

Argid Sawflies of *Arge thaumatopygia* Group (Hymenoptera, Argidae)

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Abstract *Arge thaumatopygia* group is proposed to include four Chinese and one Japanese species, namely, *Arge thaumatopygia* Wei, 1997, from Jiangxi and Guizhou Provinces, China, *A. niuae* Shinohara, Hara and Wei, n. sp., from Sichuan Province, China, *A. metalloflagella* Wei, Shinohara and Hara, n. sp., from Sichuan Province, China, *A. curvatantenna* Wei, 2002, from Guizhou, Hunan, Guangxi and Zhejiang Provinces, China, and *A. meliosmae* Shinohara and Hara, 2011, from Japan. All the species are described or redescribed and illustrated, except for a very recently described species, *A. meliosmae*.

Key words: Hymenoptera, Argidae, *Arge thaumatopygia* group, new species, *Arge niuae*, *Arge metalloflagella*.

An argid sawfly, *Arge thaumatopygia* Wei, 1997 (Hymenoptera, Argidae), was described on the basis of two females from Jiangxi Province, China (Wei and Wen, 1997). The female of this species is peculiar in having a narrow and very deep incision at the apex of the strongly subtriangularly produced hypopygium. *Arge curvatantenna* Wei, 2003, was described on the basis of one male (holotype) from Hunan Province and one female (paratype) from Fujian Province, China (Wei and Nie, 2003). The male of this species has a very specialized penis valve whose valviceps has a long dorsal process at the apex, whereas the female has a normal hypogygium with a truncate posterior margin. Close relationship of these two taxa has not been recognized until the recent discovery of a *meliosma*-feeding species, *Arge meliosmae* Shinohara and Hara, 2011, in Japan (Shinohara *et al.*, 2011).

The female of *A. meliosmae* has a strongly subtriangularly produced hypopygium with a

very deep apical incision, just as in *A. thaumatopygia*, and the male of the same species, confirmed by rearing, has a long dorsal process at the apex of the valviceps, just as in *A. curvatantenna* (Shinohara *et al.*, 2011). This has clearly shown that *A. thaumatopygia*, *A. curvatantenna* and *A. meliosmae* are very closely related to each other and form a group of species, which we herein call the *thaumatopygia* group. The female paratype of *A. curvatantenna* is not conspecific with the male holotype and does not belong to this species-group.

In this paper, we define the *thaumatopygia* group to include the two Chinese and one Japanese species mentioned above and two additional new species from Sichuan Province, China. We describe the two new species from China and redescribe the already known species except for the recently described *A. meliosmae*.

The material used in this work is kept in the Central South University of Forestry and Tech-

nology, Changsha (CSUFT) and National Museum of Nature and Science, Tokyo (NSMT). This study was partly supported by the National Natural Science Foundation of China, No. 30771741.

The group of *Arge thaumatopygia*

Members of this species-group are rather large (length 10.5–13.5 mm in female, 8.5–9.5 mm in male) and bluish black species with only the base of the hind tibia whitish (Fig. 1). The antennal flagellum in the females has three longitudinal carinae in addition to the inner ventral seam-like longitudinal carina, which is usually present in *Arge* species (Figs. 1K–O, 5). The wings are largely blackish infuscated or hyaline with a dark band below stigma in the forewing. The posterior margin of the hypopygium in the females is strongly produced and deeply incised at the apex (Fig. 6A, D, G, J, M) and the valviceps in the males has a long dorsal process at the apex (Fig. 10).

The characteristic shapes of the hypopygium and the valviceps are unique among the species of the Argidae. They are safely regarded as the autapomorphies of the *thaumatopygia* group and are useful to separate the species of this species-group from their congeners. The structure of the female antennal flagellum is also characteristic, but similar flagella are known for some *Arge* species, such as *A. magnicornis* Konow, 1898, from Myanmar and China.

We have recognized the following four Chinese and one Japanese species in the *thaumatopygia* group:

Arge thaumatopygia Wei, 1997. China: Jiangxi, Guizhou.

Arge niuae Shinohara, Hara and Wei, n. sp. China: Sichuan.

Arge metalloflagella Wei, Shinohara and Hara, n. sp. China: Sichuan.

Arge curvatantenna Wei, 2002. China: Guizhou, Hunan, Guangxi, Zhejiang.

Arge meliosmae Shinohara and Hara, 2011. Japan: Honshu.

Biology and immature stages are known only for *A. meliosmae*. The larvae of this species are gregarious leaf-feeders on *Meliosma myriantha* Siebold et Zucc. (Sabiaceae) (Shinohara *et al.*, 2011). This is the only sawfly species known to feed on the Sabiaceae in the Old World.

Arge thaumatopygia Wei, 1997

(Figs. 1A, B, K, 2A, 3A, 4A, 5A, B, 6A–C, 7A, B, 8A, B)

Arge thaumatopygia Wei, in Wei and Wen, 1997, p. 29; Wei, 2006, p. 591; Wei *et al.*, 2006, p. 515.

Female (Fig. 1A, B). Length about 12–13 mm. Black, with vivid bluish reflection. Antenna black, without distinct metallic reflection; mandible bluish black basally and dark ferruginous apically. Legs black with bluish reflection; only basal half of hind tibia (except for extreme base) obscurely creamy white ventrally. Wings blackish infuscated all over, with indistinct cloud below stigma; stigma and veins blackish brown, with basal section of vein R1 and vein C narrowly creamy white near base of stigma. Subanal area mostly blackish.

Surface generally smooth and shining; punctures on anterior part of head dense, fine and distinct, generally separated from each other. Head and thorax covered with silvery hairs.

Head in dorsal view not dilated behind eyes, its maximum width 0.68–0.72×maximum width of thorax. Distance between eyes 1.0–1.1×vertical diameter of eye; eye with vertical diameter 1.6–1.7×horizontal diameter. Postocellar area weakly convex, anterior and lateral furrows shallow but rather sharp (Fig. 2A), or anterior furrow missing because of presence of low longitudinal ridge extending anteriorly from postocellar area between lateral ocelli as in Fig. 2C. Ocellar area scarcely concave between ocelli. Frontal area anterolaterally raised and widely and shallowly depressed along mid line (Figs. 2A, 3A); this depression separated anteriorly from median fovea by low horizontal ridge, which marks dorsal margin of interantennal area. Interantennal area (Fig. 3A) shallow, with rounded bottom, nearly open above, with lateral carinae sharply defined, dorsal

