ORIENTAL BAMBOO PLANTHOPPERS: TWO NEW SPECIES OF THE GENUS *BAMBUSIPHAGA* (HEMIPTERA: FULGOROIDEA: DELPHACIDAE) FROM HAINAN ISLAND, CHINA

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ABSTRACT

Two new species of the bamboo-feeding genus *Bambusiphaga*, *B. hainanensis* Hou and Chen **sp. nov.** and *B. basifusca* Hou and Chen **sp. nov.** (Hemiptera: Delphacidae), from Hainan Island, Hainan Province, southern China, are described and illustrated. *Bambusiphaga hainanensis* belongs to the *citricolorata* group and *B. basifusca* belongs to the *fasica* group. A key to the 22 known species of this genus in the world is provided.

Key Words**:** Hemiptera, Fulgoroidea, Delphacidae, *Bambusiphaga*, new species, China

RESUMEN

Se describen e ilustran dos especies nuevas del género *Bambusiphaga* que se alimentan de bambú, *B. hainanensis* Hou y Chen **sp. nov.** y *B. basifusca* Hou y Chen **sp. nov.** (Hemiptera: Delphacidae), encontradas en la Isla Hainan Island, Provincia de Hainan, en el sur de China. *Bambusiphaga hainanensis* pertenece al grupo *citricolorata* y *B. basifusca* pertenece al grupo *fasica*. Se provee una clave de las 22 especies conocidas de este género en el mundo.

The delphacid genus *Bambusiphaga* (Hemiptera: Fulgoroidea: Delphacidae: Delphacinae: Tropidocephalini) was established by Huang & Ding (1979) with 6 new species from southwestern, southern, and eastern China (type species: *B. nigripuncata* Huang & Ding 1979). Since then, 13 species have been added to the genus, respectively, from China (11 species) (Kuoh 1980; Kuoh et al. 1980; Ding 1982; Ding & Hu 1982; Asche 1983; Ding et al. 1986; Yang & Yang 1986; Yang 1989; Qin & Yuan 1999; Chen & Li 2000; Chen et al. 2000; Qin et al. 2006; Chen & Liang 2007), The Philippines (1 species) (Asche 1983), Singapore (1 species) (Asche 1983), Malaysia (1 species) (Asche 1983) and Northeastern Himalaya (1 species) (Asche 1983). Twenty species have been recorded in the world (Chen & Liang 2007). Chen & Liang (2007) revised the species of *Bambusiphaga* and divided the 20 known species into 7 species groups based primarily on characters of male genitalia.

Species of *Bambusiphaga* feed exclusively on bamboo (Bambusoideae) (Huang et al. 1979; Ding et al. 1986; Yang & Yang 1986; Yang et al. 1999; Ding 1999; Chen 2002; Chen 2003; Liu & Chen 2008). Specimens have been collected on the leaves of several genera of bamboo including *Bambusa*, *Dendrocalamus*, *Sinocalamus*, *Neosinocalamus*, and *Phyllostachys* (Huang et al. 1979; Ding & Hu 1982; Ding et al. 1986; Yang & Yang 1986; Chen & Li 2000; Chen et al. 2000; Ding 2006; Chen & Liang 2007).

We now describe and illustrate *B. hainanensis* Hou and Chen, **sp. nov**. and *B. basifusca* Hou and Chen, **sp. nov**., from southern China (Hainan Province). Based on the morphological characters and male genitalia, the 2 new species belong, respectively, to the *citricolorata* group and the *fasica* group. A key for identifying the 22 species of the genus *Bambusiphaga* is provided.

