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Contributions to the study of butterflies from Xinjiang - 4
What are *Sinocupido lokiangensis* Lee, 1963 and *Everes acaudata* Lee, 1963?

(Lepidoptera: Lycaenidae)

by
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Abstract: *Cupido gisela* (Püngeler, 1901) and *Cupido prosecusa* (Erschoff, 1874) are reviewed. *Sinocupido lokiangensis* Lee, 1963 **syn. nov.** is regarded as a junior synonym of *Cupido gisela* (Püngeler, 1901). And *Everes acaudata* Lee, 1963 **syn. nov.** is regarded as a junior synonym of *Cupido prosecusa korlana* (Staudinger, 1901).

Introduction: For a long time the species identities of *Sinocupido lokiangensis* Lee, 1963 and *Everes acaudata* Lee, 1963 have remain a mystery. The original figures of the type specimens were based on the overexposed photos and printed in bad quality, thus the wing-pattern cannot be read in details. Fortunately the TLs were given in some details and the male genitalia were figured as black-white photos. However, the type specimens of both taxa were confirmed to be lost, not found in Institute of Zoology, Chinese Academy of Science, Beijing. To reach a stable conclusion on the identities of these blues, an exploration to the TLs is inevitable.
The first attempt to rediscover these blues was made by the senior author in early May 2022; he carefully explored the semi-deserts along the National Road G218 but failed to find the biotopes. In late May 2022 the senior author entered the desert for a few kilometers apart from the National Road and successfully collected a few specimens of both taxa. The study of this material was postponed due to the senior author's field work in 2023, thence the junior author unexpectedly collected a few specimens of these blues from the semi-desert by the Tarim River, about 500 km to the west of the TLs. Finally, a study on these materials was made by the senior author, resulting that *Sinocupido lokiangensis* Lee **syn. nov.** is a junior synonym of *Cupido gisela* (Püngeler, 1901) and *Everes acaudata* Lee **syn. nov.** is a junior synonym of *Cupido prosecusa korlana* (Staudinger, 1901).
Cupido Schrank, 1801 (type species: *Papilio minimus* Fuessly, 1775) and *Everes* Hübner, [1819] (type species: *Papilio amyntas* Denis & Schiffermüller, 1775) were widely accepted as members of Polyommatini Swainson, 1827 in subfamily Polyommatinae Swainson, 1827 (Eliot, 1973; Pelham, 2008; Vane-Wright & de Jong, 2003). They were united into a single genus by Kudrna (1986), followed by Gorbunov (2001) and some recent authors, or kept as separate genera by other authors (Lukhtanov & Lukhtanov, 1994; Zhdanko, 2000 & 2004; Tshikolovets et al., 2009 & 2016, etc.). Gorbunov (2001) gave a key to separate *Cupido* Schrank and *Everes* Hübner (as subgenera) for Russian species, as quoted below:

- "Hindwing without tail. Apex of valva costal process blunt" - *Cupido* Schrank;
- "Hindwing with a tail at vein Cu2; Apex of valva costal process pointed" - *Everes* Hübner.

However, this key is not applicable to the species from outside Russia. The presence or absence of the hindwing tail can be found in a single species, *Everes hugelii* (Gistel, 1857). Moreover, both *Cupido alaina* (Staudinger, 1887) and *Cupido gisela* (Püngeler, 1901), treated by Zhdanko (2004) as species of *Cupido* Schrank on absence of hindwing tails, have a sharply pointed apex of costal process of valva as species of *Everes* Hübner. Therefore, such generic classification on presence or absence of hindwing tails is not supported by any genital characters.
On the other hand, the genus identity of *Everes* Hübner seems to be supported by the presence of the reddish sub-tornal spots on the hindwing underside and the sharply pointed apex of the costal process of the valva, with *Cupido alaina* (Staudinger) transferred from *Cupido* Schrank to *Everes* Hübner. In such classification, *Cupido gisela* (Püngeler) will be received by a third genus (*Sinocupido* Lee, 1963), separate from both *Cupido* Schrank and *Everes* Hübner by the ♂ genitalia having a non-twisted costal process. Nevertheless, without a phylogenetic analysis, both *Everes* Hübner and *Sinocupido* Lee at best tentatively serve as subgenera under the genus *Cupido* Schrank. A summary of these subgenera is as follows:
1) Subgenus *Everes* Hübner: hindwing underside with reddish sub-tornal spot; costal process of valva twisted and intersecting ventral process of valva; apex of costal process of valva sharp.
2) Subgenus *Cupido* Schrank: hindwing underside with no reddish spot; costal process of valva twisted and intersecting ventral process of valva; apex of costal process of valva blunt.
3) Subgenus *Sinocupido* Lee: hindwing underside with no reddish spot; costal process of valva not twisted and not intersecting ventral process of valva; apex of costal process of valva sharp.

Abbreviations

CHH	Collection of Hao Huang, Qingdao
CXR	Collection of Rui Xing, Urumqi
LF	Length of forewing
TL	Type locality
ZISP	Zoological Institute, Russian Academy of Sciences (St.-Peterburg, Russia)
ZMHU	Zoologisches Museum an der Humboldt-Universität zu Berlin

List of collecting localities (fig. 29)
The specimens studied in this work are labeled by some simple geographical names for collecting localities, of which the longitude and latitude data are listed herein.

Beitun: 47.26 N, 88.17 E
Hoxtolgay: 46.46 N, 86.05 E
Huolashan: 42.11 N, 86.04 E
Jimunai: 47.87 N, 86.28 E
Jinghe: 44.46 N, 82.25 E
N Alagan: 40.41 N, 88.06 E
N Takshken: 46.24 N, 90.82 E
Shaya: 40.95 N, 83.71 E
S Buerjin: 47.53 N, 86.81 E
Takshken: 46.15 N,, 90.95 E
W Alagan: 40.15 N, 88.35 E
W Emin: 46.48 N, 83.30 E

Taxonomic accounts

***Cupido (Sinocupido) gisela* (Püngeler, 1901)** (figs. 1-3, 13-20, 29-33)

Lycaena gisela Püngeler, 1901: 180 (TL not specified, from Aksu to Tarim and Chotan rivers; now clarified as close to Tarim River), Tafel 2, figs. 12 & 12b for ♂, 12a for ♀.

Zizera gisela: Seitz, 1909: 296, redescription.

Sinocupido lokiangensis Lee, 1963: 102 & 105 (TL: Alagan, north of Ruoqiang, alongside Tarim river), pl. 1, figs. 5-8 for ♂ and ♀, pl. 2, figs. 15-16 for ♂ genitalia, **syn. nov.**

Cupido gisela: Korshunov, 1972: 361, catalogue; Zhdanko, 2004: 177-178, key to species, 184, fig. 9 for ♂ genitalia in lateral view, 186, fig. 18 for ♀ genitalia, 189, diagnosis.

Material. 3 ♂♂, 1 ♀ (CHH, CXR), Shaya, south of Kuqa, Xinjiang, 960 m, 8-9.VIII.2023, R. Xing & Y.-H. Huang leg.; 2 ♀♀ (CHH), N Alagan, Ruoqiang, Xinjiang, 830 m, 25-26.V.2022, H. Huang leg.

TL & range. Püngeler (1901) clearly stated that the specimens studied by him were collected by Ruckbeil and his son for H. Tancre in 1900 and were mixed without exact labels. The explored areas cover Aksu River, the mountains on north of Aksu, the Tarim River and the Chotan River in the desert. Thus "Aksu" labeled on the historical specimens is just a supposed locality for this species, not confirmed by further studies. This lycaenid species is found in the desert or semi-desert near the Tarim River by the authors, probably widely distributed along the north and the east edges of the Tarim basin. It has not been found in the nearby mountain ranges. Thus it becomes clear that the type specimens were collected from some place close to the Tarim River by Ruckbeil. Whether this species distributes into Chotan area remains unknown.