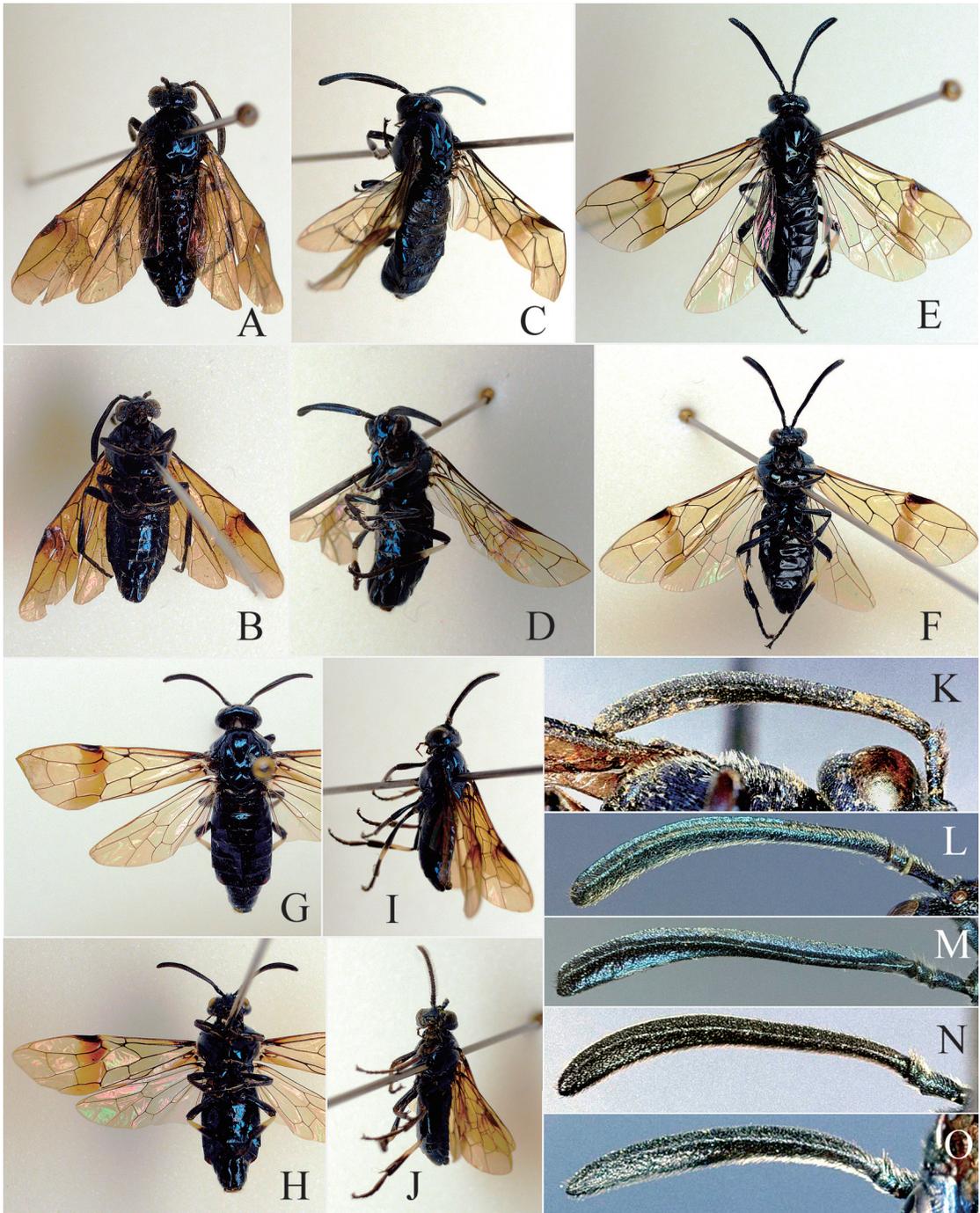


Fig. 1. *Arge thaumatopygia* (A, B, K), *A. niuae* (C, D, L), *A. metalloflagella* (E, F, M), *A. curvatantenna* (G–J, N) and *A. meliosmae* (O). — A, C, E, G, Females, holotypes, dorsal view; B, D, F, H, do., ventral view; I, male, Yua, dorsal view; J, do., ventral view; K–O, females, holotypes, antennae, outer lateral view (O, inverted image).



Fig. 2. Ocellar and postocellar areas, dorsal view, females. — A, *Arge thaumatopygia*, holotype; B, *A. niuae*, holotype, C, *A. metalloflagella*, holotype; D, *A. curvatantenna*, Jiuwanshan; E, *A. meliosmae*, paratype from Miyagi; F, do., holotype. Arrows in C and D show low longitudinal ridge extending anteriorly from postocellar area between lateral ocelli.

ends becoming obsolete and ventrally fused with each other above middle of supraclypeal area (Fig. 4A). Supraclypeal area with median ridge bluntly carinate, with side slope weakly convex. Malar space $0.8\text{--}0.9\times$ width of front ocellus. Clypeus flattened, with ventral margin rather deeply roundly incised medially (Fig. 4A). Antennal length $1.7\times$ maximum width of head; flagellum compressed in apical part (Fig. 5A), weakly curved basally and preapically and narrowly rounded at apex in lateral view (Figs. 1K, 5B), with four longitudinal carinae, outer dorsal one blunt and obsolete basally, inner ventral one (suture, arrowed in Fig. 5A) sharp and entire, and inner lateral and outer lateral ones rather blunt and obsolete near apex.

In forewing, cell 1Rs2 with anterior length $1.1\text{--}1.2\times$ posterior length, and crossvein 3r-m broadly roundly curved; in both wings, wing margin between veins Rs and Cu ciliate, with marginal glabrous area much narrower than width of vein M and marginal setae much longer than width of

vein M; marginal setae shortly protruding beyond wing margin (ciliae mostly lost in holotype).

Abdominal terga glabrous, except for lateral parts; sixth and more posterior terga also dorsally sparsely setose. Hypopygium with posterior margin strongly subtriangularly produced and deeply roundly incised at middle, thus appearing bilobed at apex (Fig. 6A), incision reaching about $1/2$ of visible length of hypopygium. Sawsheath in posterodorsal view (Fig. 6B) with lateral margin nearly straight, apex very broadly rounded, and medially not distinctly incised; dorsomedial ridge blunt and its lateral slope concave basally; in lateral view (Fig. 6C), ventral margin, except for basal convexity, weakly roundly convex, dorsal margin nearly straight or very weakly concave, and apex very broadly rounded; inner surface spinose.

Lance strongly sclerotized and pigmented, with distinct annuli and some linear membranous areas midapically; apical crest developed, with dorsal margin finely serrate and not swollen dor-

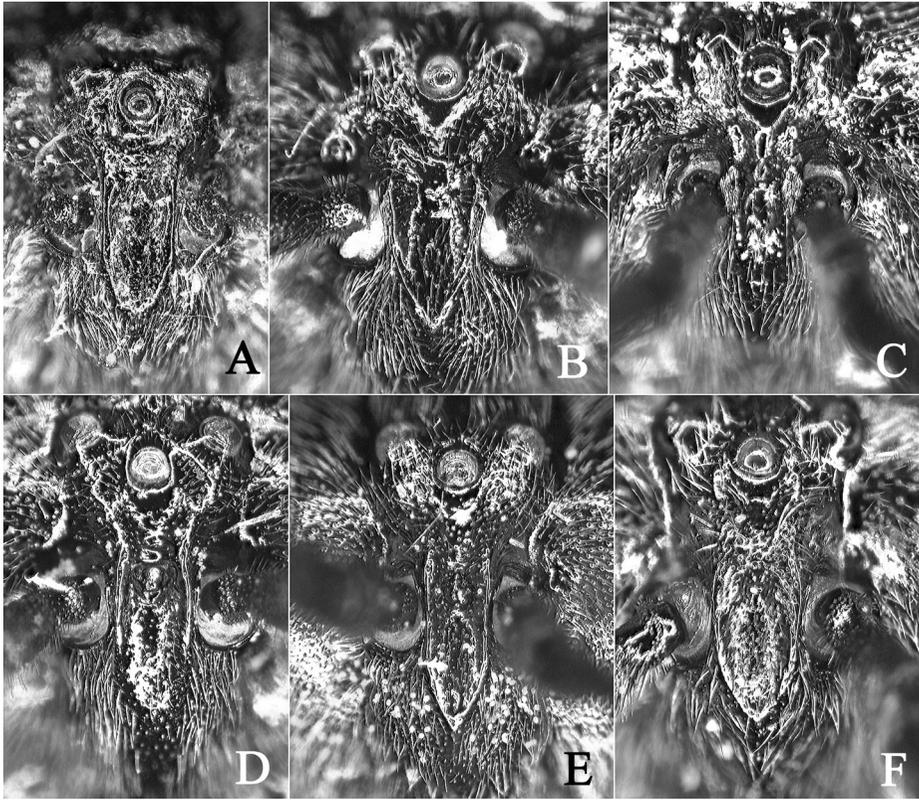


Fig. 3. Ocellar and interantennal areas, dorsofrontal view, females. — A, *Arge thaumatopygia*, holotype; B, *A. niuae*, holotype, C, *A. metalloflagella*, holotype; D, *A. curvatantenna*, Jiuwanshan; E, *A. meliosmae*, paratype from Miyagi; F, do., holotype.

sally (Fig. 7A, B). Lancet (Fig. 8A, B) rather slender, with dorsal margin nearly straight and ventral margin roundly convex, with 24–25 serrulae and narrow non-annulate area dorsoapically; dorsal marginal area above aulax well developed, broadest midapically, with rather long marginal setae; marginal sensilla very long; longitudinal rows of setae between annular plates present from apical margin of third annulus; annular plates in basal three annuli present only ventrally; fourth annular plate narrowed dorsally but reaching dorsal margin; fifth to 15th annular plates fully developed but more apical annular plates more or less fused; third and more apical annular plates each with one or two pores of sensilla in addition to ventral marginal sensilla; serrulae rather flat, and, except those in apical part of lancet, apparently separated from (or segment-

ed to) main body of lancet (Fig. 8A, B).

