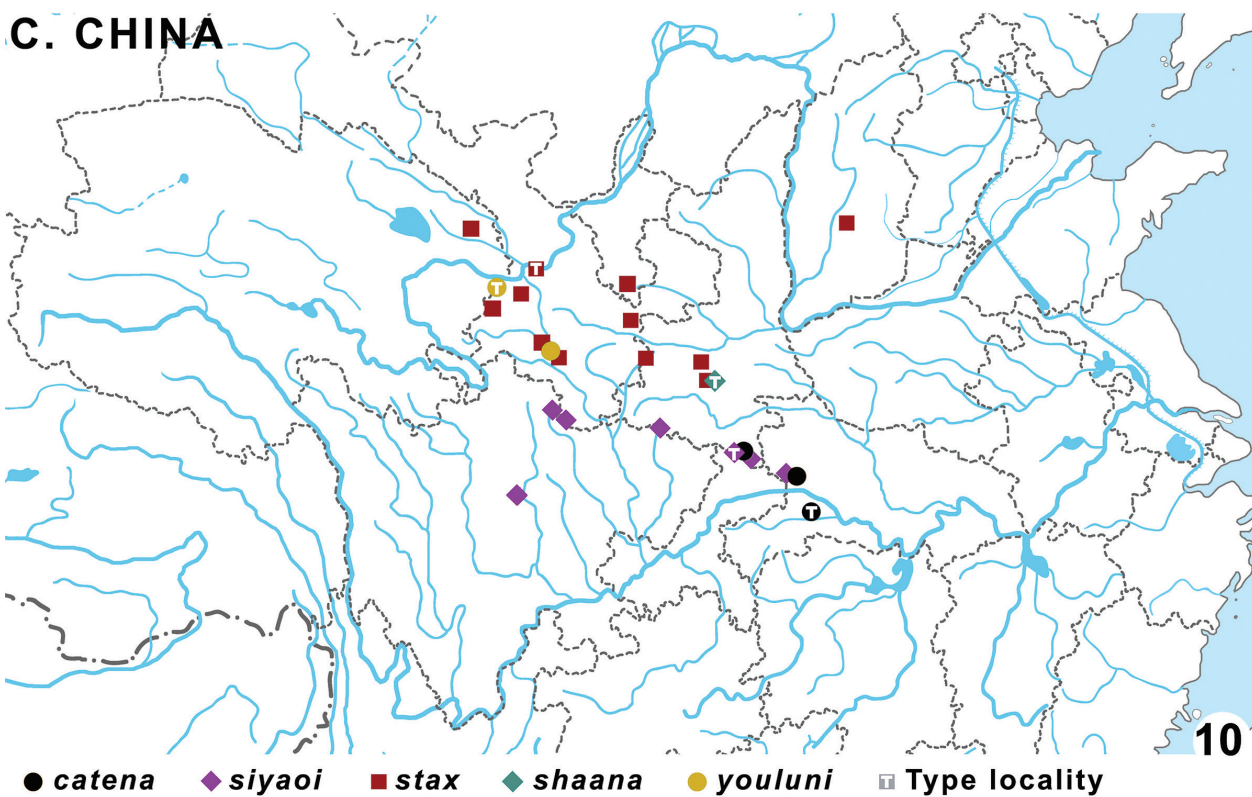


Fig. 1-3: *Lopinga siyaoi* spec. nov.: (1-2) HT ♂, Shaanxi, Lan'gao, CMNH; (3) PT ♀, Sichuan, Jiuzhaigou, LSY. Fig. 4-7: *L. catena* (LEECH, 1890): (4-5) ♂, Hubei, Shennongjia, SATY1157, LSY; (6) syntype ♂ of *Pararge catena* LEECH, "Plate XI: 9" in LEECH (1892), [Hubei], Chang-yang, this figure without a scale bar; (7) PT ♀ of *L. microcatena* LANG, Hubei, Shennongjia, LSY. Fig. 8-9: ♂ genitalia: (8) *L. siyaoi* spec. nov., PT, Shaanxi, Lan'gao, SATY0705, LSY; (9) *L. catena* (LEECH), Hubei, Shennongjia, SATY1157, LSY. Fig. 10: Distribution map of the *L. catena* (LEECH, 1890)-complex (Only exhibiting specific level taxa; sources of data: LEECH, 1892; BOZANO, 1999; SUGIYAMA, 1999; LANG, 2017, 2018, 2022; LANG & SONG, 2021; TSHIKOLOVETS, 2021, specimens kept in LSY, CMNH).

