

Notes on the genera *Caltoris* SWINHOE, 1893 and *Baoris* MOORE, [1881] from China

(Lepidoptera, Hesperidae)

by

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Abstract: Notes are given for Chinese species of the genera *Caltoris* SWINHOE and *Baoris* MOORE. The type specimens of the following taxa are illustrated: *Caltoris aurociliata* (ELWES & EDWARDS, 1897) (type locality: Sikkim), *Caltoris sirius* (EVANS, 1926) (type locality: Karen), *Caltoris kumara moorei* (EVANS, 1926) (type locality: Sikkim), *Caltoris bromus* LEECH, 1893 (type locality: Chia-Kou-Ho, Sichuan), *Caltoris cahira austeni* (MOORE, [1884]) (type locality: Khasi Hills), *Caltoris cahira carina* (EVANS, 1949) (type locality: Siao-Lou, Sichuan), *Caltoris cahira cahira* (MOORE, 1877) (type locality: Andamans), *Caltoris tenuis* (EVANS, 1932) (type locality: Burma), *Caltoris confusa* (EVANS, 1932) (type locality: Burma) and *Caltoris malaya* (EVANS, 1926) (type locality: Mergui). Seven species of *Caltoris* and four species of *Baoris* are recognized from Chinese continent and Hainan Island. A key to all known Chinese species is given for these two genera. The adult habitus and ♂ genitalia are illustrated for most of Chinese species except only *Caltoris tulsii* (DE NICEVILLE, 1883). Two species, *Baoris pagana* (DE NICEVILLE, 1887) and *Baoris penicillata chapmani* EVANS, 1937 are recorded as new to Chinese fauna; two species, *Caltoris aurociliata* (ELWES & EDWARDS, 1897) and *Caltoris kumara moorei* (EVANS, 1926), that were recorded by the author from Southeast Tibet and Yunnan respectively, are firstly illustrated herein. The individual variations in wing pattern and ♂ genitalia are investigated for *Baoris farri farri* (MOORE, 1878) and *Caltoris cahira austeni* (MOORE, [1884]), and two new synonyms are recognized: *Baoris longistigmata* HUANG, 1999 **syn. nov.** and *Caltoris cahira carina* (EVANS, 1949) **syn. nov.**

Introduction: The Hesperiid genera *Caltoris* SWINHOE and *Baoris* MOORE (Lepidoptera, Hesperidae: Hesperinae) are dark skippers with elongate wings and strong flying, known only from the Oriental region. They were associated with the genera *Genes* HÜBNER, *Parnara* MOORE, *Borbo* EVANS, *Pseudoborbo* LEE, *Pelopidas* WALKER, *Polytremis* MABILLE and *Iton* DE NICEVILLE in the *Genes* genus group by EVANS (1949) or the *Pelopidas* genus group by ELIOT (1978). According to WARREN & al. (2008), the valid tribal name for this group is Baorini DOHERTY, and this tribe is monophyletic with strong support in molecular phylogeny.

Totally 17 world species were reviewed by EVANS (1949) for *Caltoris* and five for *Baoris*, since then only one valid species, *Caltoris septentrionalis* KOIWAYA, 1996 was added from Central China. In EVANS' (1949) catalogue, only four species of *Caltoris* and two species of *Baoris* were recorded for the Chinese fauna, since then two more species (HUANG, 2000; HUANG & XUE, 2004) were newly recorded from China. In this paper two further species of *Baoris* are recorded from China. Therefore, hitherto seven species of *Caltoris* and four species of *Baoris* are known from China.

Material: A total of 85 specimens, belonging to 10 species, were examined. Most specimens from Anhui, Zhejiang, Sichuan, Yunnan and Tibet were collected by the author and preserved in the author's private collection; all the other specimens from Hainan, Fujian, Guangxi and Yunnan were collected by various authors and are preserved in the entomological collection of Institute of Zoology, Chinese Academia of Science, Beijing.

The identification was based upon EVANS' (1949) revisional work and an examination of photographs of type specimens preserved in the BMNH. To distinguish species, when possible a good number of specimens were dissected and checked for ♂ genital characters to survey the individual variations of some species in ♂ genitalia.

Terminology of wing pattern and venation follows EVANS (1949). Terminology of ♂ genitalia follows SHIROZU (1960).

The specimens examined are deposited in the following collections:

BMNH: Natural History Museum, London, U. K.

CHH: Private collection of Hao Huang, Qingdao, China

IZAS: Institute of Zoology, Chinese Academia of Science, Beijing, China

Key to Chinese species of *Caltoris* and *Baoris*

- 1 Mid tibiae heavily spined. Upperside of hindwing with black hair brush in the cell or with reddish brown hairy area in discal area, conspicuously different from the ground colour in submarginal area 2
- Mid tibiae unspined. Upperside of hindwing rather uniform in colour, without black hair brush in cell or reddish brown hairy area in discal area 5
- 2 ♂ with a black recumbent hair brush overlying a scent pouch in the cell on upperside of hindwing and correlated with a polished grey dorsal area and an oval brand on underside of forewing. Subhyaline spots on upperside of forewing white. Forewing cell spots not conjoined. Harpe of valva produced into a terminal spur at lower posterior angle. Cephalic margin of harpe on the inner wall of valva broadly serrate and produced into an inner process. Right terminal wall of phallus broad and not as an elongate process 3
- ♂ without secondary sexual characters. Subhyaline spots on upperside of forewing more or less yellow. Forewing cell spots conjoined and across cell. Harpe of valva rounded at lower posterior angle. Cephalic margin of harpe on the inner wall of valva not produced into an inner process. Right terminal wall of phallus protruded as an elongate process as well as left one *Baoris pagana*
- 3 Cell spots on upperside of forewing present. Left terminal wall of phallus protruded into an elongate process. Right terminal wall of phallus spined and with a terminal piece overturned and inserted into vesica. Saccus a little longer than half the height of ring 4

- Cell spots on upperside of forewing absent. Left terminal wall of phallus not protruded into an elongate process. Right terminal wall of phallus unspined and without a terminal piece overturned and inserted into vesica. Saccus usually not longer than half the height of ring *Baoris penicillata chapmani*
- 4 Underside of hindwing powdered by scales to form yellowish brown super-scaling. Harpe of valva shorter with a relatively smaller distance between base of inner process and distal margin. Cornuti obsolete. Spines on left terminal wall and the right terminal piece inserted into vesica relatively smaller. Phallus relatively shorter *Baoris leechii*
- Underside of hindwing with all scales very dense and forming a uniform ground colour without the powdered scales. Harpe of valva longer with a relatively larger distance between base of inner process and distal margin. Cornuti well marked as hair-tuft. Spines on left terminal wall and the right terminal piece inserted into vesica relatively larger. Phallus relatively longer *Baoris farri farri*
- 5 Forewing more or less marked with subhyaline spots. Underside of both wings without darker longitudinal streaks between veins 6
- Forewing without subhyaline spots Underside of both wings marked with darker longitudinal streaks between veins *Caltoris septentrionalis*
- 6 Underside of hindwing uniform dark brown 7
- Underside of hindwing with basal half conspicuously whitened or glossed pale purple *Caltoris tulsi*
- 7 Upperside of forewing more or less with cell spots. Uncal processes not hooked in lateral view. Gnathos not hooked upwards in lateral view. Phallus relatively broader 8
- Upperside of forewing without cell spots. Uncal processes hooked downwards in lateral view. Gnathos hooked upwards in lateral view. Phallus relatively thinner *Caltoris kumara moorei*
- 8 Uncal lobes nearly upright to tegumen, with a posterior hook pointed towards caudal end of uncus. Uncal processes very short 9
- Uncal lobes oblique to tegumen, without a hook pointed towards caudal end of uncus. Uncal processes relatively longer 10
- 9 Forewing discal spot in space 2 not closer to discal spot in space 3 than to cell spot. Antenna with 11-13 black nudum antennomeres. Ciliae bright yellow. Gnathos elongate and covering uncal processes. Ampulla not beyond dorsal process of harpe. Harpe with dorsal process reaching dorsal margin of ampulla and broadly serrate. Phallus 1.4 times as long as valva. Lateral walls of caudal end of phallus broad and not protruded into elongate process *Caltoris aurociliata*
- Forewing discal spot in space 2 closer to discal spot in space 3 than to cell spot. Antenna with 16 brown nudum antennomeres. Ciliae gray. Gnathos relatively shorter and not covering uncal processes. Ampulla well beyond dorsal process of harpe. Harpe with dorsal process below ampulla, not reaching dorsal margin of ampulla and not serrate. Phallus 1.7 times as long as valva. Lateral walls of caudal end of phallus protruded into elongate process *Caltoris sirius chimdroa*
- 10 Uncal lobes obtuse at tip and directed dorsoanteriorly. Uncal processes and gnathos expanded laterally in dorsal or ventral view. Ampulla well beyond the caudal end of harpe. Harpe rounded at lower posterior angle, not produced into an acute angle. Phallus with left terminal wall shorter than right wall, and spined on terminal ridge. Lamella postvaginalis with caudal end concave and lateral extensions stouter *Caltoris bromus bromus*
- Uncal lobes more or less pointed at tip and directed dorsally. Uncal processes and gnathos not expanded laterally in dorsal or ventral view. Ampulla extended as far as the caudal end of harpe. Harpe produced into an acute angle at lower posterior angle. Phallus with left terminal wall as long as right wall, and not spined on terminal ridge. Lamella postvaginalis with caudal end straight and lateral extensions slenderer *Caltoris cahira austeni*

Taxonomy of *Caltoris* and *Baoris* from China

Caltoris SWINHOE, 1893 (Type species: *Hesperia kumara* MOORE, 1878).

= *Milena* EVANS, 1912 (Type species: *Parnara plebeia* DE NICEVILLE, 1887).

Some species of *Caltoris* are nearly indistinguishable in wing pattern, and most of them are found in two morphological groups: one group with cell spots present and the upper cell spot not larger than the lower cell spot, comprising *Caltoris aurociliata* (ELWES & EDWARDS) (figs. 1, 2, 25, 26), *Caltoris sirius* (EVANS) (figs. 3, 4, 27, 28, 29, 30), *Caltoris cahira* (MOORE) (figs. 9-14, 33-48), *Caltoris tenuis* (EVANS) (figs. 7, 8), *Caltoris bromus* LEECH (figs. 15, 16, 49-52) and *Caltoris confusa* (EVANS) (figs. 19, 20); another group with cell spots absent, comprising *Caltoris kumara* (MOORE) (figs. 5, 6, 31, 32) and *Caltoris malaya* (EVANS) (figs. 17, 18). In EVANS' (1949) revisional work, the identification key to species in these two morphological groups is only based upon the ♂ genital characters.

In China the confusion comes from *Caltoris cahira* (MOORE) and *Caltoris bromus* LEECH, both of which are sympatric in most localities. Sometimes they can be distinguished from each other by a few characters in wing pattern, however such characters are individually variable and often useless in diagnosing the species. To distinguish them with certainty, an examination of ♂ or ♀ genitalia is always required.

1. *Caltoris aurociliata* (ELWES & EDWARDS, 1897). Type ♂, Sikkim [photos examined]. (Figs. 1, 2, 25, 26, 60, 87a, 88a.)

Specimens examined: 1 ♂ (CHH), Motuo, Southeast Tibet.

Distribution: Southeast Tibet (Motuo); Sikkim, Northeast India (Manipur, Naga Hills), North and Central Vietnam.