Male. Unknown.

Type material examined. ♀ (holotype, Fig. 1A, B), “Jiangxi, Lushan, 1988.7.10” “Holotype” “*A. thaumatopygia*” (CSUFT). 1 ♀ (paratype), “Lushan, Xiufeng, 1993.7.8” “Paratype” “*Arge thaumatopygia* Wei ♀, Det. M. Wei, 1996. ix.” (CSUFT).

Host plant. Unknown.

Distribution. China: Jiangxi, Guizhou (Wei, 2006).

Remarks. This species is well characterized by the strongly infuscated wings with an obscurely defined, even darker area below the stigma in the forewing (Fig. 1A, B) and the black hind tibia with only an obscurely whitish area ventrally in its basal half.

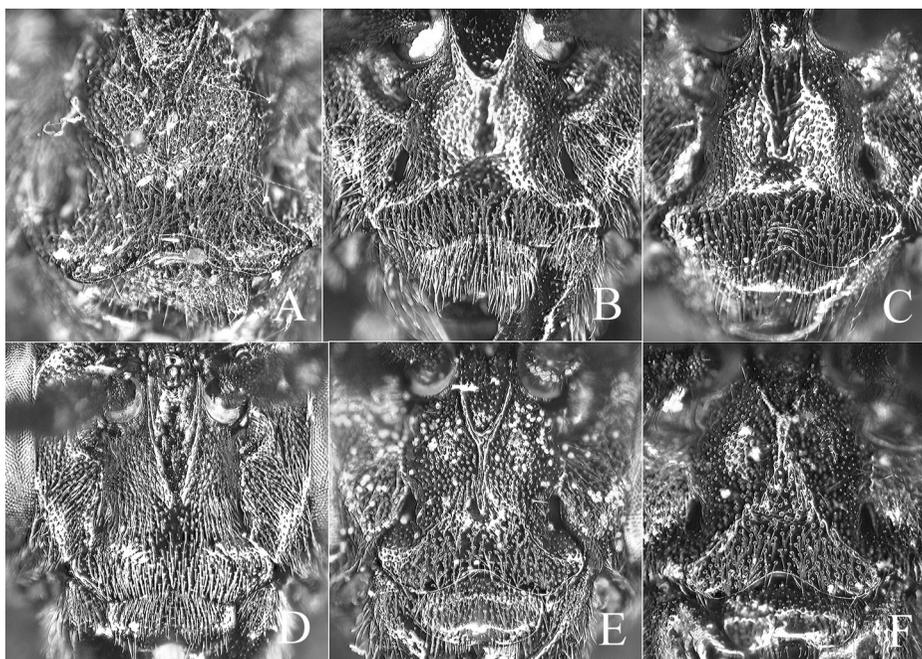


Fig. 4. Clypei and supraclipeal areas, frontal view, females. — A, *Arge thaumatopygia*, holotype; B, *A. niuae*, holotype, C, *A. metalloflagella*, holotype; D, *A. curvatantenna*, Jiuwanshan; E, *A. meliosmae*, paratype from Miyagi; F, do., holotype.

Arge niuae Shinohara, Hara and Wei, n. sp.

(Figs. 1C, D, L, 2B, 3B, 4B, 5C–E, 6D–F, 7C, 8C)

Female (Fig. 1C, D). Length about 12 mm. Black, with vivid bluish reflection. Antenna black, with distinct bluish reflection; mandible bluish black basally and dark ferruginous apically. Legs black with bluish reflection; only basal half of hind tibia (except for extreme base) creamy white. Wings hyaline, slightly infuscated, with distinct blackish band below stigma, covering base of cell 2R1, and about 3/4–4/5 of cells Rs, 2M and 3Cu; stigma and veins blackish brown, with extreme base of stigma and adjacent areas of basal section of vein R1 and apex of vein C creamy white. Subanal area mostly blackish.

Surface generally smooth and shining; punctures on anterior part of head dense, fine and distinct, generally separated from each other. Head and thorax covered with silvery hairs.

Head in dorsal view not dilated behind eyes, its maximum width $0.72 \times$ maximum width of

thorax. Distance between eyes $1.2 \times$ vertical diameter of eye; eye with vertical diameter $1.6 \times$ horizontal diameter. Postocellar area very weakly convex, anterior and lateral furrows defined as obscure slight depression (Fig. 2B). Ocellar area scarcely concave between ocelli. Frontal area anterolaterally raised and depressed along mid line (Figs. 2B, 3B); this depression not separated anteriorly from interantennal area. Interantennal area (Fig. 3B) with nearly flattened bottom, with lateral carinae sharply defined, dorsal ends continuous to lateral ridges of frons and ventrally fused with each other above middle of supraclipeal area into very bluntly caninate median ridge (Fig. 4B), with side slope convex. Malar space $0.9 \times$ width of front ocellus. Clypeus flattened, with ventral margin rather shallowly incised medially (Fig. 4B). Antennal length $2.1 \times$ maximum width of head; flagellum hardly compressed in apical part (Fig. 5C), weakly curved in apical 2/3 and narrowly rounded at apex in lateral view (Figs. 1L, 5E), with four longitudinal cari-

