

A checklist of the Chinese endemic genus *Semibetatropis* (Hemiptera: Fulgoroidea: Achilidae) with the first description of the male of *Semibetatropis patungkuanensis* Chen, Yang & Wilson

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Abstract: The Oriental and Chinese endemic genus *Semibetatropis* is reviewed and currently includes 8 species. The male of *Semibetatropis patungkuanensis* Chen, Yang & Wilson, 1989 (southeastern China: Taiwan) is reported and described for the first time. The generic characters are added by male genitalia characters. A key to species based on the males of the genus *Semibetatropis* is provided.

Key words: Fulgoromorpha; taxonomy; key

中国特有半颖蜡蝉属名录及八通关半颖蜡蝉 *Semibetatropis patungkuanensis* 雄性外生殖器首次描述(半翅目: 蜡蝉总科: 颖蜡蝉科)

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摘要: 首次描述了八通关半颖蜡蝉 *Semibetatropis patungkuanensis* Chen, Yang & Wilson, 1989 成虫的雄性外生殖器, 增补了该属的雄性外生殖器特征, 并给出了该属雄性分种检索表。研究标本保存于贵州大学昆虫研究所。

关键词: 蜡蝉次目; 分类; 检索表

Introduction

The achilid genus *Semibetatropis* (Hemiptera: Fulgoromorpha: Achilidae: Plectoderini) was established by Chen, Yang & Wilson (1989) with *S. mukwaensis* Chen, Yang & Wilson, 1989 as its type species. At the same time, another four species were described (*S. animosa*, *S. cruenta*, *S. patungkuanensis* and *S. punicea*). Two new combinations: *S. nitobei* (Matsumura, 1914) (previously placed in the genus *Akotropis*) and *S. horishana* (Matsumura, 1914) (previously placed in the genus *Betatropis*) were also proposed. Recently, Xu & Liang (2012) made a new combination: *Semibetatropis denticulata* (Fennah, 1956) which was previously in

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the genus *Magadha*. *Semibetatropis* currently contains eight species. All species are only found in China. Seven species occur in Taiwan (Oriental Region) and one species, *S. denticulata*, is found in Hubei and Guangdong (Oriental Region). However, Chen *et al.* (1989) described *S. patungkuanensis* based only on three female specimens from Taiwan.

Here, the genus *Semibetatropis* is reviewed. Male genitalia characters are added to the generic characters. A key to species based on males in the genus *Semibetatropis* is provided. The male genitalia for the species *S. patungkuanensis* is described and illustrated for the first time. The examined specimens are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

Material and methods

Specimens were collected by sweeping. Dry specimens were used for the description and illustrations. External morphology was observed under a stereoscopic microscope and characters were measured with an ocular micrometer. The genital segments of the examined specimens were macerated in 10% KOH and drawn from preparations in glycerin jelly using a Leica MZ 12.5 stereomicroscope. Illustrations were scanned with a Canon CanoScan LiDE 200 and imported into Adobe Photoshop CS3 for labeling and plate composition. Terminology generally follows Chen *et al.* (1989); terminology of male genitalia follows Yang and Chang (2000). The spinal formula is based on the numbers of apical spines of the hind tibiae and 1st and 2nd hind tarsomeres.

Taxonomy

Genus *Semibetatropis* Chen, Yang & Wilson, 1989

Semibetatropis Chen *et al.*, 1989: 45.

Type species: *Semibetatropis mukwaensis* Chen, Yang & Wilson, 1989: 45, by original designation.

Redescription. The distinctive characters used by Chen *et al.* (1989) are modified as follows.