Based upon the historical specimens collected before 1910, Zhdanko (2004) list three further localities, of which only two possible localities are recognized on the modern map: one is the Yarkand River between Kashgar and Aksu, another is Maral-Bashi, on road from Kashgar to Aksu. Thus it is possible that this lycaenid species is also known from the west edge of the Tarim basin.

Identification & synonymy. Zhdanko (2004) reviewed this species and figured the lateral view of the ♂ genitalia taken from some historical specimens (fig. 16), one of which was labeled from "Ak-su" in Tancre's collection, probably belonging to the type series of *Lycaena gisela* Püngeler. A syntype ♂ in ZMHU (fig. 3) was examined by photos, matching the specimens from Shaya (fig. 1- c2-c5) in all external features. The ♂ genitalia taken from the Shaya specimens (fig. 13) match those of the historical specimen examined by Zhdanko (fig. 16) in all details, including the non-twisted costal process of valva.

The original figures of the ♂ genitalia taken from the holotype of *Sinocupido lokiangensis* Lee are composed of the uncus and the valvae in ventral view (fig. 17), matching the ♂ genitalia of *C. gisela* (Püngeler) taken from the Shaya specimens (figs. 13-15).

Moreover, the ♀ genitalia taken from the Shaya specimens (fig. 18) are in common with those of the topotypes of *Sinocupido lokiangensis* Lee (figs. 19-20).

In conclusion, *Sinocupido lokiangensis* Lee is a junior synonym of *C. gisela* (Püngeler).

Genitalia morphology. Lee (1963) established his new genus, *Sinocupido* Lee mainly on the peculiar ♂ genital character that the costal process of valva non-twisted and sharply pointed at tip. Zhdanko (2004) also noticed this, stating that the two branches of valva in *C. gisela* (Püngeler) do not intersect as in other species of *Cupido* Schrank. Whether such difference indicates a generic difference requires a further research on the phylogeny of these taxa in future.

The ♀ genitalia of *Cu. gisela* (Püngeler) are similar to those of *C. prosecusa* (Erschoff) in following aspects: the apophyses posteriores well defined; the sterigma consisting of an ostial capsule (i.e. lamella antevaginalis and lamella postvaginalis entirely fused into a specialized capsule enclosing the caudal part of ductus bursae); the ostial capsule hidden in an eversible membranous cavity; the ostial capsule with a membranous area at caudal end just above the ostium bursae; the ductus bursae membranous; the attachment point of the ductus seminalis on the ductus bursae close to the ostium bursae and hidden deeply into the ostial capsule; the corpus bursae with no signa.

Biology. Two generations are recorded: one in April-May and another in August. The two generations are hardly different in size and wing-pattern. This species is only found in the extensive bushy areas close to the rivers in the desert. It flies with *C. prosecusa korlana* (Staudinger, 1901) and *Plebejus agnata* (Staudinger, 1889).

***Cupido* (*Cupido*) *prosecusa* (Erschoff, 1874)**

Diagnosis. Zhdanko (2004) gave a full discussion on the species identity based upon external features and both, ♂ and ♀ genitalia. This species is characterized in male genitalia by the longer triangular socii and the longer falces than other species.

Subspecific classification. Only three valid subspecies are known as listed below. There is no marked ♂ genital difference between *C. p. prosecusa* (Erschoff) and *C. p. korlana* (Staudinger, 1901). The ♂ genitalia of *C. p. duplex* (Alphéraky, 1887) remain unknown, but they could be in common with those of *C. p. korlana* (Staudinger) due to the very similar wing characters. The ♀ genitalia show some difference between *C. p. prosecusa* (Erschoff) and *C. p. korlana* (Stgr.) but they are individually variable in either of the two subspecies.

The following key is useful in distinguishing subspecies:

1. ♂ with no discrete black marginal spots on hindwing upperside; ♀ usually with no pale submarginal spot on hindwing upperside and usually with grayer ground color on both wings underside.....*C. p. prosecusa* (Erschoff)
-. ♂ with discrete black marginal spots on hindwing upperside; female usually with pale submarginal spot on hindwing upperside and usually with browner or yellower ground color on both wings underside.....2
2. ♀ with no pale spot on forewing upperside and with grayish pale spots on hindwing upperside.....*C. p. korlana* (Stgr.)
-. ♀ with bluish pale spots on both wings upperside.....*C. p. duplex* (Alphéraky)

***Cupido* (*Cupido*) *prosecusa prosecusa* (Erschoff, 1874)** (figs. 5, 7-8, 10, 21-22, 27, 29, 39-41)

Lycaena prosecusa Erschoff, 1874: 13 (TL: "Habitat prope urbem Turkestanum (Hasret), volat mense majo"; neotype (Zhdanko, 2004) labeled from the outskirts of the city of Turkestan), Tab. 1, fig. 9 for ♂; Staudinger, 1901: 90, catalogue.

Zizera prosecusa: Seitz, 1909: 296, pl. 82h.

Everes prosecusa duplex: Forster, 1968: 201, record from Mongolia; Bálint, 1989: 105, record from Mongolia. Misidentification

Cupido prosecusa: Korshunov, 1972: 366, catalogue; Zhdanko, 2000: 442, pl. 62, figs. 45-47; Zhdanko, 2004: 177-178, key to species, 184, fig. 8 for ♂ genitalia in lateral view, 186, fig. 17 for ♀ genitalia, 188-189, neotype designation, redescription & discussion on range, habitats & biology; Tshikolovets, 2005: 187, list of references for Kyrgyzstan, pl. XLIV, figs. 21-25 & 30; Toropov & Zhdanko, 2009: 234-235, figs.; Tshikolovets et al., 2009: 102-103, list of references for Mongolia, pl. XVI, figs. 26-28; Tshikolovets et al., 2016: 163, list of references for Kazakhstan, 164, notes on biology, pl. XXIII, figs. 21-25.

Material. 1 ♀ (CHH), Jinghe, 990 m, 27.VI.2022, H. Huang leg.; 11 ♂♂, 2 ♀♀ (CHH), 1120 m, Takshken, 15.VI.2022, H. Huang leg.; 8 ♂♂, 5 ♀♀ (CHH), N Takshken, 1160 m, 16.VI. & 11.VII. 2022, H. Huang leg.; 4 ♂♂, 1 ♀ (CHH), Beitun, 500 m, 19.VI.2022, H. Huang leg.; 8 ♂♂, 5 ♀♀ (CHH), Jimunai, 390 m, 20-21.VI.2022, H. Huang leg.; 1 ♂ (CHH), W Emin, 380 m, 22.VI.2022, H. Huang leg.; 1 ♂ (CHH), S Buerjin, 940 m, 20.VI.2022, H. Huang leg.; 1 ♂ (photos by S.-S. Wang), Hoxtolgay, VI. 2022, S.-S. Wang leg. 8 ♂♂, 8 ♀♀ dissected.
Range. This subspecies is widely distributed as shown in fig. 29. In China it is restricted to the north of Tianshan Mts..
Identification & synonymy. Zhdanko (2004) designed a neotype from the TL and re-described this species in details. He gave the description and figure of ♂ genitalia probably taken from the neotype and stated that the variability of genital structures in both sexes is very weak throughout the range of the species. The specimens examined in this work match Zhdanko's (2004) description and figures of ♂ and ♀ genitalia.
Forster (1968) and Bálint (1989) recorded this species from Mongolia as *Cupido prosecusa duplex* (Alphéraky), but the specimens from Mongolia actually belong to *C. p. prosecusa* (Erschoff) with no discrete marginal spots on hindwing upperside of male. Tshikolovets et al. (2009), based on such misidentification, incorrectly regarded *Cupido prosecusa duplex* (Alphéraky) as a synonym of *C. p. prosecusa* (Erschoff).
Biology. The senior author's observations confirmed Zhdanko's (2004) statements on habitats and biology. This taxon is associated with *Sphaerophysa salsula* Pall. (Fabaceae) at most of the biotopes found in Xinjiang.