MATERIALS AND METHODS

Morphological terminology used in this work follows Yang & Yang (1986). Dry specimens were used for the description and illustration. External morphology of specimens was observed with a stereoscopic microscope and characters were measured with an ocular micrometer. The genital segments of the examined specimens were macerated in 10% KOH and details of the genitalia were drawn from preparations in glycerin jelly with aid of a light microscope. Illustrations of the specimens were made with a Leica MZ 12.5 stereomi-

croscope and were scanned with Canon CanoScan LiDE 200, and then were imported into Adobe Photoshop 8.0 for labeling and plate composition. The designation of spines refers to the numbers of apical spines of the hind tibiae and 1st and 2nd hind tarsomeres. The type specimens and examined specimens are deposited in the Insect Collection at the Institute of Entomology, Guizhou University, Guiyang, Guizhou Province, China (IEGU).

DESCRIPTIVE TAXONOMY

Bambusiphaga Hung and Ding

Bambusiphaga Huang and Ding 1979: 170; Asche, 1983: 211; Ding & Tian, 1983 (in Kuoh et al. 1983): 49; Yang & Yang, 1986: 37; Wang & Ding, 1996: 22; Ding et al., 1999: 441; Ding, 2006: 126; Chen & Liang, 2007: 504.

Type Species: *Bambusiphaga nigripuncata* Huang and Ding 1979, by original designation.

Description: Slender and elongate delphacid species, body length 2.8-5.2 mm (from apex of vertex to end of forewing). General color milky-yellow to yellowish-brown, often with brown or black markings.

Head, including eyes, narrower than pronotum. Vertex quadrate or rectangular, slightly longer or shorter medially than width at base, slightly narrower at apex than at base, lateral margins more or less diverging anteriorly, apical part slightly projecting in front of eyes, apical margin evenly rounded into frons, submedian carinae originating from near apical 1/3 of lateral carinae, uniting at apex of vertex, lateral carinae curved inward, Y-shaped carina distinct and fine. Frons elongate, rectangular, longer at middle line than wide (2.0-2.7:1), median carina distinct and simple, lateral carinae parallel or subparallel. Postclypeus with incomplete median carina, lateral carinae absent. Rostrum reaching mesotrochanters, apical segment slightly longer than wide. Antennae cylindrical, basal segment slightly longer or equal to width, 2nd segment longer than 1st (more than 2.7:1), reaching or not reaching frontoclypeal suture. Pronotum about as long as vertex, lateral carinae straight, reaching or almost reaching hind margin. Mesonotum longer at middle line than vertex and pronotum together (about 1.3-2.0:1), median carina extending to tip of scutellum. Spinal formula of hind leg 5-6-4. Post-tibial spur without teeth along posterior margin, but with an apical tooth. Forewing much longer than abdomen, hyaline, cross vein deposited medially, apical margin acutely rounded.

Anal style small. Anal segment of male ring-like, ventral margin with or without a process. Pygofer with or without medioventral processes. Aedeagus with or without phallobase; phallus complex, tubular. Genital styles simple, with a process, or forked apically. Seventh abdominal sternite of female present or absent.

Host Plant: Bamboo (Bambusoideae). Specimens were collected on leaves of bamboo in several genera, *Bambusa*, *Dendrocalamus*, *Sinocalamus*, *Neosinocalamus*, and *Phyllostachys* (Huang et al. 1979; Ding & Hu 1982; Ding et al. 1986; Yang & Yang 1986; Chen and Li 2000; Chen et al. 2000; Chen & Liang 2007).

Distribution: Oriental region, with abundant species in China.

KEY TO SPECIES OF *BAMBUSIPHAGA* HUANG AND DING

1. Vertex dark brown or with blackish-brown markings 2
— Vertex without markings 3
2. Vertex yellowish-brown, basal compartment with a black oval spot in middle part (Huang et al. 1979); anal segment of male without process, pygofer without medioventral process . . . . . *B. nigropunctata*
— Vertex dark brown, basal compartment of vertex without black oval spot; anal segment of male with a very long process which surpasses base of genital styles; pygofer with conjugated medioventral processes . . . . . *B. pianmaensis*
3. Mesonotum with blackish-brown markings 4
— Mesonotum lacking blackish-brown markings 7
4. Pronotum with blackish-brown markings on lateral areas; tegmina with blackish-brown markings on basal 1/2 5
— Pronotum and tegmina without above marking 6
5. Basal 1/2 of tegmina black; pygofer without medioventral process; genital styles not forked at apex . . . . . *B. fascia*
— Basal 1/3 of tegmina with black marking; pygofer with conjugated medioventral processes; genital styles with forked apex . . . . . *B. maculata*