Important characters: Length of forewing: 21 mm. Antenna with 11-13 black nudum antennomeres. Ciliae of both wings bright yellow. Discal hairy area on upperside of hindwing dark brown. Cell spots of forewing well separated, with the upper cell spot minute and beyond the lower cell spot. Saccus nearly 1/3 times as long as height of ring. Uncal lobes nearly upright to tegumen and hooked towards caudal end of uncus. Uncal processes very short and obtuse at tip. Gnathos obtuse at tip, very long and bent upwards to cover the tip of uncal processes. Ampulla not protruded beyond the dorsal process of harpe. Harpe right-angled at lower posterior angle, with dorsal process reaching dorsal margin of ampulla, very broad and serrate at tip. Phallus nearly 1.4 times as long as valva, broader than in other species, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbous ejaculatorius nearer to zone than to cephalic end. Caudal end of phallus broadly and densely spined at both lateral wall and ridge, with left branch as long as right branch.

2. *Caltoris sirius chimdroa* (EVANS, 1926). Holotype ♂, Chimdro valley (now Motuo), Southeast Tibet. (Figs. 27-30, 62, 87s, 88s.)

Specimens examined: 2 ♂♂ (CHH), Motuo, Southeast Tibet.

Distribution: Southeast Tibet (Motuo).

Important characters: Length of forewing: 17 mm. Antenna with 16 dark brown nude antennomeres. Ciliae of both wings gray. Hairy discal area on upperside of hindwing greenish brown. Cell spots of forewing separated, with the upper cell spot minute and beyond the lower cell spot, sometimes absent. Saccus nearly 1/3 times as long as height of ring. Uncal lobes nearly upright and hooked towards caudal end of uncus. Uncal processes very short and obtuse at tip. Gnathos obtuse at tip. Ampulla protruded weakly, as far as the caudal end of harpe. Harpe rounded at lower posterior angle, with dorsal process well below ampulla, very short and smooth at tip. Phallus nearly 1,7 times as long as valva, thinner than in other species, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius markedly nearer to zone than to cephalic end. Caudal end of phallus with lateral branches strongly protruded as a pair of free processes, densely and heavily spined at both lateral wall and ridge, with left branch as long as right branch.

3. *Caltoris cahira austeni* (MOORE, [1884]). Type ♂, Khasias, Assam [photos examined]. (Figs. 9, 10, 33-48, 63-68, 70, 87c1-c5, 88c1-c5.) = *Caltoris cahira carina* (EVANS, 1937) **syn.nov.** Type ♂, Siao Lou, Sichuan [photos examined] (figs. 11, 12).

= *Caltoris cahira confuciana* (EVANS, 1937). Type ♂, Omeishan, Sichuan. Synonymised by EVANS (1949).

Specimens examined: 14 ♂♂, 1 ♀ (IZAS, CHH), Sichuan; 3 ♂♂ (IZAS), Guangxi; 2 ♂♂ (IZAS), Fujian; 5 ♂♂ (IZAS), Hainan; 1 ♂ (CHH), Nujiang, Northwest Yunnan; 3 ♂♂ (IZAS), Guangxi; 1 ♂ (IZAS), Gengma, South Yunnan.

Distribution: Sichuan, Yunnan, Guangxi, Guangdong, Hainan, Fujian, Hubei; Sikkim, Northeast India, Burma, Thailand, Laos, North and Central Vietnam, Malaya.

Important characters: Length of forewing: 16,5-19 mm. Antenna with 15-16 dark brown nude antennomeres. Ciliae of both wings pale grayish yellow. Hairy area on upperside of hindwing greenish brown. Cell spots of forewing separated, with the upper cell spot minute and beyond the lower cell spot, sometimes absent. Pale spot in space 1b usually absent, occasionally present. Saccus nearly 1/3 times as long as height of ring. Uncal lobes oblique and angled at dorsal tip. Uncal processes moderate in length and obtuse at tip. Gnathos obtuse at tip. Ampulla protruded strongly, as far as the caudal end of harpe. Harpe acutely angled at lower posterior angle, with dorsal process smooth at tip, very variable individually in width and length (figs. 63-68). Phallus nearly 1,4 times as long as valva, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius only a little nearer to zone than to cephalic end. Caudal end of phallus broadly and densely spined at lateral wall but not at ridge, with left branch nearly as long as right branch.

Taxonomic notes: *Caltoris cahira carina* (EVANS, 1949) was described as to be paler and larger than *C. cahira austeni* (MOORE), with a tendency for the upper cell spot to be absent and more rarely the apical and upper discal spot. *C. cahira carina* (EVANS) was originally described from West Sichuan and recorded by EVANS (1949) also from Fujian, Hubei and Yunnan. *Caltoris cahira austeni* (MOORE) was originally described from Khasias, Northeast India and recorded by EVANS (1949) also from Guangdong, Hainan, Sikkim, Assam, Burma, Siam, Indo-China and Malaya. However, as illustrated in this paper, the type specimens of *C. cahira austeni* (MOORE) and *C. cahira carina* (EVANS) are hardly distinguishable from each other. Even in such a small collection examined by the author from China, the upper cell spot, the apical and upper discal spot of forewing are always well marked in most specimens from Sichuan and all specimens from Fujian, not smaller or fewer than in specimens from Hainan or type specimen of *C. cahira austeni* (MOORE) from India. The specimens from Hainan (figs. 33, 34, 37, 38) usually have ground colour much darker than in type specimen of *C. cahira austeni* (MOORE) from India, thus could be regarded as a further subspecies in accordance with the EVANS' (1949) standard for subspecific rank. The specimens from Guangxi include both the very dark form (figs. 41, 42) and the moderate dark form (fig. 48), the specimens from Sichuan include both the moderate dark form (figs. 35, 36) and the pale form (figs. 39, 40). One specimen from Nujiang, Northwest Yunnan belongs to the very dark form (fig. 44). Therefore it is impossible to draw a geographical line to separate these forms into two subspecies. Among the specimens from Sichuan, those from higher area around the Gonggashan Mountains and Baoping sometimes have spots of forewing smaller or fewer, however those from lower area around the Qingchengshan Mountains are all in normal form as well as the specimens from other provinces in China. It is not reasonable to regard only the populations from higher area of Sichuan as a separate subspecies. In conclusion *C. cahira carina* (EVANS) **syn.nov.** is considered as a junior synonym of *C. cahira austeni* (MOORE).

4. *Caltoris bromus bromus* LEECH, 1893. Holotype ♀, Chia-Kou-Ho (now Jin-kou-he), Sichuan [photos examined]. (Figs. 15, 16, 49-52, 57-59, 87b1-b3, 88b1-b2)

Specimens examined: 3 ♂♂ (IZAS), Guanxian, Sichuan; 1 ♂ (IZAS), Yunnan; 1 ♂ (CHH), Banna, South Yunnan; 2 ♂♂ (IZAS), Fujian.

Distribution: Sichuan, Yunnan, Fujian, Zhejiang, Hong Kong; Northeast India, Burma, Laos, Vietnam, Thailand, Malaya, Sumatra, Java, Borneo, Celebes.

Important characters: Length of forewing: 18-20 mm. Antenna with 15-16 dark brown nude antennomeres. Ciliae of both wings from pale grayish yellow to dark brownish gray. Spot in space 1b usually present, sometimes absent. Saccus nearly 1/3 times as long as height of ring. Uncal lobes oblique and obtuse at tip. Uncal processes moderate in length and expanded laterally at tip. Gnathos obtuse and expanded laterally at tip. Ampulla elongate, protruded well beyond the caudal end of harpe. Harpe rounded at lower posterior angle, with dorsal process short and smooth at tip. Phallus nearly 1.5 times as long as valva, with subzonal sheath nearly 2,5 times as long as suprazonal sheath. Opening of bulbus ejaculatorius only a little nearer to zone than to cephalic end. Caudal end of phallus broadly and sparsely spined at both ridge and lateral wall, with left branch shorter than right branch.

Notes: Besides the ♂ and ♀ genital characters in the key, *C. b. bromus* LEECH sometimes can be distinguished from *C. cahira austeni* (MOORE) by the following external characters: 1) underside of hindwing sometimes with a non-hyaline spot in space 2 and sometimes in space 3 also; 2) forewing sometimes with three subapical spots whereas that of *C. cahira austeni* (MOORE) usually with two subapical spots. The larval host of *C. b. bromus* LEECH was established by YOUNG (2001) as *Phragmites karka* (Poaceae) in Hong Kong; according to HSU & WANG (2004), the larval host of *C. b. yanuca* FRUHST. was *Phragmites vallatoria*, a reed widespread in freshwater wetlands. The immature stages of *C. b. yanuca* FRUHST. were fully described by HSU & WANG (2004).

5. *Caltoris kumara moorei* (EVANS, 1926). Type ♂, Sikkim [photos examined]. (Figs. 5, 6, 31, 32, 61, 69, 87k1-k2, 88k1-k2.)

Specimens examined: 2 ♂♂ (CHH), Banna, South Yunnan.

Distribution: South Yunnan; Sikkim, India (Assam), Burma, Laos, North & Central Vietnam.

Important characters: Length of forewing: 18 mm. Antenna with 16 black nudum antennomeres. Ciliae of both wings pale grayish

yellow. Hairs on hindwing greenish brown. Cell spots of forewing totally absent. Saccus nearly 1/3 times as long as height of ring. Uncal lobes oblique and angled at dorsal tip. Uncal processes rather long and hooked downwards at tip. Gnathos pointed and hooked upwards at tip. Ampulla protruded moderately, as far as the caudal end of harpe. Harpe rounded at lower posterior angle, with dorsal process slender and smooth at tip. Phallus nearly 1.4 times as long as valva, slenderer than in other species, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius only a little nearer to zone than to cephalic end. Caudal end of phallus narrowly and sparsely serrate at lateral walls but not as ridges, with left branch a little shorter than right branch.

6. *Caltoris tulsii tulsii* (DE NICEVILLE, 1883). Type ♂, Sikkim.

Specimens examined: none.

Distribution: Yunnan; Bhutan, Sikkim, Northeast India, Burma, Thailand, Malaya, Laos, North & Central Vietnam.

This species is well characterized by the glossed pale purple basal area on underside of hindwing. The first record of this species for Chinese fauna was made by EVANS (1949), who recorded one pair from Yunnan. LEE (1962) also recorded this species in his list of collection made by the Academia Sinica Expeditions to Yunnan, but I failed to locate any specimen of this species in IZAS.

7. *Caltoris septentrionalis* KOIWAYA, 1996. Holotype ♂, Shaanxi. (Figs. 21-24, 70, 87se, 88se.)

Specimens examined: 1 ♂ (CHH), Banfangzi, Zhouzhi, Shaanxi; 1 ♂ (IZAS), Hubei.

Distribution: Shaanxi, Hubei.

Important characters: Length of forewing: 20-20.5 mm. Antenna with 13 black nude antennomeres. Ciliae of both wings blackish gray. Hairs on hindwing blackish gray. Upperside of both wings black and unmarked. Underside of both wings marked with longitudinal black streaks between veins. Saccus nearly half as long as height of ring. Uncal lobes oblique and a little pointed dorsoanteriorly at tip. Uncal processes moderate in length and obtuse at tip. Gnathos obtuse at tip. Ampulla not protruded beyond the dorsal process of harpe. Harpe rounded at lower posterior angle, with dorsal process stout, broadly serrate at tip and reaching dorsal margin of ampulla. Phallus nearly 1.8 times as long as valva, with subzonal sheath twice as long as suprazonal sheath. Opening of bulbus ejaculatorius much nearer to zone than to cephalic end. Caudal end of phallus narrowly spined along lateral ridges. Cornuti weakly marked.