***Cupido* (*Cupido*) *prosecusa korlana* (Staudinger, 1901)** (figs. 4, 6, 9, 11, 23-26, 28, 29, 32-38)
Lycaena Prosecusa v. *Korlana* Staudinger, 1901: 90 (TL: Korla).
Zizera prosecusa form *korlana*: Seitz, 1909: 296.
Everes acaudata Lee, 1963: 101 & 104 (TL: Ruoqiang, Milan), pl. 1, figs. 3-4 for ♂ & ♀, pl. 2, figs. 12-14 for male genitalia. **syn. nov.**

Material. 1 ♀ (CXR), Shaya, 960 m, 8.VIII.2023, R. Xing & Y.-H. Huang leg.; 5 ♂♂, 3 ♀♀ (CHH), W Alagan, Ruoqiang, 750 m, 24.V.2022, H. Huang leg.; 3 ♂♂, 2 ♀♀ (CHH), N Alagan, Ruoqiang, 830 m, 25-26.V.2022, H. Huang leg.; 2 ♂♂, 8 ♀♀ (CHH), Huolashan, Yanqi, 1400 m, 27.V.2022, H. Huang leg. 6 ♂♂, 7 ♀♀ dissected.
Range. This subspecies is restricted to the bushy areas at the north and east edges of the Tarim basin.
Identification & synonymy. *Cupido p. korlana* (Stgr.) was originally described on 3 ♀♀ from Korla area, with "underside of wings much darker brownish-grey and with more obsolete markings" than the nominotypical subspecies. A detected locality at Huolashan, Yanqi, north of the city of Korla, is probably very close to the TL. Although the type specimens have not been traced in the museums, the specimens from Huolashan match the original description and a dissection of ♂ and ♀ genitalia proves these specimens to be *C. prosecusa* (Erschoff).
It is noteworthy that Lee (1963) described his *Everes acaudata* Lee on the specimens from two localities: one from Milan of Ruoqiang (to south of Korla) and another from Yanqi (on north of Korla). Thus the range of *E. acaudata* Lee actually covers the TL of *C. p. korlana* (Stgr.).
A careful comparison between the specimens from Huolashan, Yanqi and those from Alagan, Ruoqiang does not carry out any difference in wing pattern and genitalia (figs. 4, 6, 9, 23, 25-26). And the original figures of ♂ genitalia taken from the type specimens of *Everes acaudata* Lee (fig. 24) match those of *Cupido prosecusa* (Erschoff) in general (figs. 21-22). Therefore, *Everes acaudata* Lee **syn. nov.** is considered a junior synonym of *Cupido prosecusa korlana* (Staudinger).
Remarks. This subspecies shows some slight but rather consistent differences in female genitalia from the nominotypical subspecies: ostial capsule in dorsal or ventral view broader, with caudal apex less protruding and with lateral sides not pointed caudally. A further research on DNA sequences or early stages is necessary in the future.
Biology. Two generations are recorded: one in April-May and another in August-September. The second generation tends to be larger than the first generation. This taxon is generally found in the bushy areas close to the rivers in the desert, but a population found from Huolashan inhabits the grassland in the outskirt of the mountain. It is associated with *Sphaerophysa salsula* Pall. (Fabaceae) at all of the known localities and flies with *Plebejus agnata* (Staudinger, 1889).

***Cupido* (*Cupido*) *prosecusa duplex* (Alphéraky, 1887)** (figs. 12, 29)
Lycaena Prosecusa var. *Duplex* Alphéraky, 1887: 405 (TL: between Aksu and Lob-noor); Alphéraky, 1889: 78, note on TL (contrée de Lob-Noor), pl. IV, fig. 5a-b for ♂ and ♀; Zhdanko, 2000: 442, taxonomic note on "lectotype" (invalid; actually syntype); Zhdanko, 2004: 188, notes on morphology and genitalia of "lectotype"; Tshikolovets, 2005: 187, note; Tshikolovets et al., 2009: 102, synonymy for *Cupido prosecusa* (Erschoff); Tshikolovets et al., 2016: 163.
Zizera prosecusa duplex: Seitz, 1909: 296, note (suspecting as a seasonal form).

Material. None.
TL & range. The TL was originally stated as an uncertain place between Aksu and Lob-noor, but subsequently stated by the same author (Alphéraky, 1889) as from Lob-Noor area. As *C. p. korlana* (Stgr.) is known between Aksu and Lob-noor, there is only one option for the true TL of *C. p. duplex* (Alphéraky): to the west of Korla or to the east. Since the specimen from Shaya (a locality very close to Aksu) belongs to *C. p. korlana* (Stgr.), the only possible TL of *C. p. duplex* (Alphéraky) should be the Lob-noor area, to the east of Korla area.
Remarks. Tshikolovets et al. (2009) incorrectly treated *C. p. duplex* (Alphéraky) as a synonym of *C. p. prosecusa* (Erschoff). The two taxa are markedly different in the presence or the absence of the discrete marginal spots on the hindwing upperside of the ♂.
However, whether *C. p. korlana* (Stgr.) is a synonym of *C. p. duplex* (Alphéraky) remains uncertain, as only very few specimens are known for *C. p. duplex* (Alphéraky). It is noteworthy that the bluish submarginal spots found on forewing upperside of *C. p. duplex* (Alphéraky) female have never been found in any ♀ specimens of *C. p. korlana* (Stgr.).