6. Tegmina somewhat reddish-orange, costal margin blackish-brown; genital styles relatively broad and short ..... *B. nigromarginata*

— Tegmina somewhat yellowish-brown, costal margin yellowish-brown; genital styles relatively slender ..... *B. taiwanensis*

7. Ventral margin of anal segment with a process 8

— Ventral margin of anal segment without a process 13

8. Pygofer with 1 or 3 medioventral processes 9

— Pygofer without a medioventral process 10

9. Tegmina with a brown band along transverse vein, pygofer with 1 medioventral process ..... *B. bakeri*

— Tegmina dark brown at basal 1/2, pygofer with 3 medioventral processes ..... *B. basifusca* **sp. nov.**

10. Process of anal segment very long, reaching ventral margin of pygofer 11

— Process of anal segment very short 12

11. Body length of male 3.5-3.6 mm; genital styles with a process at base (Ding et al. 1986) ..... *B. jinghongensis*

— Body length of male 4.3 mm; genital styles without a process at base (Huang et al. 1979) ..... *B. mirostylis*

12. Apical 1/2 of pterygodes blackish-brown; hind margin of male pygofer with produced acute angle medially; genital styles slender; aedeagus without phallobase (Ding & Hu 1982) ..... *B. huangi*

— Pterygodes yellowish-brown; hind margin of male pygofer not produced into an angle medially; genital styles broad and short; aedeagus with developed phallobase ..... *B. wangmoensis*

13. Ventral margin of pygofer with a spine 14

— Ventral margin of pygofer without a spine 15

14. With reddish-orange stripes along median carina of vertex and of pronotum; aedeagus without a process ..... *B. luodianensis*

— Without reddish-orange stripe along median carina of vertex or of pronotum; aedeagus with a contrary process ..... *B. singaporensis*

15. Base of genital styles with a finger-like process 16

— Base of genital styles without a finger-like process 17

16. Near apex of genital styles with a finger-like process ..... *B. maolanensis*

— Near apex of genital styles with a lobation-like process ..... *B. hainanensis* **sp. nov.**

17. Apex of genital styles forked (Asche 1983) 18

— Apex of genital styles not forked 20

18. Frons longer at middle line than wide at widest part, about 2.0: 1; basocaudal portion of genital styles in profile produced into a right angle, granulate ..... *B. membranacea*

— Frons longer at middle line than wide at widest part, about 2.5: 1; basocaudal portion of genital styles in profile not produced into a right angle (Asche 1983) 19

19. Median portion of genital styles granulate ..... *B. furca*

— Median portion of genital styles not granulate (Asche 1983) ..... *B. lynchi*

20. Ventral margin of anal segment incised medially; genital styles short, lamellate ..... *B. lacticolorata*

— Ventral margin of anal segment not incised medially; genital styles slender 21

21. Apex of vertex obviously broadened, frons widest at base; apex of genital styles without small tooth; aedeagus short, stout (Huang et al. 1979) ..... *B. similis*