Body medium-sized, length (from apex of vertex to tip of forewings): male 4.6–6.2 mm, female 4.6–6.7 mm. Head with eyes about 0.8 times as wide as pronotum. Disk of vertex depressed and not declivous, with ratio width across base to length in middle line 1.3–2.0 : 1, median carina present near base, anterior margin carinate, acutely rounded, lateral margin carinate, convex, diverging basad, posterior margin deeply concave. Frons slightly convex in lateral view. Ratio length of frons in middle line to maximum width 1.2–1.6 : 1, ratio maximum width to width at base 2–3 : 1, basal margin slightly convex, median carina distinct and percurrent, lateral margins carinate, slightly foliate laterad distally, disk of frons slightly inclined on each side of median carina. Postclypeus short, medially and laterally carinate, with ratio length in middle line to length of frons 0.3–0.5 : 1. Rostrum with ratio apical to subapical segment 1.4–2.3 : 1. Antennae subglobose, not sunk in a depression. Ocelli remote from eyes. Eyes not excavated beneath, slightly overlapping pronotum. Pronotum rather short, length behind eyes shorter than length in middle line, anterior margin truncate-convex, posterior margin subrectangularly excavate, median carina present, lateral carinae straight, diverging

basad and attaining hind margin, ratio length of lateral carinae to length of median carina 1.9–2.8 : 1, lateral disk only slightly inclined anteroventrally, with several ridges behind each eye, or not, ventral margin of lateral pronotal lobes angulate and oblique. Mesonotum with length in middle line longer than lengths of vertex and pronotum combined, if only slightly so, tricarinate; lateral carinae straight, diverging basad. Tegulae not carinate. Post-tibiae with a single spine basad of middle. Forewing with ratio length to maximum width 3 : 1, costal margin slightly convex, Sc+R forking slightly distad of Cu₁ fork, the latter nearly level with union of claval veins, M forking at level of nodal line, eight to ten apical areoles distad stigma, Cu_{1b} not deeply convex distad apex of clavus, clavus terminating at middle of forewing. Male genitalia. Anal segment in dorsal view with basal and apical margins more or less concave, anal style at most slightly overstepping hind margin (Fig. 10). Pygofer in lateral view with dorsal margin distinctly shorter than ventral margin; in ventral view medioventral process paired, middle cleft acutely concave (Figs. 11, 12). Genital styles in dorsal view with apical margin roundly convex; dorsal margin produced into two larger processes, inner face near base with a process (Fig. 13). Aedeagus with phallobase complex, submembranous and asymmetrical (Figs. 14, 15). Phallobase generally serrated; ventral lobe with apical margin concave in the middle (Figs. 14, 15). Each phallic appendage with a corner near apex (Fig. 16).

Host plant. Unknown.

Distribution. Oriental Region (China).

Checklist and distribution of *Semibetatropis* Chen, Yang & Wilson

- S. animosa* Chen, Yang & Wilson, 1989—China (Taiwan)
- S. cruenta* Chen, Yang & Wilson, 1989—China (Taiwan)
- S. denticulata* (Fennah, 1956)—China (Hubei, Guangdong)
- S. horishana* (Matsumura, 1914)—China (Taiwan)
- S. mukwaensis* Chen, Yang & Wilson, 1989—China (Taiwan)
- S. nitobei* (Matsumura, 1914)—China (Taiwan)
- S. patungkuanensis* Chen, Yang & Wilson, 1989—China (Taiwan)
- S. punicea* Chen, Yang & Wilson, 1989—China (Taiwan)

Key to species of *Semibetatropis* Chen, Yang & Wilson (males)

1. Medioventral process of pygofer in ventral view subtriangular (Fig. 12; Chen *et al.*, 1989: Figs. 20F, 23G, 25G; Xu & Liang, 2012: Fig. 4)..... 2
 - Medioventral process of pygofer in ventral view not triangular (Chen *et al.*, 1989: Figs. 21G, 24H, 26F)..... 6
2. Medioventral process in ventral view stout at apex (Chen *et al.*, 1989: Fig. 25: G)..... *S. nitobei*
 - Medioventral process in ventral view gradually narrowing apically (Fig. 12; Chen *et al.*, 1989: Figs. 20F, 23G)..... 3
3. Anal style distinctly not attaining apical margin (Xu & Liang, 2012: Fig. 10)..... *S. denticulata*
 - Anal style attaining or slightly surpassing apical margin (Fig. 10; Chen *et al.*, 1989: Figs. 20H, 23J)..... 4
4. Phallobase in dorsal view with inside margins of two dorsal lobes serrated; a schistose process with dorsal margin serrated and crabwise produced in the middle of base of phallobase (Fig. 14)..... *S. patungkuanensis*
 - Phallobase not as above..... 5
5. Apex of phallic appendage with three spines (Chen *et al.*, 1989: Fig. 23I)..... *S. animosa*
 - Apex of phallic appendage with one spine (Chen *et al.*, 1989: Fig. 20I)..... *S. mukwaensis*