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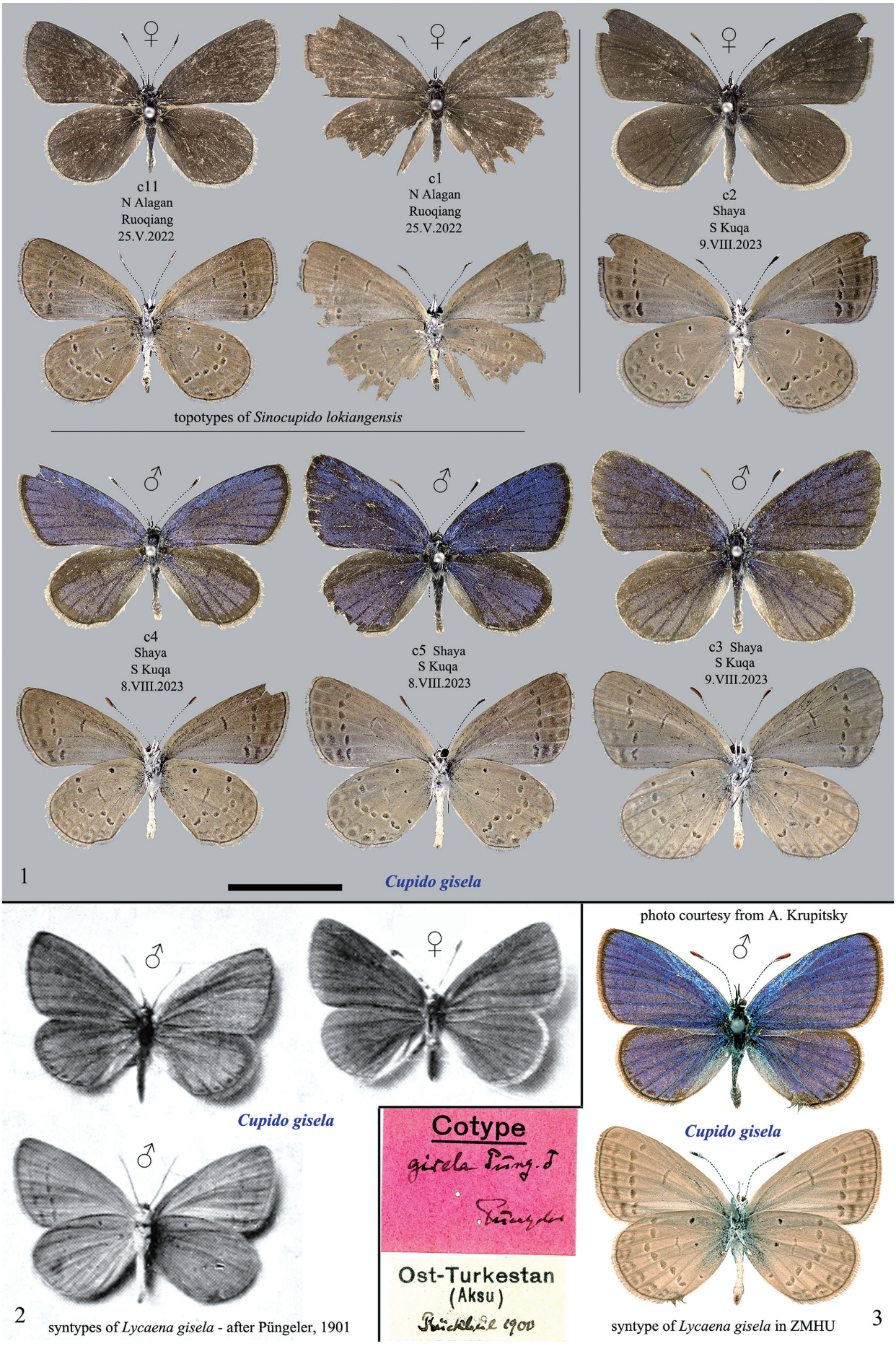
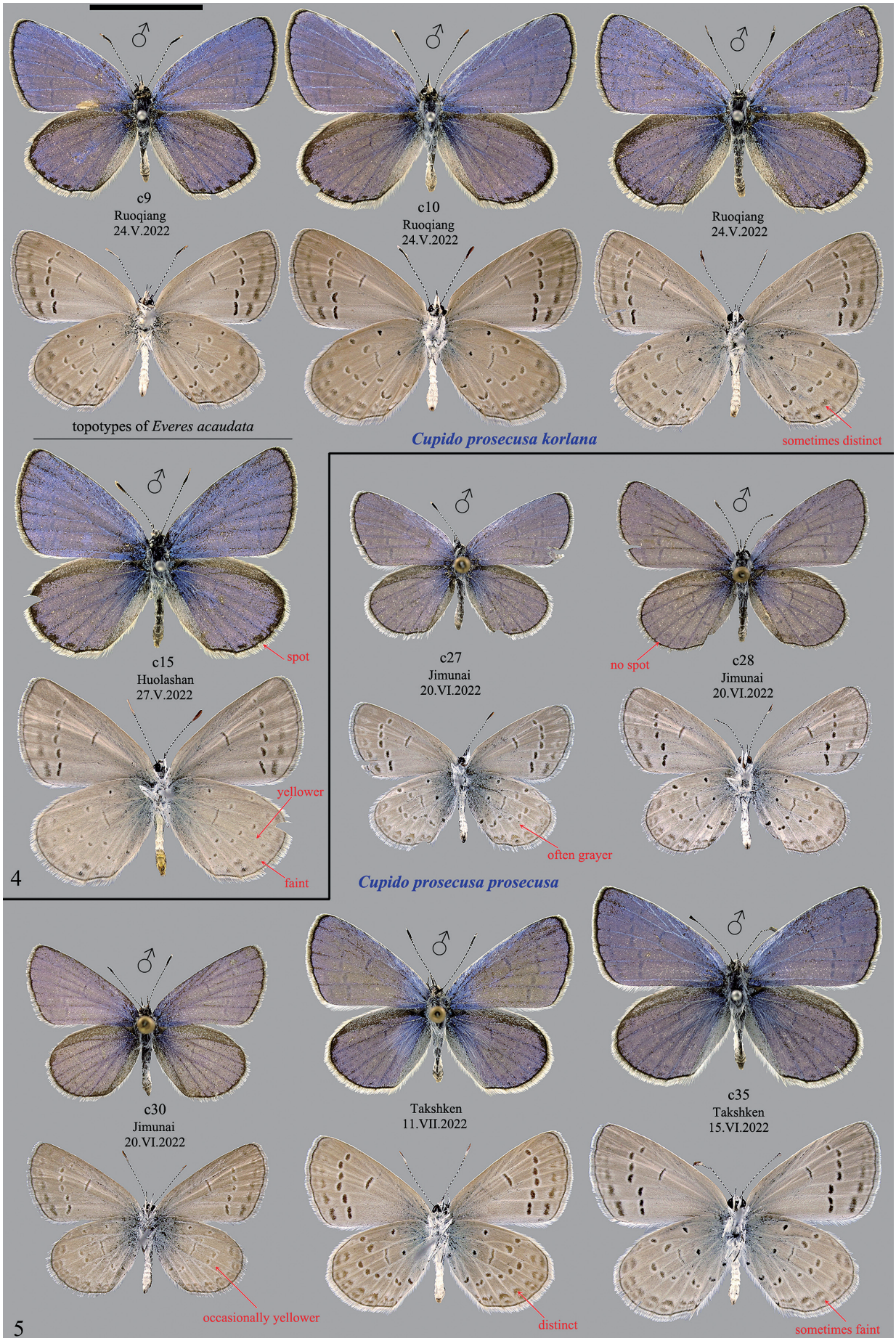
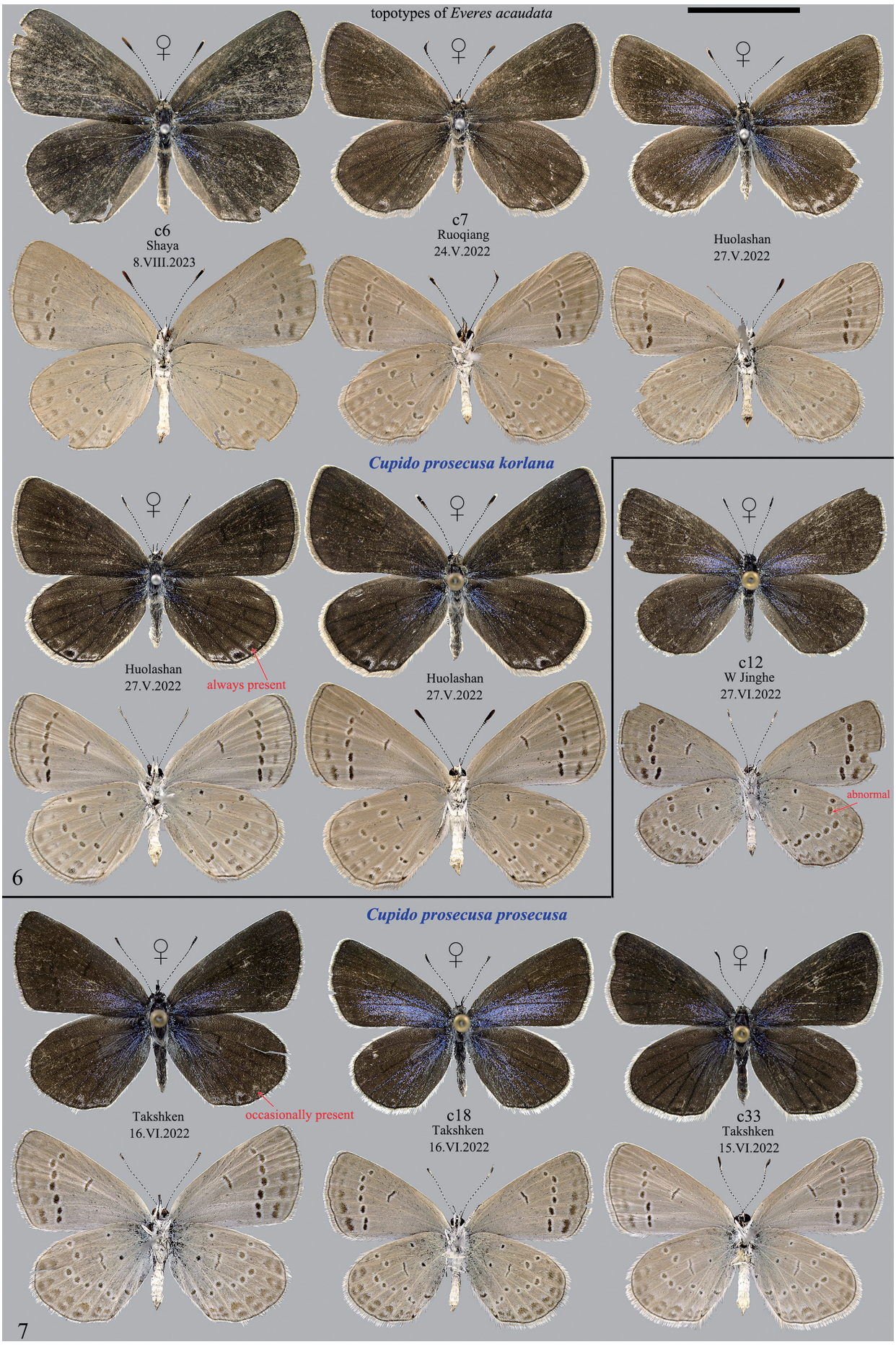