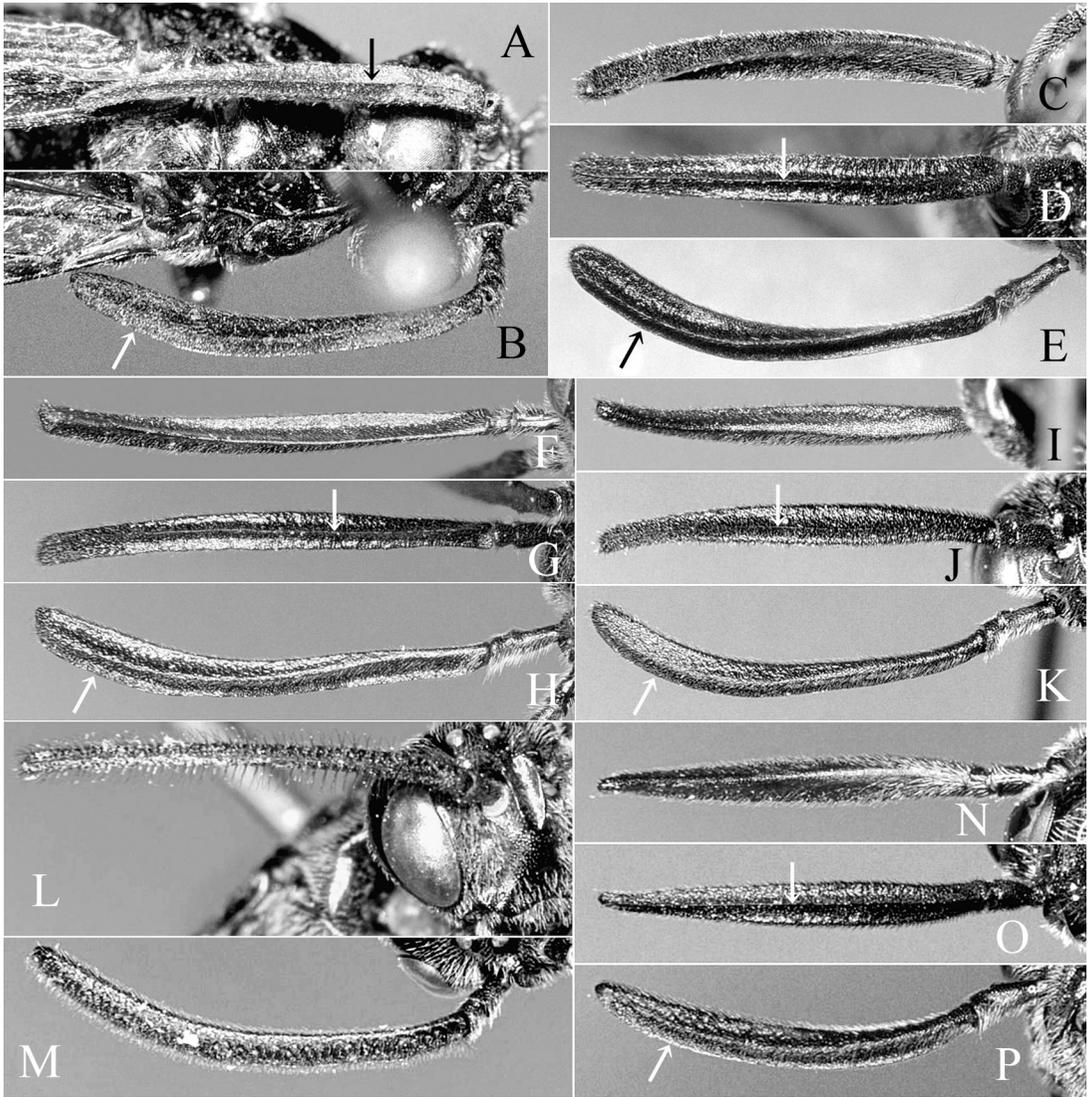


Fig. 5. Antennae, inner ventral (A, D, G, J, L, O), inner lateral (B, E, H, K, M, P) and outer dorsal (C, F, I, N) view, females (A–K, N–P) and male (L, M). — A, B, *Arge thaumatopygia*, holotype; C–E, *A. niuae*, holotype; F–H, *A. metalloflagella*, holotype; I–K, *A. curvatantenna*, Jiuwanshan; L, M, *A. curvatantenna*, Yuao; N–P, *A. meliosmae*, holotype (P, inverted image). Arrows show inner ventral seam-like carinae.

nae, outer dorsal one blunt and obsolete basally, inner ventral one (suture, arrowed in Fig. 5D, E) sharp and entire, inner lateral one blunt and obsolete basally, and outer lateral one sharp and entire.

In forewing, cell 1Rs2 with anterior length $1.0 \times$ posterior length, and crossvein 3r–m very weakly broadly curved; in both wings, wing mar-

gin between veins Rs and Cu with marginal glabrous area about as broad as vein M and marginal setae about as long as or shorter than width of vein M, thus marginal setae not protruding beyond wing margin.

Abdominal terga glabrous, except for lateral parts; fifth and more posterior terga also dorsally setose. Hypopygium with posterior margin

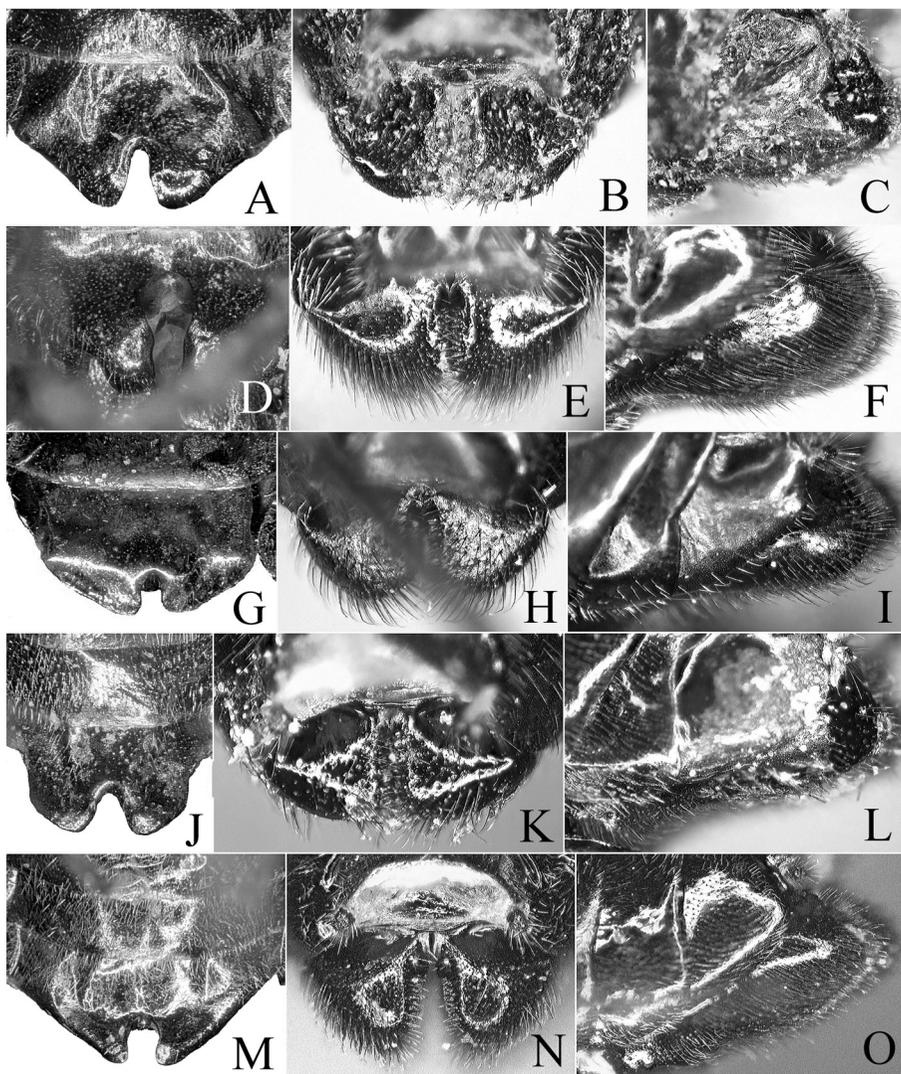


Fig. 6. Hypopygia, ventral view (A, D, G, J, M) and sawsheaths, dorsal (B, E, H, K, N) and lateral (C, F, I, L, O) view. — A–C, *Arge thaumatopygia*, holotype; D–F, *A. niuae*, holotype; G–I, *A. metalloflagella*, holotype; J–L, *A. curvatantenna*, Jiuwanshan; M–O, *A. meliosmae*, holotype.

strongly roundly produced and very deeply incised at middle, thus appearing bilobed at apex (Fig. 6D), incision reaching about 3/4 of visible length of hypopygium. Sawsheath in posterodorsal view (Fig. 6E) with lateral margin rounded, apex very broadly rounded, and medially not distinctly incised; dorsomedial ridge blunt and its lateral slope weakly concave; in lateral view (Fig. 6F), ventral margin, except for basal convexity, weakly convex, dorsal margin weakly convex,

and apex very broadly rounded; inner surface spinose.

Lance strongly sclerotized and pigmented, with distinct annuli and some linear membranous areas midapically; apical crest developed, with dorsal margin finely serrate and distinctly swollen dorsally (Fig. 7C). Lancet (Fig. 8C) rather thick, strongly sclerotized and pigmented, with dorsal margin nearly straight and ventral margin very weakly roundly convex, with 21 ser-