Baoris MOORE, [1881] (Type species: *Hesperia oceia* HEWITSON, [1868])

1. *Baoris pagana* (DE NICEVILLE, 1887). Type ♂, Sikkim (figs. 53-56, 71, 89pa).

Specimens examined: 1 ♂, 1 ♀ (IZAS), Motuo, Southeast Tibet.

Distribution: Southeast Tibet; Sikkim, India, Burma, North & Central Vietnam, Laos, Thailand, Borneo.

Important characters: Length of forewing ♂: 22 mm. Antenna with 15 black nude antennomeres. Ciliae of both wings orange-brown. Upperside of hindwing without black hair tuft in cell. Basal and discal area on upperside of hindwing densely clad with bright reddish brown hairs, much paler than submarginal area of hindwing. Cell spot of forewing double, conjoined and upright to costa of forewing. Underside of forewing without pale area and band near dorsum. Saccus very long, about 2/3 times as long as height of ring. Uncal lobes oblique to tegumen, pointed at tip and directed dorsoanteriorly. Length of forewing ♀: 23 mm. Antenna with 15 black nudum antennomeres. Wing-shape similar to that of ♂ but with dorsum of forewing longer and termen of forewing more convex. Orange ciliae restricted to tornal area of hindwing, leaving other ciliae brownish. Ground colour on both sides of both wings as in ♂. All pale spots of forewing similar to those of ♂, but a little bigger and closer to one another. An additional pale spot present in space 1b of forewing on upperside, a little inside of spot in space 2. Otherwise as in ♂.

2. *Baoris farri farri* (MOORE, 1878). Type ♀, Calcutta, India. (Figs. 72, 75, 77, 79, 82, 84, 86, 89f1-f7).

= *Baoris longistigmata* HUANG, 1999 **syn.nov.** Holotype ♂, Hekou, Southeast Yunnan [examined] (figs. 82, 89f7).

Specimens examined: 1 ♂ (IZAS, holotype of *Baoris longistigmata*), Hekou, Southeast Yunnan; 5 ♂♂ (CHH), Banna, South Yunnan; 3 ♂♂ (IZAS), Guangxi; 4 ♂♂ (IZAS), Hainan; 1 ♂ (IZAS), Wuhu, Anhui.

Distribution: Yunnan, Guangxi, Hainan, Anhui, Jiangxi, Hong Kong; India, Sikkim, Burma, Thailand, Laos, Vietnam, Malaya, Sumatra.

Important characters: Length of forewing: 19-20 mm. Antenna with 15-16 brown nude antennomeres. ♂ with band near dorsum on underside of forewing and with black hair brush and scent pouch in cell on upperside of hindwing. Upperside of forewing with cell spots. Underside of hindwing uniform dark brown, without superscaling. Saccus about 2/3 times as long as height of ring. Harpe of valva relatively longer, with a relatively larger distance between base of inner process and distal margin. Inner process of harpe weakly protruded basad and obtuse at tip. Dorsal process of harpe relatively less marked and obtuse at tip. Lower spine of harpe relatively longer and bent upwards. Phallus nearly twice as long as valva, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius a little nearer to cephalic end than to zone. Left terminal wall of phallus protruded as an elongate process and heavily spined. Right terminal wall of phallus broad and spined, with a terminal piece inserted into vesica and heavily serrate at end. Cornuti remarkable and in shape of hair tuft.

Taxonomic notes: The ♂ genital characters of the holotype of *B. longistigmata* HUANG, 1999 **syn.nov.** do not run out of the individual variations of *B. farri farri* (MOORE), thus the former is considered as a junior synonym of the latter.

3. *Baoris leechii* (ELWES & EDWARDS, 1897). Type ♂, Kiu Kiang (now Jiujiang, Jiangxi) (figs. 74, 76, 78, 80, 89i1-15).

Specimens examined: 5 ♂♂ (CHH, IZAS), Sichuan; 5 ♂♂, 3 ♀♀ (CHH), Zhejiang; 3 ♂♂ (CHH), Anhui; 3 ♂♂ (CHH), Fujian.

Distribution: Sichuan, Zhejiang, Anhui, Fujian, Jiangxi, Shanghai, Shaanxi, Hunan.

Important characters: Length of forewing: 18-19 mm. Antenna with 15 brown nude antennomeres. ♂ with band near dorsum on underside of forewing and with black hair brush and scent pouch in cell on upperside of hindwing. Upperside of forewing with cell spots. Underside of hindwing densely powdered with yellowish brown scales. Saccus about 2/3 times as long as height of ring. Harpe of valva relatively shorter, with a relatively smaller distance between base of inner process and distal margin. Inner process of harpe markedly protruded basad. Dorsal process of harpe a little pointed. Lower spine of harpe relatively shorter. Phallus nearly twice as long as valva, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius markedly nearer to cephalic end than to zone. Left terminal wall of phallus protruded as an elongate process and densely spined. Right terminal wall of phallus broad and spined, with a terminal piece inserted into vesica and serrate at end. Cornuti obsolete.

Notes: This species is nearly sympatric with *B. farri* (MOORE) in Anhui province of China.

4. *Baoris penicillata chapmani* EVANS, 1937. Type ♂, Thaungyin, Burma (figs. 73, 81, 83, 85, 89p1-p3).

Specimens examined: 4 ♂♂ (IZAS), Hainan.

Distribution: Hainan; Northeast India, Burma, Thailand, Laos, Vietnam, Malaya.

Important characters: Length of forewing: 18-19 mm. Antenna with 15-16 brown nude antennomeres. ♂ with brand near dorsum on underside of forewing and with black hair brush and scent pouch in cell on upperside of hindwing. Upperside of forewing without cell spots. Underside of hindwing uniform dark brown, without superscaling. Saccus about half as long as height of ring. Harpe of valva relatively longer, with a relatively larger distance between base of inner process and distal margin. Inner process of harpe pointed basad at an acute angle. Dorsal process of harpe pointed dorsoanteriorly at an acute angle. Lower spine of harpe straight and relatively longer. Phallus nearly 1.7 times as long as valva, with subzonal sheath nearly twice as long as suprazonal sheath. Opening of bulbus ejaculatorius markedly nearer to cephalic end than to zone. Left terminal wall of phallus broad and spined but not protruded into an elongate process. Right terminal wall of phallus broad and unspined, without a terminal piece inserted into vesica. Cornuti remarkable and in shape of hair tuft.

Acknowledgements: I wish to express my thanks to Mr. G. C. BOZANO, Italy, who helped to take photographs of type specimens in BMNH, and to Mr. P. ACKERY, UK, who allowed me to use these photos for research and publication. My thanks are also due to Dr. CHUN-SHENG WU, Beijing, who allowed me to examine some specimens preserved in IZAS.

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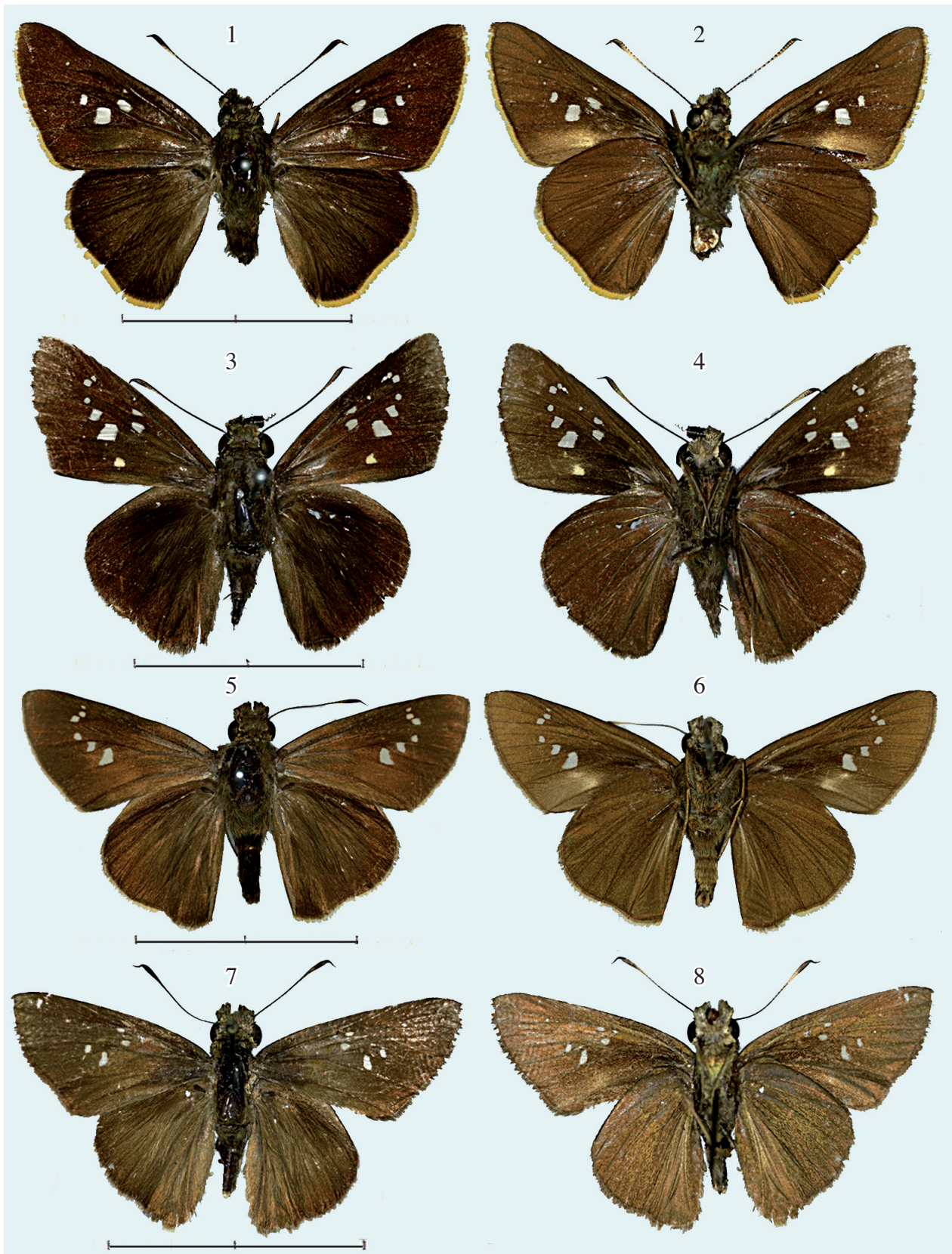


Fig. 1, 2: *Caltoris aurociliata* (ELWES & EDWARDS, 1897), type ♂, Sikkim, dorsal and ventral view.
 Fig. 3, 4: *Caltoris sirius sirius* (EVANS, 1926), type ♂, Karen, dorsal and ventral view.
 Fig. 5, 6: *Caltoris kumara moorei* (EVANS, 1926), type ♂, Sikkim, dorsal and ventral view.
 Fig. 7, 8: *Caltoris tenuis* (EVANS, 1932), type ♂, Ataran, Burma, dorsal and ventral view.



Fig. 9, 10: *Caltoris cahira austeni* (MOORE, [1884]), type ♂, Khasias, dorsal and ventral view.
 Fig. 11, 12: *Caltoris cahira carina* (EVANS, 1949), type ♂, Siao Lou, dorsal and ventral view.
 Fig. 13, 14: *Caltoris cahira cahira* (MOORE, 1877), type ♂, Andamans, dorsal and ventral view.
 Fig. 15, 16: *Caltoris bromus* LEECH, 1893, type ♀, Chia Kou Ho, dorsal and ventral view.