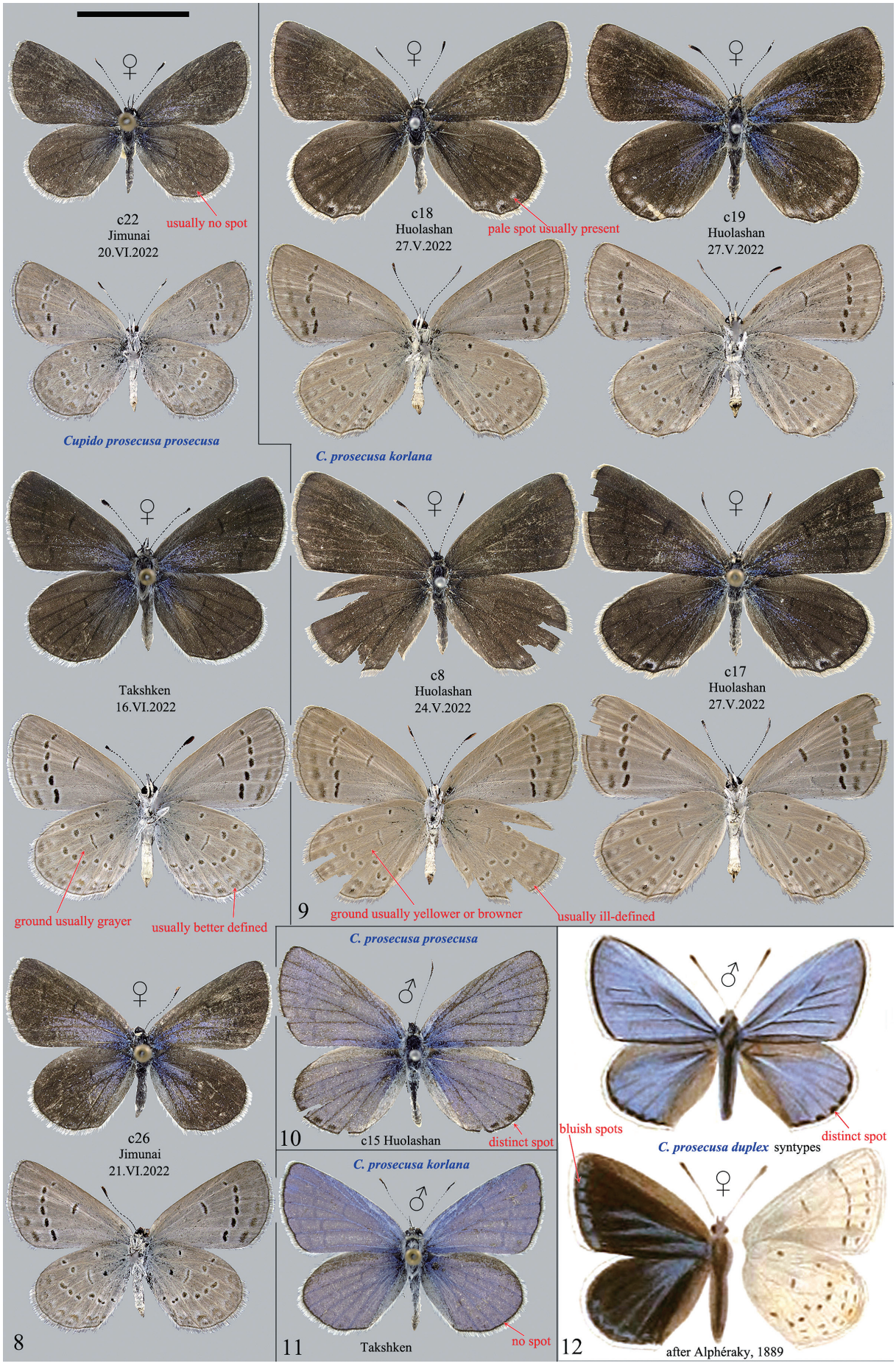
Figs. 1-3: Habitus of *Cupido gisela* (PÜNGELER, 1901) under same scale (scale bar = 1 cm).