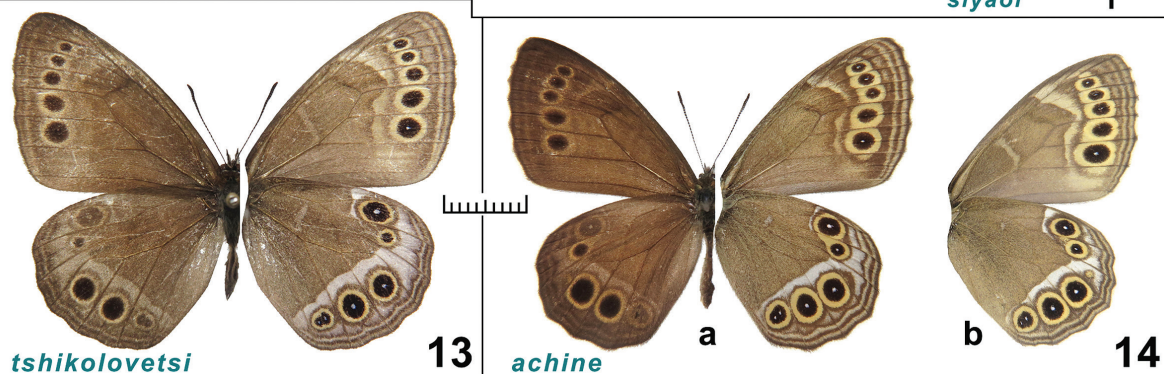
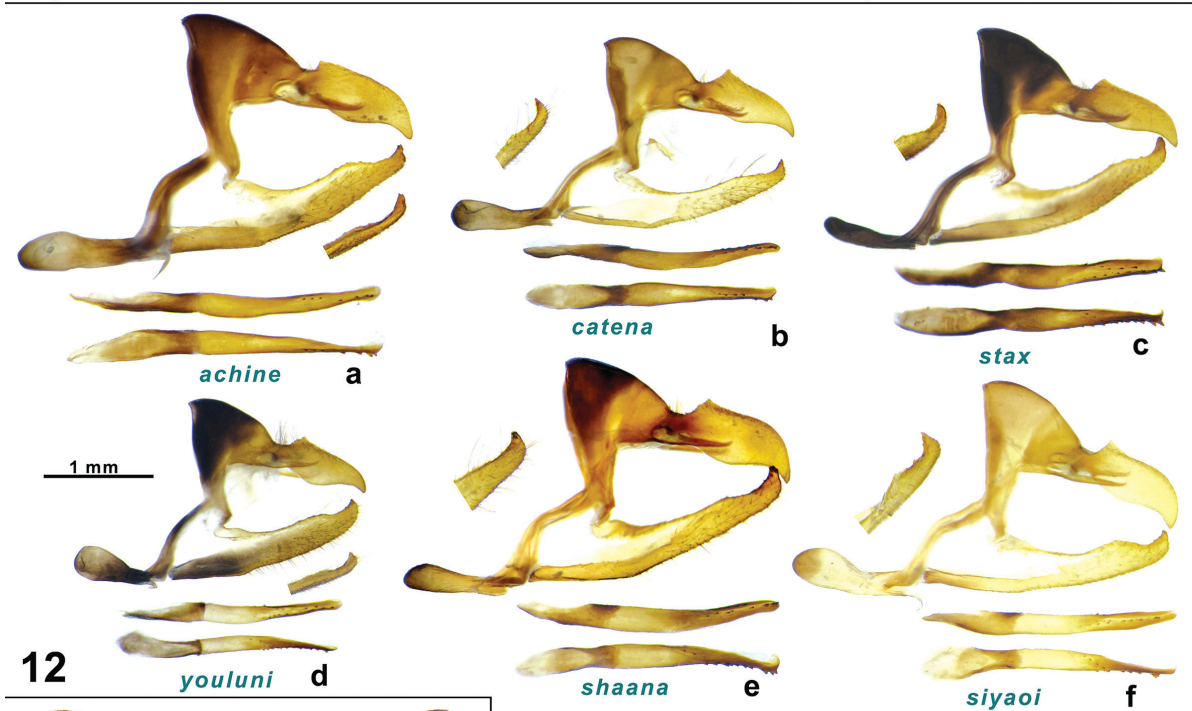
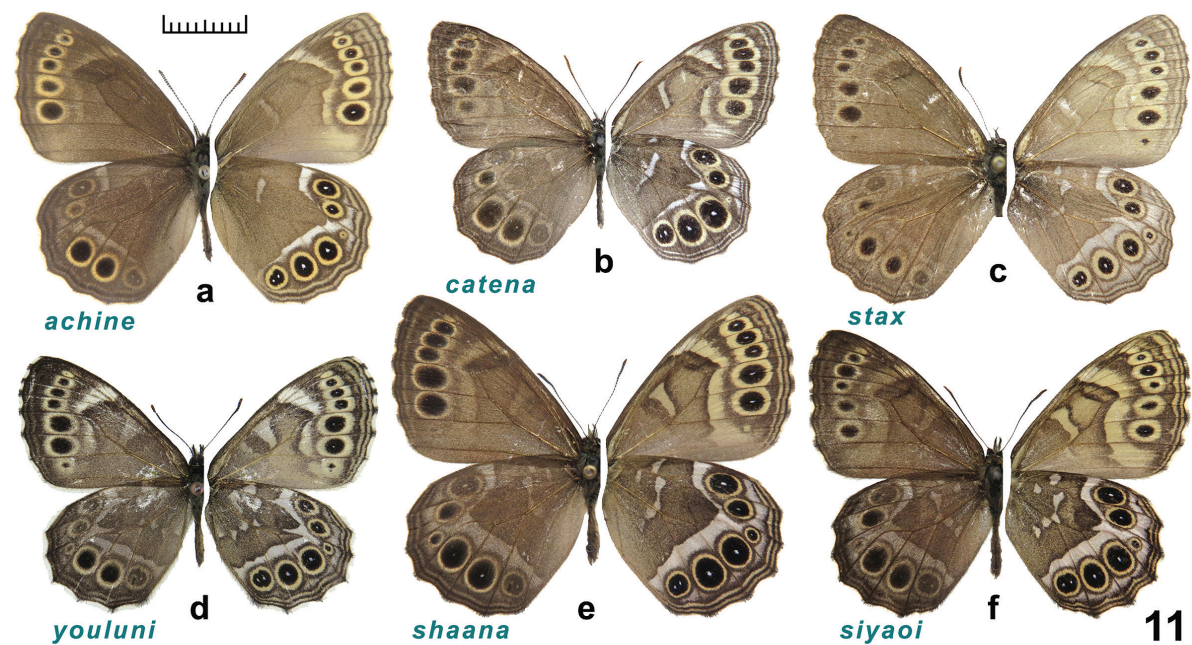


Fig. 11: *Lopinga* MOORE, 1893: **a:** *L. achine* (SCOP., 1763), ♂, Inner Mongolia, Orogen, LSY; **b:** *L. catena* (LEECH, 1890), PT ♂ of *L. microcatena* LANG, Hubei, Shennongjia, SATY0703, LSY; **c:** *L. stax* SUGIYAMA, 1999, ♂, Gansu, Hezheng, SATY0560, LSY; **d:** *L. youluni* LANG & SONG, 2021, HT ♂, Qinghai, Xunhua, CMNH; **e:** *L. shaana* LANG & TSHIK., 2017, HT ♂, Shaanxi, Ningshan, SATY0558, CMNH; **f:** *L. siyai* spec. nov., PT ♂, Shaanxi, Lan'gao, SATY0715, LSY. **Fig. 12:** ♂ genitalia: **a:** *L. achine* (SCOP.), Beijing, SATY0606, LSY; **b:** *L. catena* (LEECH), PT of *L. microcatena* LANG, Hubei, Shennongjia, SATY0703, LSY; **c:** *L. stax* SUGIYAMA, Gansu, Hezheng, SATY0560, LSY; **d:** *L. youluni* LANG & SONG, PT, Qinghai, Xunhua, SATY1097, LSY; **e:** *L. shaana* LANG & TSHIK., PT, Shaanxi, Ningshan, SATY0559, LSY; **f:** *L. siyai* spec. nov., PT, Shaanxi, Lan'gao, SATY0715, LSY. **Fig. 13:** *L. tshikolovetsi* LANG et al., 2018 stat. nov., ♂, HT, Anhui, Yuexi, SATY0600, CMNH. **Fig. 14:** *L. achine* (SCOP.): **a:** *L. achine achinoides* (BUTLER, 1878), ♂, JAPAN: Yamanashi, Yamanashi-shi, SATY0818, LSY; **b:** *L. achine achine* (SCOP.), ♂, Inner Mongolia, Orogen, LSY.