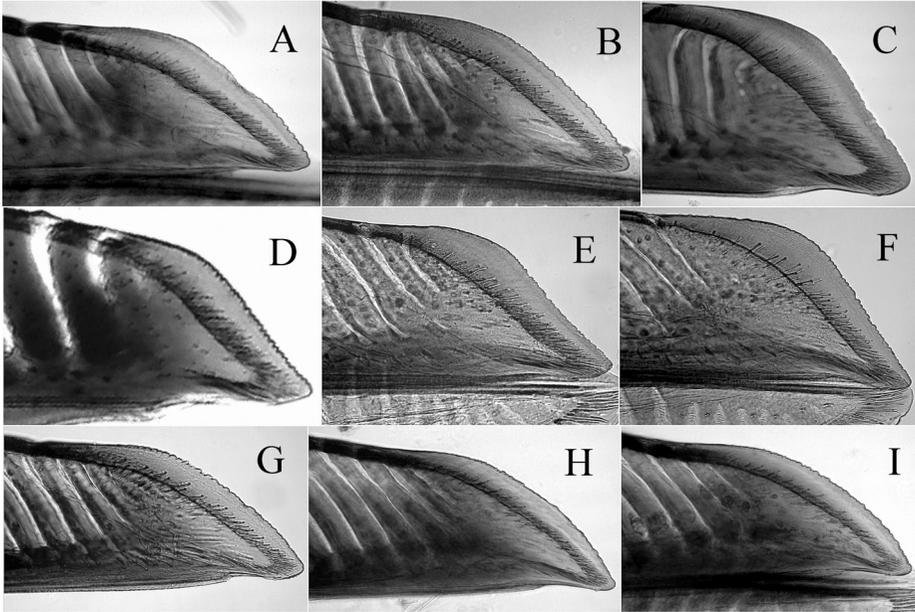


Fig. 7. Apical parts of lances, lateral view. — A, *Arge thaumatopygia*, holotype; B, do., paratype; C, *A. niuae*, holotype; D, *A. metalloflagella*, holotype; E, *A. curvatantenna*, Jiuwanshan; F, do., Andaihou; G, *A. meliosmae*, paratype from Miyagi; H, do., holotype; I, do., paratype.

rulae and without distinct non-annulate area; dorsal marginal area above aulax well developed, broadest midapically, with rather long marginal setae; marginal sensilla very long; longitudinal rows of setae between annular plates present from apical margin of third annulus; annular plates in basal three annuli present only ventrally; fourth annular plate strongly narrowed dorsally but reaching dorsal margin; fifth to 13th annular plates fully developed but more apical annular plates more or less fused; third and more apical annular plates each with one to three pores of sensilla in addition to ventral marginal sensilla; serrulae subtriangular, not separated from (or segmented to) main body of lance (Fig. 8C).

Male. Unknown.

Holotype (Fig. 1C, D). ♀, “Sichuan, Qingchenghoushan, Baiyansi, 2006.vi.29, Zhou Hu, E 103 28.428, N 30 56.033, altitude 1600 m” (CSUFT).

Etymology. The species is named after Ms. Gengyun Niu, Central South University of Forestry and Technology, Changsha.

Host plant. Unknown.

Distribution. China: Sichuan.

Remarks. This new species is well characterized by the metallic bluish flagellum, the extremely deep incision on the posterior margin of the hypopygium (Fig. 6D), and the subtriangular serrulae, which are not separated from (or segmented to) the main body of the lance (Fig. 8C). A combination of these features will easily separate *A. niuae* from the related species.

Arge metalloflagella Wei, Shinohara and Hara, n. sp.

(Figs. 1E, F, M, 2C, 3C, 4C, 5F–H, 6G–I, 7D, 9A)

Female (Fig. 1E, F). Length about 13 mm. Black, with coppery bluish reflection. Antenna black, with distinct bluish reflection; mandible bluish black basally and dark ferruginous apically. Legs black with bluish reflection; only basal half of hind tibia (except for extreme base) creamy white. Wings hyaline, slightly infuscated, with distinct blackish band below stigma, cover-

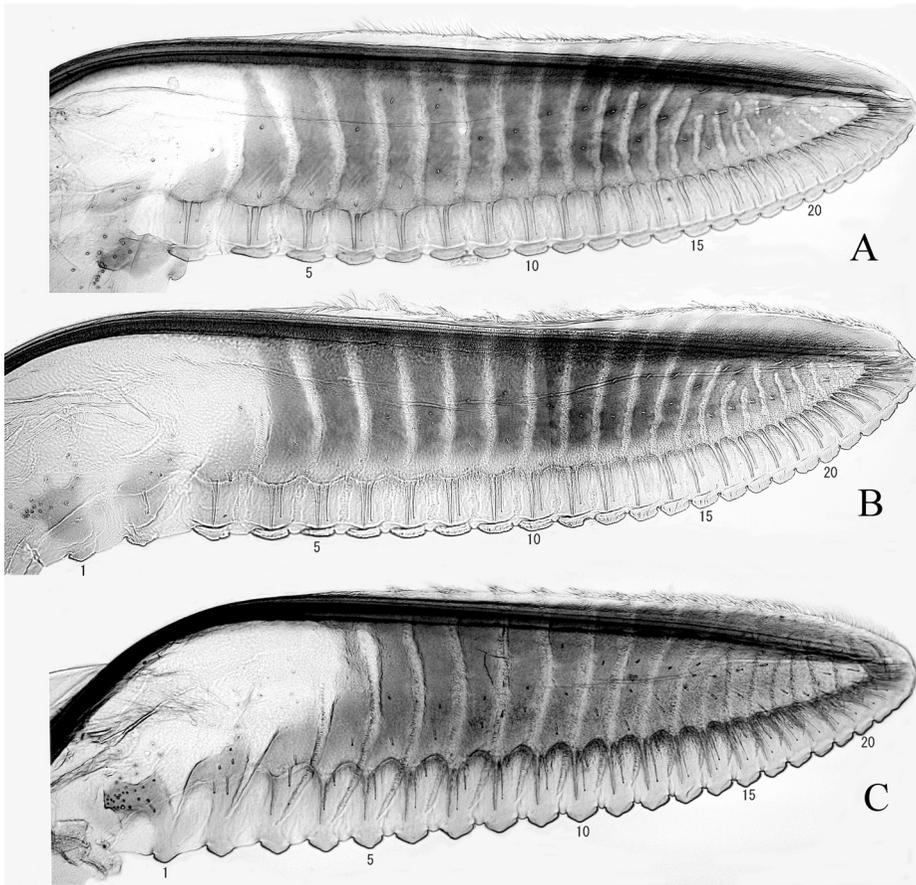


Fig. 8. Lancets, lateral view. — A, *Arge thaumatopygia*, holotype; B, do., paratype; C, *A. niuae*, holotype.

ing base of cell 2R1, and about 1/2–2/3 of cells Rs, 2M and 3Cu; stigma and veins blackish brown, with extreme base of stigma and adjacent areas of basal section of vein R1 and apex of vein C creamy white. Subanal area yellowish white, with large blackish mark.

Surface generally smooth and shining; punctures on anterior part of head dense, fine and distinct, generally separated from each other. Head and thorax covered with silvery hairs.

Head in dorsal view not dilated behind eyes, its maximum width $0.65 \times$ maximum width of thorax. Distance between eyes $1.2 \times$ vertical diameter of eye; eye with vertical diameter $1.8 \times$ horizontal diameter. Postocellar area convex anteriorly, with low longitudinal ridge (arrowed

in Fig. 2C) extending anteriorly between lateral ocelli, anterior furrow thus missing, and lateral furrows shallow but rather sharp. Ocellar area scarcely concave between ocelli. Frontal area anterolaterally raised and narrowly depressed along mid line (Figs. 2C, 3C); this depression not separated anteriorly from interantennal area. Interantennal area (Fig. 3C) rather narrow and small, with rounded bottom, with lateral carinae sharply defined almost only between antennae, dorsal ends continuous to lateral ridges of frons and ventrally becoming obsolete and fused with each other above middle of supraclypeal area into rounded median ridge (Fig. 4C), with side slope convex. Malar space $1.3 \times$ width of front ocellus. Clypeus flattened, with ventral margin rather