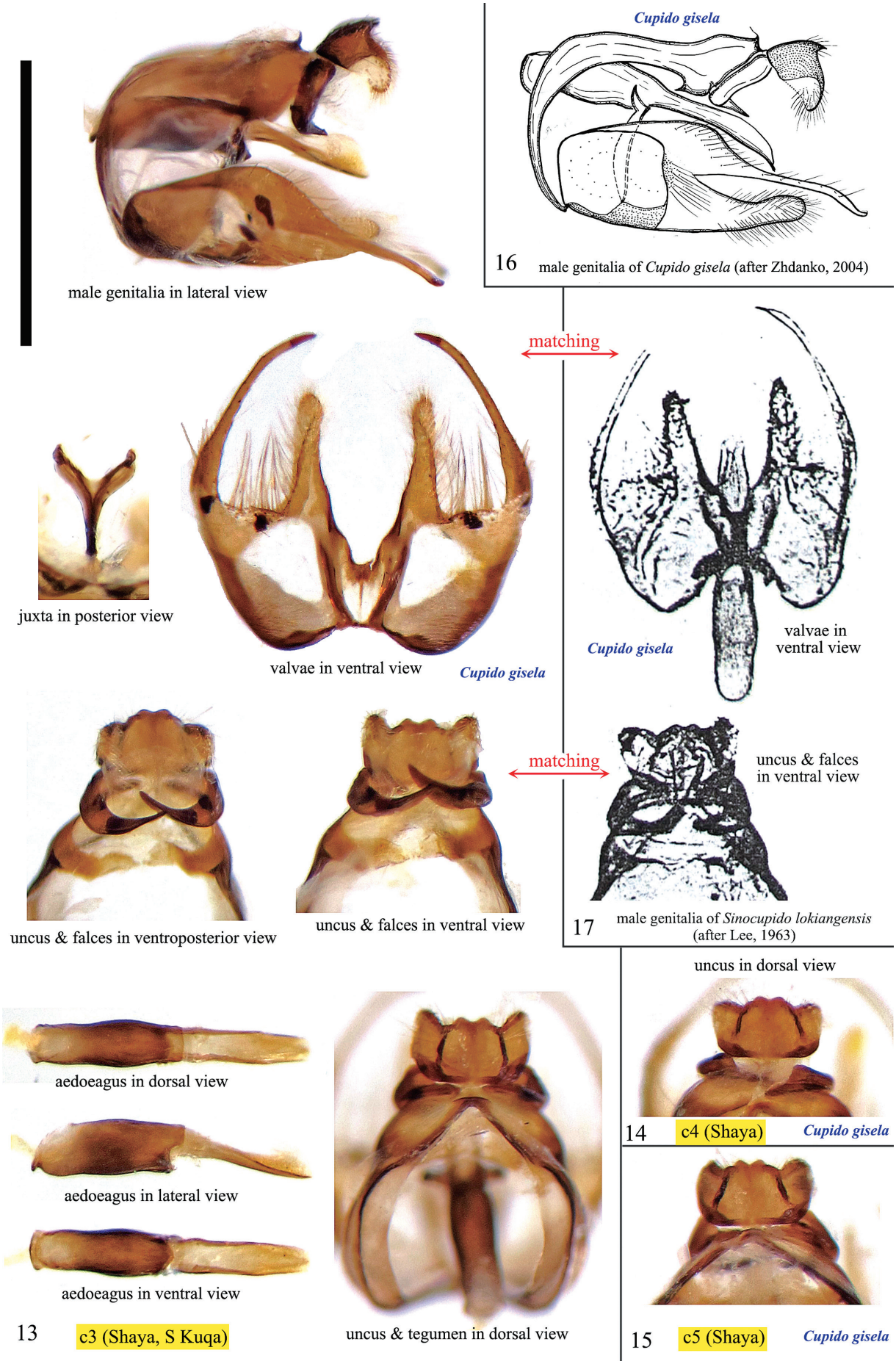
Figs. 4-5: Habitus of *Cupido prosecusa* (ERSCHOFF, 1874) males under same scale (scale bar = 1 cm).



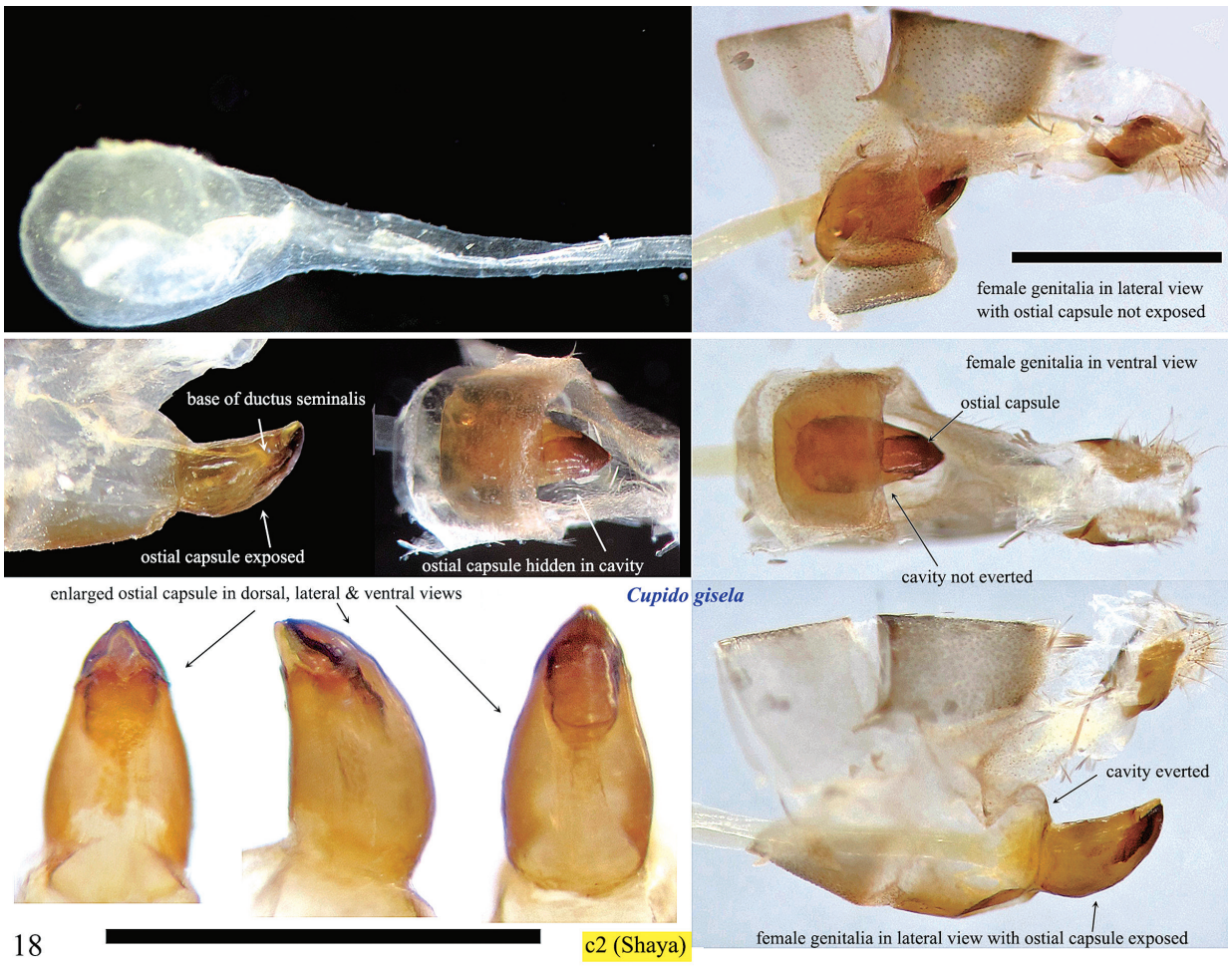
Figs. 6-7: Habitus of *Cupido prosecusa* (Erschoff, 1874) ♀♀ under same scale (scale bar = 1 cm).