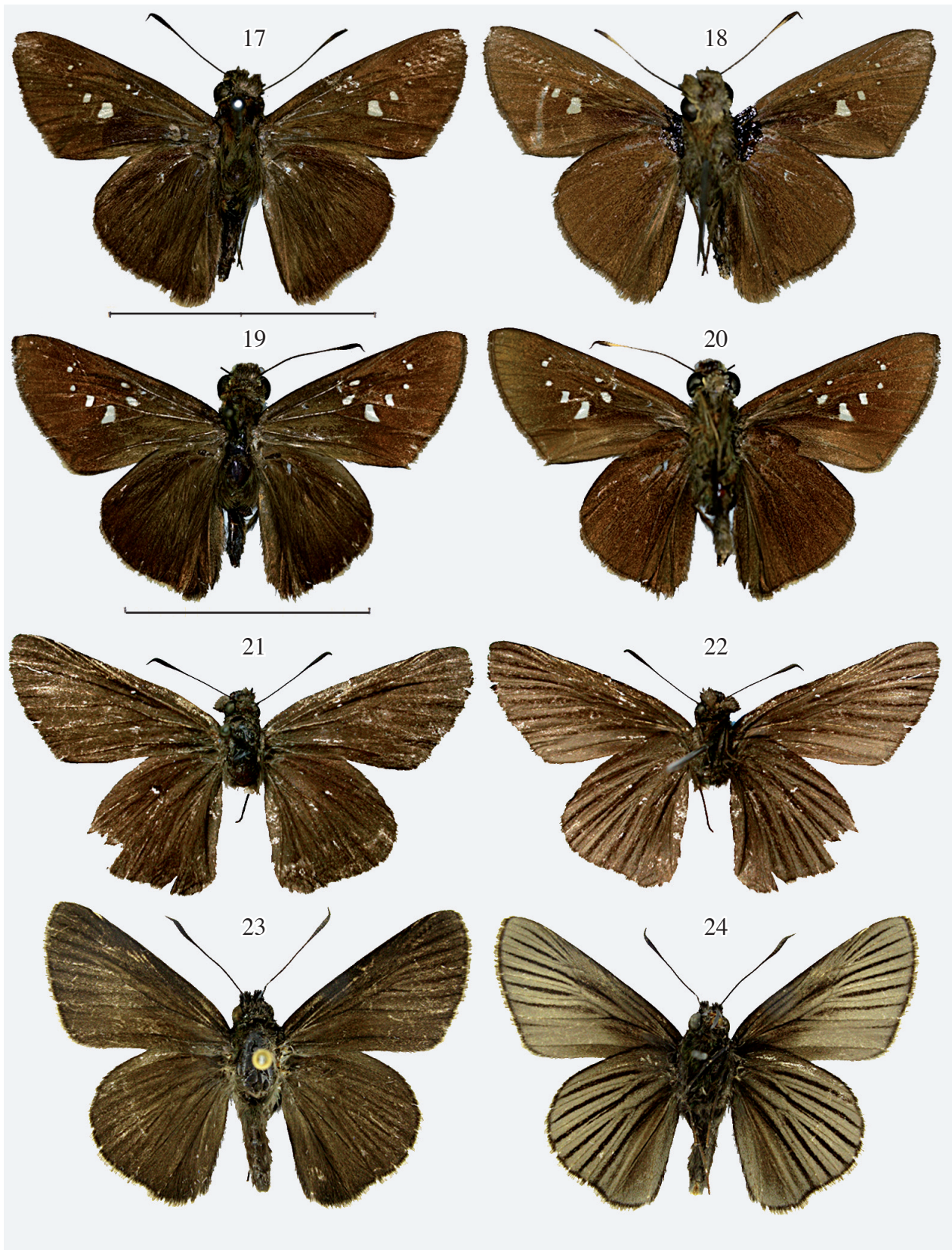


Fig. 17, 18: *Caltoris aurociliata* (ELWES & EDWARDS, 1897), type ♂, Mergui, dorsal and ventral view.
 Fig. 19, 20: *Caltoris confusa* (EVANS, 1932), dorsal view, male type, Ataran, Burma, dorsal and ventral view.
 Fig. 21, 22: *Caltoris septentrionalis* KOIWAYA, 1996, ♀, Xingshan, Hubei, dorsal and ventral view.
 Fig. 23, 24: *Caltoris septentrionalis* KOIWAYA, 1996, ♂, Qinling, Shaanxi, dorsal and ventral view.

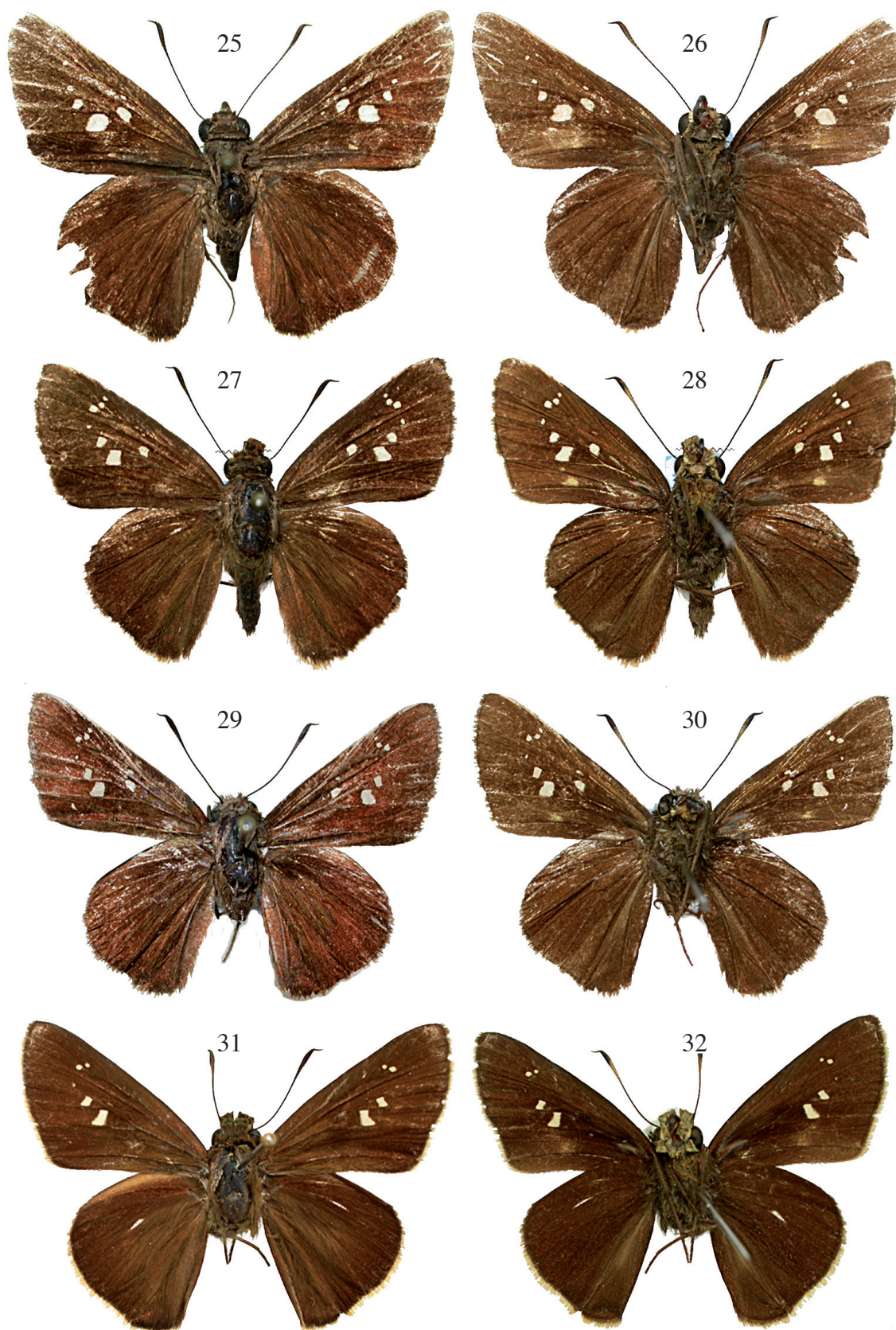


Fig. 25, 26: *Caltoris aurociliata* (ELWES & EDWARDS, 1897), ♂, Motuo, Tibet, dorsal and ventral view.
 Fig. 27, 28: *Caltoris sirius chindroa* (EVANS, 1926), ♂, Motuo, Tibet, dorsal and ventral view.
 Fig. 29, 30: *Caltoris sirius chindroa* (EVANS, 1926), ♂, Motuo, Tibet, dorsal and ventral view.
 Fig. 31, 32: *Caltoris kumara moorei* (EVANS, 1926), ♂, Banna, Yunnan, dorsal and ventral view.

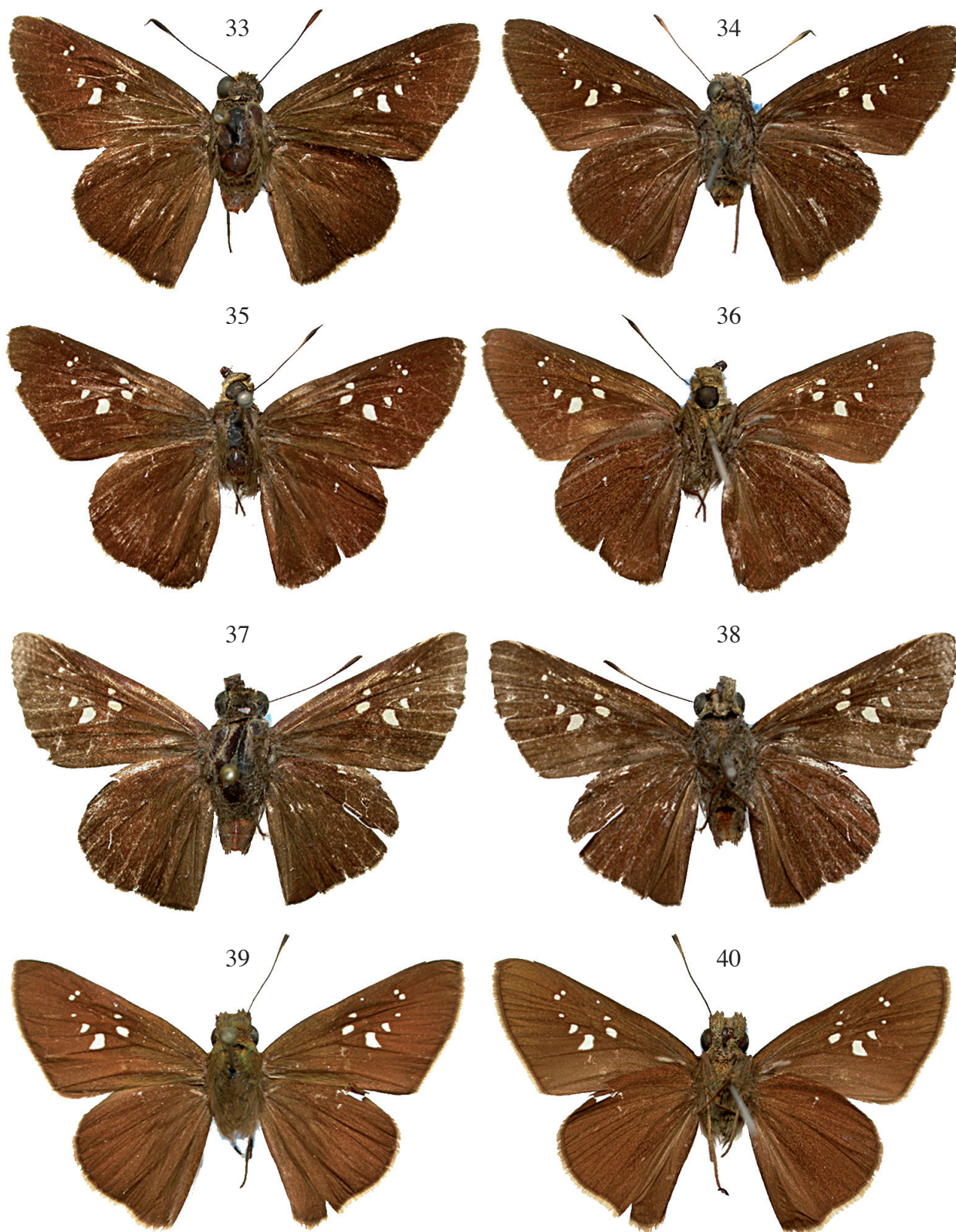


Fig. 33, 34: *Caltoris cahira austeni* (MOORE, [1884]), ♂, Hainan, dorsal and ventral view.
 Fig. 35, 36: *Caltoris cahira austeni* (MOORE, [1884]), ♂, Qingchengshan, Sichuan, dorsal and ventral view.
 Fig. 37, 38: *Caltoris cahira austeni* (MOORE, [1884]), ♂, Hainan, dorsal and ventral view.
 Fig. 39, 40: *Caltoris cahira austeni* (MOORE, [1884]), ♂, Qingchengshan, Sichuan, dorsal and ventral view.