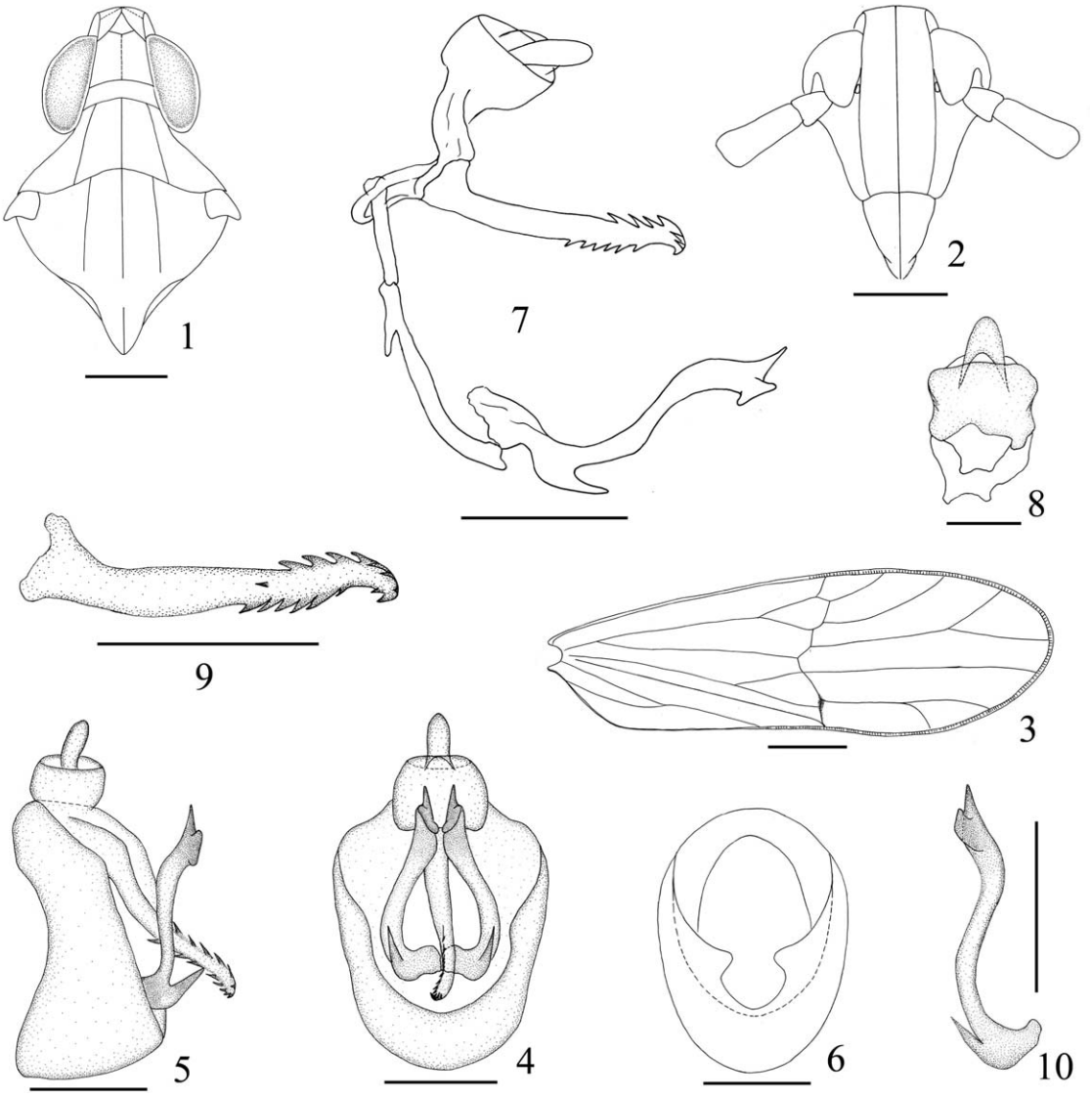
— Apex of vertex not broadened, frons widest at apex; apex of genital styles with several small teeth; aedeagus relatively long ..... *B. citricolorata*

Bambusiphaga hainanensis Hou and Chen **sp. nov.** (Figs. 1-10)

Description. Length of body 1.5-1.8mm (male), 1.9-2.1mm (female); including forewing 2.9-3.1mm (male), 3.4-3.5mm (female).