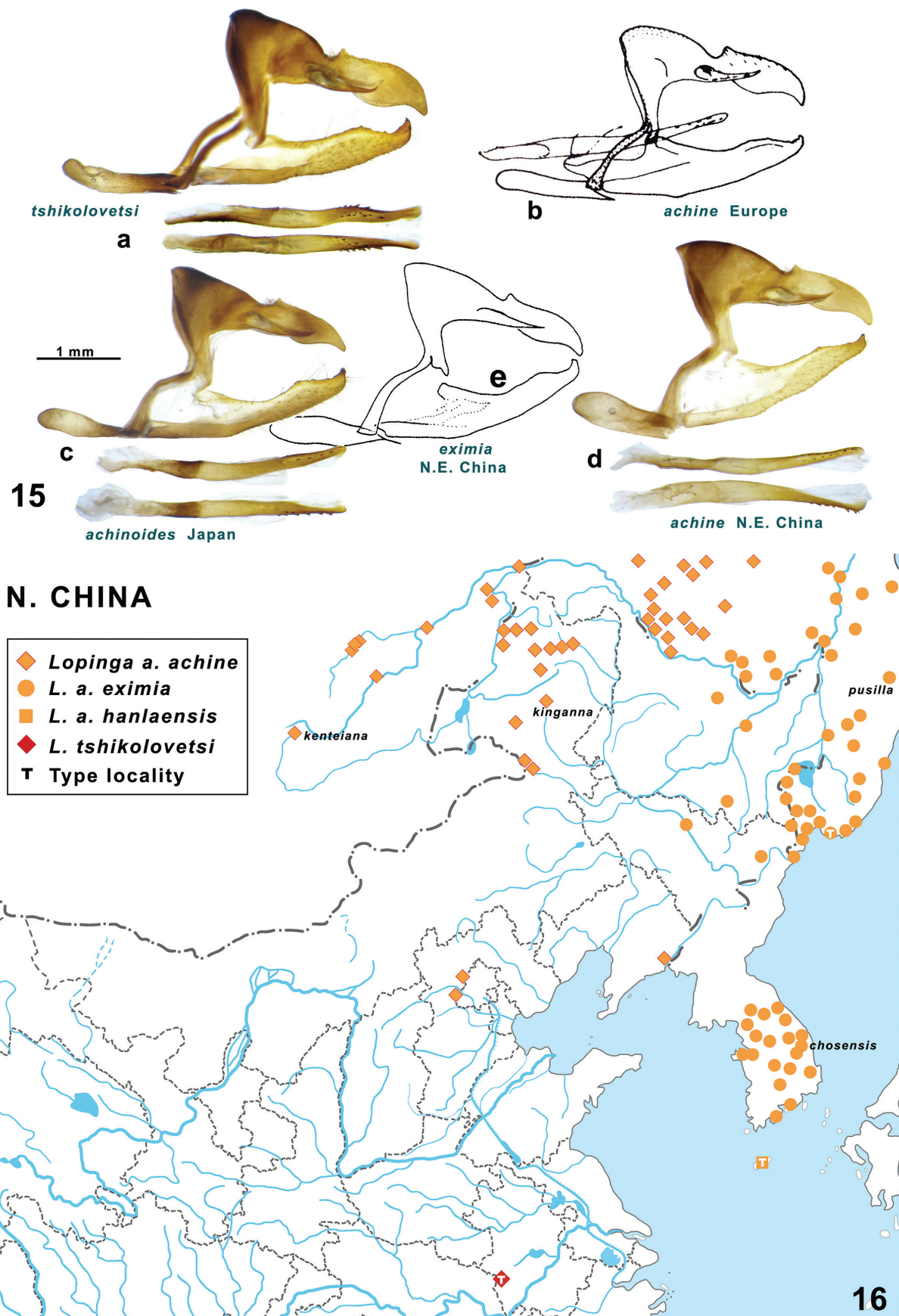


Fig. 15: ♂ genitalia: **a:** *Lopinga tshikolovetsi* LANG et al., 2018 **stat. nov.**, HT, Anhui, Yuexi, SATY0600, CMNH; **b:** *L. achine achine* (SCOP., 1763), EUROPE, after Higgins (1975), this figure without a scale bar; **c:** *L. achine achinoides* (BUTLER, 1878), JAPAN: Yamanashi, Yamanashi-shi, SATY0818, LSY; **d:** *L. achine achine* (SCOP.), Inner Mongolia, Orogen, SATY1093, LSY; **e:** *L. achine eximia* (STDG., 1892), Heilongjiang, Ichun, after GÖRGNER (1990)'s "*Lopinga achine achinoides* BTLR.", this figure without a scale bar. **Fig. 16:** Distribution map of *L. achine* (SCOP.) and *L. tshikolovetsi* LANG et al. **stat. nov.** in N. China and surroundings (Sources of data: MORI & CHÔ 1938; BRYK, 1953; OKANO & PAK, 1968; GÖRGNER, 1990; WANG, 1999; TSHIKOLOVETS et al., 2002, 2009; KIM et al., 2012; LANG et al., 2018; TSHIKOLOVETS & STRELTZOV, 2019; specimens kept in LSY, CMNH).

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