6. Anal segment in dorsal view subrectangular; in lateral view basal third produced in a stout spine downward, apical margin slightly concave (Chen *et al.*, 1989: Figs. 24I, K)..... *S. punicea*
 -. Anal segment not as above..... 7
7. Pygofer in lateral view with hind margin subangularly convex dorsally; each apex of medioventral process produced as a small process (Chen *et al.*, 1989: Figd. 21F, G)..... *S. cruenta*
 -. Pygofer in lateral view with hind margin straight dorsally; each apex of medioventral process transverse, spiral (Chen *et al.*, 1989: Figs. 26E, F)..... *S. horishana*

***Semibetatropis patungkuanensis* Chen, Yang & Wilson, 1989** (Figs. 1–16)

Semibetatropis patungkuanensis Chen *et al.*, 1989: 49.

Body length (from apex of vertex to tip of forewings): male 5.2 mm ($n = 1$), female 5.5–6.0 mm ($n = 9$); forewing length: male 4.5 mm ($n = 1$), female 4.6–5.1 mm ($n = 9$).

Coloration. Pale yellowish to fuscous (Figs. 1–4). Vertex fuscous except median line and inside basal half of lateral margin yellowish (Fig. 5). Frons grey brown (Fig. 6). Genae pale yellowish with transverse fuscous stripe across upper of eyes (Fig. 7). Pronotum fuscous except lateral lobe pale yellowish (Fig. 5). Tegula pale yellowish. Mesonotum brown with outside of lateral carinae fuscous (Fig. 5). Forewing grey brown with a milky stripe on anterior area of Sc (Figs. 1–4, 8).

Head and thorax. Ratio width of vertex across base to length in middle line 1.53 : 1 (Fig. 5). Ratio length of frons in middle line to maximum width 1.50 : 1, ratio maximum width to width at base 2.92 : 1 (Fig. 6). Ratio length of postclypeus in middle line to length of frons 0.44 : 1 (Fig. 6). Rostrum attaining post-coxae, with ratio length of apical segment to subapical length 1.4 : 1. Pronotum slightly depressed, with ratio length in middle line to length of vertex 0.53 : 1 and length of median carina to length of lateral carinae 0.38 : 1, anterior margin subtruncate, lateral carinae straight, diverging posteriorly and attaining hind margin, posterior margin angulately concave, with three obsolete ridges on each lateral lobe (Fig. 5). Forewing with ratio of length to maximum width 2.89 : 1, Sc+R forking distad Cu₁ fork, slightly basad than apex of clavus, M forking at level of node, eight apical areolets distad of stigma, clavus terminating about at middle of forewing (Fig. 8). Hindwing with ratio of length to maximum width 1.77 : 1 (Fig. 9). Spinal formula of hind leg 7-5-5.

Male genitalia. Anal segment in dorsal view (Fig. 10) with ratio of length to maximum width 0.91 : 1, basal and apical margins broadly concave, anal style attaining hind margin; in lateral view (Fig. 11) anal segment with half basally broad, half apically narrow and slightly curved downward, ventral margin with an obtusely convex at the widest part. Pygofer in lateral view (Fig. 11) with posterior margin broadly convex dorsally, a process contorting inwards beneath the middle; in ventral view (Fig. 12) medioventral process paired, each angularly produced and slightly bent outwards, outside margin with apical 2/3 slightly rolled ventrad, middle cleft deeply and acutely concave. Genital styles in dorsal view (Fig. 13) slightly constricted medially, apical margin roundly convex; dorsal margin medially produced into two processes, the narrow one bent outwards, with apical margin roundly convex, the broad one bent inwards, with apical margin roundly incised; inner surface of base with a process. Aedeagus with phallobase complex, submembraneous and asymmetrical. Phallobase in dorsal view (Fig. 14), two dorsal lobes with apical and inside margins serrated, ventral surfaces shagreened; a schistose process with dorsal margin serrated and crabwise produced in