Coloration. General coloration light yellow or reddish-orange. Forewings color lighter than body, veins same to body, with a small brown mark along cross vein near apex of clavus. Ocelli, eyes dark brown. Abdomen color darker than other area, pygofer yellowish white, anal style dark brown.

Head and Thorax. Structural features as in generic descriptions. Vertex quadrate, length than wider at base about 1.1:1, broader at apex than at base (1:1.3), apical margin arch, carinae distinct, submedian carinae uniting at apex. Frons oblong, longer in middle line than wide at widest part about 2.4:1, slightly narrower at apex than at base, median carina simple. Clypeus developed, postclypeus wider at base than frons at apex obvi-



Figs. 1-10. *Bambusiphaga hainanensis* Hou and Chen, **sp. nov.** 1. Head and thorax, dorsal view; 2. Frons and clypeus; 3. Forewing; 4. Male genitalia, caudal view; 5. Male genitalia, lateral view; 6. Pygofer, caudal view; 7. Anal segment, aedeagus, connective and genital style, lateral view; 8. Anal segment and suspensorium, posterior view; 9. Aedeagus, left side; 10. Left genital style, caudal-lateral view. Scale bars = 0.2 mm (Figs. 1-2, 4-7, 9-10); 0.4 mm (Fig. 3); 0.1 mm (Fig. 8).

ously, median carina feeble. Antennae with first segment long equal to wide, second segment 2.7 times as long as first, 2 segments together reaching to frontoclyeal suture. Pronotum as long as vertex, lateral carinae attaining hind margin. Mesonotum about 1.3 times the length of vertex and pronotum together, median carina attaining the end of scutellum.

Male Genitalia. Anal segment of male ringlike, no process. Pygofer in profile much longer ventrally than dorsally, in posterior view opening longer than wide, no process at ventral margin. Aedeagus slender, very long, tubular, several spines at dorsal and ventral margin of apical half, blunt end with some small spines at apex. Genital styles long, S-shaped, apical part turning outward, tapering to apex, near apex and near base respectively with 1 lobe-like process and 1 spinous process.

Specimens Examined. Holotype male, CHINA: Hainan, Changjiang, Bawangling National Natural Reserve (19°05'N, 109°07'E), 600-880m, 24~28-IV-2009 (X.-H. Hou). Paratypes 4 males, 6 females, same data as for holotype; 11 males, 6 females, Hainan, Wuzhishan, Wuzhishan National Natural Reserve (18°54'N, 109°40'E), 668-800m, 13~15-IV-2009 (X.-H. Hou); 1male, 1 female, Hainan, Lingshui, Diaoluoshan National Natural Reserve (18°43'N, 109°52'E), 300-850m, 9~12-IV-2009 (X.-H. Hou).

Host Plant. Bamboo.

Etymology. This new species is named after the type locality, Hainan Province, China.

Distribution. Southern China (Hainan: Changjiang, Wuzhishan and Lingshui).

Remarks. Based on the morphological characters and male genitalia, this species should belong to the *citricolorata* group. This species resembles *B. maolanensis*, but differs in the following: genital styles near apex with 1 lobe-like process (with 1 finger-like process in the latter); aedeagus straight, with several teeth at dorsal and ventral margin of apical half (in the latter, aedeagus arched in middle, with 4 teeth surrounding gonopore). It is distinguished from *B. citricolorata* by aedeagus slender, with several teeth at apical half, and some small spines at apex (in *B. citricolorata*, aedeagus stout, with a node and several short gear-like processes at apex); genital styles tapering to apex, with 1lobe-like process near apex (narrowing to apex, with small teeth at apex in *B. citricolorata*).

Bambusiphaga basifusca Hou and Chen
sp. nov. (Figs. 11-21)

Description. Length of body 1.5-1.6 mm (male), 1.9-2.0 mm (female); including forewing 2.8-2.9 mm (male), 3.2-3.5 mm (female).