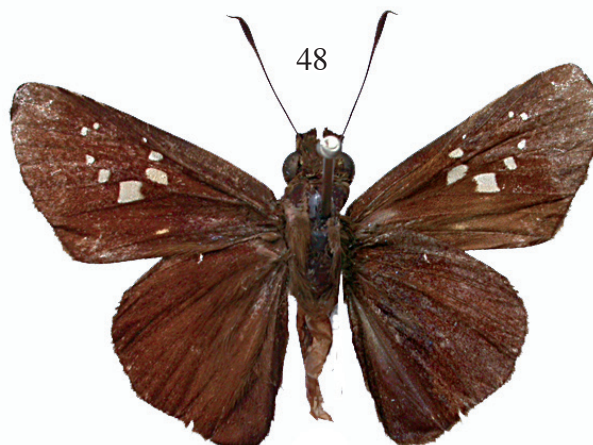
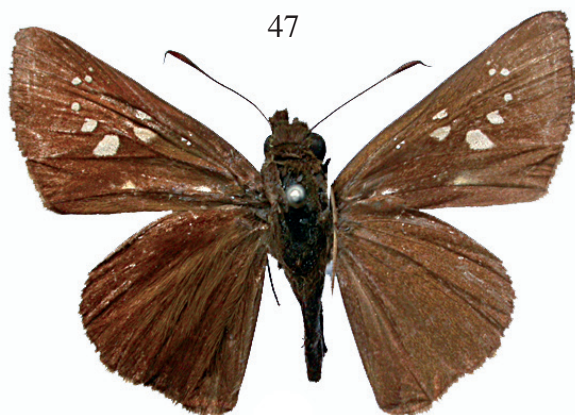
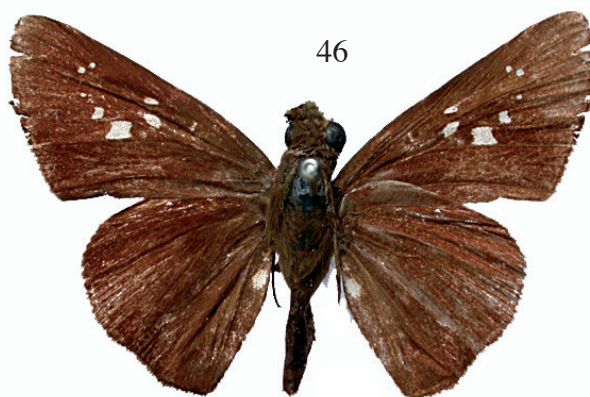
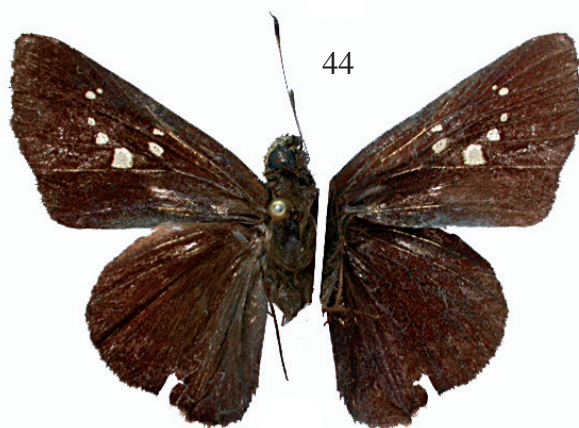
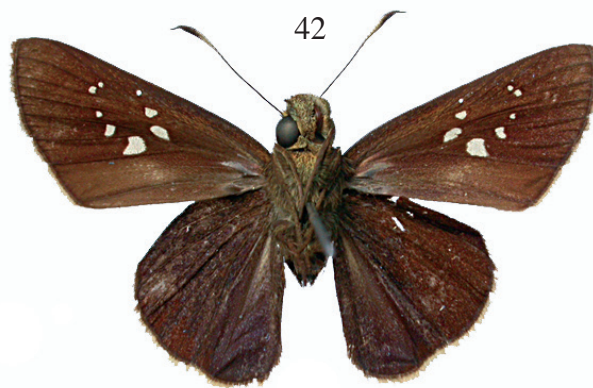
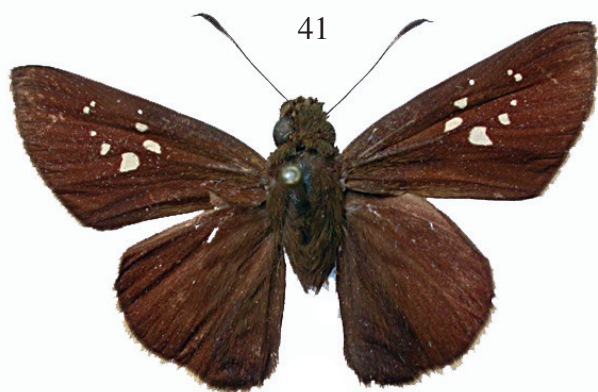


Fig. 41-48: *Caltoris cahira austeni* (MOORE, [1884])

Fig. 41, 42: ♂, Guangxi, dorsal and ventral view.

Fig. 43: ♂, Gengma, South Yunnan, dorsal and ventral view.

Fig. 44: ♂, Nujiang, Yunnan, dorsal and ventral view.

Fig. 45: ♂, Fujian, dorsal and ventral view.

Fig. 46: ♂, Fujian, dorsal and ventral view.

Fig. 47: ♂, Sichuan, dorsal and ventral view.

Fig. 48: ♂, Guangxi, dorsal and ventral view.

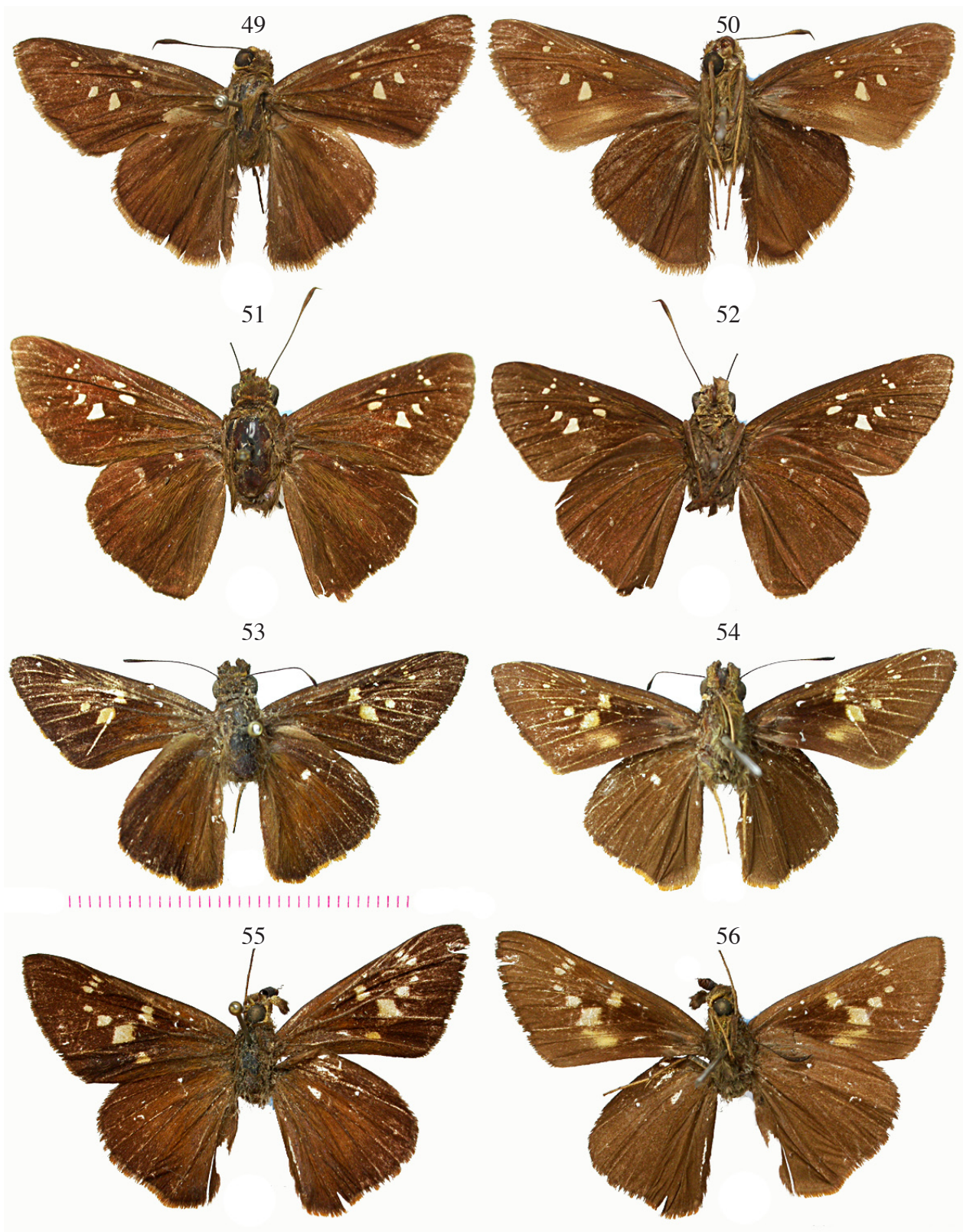


Fig. 49, 50: *Caltoris bromus bromus* LEECH, 1893, ♂, Fujian, dorsal and ventral view.

Fig. 51, 52: *Caltoris bromus bromus* LEECH, 1893, ♂, Banna, South Yunnan, dorsal and ventral view.

Fig. 53, 54: *Baoris pagana* (DE NICEVILLE, 1887), ♂, Motuo, Tibet, dorsal and ventral view.

Fig. 55, 56: *Baoris pagana* (DE NICEVILLE, 1887), ♀, Motuo, Tibet, dorsal and ventral view.