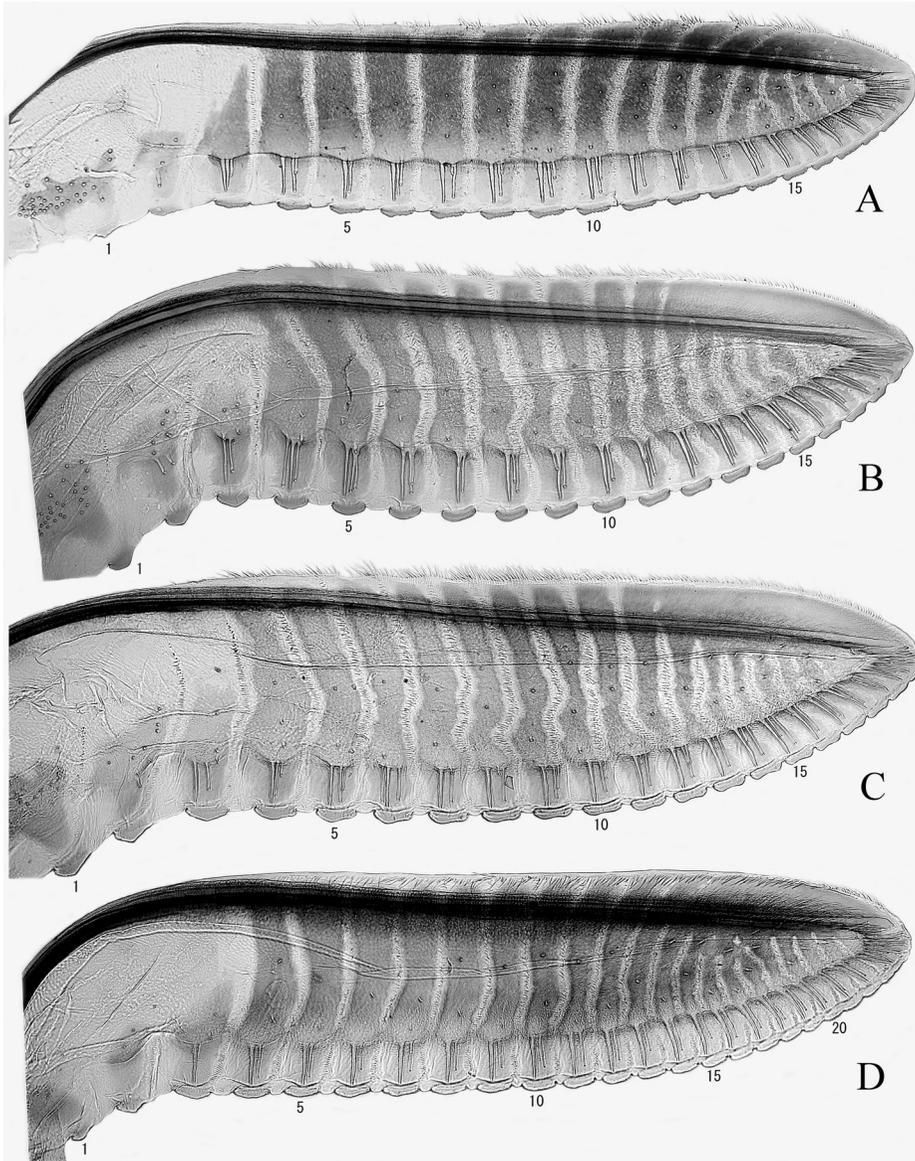


Fig. 9. Lancets, lateral view. — A, *Arge metalloflagella*, holotype; B, *A. curvatantenna*, Jiuwanshan; C, do., Andaihou; D, *A. meliosmae*, paratype from Miyagi.

deeply roundly incised medially (Fig. 4C). Antennal length $2.1 \times$ maximum width of head; flagellum hardly compressed in apical part (Fig. 5F), weakly curved in apical $2/3$ and narrowly rounded at apex in lateral view (Figs. 1M, 5H), with four longitudinal carinae, outer dorsal one blunt, inner ventral one (suture, arrowed in Fig. 5G, H) sharp and entire, inner lateral one blunt

and obsolete basally, and outer lateral one sharp and entire.

In forewing, cell 1Rs2 with anterior length $1.0 \times$ posterior length, and crossvein 3r-m very weakly broadly curved; in both wings, wing margin between veins Rs and Cu with marginal glabrous area broader than width of vein M and marginal setae shorter than width of vein M, thus

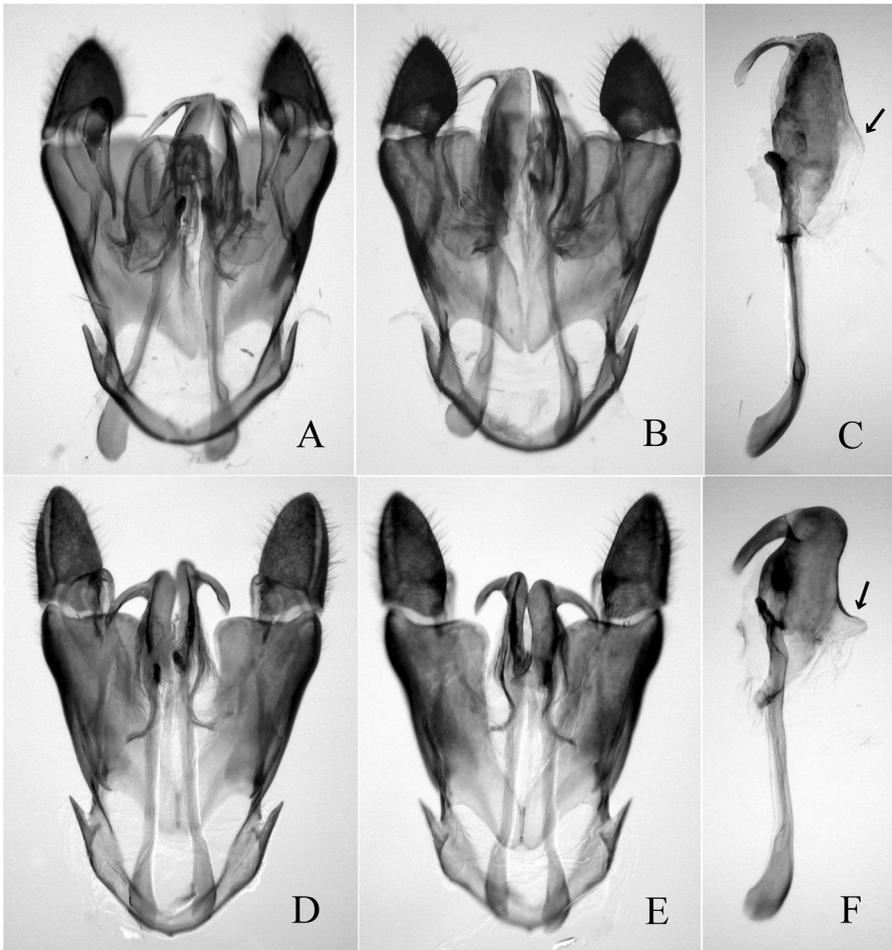


Fig. 10. Male genitalia, *Arge curvatantenna*, Yuaos (A–C) and *A. meliosmae*, paratype from Yamanashi (D–F). — A, D, Genital capsules, dorsal view; B, E, do., ventral view; C, F, penis valves, lateral view (left dorsal; arrows showing ventral process).

marginal setae not protruding beyond wing margin.

Abdominal terga glabrous, except for lateral parts; fifth and more posterior terga also dorsally very sparsely setose. Hypopygium with posterior margin strongly roundly produced and incised at middle, thus appearing bilobed at apex (Fig. 6G), incision reaching about 1/4 of visible length of hypopygium. Sawsheath in posterodorsal view (Fig. 6H) with lateral margin weakly rounded, apex very broadly rounded, and medially not distinctly incised; dorsomedial ridge very blunt and its lateral slope flattened; in lateral view (Fig. 6I),

ventral margin, except for basal convexity, nearly straight, dorsal margin nearly straight or very weakly concave, and apex very broadly rounded; inner surface spinose.

Lance strongly sclerotized and pigmented, with distinct annuli and some linear membranous areas midapically; apical crest developed, with dorsal margin finely serrate and slightly swollen dorsally (Fig. 7D). Lancet (Fig. 9A) rather slender, with dorsal margin nearly straight and ventral margin roundly convex, with 19 serrulae; segmentation of 14th and more apical annuli irregular but without distinct non-annulate area;

dorsal marginal area above aulax well developed, broadest midapically, with rather long marginal setae; marginal sensilla very long; longitudinal rows of setae between annular plates present from apical margin of second annulus; annular plates in basal three annuli present only ventrally; fourth annular plate slightly narrowed dorsally but reaching dorsal margin; fifth to 14th annular plates fully developed but more apical annular plates more or less fused; third and more apical annular plates each with one to three pores of sensilla in addition to ventral marginal sensilla; serrulae rather flat, each one basally more or less angled, and, except those in apical part of lancet, apparently separated from (or segmented to) main body of lancet (Fig. 9A).