Coloration. Generally color yellowish white with dark brown markings. Basal half of vertex, margins and area between lateral carina of pronotum (except oblong area dark brown markings), area of inner omia and escutcheon dirty yellowish white. Apex half of vertex light yellowish brown. Areas of outer lateral carinae of pronotum, mesonotum and outer area of omia dark brown to blackish brown. Base and apical 1/3 of fron and area of inner half of genae yellowish brown, fron medial mostly, area of outer half of genae and clypeus dark brown. First segment of antennae brown, 2nd yellowish brown. Ocelli and eye reddish brown to brown. Basal 1/2 of forewing black. Thorax yellowish brown to dark brown. Femora of fore legs and median legs dark brown, tibiae and digitus of fore legs and median legs and femora of hind legs yellowish brown, tibiae and tarsi of hind legs yellowish white. Abdomen dark brown, except yellowish brown posterior margin of each segment. Pygofer and anal segment dark brown.

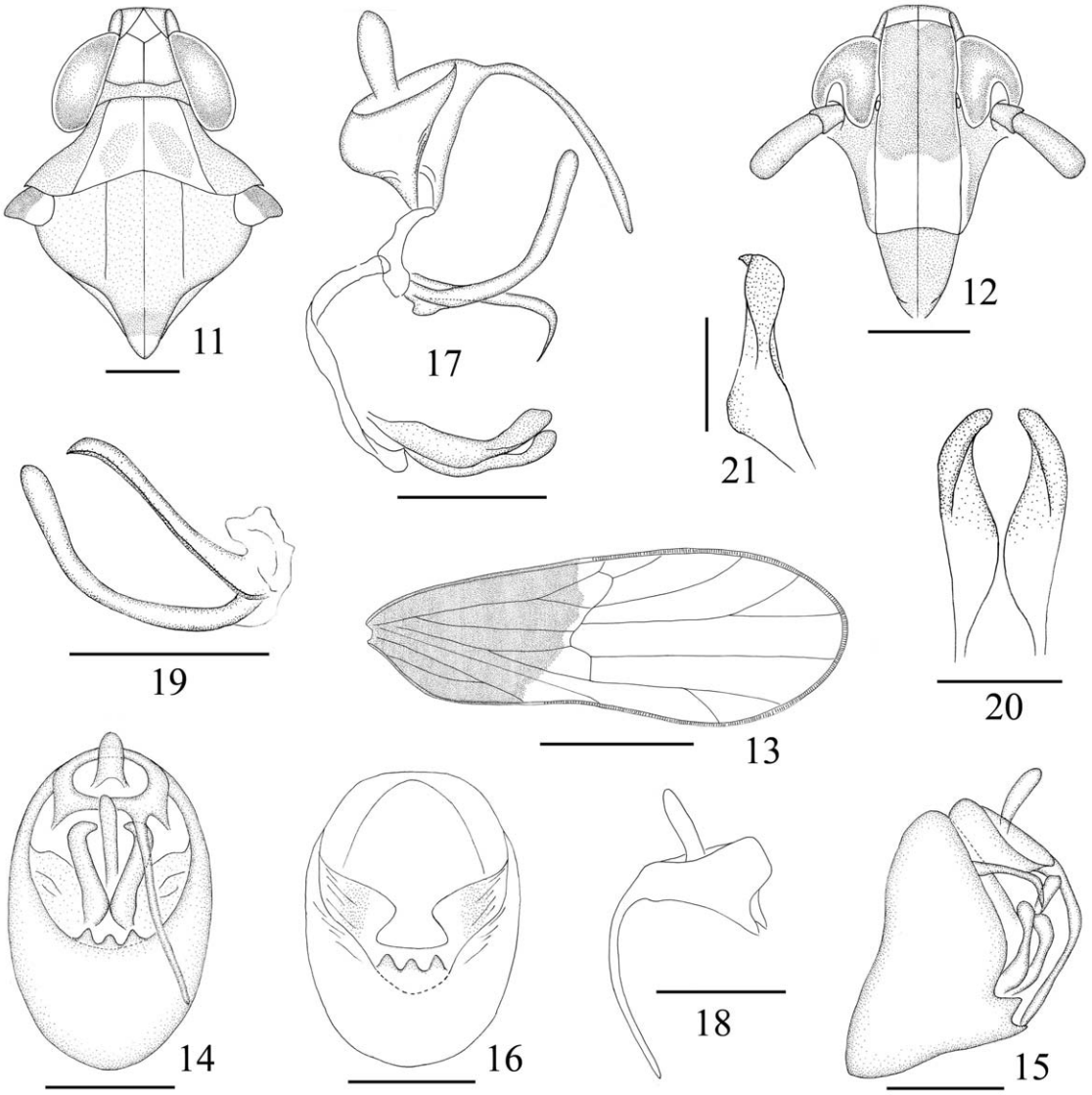
Head and Thorax. Structural features as in generic descriptions. Vertex quadrate, length than wider at base about 1.1:1, narrower at apex than at base (1:1.6), apical margin arch, carinae distinct, submedian carinae uniting at apex. Frons oblong, longer in middle line than wide at widest part about 2.5:1, broader at apex than at base, median carina simple. Clypeus developed, postclypeus as wide at base as frons at apex, median carina distinct. Antennae with first segment long equal to wide, second segment 2.7 times as long as first, both segments together not reaching to frontoclyeal suture. Pronotum as long as vertex, lateral carinae attaining hind margin. Mesonotum about 1.3 times the length of vertex and pronotum together, median carina attaining the end of scutellum.