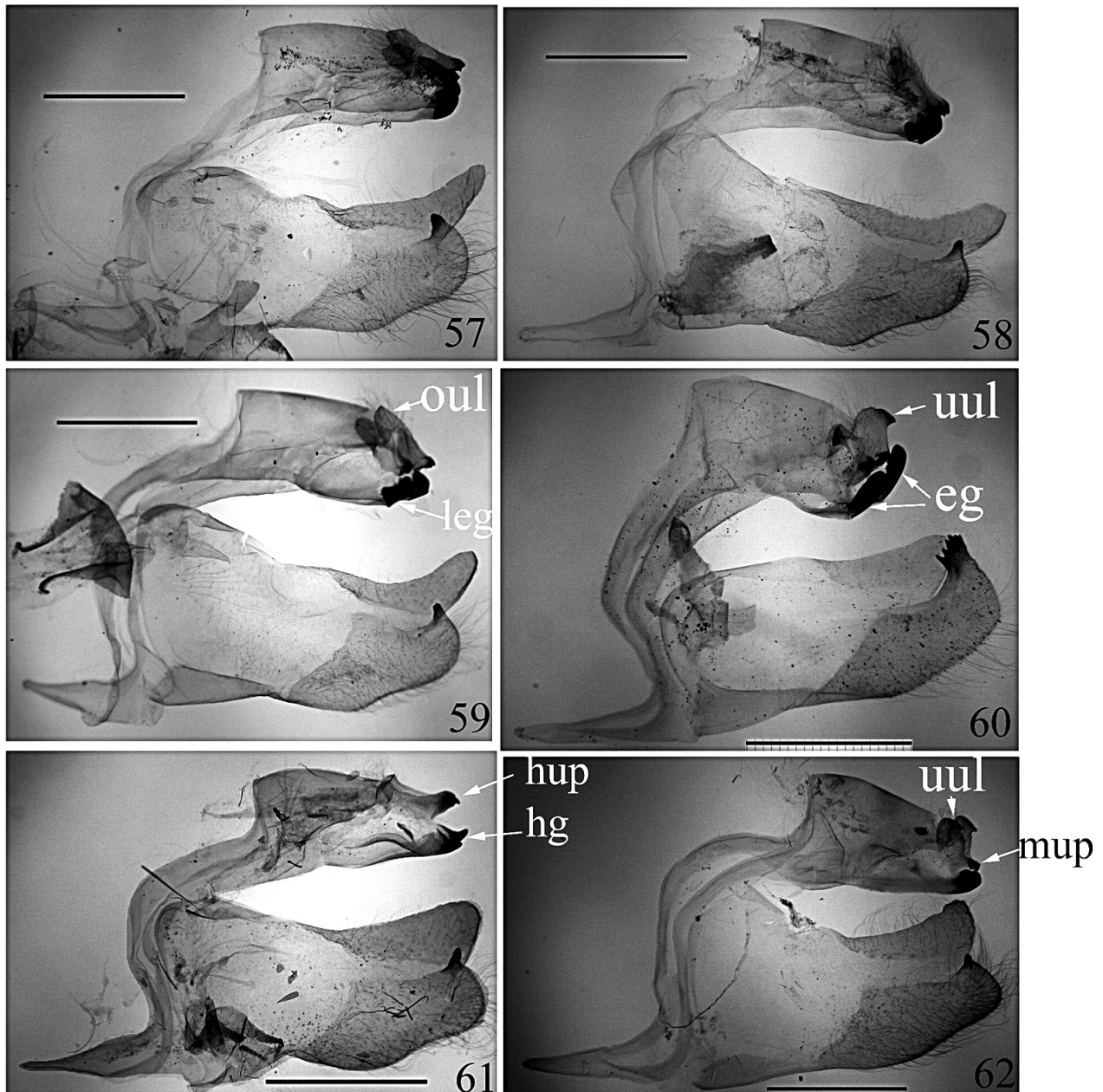


Fig. 57-62: ♂ genitalia of *Caltoris* in lateral view with left valva and phallus removed.

Fig. 57: *Caltoris bromus bromus* LEECH, 1893, Banna, South Yunnan.

Fig. 58: *Caltoris bromus bromus* LEECH, 1893, Fujian.

Fig. 59: *Caltoris bromus bromus* LEECH, 1893, Sichuan.

Fig. 60: *Caltoris aurociliata* (ELWES & EDWARDS, 1897), Motuo, Tibet.

Fig. 61: *Caltoris kumara moorei* (EVANS, 1926), Banna, South Yunnan.

Fig. 62: *Caltoris sirius chindroa* (EVANS, 1926), Motuo, Tibet.

Abbreviations: oul - oblique uncal lobe; leg - laterally expanded gnathos; uul - upright uncal lobe; eg - elongate gnathos; hup - hooked uncal process; hg - hooked gnathos; mup - minute uncal process.

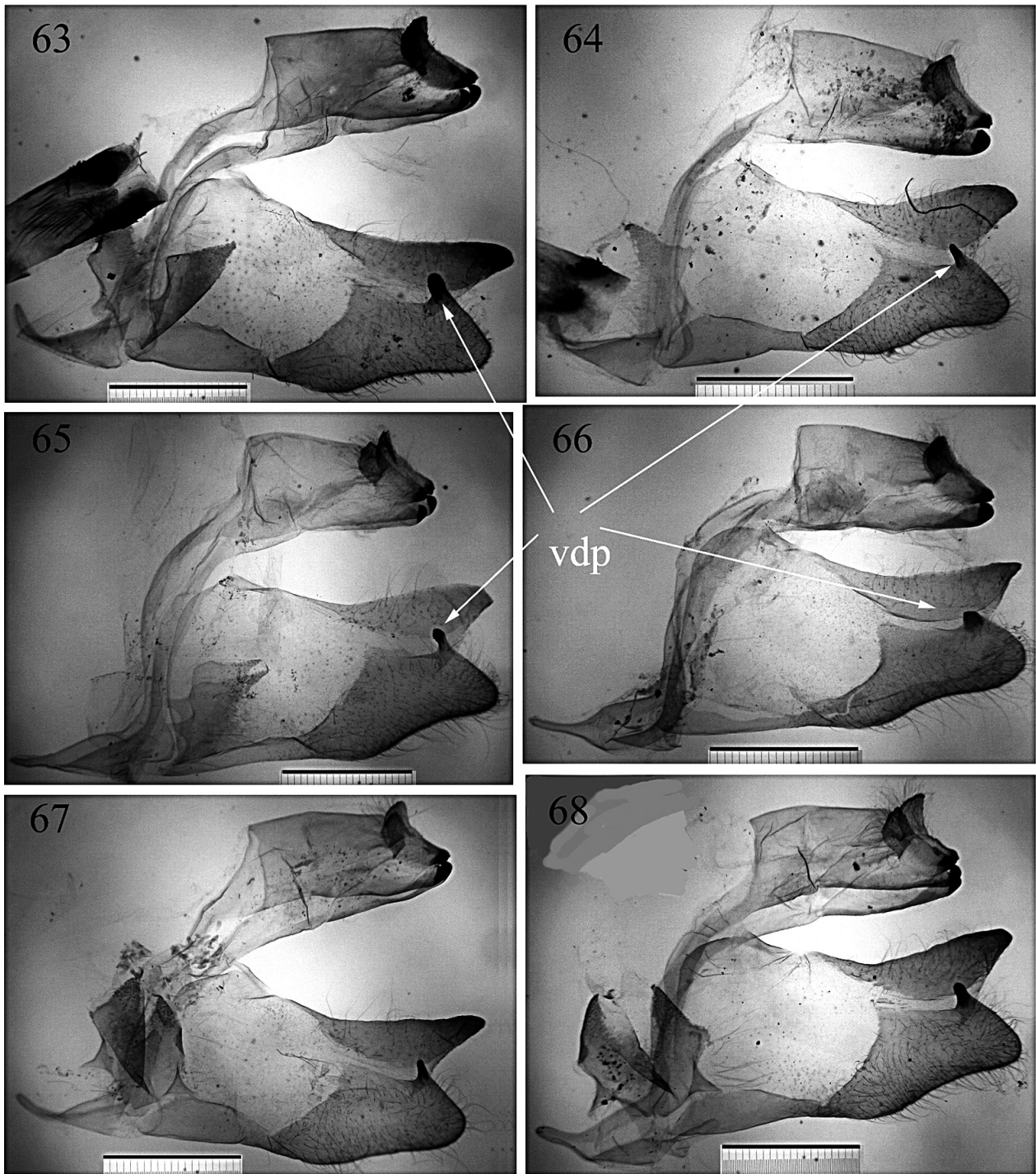


Fig. 63-68: ♂ genitalia of *Caltoris* in lateral view with left valva and phallus removed.

Fig. 63: *Caltoris cahira austeni* (MOORE, [1884]), Hainan;

Fig. 64: *Caltoris cahira austeni* (MOORE, [1884]), Guangxi;

Fig. 65: *Caltoris cahira austeni* (MOORE, [1884]), Fujian;

Fig. 66: *Caltoris cahira austeni* (MOORE, [1884]), Guangxi;

Fig. 67: *Caltoris cahira austeni* (MOORE, [1884]), Qingchengshan, Sichuan;

Fig. 68: *Caltoris cahira austeni* (MOORE, [1884]), Hainan.

Abbreviations: vdp - variable dorsal process of harpe.

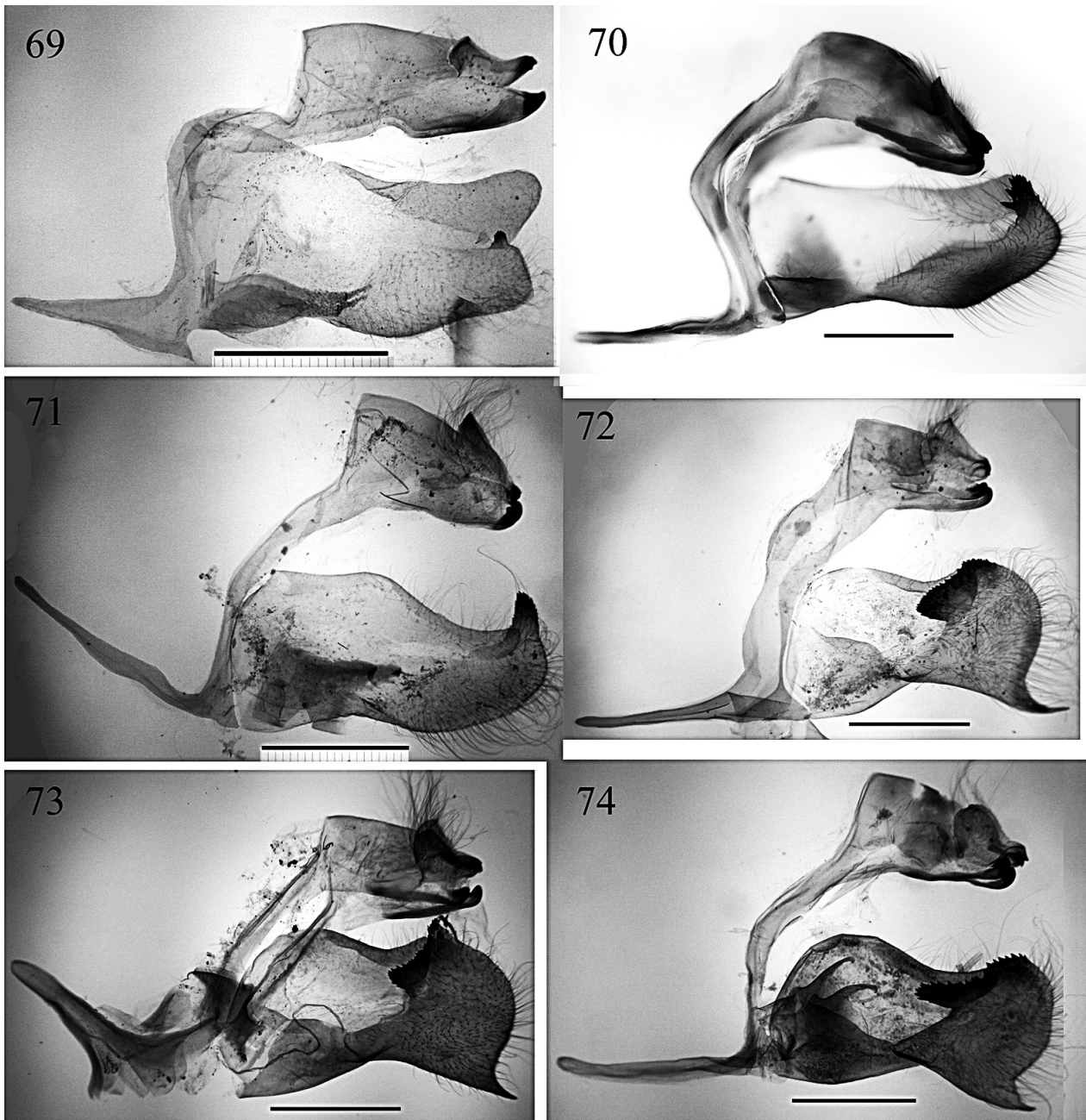


Fig. 69-74: ♂ genitalia of *Caltoris* and *Baoris* in lateral view with left valva and phallus removed.