Male. Unknown.

Holotype (Fig. 1E, F). ♀, “Sichuan, Emeishan, Xixiangchi, 2006. vii. 02, Zhong Yi-Hai, E 103 20.327, N 29 32.788, altitude 2000 m” “Holotype” “*A. metalloflagella*” (CSUFT).

Etymology. The species epithet, *metalloflagella*, refers to the metallic bluish flagellum of the antenna.

Host plant. Unknown.

Distribution. China: Sichuan.

Remarks. This new species is similar to *A. niuae*, which is described above, in having a bluish black antennal flagellum, but the postocellar area in *A. metalloflagella* is convex anteriorly, with a low longitudinal ridge (arrowed in Fig. 2C) extending anteriorly between the lateral ocelli, the blackish band on the forewing is narrow, the apical incision of the hypopygium is not very deep, reaching only 1/4 of the visible part of the hypopygium (Fig. 6G), and the serrulae of the lancet are rather flat, each one basally more or less angled, and, except those in the apical part of the lancet, apparently separated from (or segmented to) the main body of the lancet (Fig. 9A). Rather dull coppery bluish reflection of the body and the comparatively small head, with its maximum width about $0.65 \times$ maximum width of the thorax, are also characteristic of *A. metalloflagella*.

Arge curvatantenna Wei, 2003

(Figs. 1 G–J, N, 2D, 3D, 4D, 5I–M, 6J–L, 7E, F, 9B, C, 10A–C)

Arge curvatantenna Wei, in Wei and Nie, 2003, p. 172.

Female (Fig. 1G, H, hitherto undescribed). Length about 11–13.5 mm. Black, with vivid bluish reflection. Antenna black, flagellum without distinct metallic reflection; mandible bluish black basally and dark ferruginous apically. Legs black with bluish reflection; fore and mid tibiae obscurely brownish ventrally and basal half of hind tibia (except for extreme base) creamy white. Wings hyaline, slightly infuscated, with distinct blackish band below stigma, covering base of cell 2R1, and most of cells Rs, 2M and 3Cu; stigma and veins blackish brown, with extreme base of stigma and adjacent areas of basal section of vein R1 and apex of vein C creamy white. Subanal area blackish, with lateral parts yellowish white.

Surface generally smooth and shining; punctures on anterior part of head dense, fine and distinct, generally separated from each other. Head and thorax covered with silvery hairs.

Head in dorsal view distinctly dilated behind eyes, its maximum width $0.72\text{--}0.74 \times$ maximum width of thorax. Distance between eyes $1.2\text{--}1.3 \times$ vertical diameter of eye; eye with vertical diameter $1.7\text{--}1.8 \times$ horizontal diameter. Postocellar area convex anteriorly, with low longitudinal ridge (arrowed in Fig. 2D) extending anteriorly between lateral ocelli, anterior furrow thus missing, and lateral furrows defined as very obscure slight depression. Ocellar area scarcely concave between ocelli. Frontal area anterolaterally raised and narrowly depressed along mid line (Figs. 2D, 3D); this depression not separated anteriorly from interantennal area. Interantennal area (Fig. 3D) rather narrow, with rounded bottom, with lateral carinae sharply defined almost only between antennae, dorsal ends continuous to lateral ridges of frons and ventrally becoming obsolete and fused with each other above middle of supra-clypeal area into rounded median ridge (Fig. 4D), with side slope convex. Malar space $0.8\text{--}1.1 \times$

width of front ocellus. Clypeus flattened, with ventral margin rather shallowly incised medially (Fig. 4D). Antennal length 1.5–1.7×maximum width of head; flagellum compressed in apical part (Fig. 5I), weakly curved in apical 2/3 and narrowly rounded at apex in lateral view (Figs. 1N, 5K), with four longitudinal carinae, outer dorsal one blunt and obsolete basally, inner ventral one (suture, arrowed in Fig. 5J, K) sharp and entire, inner lateral one blunt and obsolete basally, and outer lateral one sharp and entire.

In forewing, cell 1Rs2 with anterior length 1.1×posterior length, and crossvein 3r-m very weakly broadly curved; in both wings, wing margin between veins Rs and Cu with marginal glabrous area about as broad as vein M and marginal setae about as long as or shorter than width of vein M, thus marginal setae not protruding beyond wing margin.

Abdominal terga glabrous, except for lateral parts; fifth and more posterior terga also dorsally sparsely setose. Hypopygium narrow with posterior margin strongly roundly produced and deeply incised at middle, thus appearing bilobed at apex (Fig. 6J), incision reaching about 1/2 of visible length of hypopygium. Sawsheath in posterodorsal view (Fig. 6K) with lateral margin rounded, apex very broadly rounded, and medially not distinctly incised; dorsomedial ridge very blunt and its lateral slope weakly convex; in lateral view (Fig. 6L), ventral margin, except for basal convexity, and dorsal margin nearly straight, and apex very broadly rounded; inner surface spinose.

Lance strongly sclerotized and pigmented, with distinct annuli and some linear membranous areas midapically; apical crest developed, with dorsal margin finely serrate and distinctly swollen dorsally (Fig. 7E, F). Lancet (Fig. 9B, C) rather thick, with dorsal margin nearly straight and ventral margin roundly convex, with 19–20 serrulae; dorsal non-annulate area on 13th and more apical annuli present but very narrow or missing below aulax; dorsal marginal area above aulax well developed, broadest midapically, with rather long marginal setae; marginal sensilla very

long; annuli distinctly sinuous; longitudinal rows of setae between annular plates present from apical margin of first annulus; annular plates in basal three annuli present only ventrally; fourth annular plate strongly narrowed dorsally but reaching dorsal margin; fifth to 12th annular plates fully developed but more apical annular plates more or less fused; third and more apical annular plates each with one to three pores of sensilla in addition to ventral marginal sensilla; serrulae rather flat, and, except those in apical part of lancet, apparently separated from (or segmented to) main body of lancet (Fig. 9B, C).

Male (Fig. 1I, J). Length about 8–9.5 mm. Color similar to that of female. Wings infuscated, with cloud below stigma obscure, not recognizable posteriorly to vein M.

Structure similar to that of female. Maximum width of head 0.86×maximum width of thorax. Distance between eyes 1.1–1.2×vertical diameter of eye; eye with vertical diameter 1.6–1.7×horizontal diameter. Malar space 0.9×width of front ocellus. Antennal length 1.8–1.9×maximum width of head; flagellum compressed, with sharp inner ventral carina (Fig. 5L, M). In forewing, cell 1Rs2 with anterior length 1.0×posterior length. Subgenital plate with posterior margin broadly rounded. Gonostipes in ventral view not distinctly widened apically, with median and apical margins subtruncate and apical width much broader than basal width of harpe (Fig. 10A, B). Harpe small, widest at basal third, gradually narrowing towards apex. Membranous area dorsal to base of valviceps distinctly darkened. Penis valve with valviceps nearly flattened (Fig. 10A), with long and slender dorsolateral process at apex directing anteriorly and low and broad ventral process at middle (Fig. 10C).

Type material examined. Holotype: ♂, “Hunan, Taoyuandong, 1995-VII-23, Zheng Boyi” “Holotype” (CSUFT).

Other material examined. 1♂ (Fig. 1I, J), “Guizhou, Fanjingshan, Yua, 2001-VIII-2, 900 m, Chen Ming-li, Huang Ning-ting” (CSUFT); 1♀ (Fig. 1G, H), “Guangxi, Rongshui, Jiuwan-shan, 1000 m, 2001-VIII-24, Xiao Wei” (CSUFT);

1♀, “Zhejiang, Songyang, Andaihou, 1989, VII. 15–17, 894583, He Junhua” (CSUFT).

Host plant. Unknown.

Distribution. China (Guizhou, Hunan, Guangxi, Zhejiang).