Male Genitalia. Anal segment of male ringlike, right lateroapical angle strongly produced into a long and slender process, surpassing ventral margin of pygofer, slightly arched in lateral view. Dorsal margin of pygofer obviously shorter in profile than ventral margin. Opening of pygofer longer than wide in posterior view, with 3 small lobe-shape processes on ventral margin medially. Aedeagus slender, with simple phallobase. Phallobase small, in profile broad at base, thin and curved at apex. Phallus slender, long, tubular, curved medially, blunt end. Genital styles moderate long, broad at base, apical part turning inward, tapering apically.

Specimens Examined. Holotype male, CHINA: Hainan, Ledong, Jianfengling National Natural Reserve (18°43'N, 108°53'E), 800-1400m, 17~20-IV-2009 (X.-H. Hou). Paratype 4 males, 4 females, same data as for holotype.

Host plant. Bamboo.

Etymology. This new species is named after the distinctive characters by basal half of forewing black, which can be distinguished from the other species.



Figs. 11-21. *Bambusiphaga basifusca* Hou and Chen **sp. nov.** 11. Head and thorax, dorsal view; 12. Frons and clypeus; 13. Forewing; 14. Male genitalia, caudal view; 15. Male genitalia, lateral view; 16. Pygofer, caudal view; 17. Anal segment, aedeagus, connective and genital styles, lateral view; 18. Anal segment, right side; 19. Aedeagus, ventral view; 20. Genital style, caudal view; 21. Right genital style, lateral view. Scale bars = 0.2 mm (Figs. 11-12, 14-19); 0.4 mm (Fig. 3); 0.1 mm (Figs. 20-21).

Distribution. Southern China (Hainan: Ledong).

Remarks. Based on the morphological characters and male genitalia, this species should belong to the *fasica* group. This species resembles *B. fascia*, but differs in the following: forewing of male and female with basal half black (in the latter, forewing of female only with a dark brown transverse stripe medially); median area of frons dark brown (frons yellowish white in the latter); pygofer with 3 small lobe-shaped medioventral processes (absent in the latter); anal segment with a right lateroapical angle process (with a left lateroapical angle process in the latter); aedeagus with simple phallobase (absent in the latter).

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