Fig. 69: *Caltoris kumara moorei* (EVANS, 1926), Banna, South Yunnan.

Fig. 70: *Caltoris septentrionalis* KOIWAYA, 1996, Shaanxi.

Fig. 71: *Baoris pagana* (DE NICEVILLE, 1887), Motuo, Tibet.

Fig. 72: *Baoris farri farri* (MOORE, 1878), Hainan.

Fig. 73: *Baoris penicillata chapmani* EVANS, 1937, Hainan.

Fig. 74: *Baoris leechii* (ELWES & EDWARDS, 1897), Anhui.

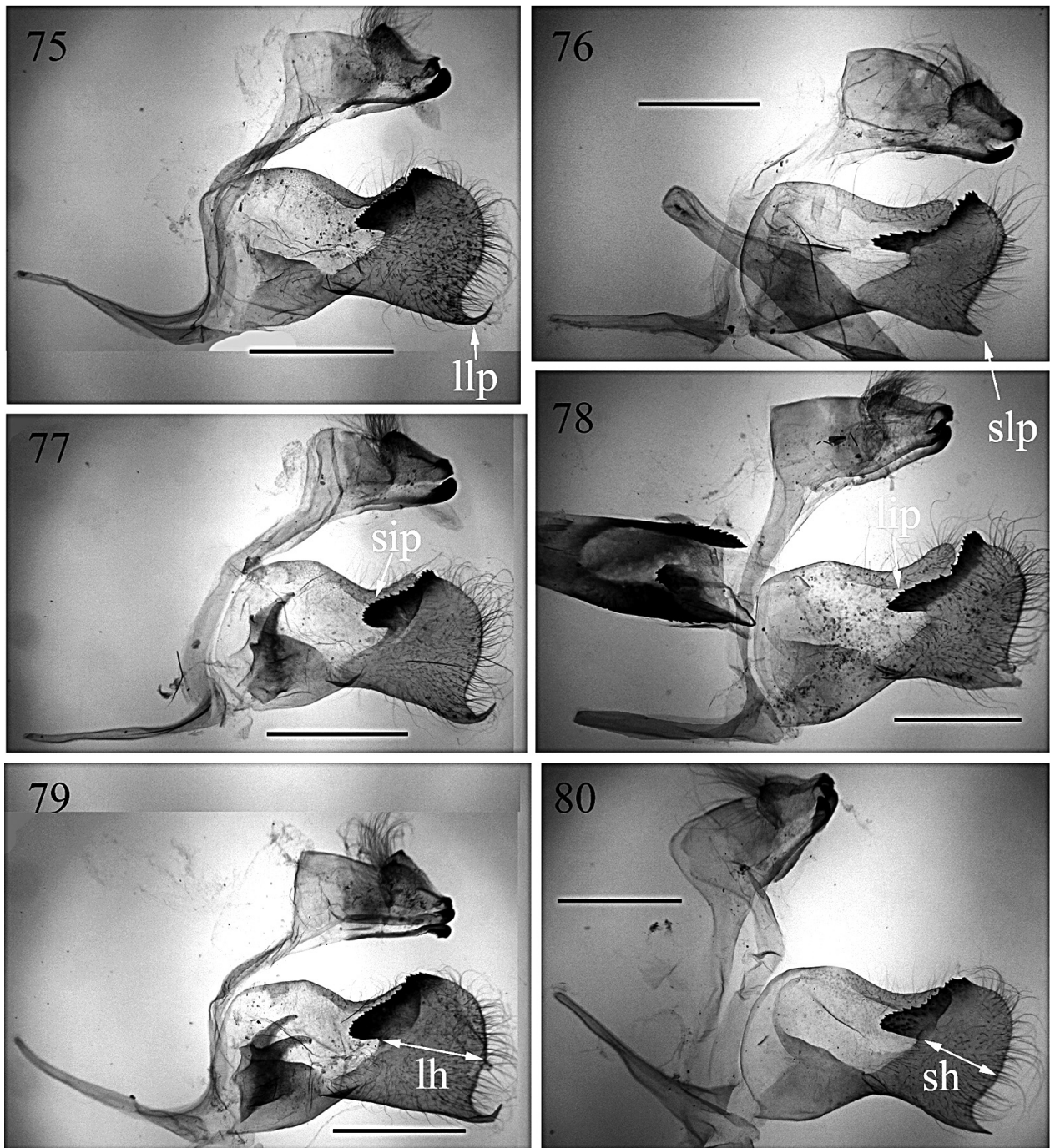


Fig. 75-80: ♂ genitalia of *Baoris* in lateral view with left valva and phallus removed.

Fig. 75: *Baoris farri farri* (MOORE, 1878), Banna, South Yunnan.

Fig. 76: *Baoris leechii* (ELWES & EDWARDS, 1897), Qingchengshan, Sichuan.

Fig. 77: *Baoris farri farri* (MOORE, 1878), Banna, South Yunnan.

Fig. 78: *Baoris leechii* (ELWES & EDWARDS, 1897), Qingchengshan, Sichuan.

Fig. 79: *Baoris farri farri* (MOORE, 1878), Banna, South Yunnan.

Fig. 80: *Baoris leechii* (ELWES & EDWARDS, 1897), Fujian.

Abbreviations: llp - longer lower process of harpe; sip - shorter inner process of harpe; slp - shorter lower process of harpe; lip - longer inner process of harpe; lh - longer harpe; sh - shorter harpe.



Fig. 81-86: ♂ genitalia of *Baoris* in lateral view with left valva and phallus removed.

Fig. 81: *Baoris penicillata chapmani* EVANS, 1937, Hainan.

Fig. 82: *Baoris farri farri* (MOORE, 1878), Hekou, South Yunnan (holotype of *Baoris longistigmata* HUANG, 1999).

Fig. 83: *Baoris penicillata chapmani* EVANS, 1937, Hainan.

Fig. 84: *Baoris farri farri* (MOORE, 1878), Wuhu, Anhui.

Fig. 85: *Baoris penicillata chapmani* EVANS, 1937, Hainan.

Fig. 86: *Baoris farri farri* (MOORE, 1878), South Yunnan.

Abbreviations: ss - shorter saccus; pdp - pointed dorsal process of harpe; cm - concaved inner margin of harpe; pip - pointed inner process of harpe; ls - longer saccus; rdp - rounded dorsal process of harpe; scm - slightly concaved inner margin of harpe; oip - obtuse inner process of harpe.

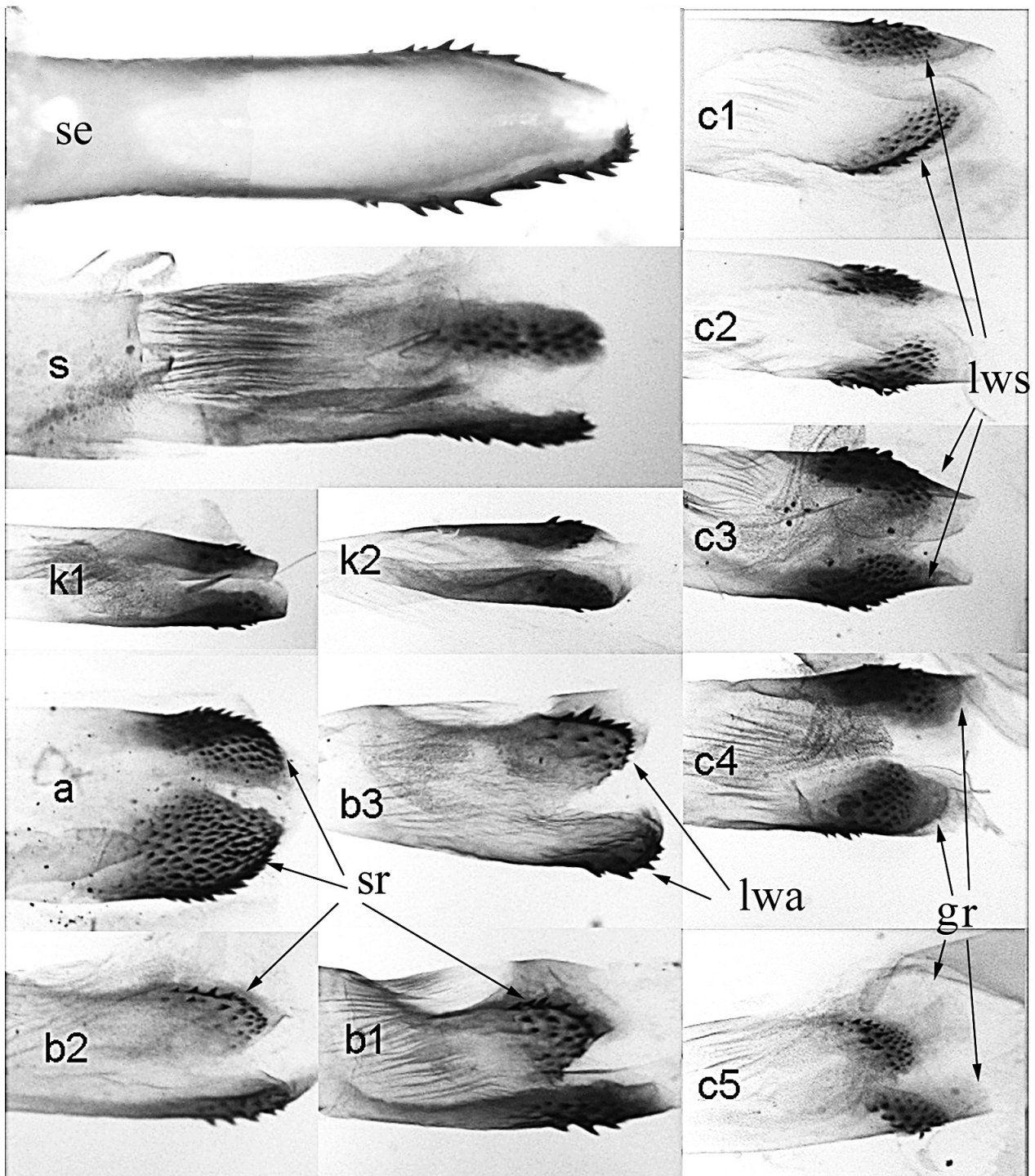


Fig. 87: Tip of phallus of *Baoris* and *Caltoris* in ventral view.

se - *Caltoris septentrionalis* KOIWAYA, 1996, Shaanxi.

s - *Caltoris sirius chimdroa* (EVANS, 1926), Motuo.

k1 - *Caltoris kumara moorei* (EVANS, 1926), Banna.

k2 - *Caltoris kumara moorei* (EVANS, 1926), Banna.

a - *Caltoris aurociliata* (ELWES & EDWARDS, 1897), Motuo.

b1 - *Caltoris bromus bromus* LEECH, 1893, Sichuan.

b2 - *Caltoris bromus bromus* LEECH, 1893, Fujian.

b3 - *Caltoris bromus bromus* LEECH, 1893, Banna.

c1 - *Caltoris cahira austeni* (MOORE, [1884]), Guangxi.

c2 - *Caltoris cahira austeni* (MOORE, [1884]), Fujian.

c3 - *Caltoris cahira austeni* (MOORE, [1884]), Hainan.

c4 - *Caltoris cahira austeni* (MOORE, [1884]), Hainan.

c5 - *Caltoris cahira austeni* (MOORE, [1884]), Guangxi.