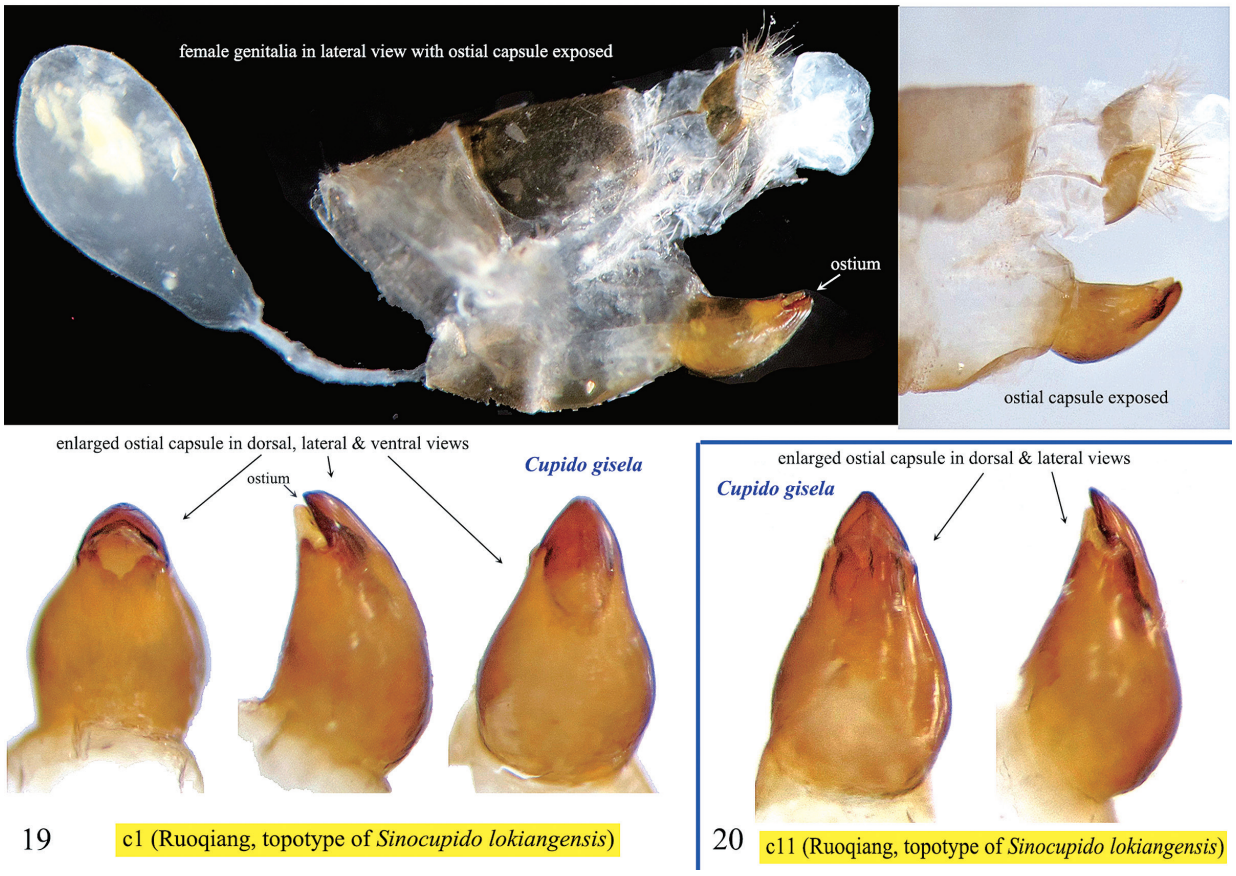


Figs. 8-12: Habitus of *Cupido prosecusa* (Erschoff, 1874) under same scale (scale bar = 1 cm).

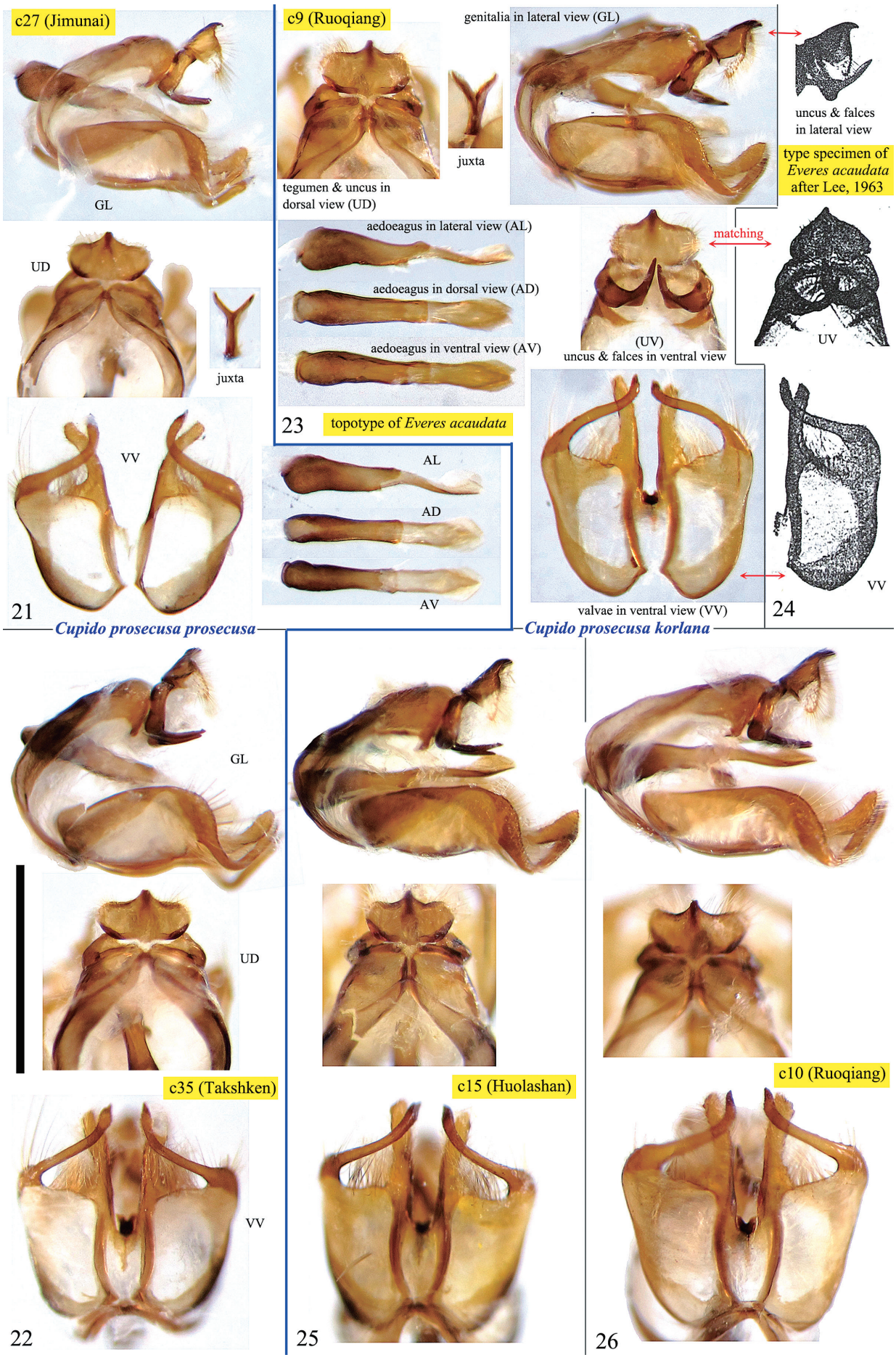


Figs. 13-17: ♂ genitalia of *Cupido gisela* (Püngeler, 1901) (scale bar = 1 mm).