the middle of base; right lateral produced in a subtriangular process. Phallobase in ventral view (Fig. 15), apical margin of ventral lobe serrated, ventrad rising and concave in the middle; apical margin on left side basad extending to the subapical, thence projecting outwards; left lateral margin with a process produced outwards in the middle, thence to base crookedly serrated; right lateral margin with a process produced outwards near apex; right surface near the middle with a longitudinal serrated band. Each phallic appendage with a corner near apex, beneath left apex of phallic appendage with two spines (one big and one small), and the right apex with only one big spine (Fig. 16).

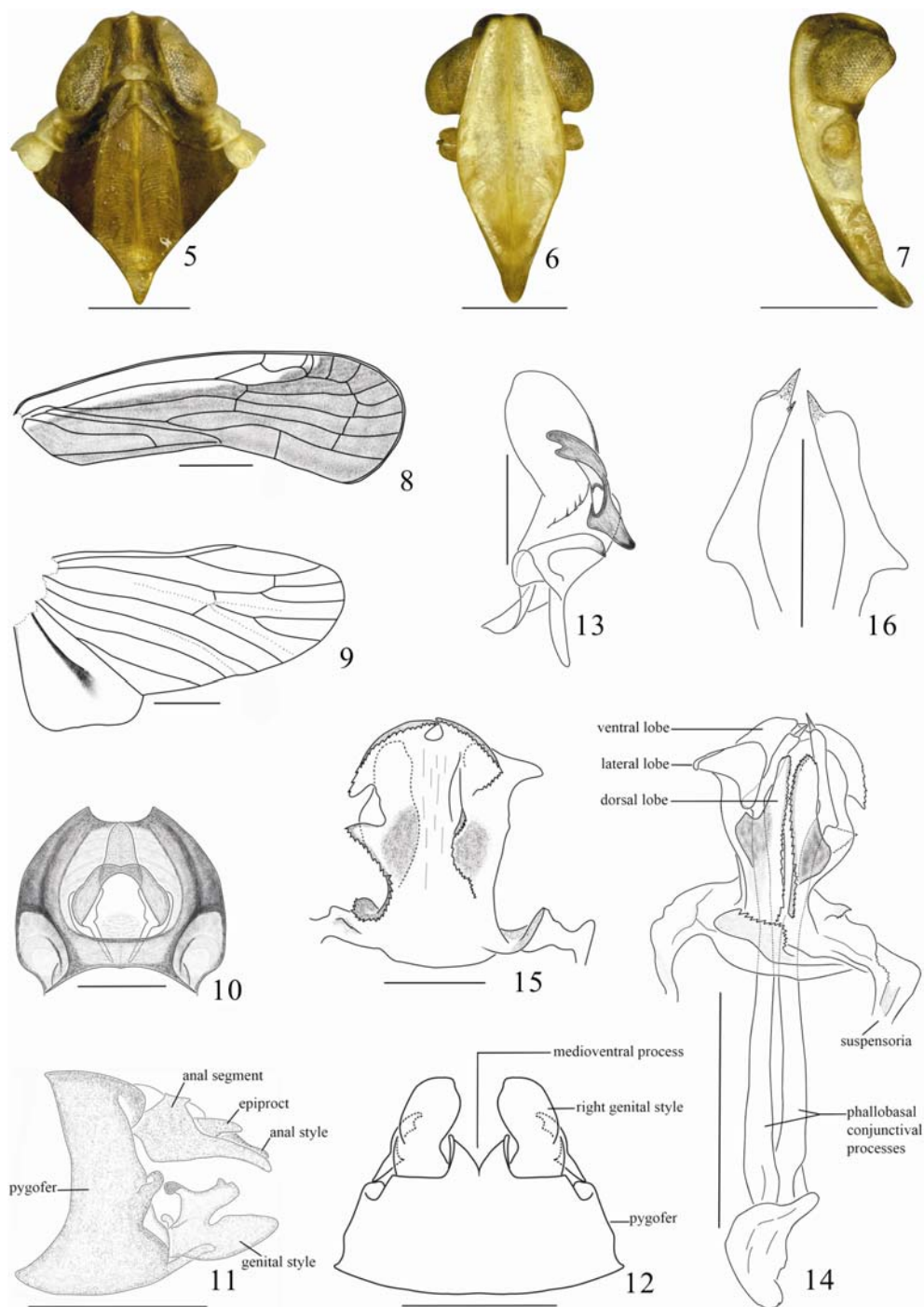


Figures 1–4. *Semibetatropis patungkuanensis* Chen, Yang & Wilson, 1989. 1. Male habitus, dorsal view; 2. Female habitus, dorsal view; 3. Male habitus, lateral view; 4. Female habitus, lateral view.

Specimens examined. 1♂9♀, **China**, Taiwan, Kaohsiung, Tienchi, 1300–1400 m, 12-VII-2007, coll. Xiangsheng CHEN.

Distribution. Oriental Region (China: Taiwan).

Remarks. This species differs from other species of *Semibetatropis* in: anterior area of Sc of forewing from node, through tegula, to lateral lobe of pronotum, forming a straight pale yellowish band (Figs. 1–4). This species is similar to *S. mukwaensis*, but differs from the latter in: phallobase in dorsal view (Fig. 14), a schistose process with dorsal margin serrated and crabwise produced in the middle of base (*S. mukwaensis* without); phallobase in ventral view (Fig. 15), ventral lobe with apical margin distinctly serrated (*S. mukwaensis* not serrated); beneath left apex of phallic appendage (Fig. 16) with one big and one small spine (*S. mukwaensis* with one).