Abbreviations: sr - serrate ridge; lwa - lateral walls asymmetric in length; lws - lateral walls symmetric in length; gr - glabrous ridge.

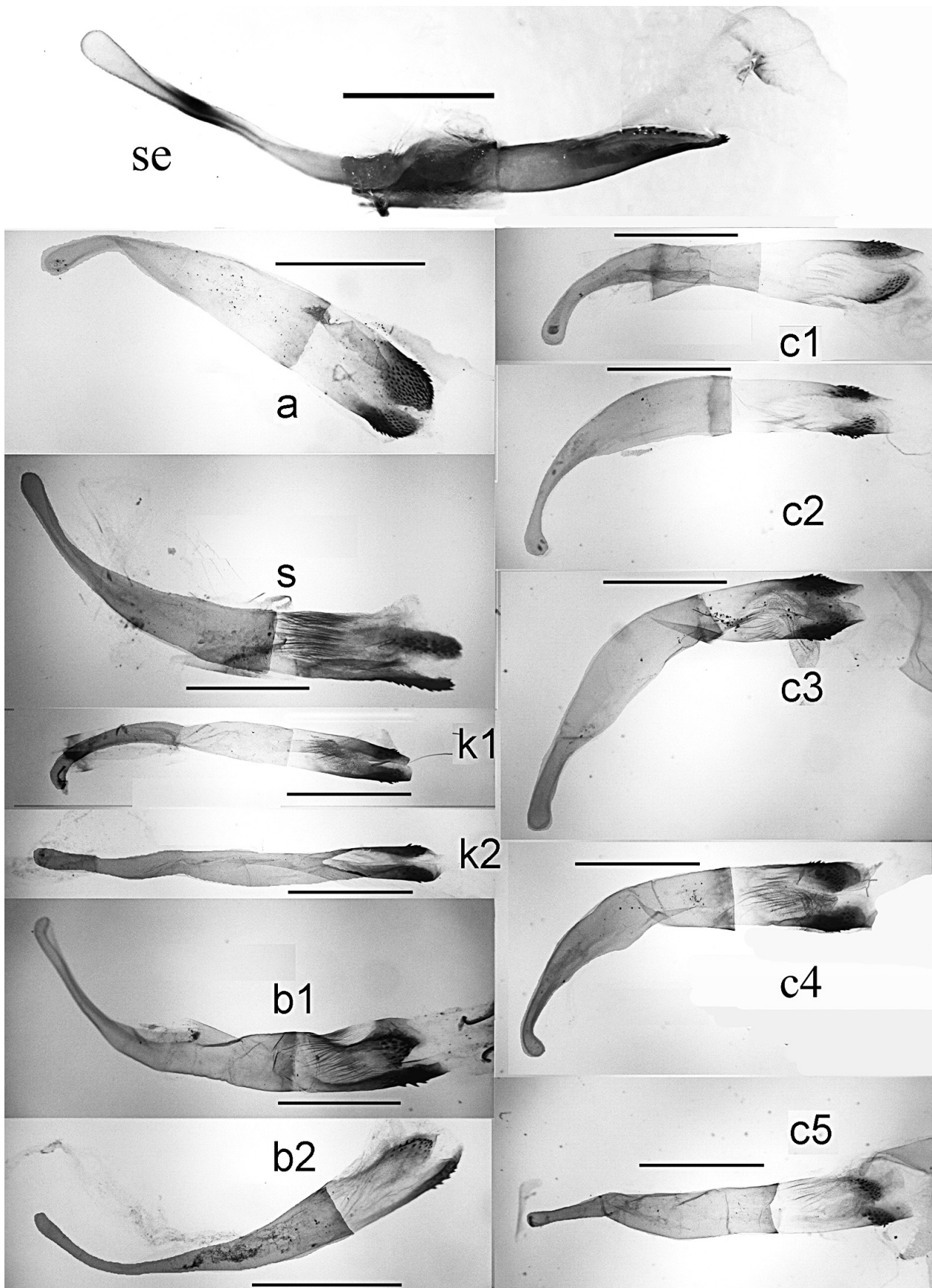


Fig 88: Phallus of *Caltoris*, mostly flattened in ventral view (scale = 1mm).

se - *Caltoris septentrionalis* KOIWAYA, 1996, Shaanxi.

a - *Caltoris aurociliata* (ELWES & EDWARDS, 1897), Motuo.

s - *Caltoris sirius chimdroa* (EVANS, 1926), Motuo.

k1 - *Caltoris kumara moorei* (EVANS, 1926), Banna.

k2 - *Caltoris kumara moorei* (EVANS, 1926), Banna.

b1 - *Caltoris bromus bromus* LEECH, 1893, Sichuan.

b2 - *Caltoris bromus bromus* LEECH, 1893, Fujian.

c1 - *Caltoris cahira austeni* (MOORE, [1884]), Guangxi.

c2 - *Caltoris cahira austeni* (MOORE, [1884]), Fujian.

c3 - *Caltoris cahira austeni* (MOORE, [1884]), Hainan.

c4 - *Caltoris cahira austeni* (MOORE, [1884]), Hainan.

c5 - *Caltoris cahira austeni* (MOORE, [1884]), Guangxi.

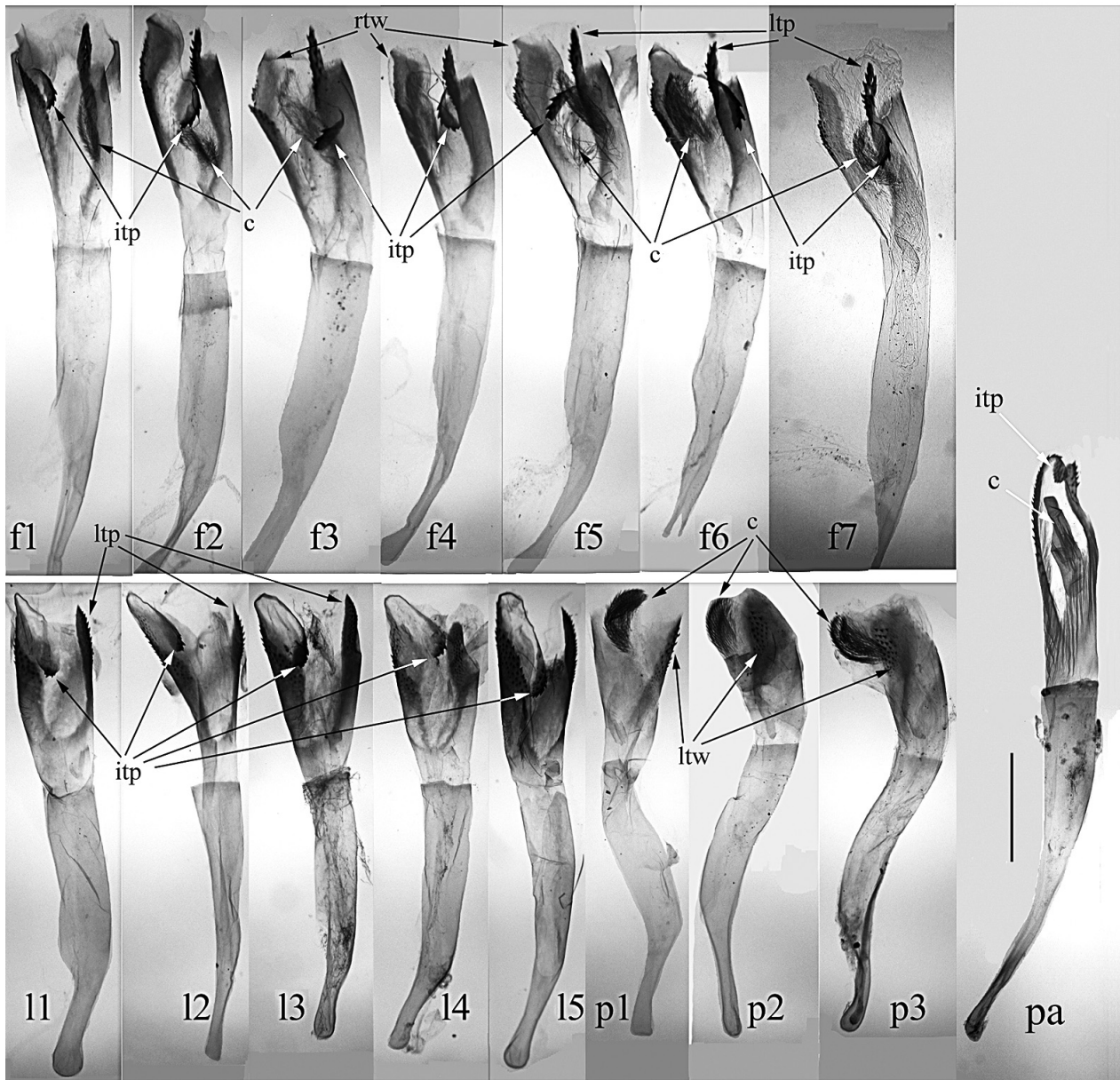


Fig. 89: Phallus of *Baoris*, mostly flattened in dorsal view (scale = 1mm).

f1 - *Baoris farri farri* (MOORE, 1878), Wuhu, Anhui.

f2 - *Baoris farri farri* (MOORE, 1878), Banna, South Yunnan.

f3 - *Baoris farri farri* (MOORE, 1878), Hainan.

f4 - *Baoris farri farri* (MOORE, 1878), Banna.

f5 - *Baoris farri farri* (MOORE, 1878), Hainan.

f6 - *Baoris farri farri* (MOORE, 1878), Banna, South Yunnan.

f7 - *Baoris farri farri* (MOORE, 1878), Hekou, South Yunnan (holotype of *Baoris longistigmata*).

pa - *Baoris pagana* (DE NICEVILLE, 1887), Motuo.

11 - *Baoris leechii* (ELWES & EDWARDS, 1897), Qingchengshan, Sichuan.

12 - *Baoris leechii* (ELWES & EDWARDS, 1897), Fujian.

13 - *Baoris leechii* (ELWES & EDWARDS, 1897), Fujian.

14 - *Baoris leechii* (ELWES & EDWARDS, 1897), Moganshan, Zhejiang.

15 - *Baoris leechii* (ELWES & EDWARDS, 1897), Anhui.

p1 - *Baoris penicillata chapmani* EVANS, 1937, Hainan.

p2 - *Baoris penicillata chapmani* EVANS, 1937 in lateral view, Hainan.

p3 - *Baoris penicillata chapmani* EVANS, 1937 in lateral view, Hainan.

Abbreviations: itp - inserted terminal piece; c - cornuti; ltp - left terminal process; rtw - right terminal wall; ltw - left terminal wall.

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