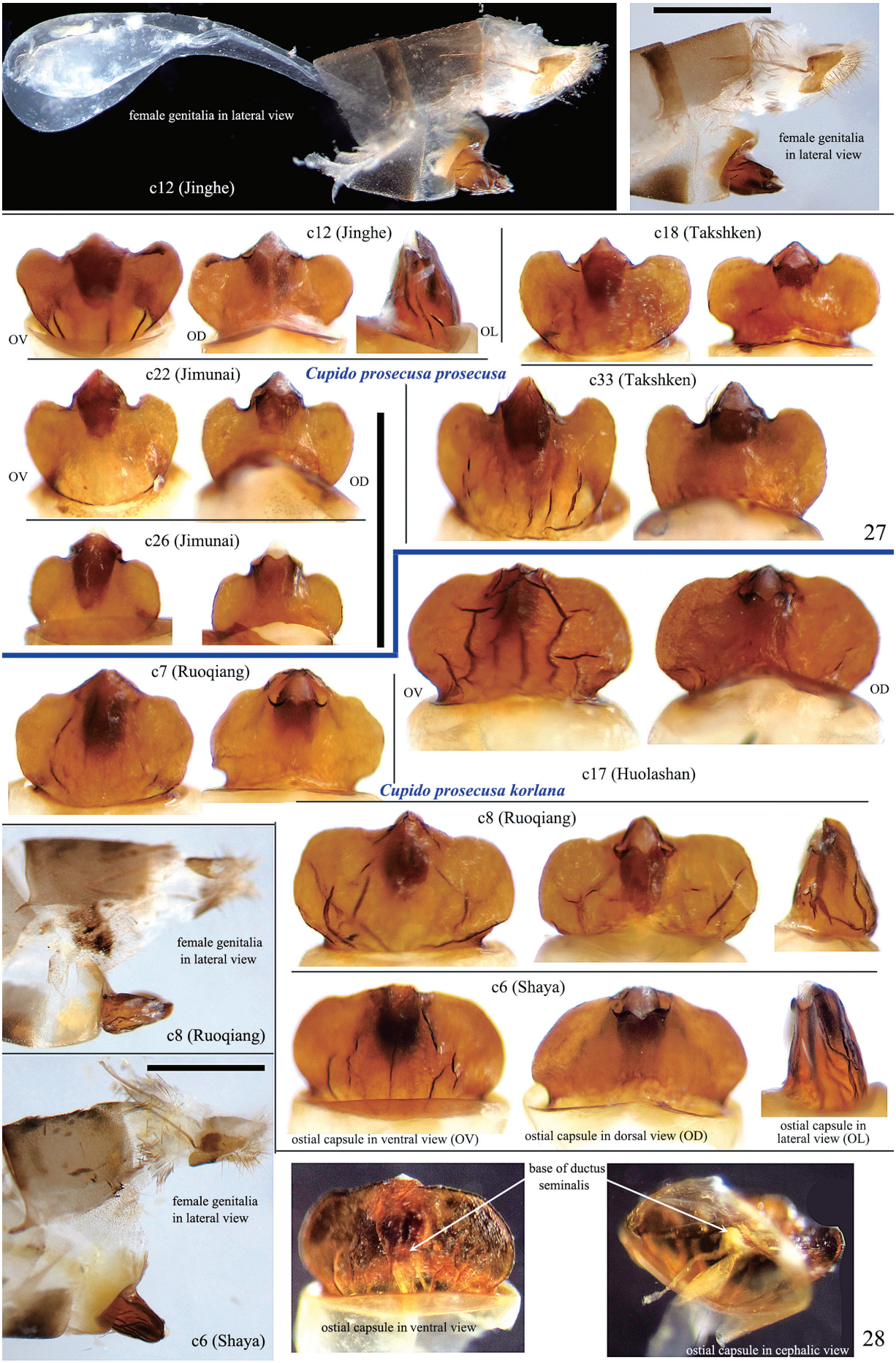




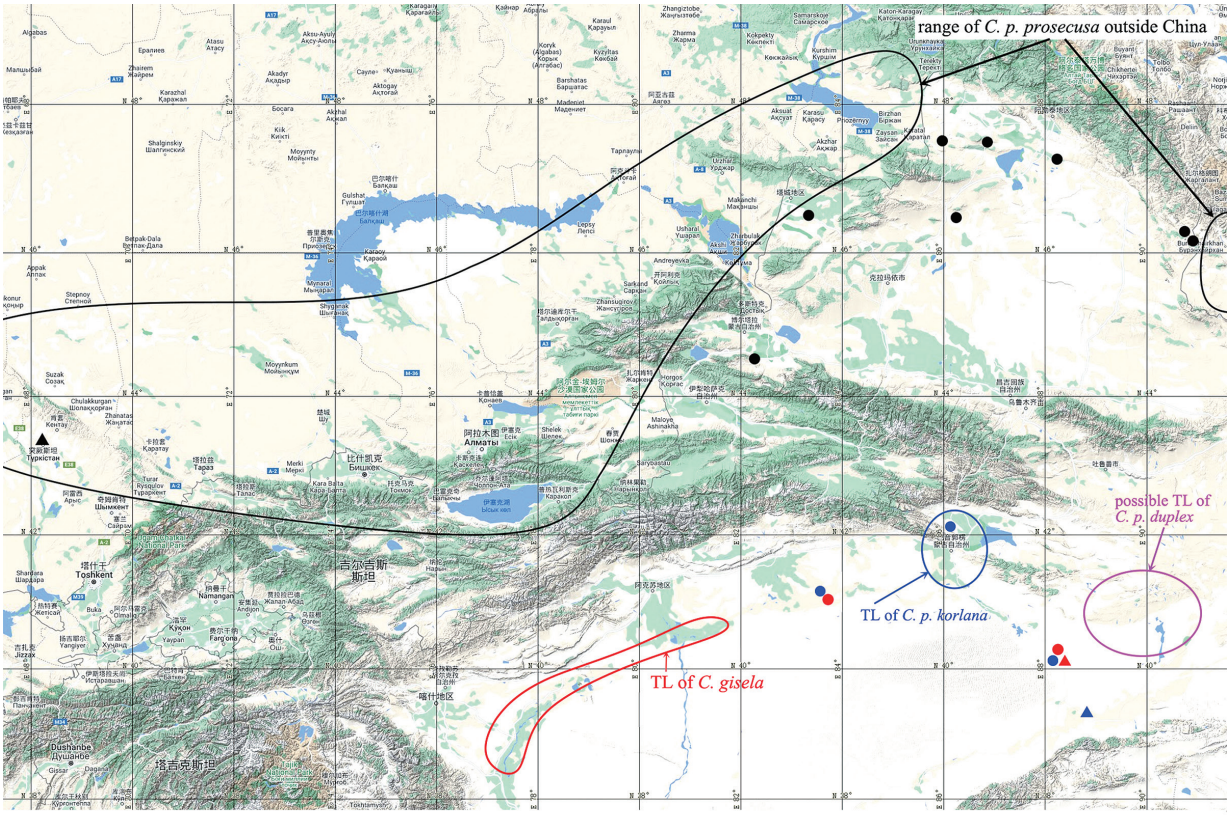
Figs. 18-20: ♀ genitalia of *Cupido gisela* (PÜNGELER, 1901) (scale bar = 1 mm).



Figs. 21-26: Male genitalia of *Cupido prosecusa* (ERSCHOFF, 1874) (scale bar = 1 mm).



Figs. 27-28: ♀ genitalia of *Cupido prosecusa* (Erschoff, 1874) (scale bar = 1 mm).



29 Distribution of *Cupido prosecusa* and *C. gisela*

Fig. 29: Distribution of *Cupido prosecusa* (Erschoff, 1874) and *Cupido gisela* (Püngeler, 1901).
Figs. 30-31: Biotopes of *Cupido gisela* (Püngeler, 1901) at Shaya.
Figs. 32-33: Biotopes of *Cupido gisela* (Püngeler, 1901) and *C. prosecusa korlana* (Staudinger, 1901) at N Alagan, Ruoqiang.

Figs. 34-37: Biotopes of *Cupido prosecusa korlana* (Staudinger, 1901) at W Alagan, Ruoqiang.
Fig. 38: Biotope of *Cupido prosecusa korlana* (Staudinger, 1901) at Huolashan.
Fig. 39: Biotope of *Cupido prosecusa prosecusa* (Erschoff, 1874) at Jimunai.
Figs. 40-41: Biotope of *Cupido prosecusa prosecusa* (Erschoff, 1874) at Takshken.