Remarks. This species was described on the basis of the male holotype from Hunan and one female paratype from Fujian. However, the latter specimen does not belong to *A. curvantenna*, as Shinohara *et al.* (2011) noted, and thus *A. curvantenna* has not been found in Fujian.

Among the species of the *thaumatopygia* group, *A. curvantenna* can be recognized by the distinctly dilated head behind the eyes in dorsal view, the convex anterior part of the postocellar area with a low longitudinal ridge extending anteriorly between the lateral ocelli (arrowed in Fig. 2D), the shallow median incision on the ventral margin of the clypeus (Fig. 4D), and the black antennal flagellum without distinct bluish metallic luster. The relatively narrow hypopygium (Fig. 6J), distinctly swollen dorsal part of the apical crest of the lance (Fig. 7E, F) and rather thick lancet with 19–20 distinct serrulae (Fig. 9B, C) in the female and the relatively short and wide harpe (Fig. 10B) and low and broad ventral process on the valviceps (Fig. 10C) in the male are also characteristic.

***Arge meliosmae* Shinohara and Hara, 2011**

(Figs. 10, 2E, F, 3E, F, 4E, F, 5N–P, 6M–O, 7H, I, 9D, 10D–F)

Arge meliosmae Shinohara and Hara, in Shinohara *et al.*, 2011, p. 100.

Type material examined. Holotype: ♀, Bichuzawa, 125 m, N36-45-50 E140-9-33, Wami, Nakagawa, Tochigi Pref., larva coll. 18. VIII. 2010, mat. 27. VIII., em. 14. IX. 2010, Host: *Meliosma myriantha* Siebold et Zucc., S. Ibuki (NSMT). Paratypes: 4♀7♂ from Miyagi, Tochigi and Yamanashi Prefectures, Honshu, Japan (NSMT) (Shinohara *et al.*, 2011).

Other material examined. 23 larvae in ethanol from Tochigi and Hyogo Prefectures, Honshu, Japan (NSMT) (Shinohara *et al.*, 2011). Additional material: Hyogo Pref.: 2♀1♂, Akasai-keikoku, ca. 500 m, Shiso, larvae coll. 12. X. 2010, mat. 13. X., em. 24–25. IV. 2011, Host: *Meliosma myriantha*, A. Shinohara (NSMT).

Host plant. *Meliosma myriantha* Siebold et Zucc. (Sabiaceae).

Distribution. Japan (Honshu: Miyagi, Tochigi, Yamanashi and Hyogo Prefectures).

Remarks. This recently described species has much in common with *A. thaumatopygia* in the structure of the head, hypopygium and lancet, but the hyaline and banded wings and the mostly whitish basal half of the hind tibia will easily distinguish *A. meliosmae* from *A. thaumatopygia*. For a full description of *A. meliosmae*, see Shinohara *et al.* (2011).

The emergence of the adults in late April, 2011, from the larvae collected in October, 2010 (see material examined above) strongly suggests that this species has three generations a year in Honshu (see discussion in Shinohara *et al.*, 2011).

Key to species and summary of diagnostic characters and distribution

1. Females. 2
- Males. 6
2. Wings strongly infuscated all over, with obscurely defined, even darker area below stigma (Fig. 1A, B); hind tibia obscurely whitish ventrally in basal half.

(Head not dilated behind eyes, its maximum width 0.68–0.72×maximum width of thorax; anterior part of postocellar area with or without longitudinal ridge; clypeus with ventral margin rather deeply roundly incised medially (Fig. 4A); antenna without distinct metallic luster; hypopygium with posterior margin strongly subtriangularly produced, with median incision reaching about 1/2

of visible length of hypopygium (Fig. 6A); lancet with 24–25 serrulae, serrulae rather flat with rounded top, and, except those in apical part of lancet, apparently separated from (or segmented to) main body of lancet (Fig. 8A, B); subanal area mostly blackish.) China: Jiangxi, Guizhou.

- *A. thaumatopygia* Wei, 1997.
- Wings hyaline with blackish band below stigma (Fig. 1C–H); hind tibia mostly whitish in basal half. 3
3. Hypopygium with median incision on posterior margin very deep, reaching about 3/4 of visible length of hypopygium (Fig. 6D); lancet with serrulae subtriangular, not separated from (or segmented to) main body of lancet (Fig. 8C).
(Head not dilated behind eyes, its maximum width $0.72 \times$ maximum width of thorax; anterior part of postocellar area without longitudinal ridge; clypeus with ventral margin rather shallowly incised medially (Fig. 4B); antenna with distinct metallic luster (Fig. 1L), not compressed apically in outer dorsal view (Fig. 5C); blackish band on fore wing broad; hypopygium as in Fig. 6D; lancet with 21 serrulae; subanal area mostly blackish.) China: Sichuan.
..... *A. niuae* Shinohara, Hara and Wei, n. sp.
- Hypopygium with median incision on posterior margin shallow, not reaching 1/2 of visible length of hypopygium (Fig. 6A, G, J, M); lancet with serrulae rather flat with rounded top, and, except those in apical part of lancet, apparently separated from (or segmented to) main body of lancet (Figs. 8A, B, 9). 4
4. Antenna with distinct bluish metallic luster (Fig. 1M), not compressed apically in outer dorsal view (Fig. 5F); abdomen rather weak coppery bluish reflections; blackish band below stigma narrow, blackish parts on cells 1Rs, 2M and 3Cu covering only 1/2–2/3 of their areas (Fig. 1E, F).
(Head not dilated behind eyes, its maximum width $0.65 \times$ maximum width of thorax; anterior part of postocellar area convex with low longitudinal ridge extending anteriorly between lateral ocelli; clypeus with ventral margin rather shallowly roundly incised medially; hypopygium wide and posterior medial incision small (Fig. 6G); lancet with 19 serrulae; subanal area yellowish white, with large blackish mark.) China: Sichuan.
..... *A. metalloflagella* Wei, Shinohara and Hara, n. sp.
- Antenna without distinct bluish metallic luster (e.g. Fig. 1N), compressed apically in outer dorsal view (Fig. 5I, N); abdomen with vivid bluish reflections (Fig. 1G, H); blackish band below stigma broad, blackish parts on cells 1Rs, 2M and 3Cu covering almost all of their areas (e.g. Fig. 1G, H).
..... 5
5. Head dilated behind eyes; anterior part of postocellar area convex, with low longitudinal ridge extending anteriorly between lateral ocelli (arrowed in Fig. 2D); clypeus with ventral margin shallowly incised medially (Fig. 4D); hypopygium narrow, inverted bell-shaped (Fig. 6J); lancet rather thick, with 19–20 serrulae (Fig. 9B, C); subanal area blackish, with lateral parts yellowish white.
(Maximum width of head 0.72 – $0.74 \times$ maximum width of thorax.) China: Guizhou, Hunan, Guangxi, Zhejiang.
..... *A. curvatantenna* Wei, 2002.
- Head not distinctly dilated behind eyes; anterior part of postocellar area rather flat, without longitudinal ridge (Fig. 2E, F); clypeus with ventral margin deeply incised medially (Fig. 4E, F); hypopygium wide, subtriangular (Fig. 6M); lancet rather slender, with 23–24 serrulae (Fig. 9D); subanal area usually mostly yellowish white.
(Maximum width of head 0.70 – $0.77 \times$ maximum width of thorax.) Japan: Honshu.
..... *A. meliosmae* Shinohara and Hara, 2011.
6. Anterior part of postocellar area convex, with very short longitudinal ridge; supraclypeal ridge rounded; clypeus shallowly incised; head rather long behind eyes, its maximum width $0.86 \times$ maximum width of thorax; harpe short and wide (Fig. 10B); ventral process on valviceps low and broad (Fig. 10C). *A. curvatantenna*
- Anterior part of postocellar area flat, without longitudinal ridge; supraclypeal ridge carinate;

clypeus deeply incised; head rather short behind eyes, its maximum width 0.76–0.84×maximum width of thorax; harpe slender (Fig. 10E); ventral process on valviceps high and narrow (Fig. 10F).

..... *A. meliosmae*

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