Figures 5–16. *Semibetotropis patungkuanensis* Chen, Yang & Wilson, 1989. 5. Head and thorax, dorsal view; 6. Frons and clypeus; 7. Head, lateral view; 8. Forewing; 9. Hindwing; 10. Anal segment, dorsal view; 11. Male genitalia, lateral view; 12. Male genitalia, ventral view; 13. Left genital style, dorsal view; 14. Aedeagus, dorsal view; 15. Phallobase, ventral view; 16. Apex of phallic appendages, ventral view. Scale bars = 1 mm (8, 9); 0.5 mm (5–7, 11, 12, 14); 0.2 mm (10, 13, 15, 16).

Discussion

The taxonomic status of the achilid genus *Semibetatropis* Chen, Yang & Wilson, 1989 places it in the tribe Plectoderini for: head with eyes about 0.8 times as wide as pronotum (more than two-thirds width of pronotum); anterior margin of vertex convex in the middle; forewings shallowly rounded over dorsum and with membranous areas overlapping when folded; apical margin of forewing strongly convex; vein Sc of forewing with anterior branch short; post-tibiae with one spine. The genus is similar to genus *Betatropis* Matsumura, 1914, but differs from the latter in: vertex with length in middle line distinctly shorter than width across base (*Betatropis* with length in middle line at least equal to width across base); vertex produced before eyes at best half of its length (*Betatropis* at least three fifths of its length). This genus is also similar to the genus *Epirama* Melichar, 1903, but differs from the latter in: vertex with median carina only present near base (*Epirama* with median carina of vertex distinct throughout); clavus terminating at middle of forewing (*Epirama* with clavus terminating distad of middle).

Species in genus *Semibetatropis* Chen, Yang & Wilson, 1989 are so far only found in the Oriental Region (China). Only *Semibetatropis denticulata* (Fennah, 1956) is found on the Chinese Mainland (Hubei and Guangdong) (Xu & Liang 2012) and appears to be widespread. The other seven *Semibetatropis* are only found in Taiwan, China (Chen *et al.* 1989) and appear to be narrowly distributed. It is likely that there are undiscovered species on the Chinese Mainland, but the Chinese endemic status of genus *Semibetatropis* is accepted.

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