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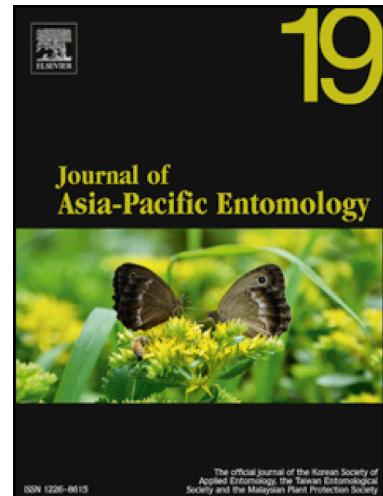
Taxonomic review of the family Ricaniidae (Hemiptera: Auchenorrhyncha: Fulgoroidea) from Korea

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# Taxonomic review of the family Ricaniidae (Hemiptera: Auchenorrhyncha: Fulgoroidea) from Korea

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## ABSTRACT

In this study, we taxonomically reviewed the family Ricaniidae (Hemiptera: Fulgoroidea) from Korea. Some members of the family Ricaniidae are significant insect pests in agriculture and forestry. In Korea, eight species have been recognized along with a new record, *Ricania fumosa* (Walker, 1851). We confirmed that an invasive species, *R. speculum* (Walker, 1851), has now spread throughout Korea, except Jeju Island, since its first discovery in 2015. Diagnoses and redescriptions of the species are presented with photographs of habitus, male and female genitalia, and with a key to the Korean species of Ricaniidae.

**Keywords:** Fulgoroidea, pest, *Ricania fumosa*, Ricaniidae, taxonomic review

## Introduction

The planthopper family Ricaniidae Amyot and Audinet-Serville belongs to the superfamily Fulgoroidea (Hemiptera: Auchenorrhyncha: Fulgoromorpha), which contains 67 genera and 437 species distributed worldwide (except Nearctic; Bourgoin, 2021). The family Ricaniidae is a morphologically unique group, and it can be easily recognized in Fulgoroidea as most species have expanded, membranous and triangular tegmina (Gnezdilov, 2009; O'Brien and Wilson, 1985; Shcherbakov, 1981; Stroiński et al., 2011; Wilson, 2005).

Several members of the family Ricaniidae are known to be significant insect pests worldwide in agriculture and forestry. The economic importance of ricaniid planthoppers is well known due to their large populations, oviparity, secretion of honeydew, vectorings of plant disease and/or polyphagous feeding habit. (Luo, 2003; Rossi and Lucchi, 2015; Mazza et al., 2014; Mazza et al., 2020). For example, *Ricania simulans* (Demir, 2009; Gjonov, 2011; Karataş, 2020), *R. sublimata* (Hizal et al., 2019; Park and Jung, 2020), *R. speculum* (Rossi and Lucchi, 2015; Mazza et al., 2020) and *Scolypopa australis* (Charles, 1998; Fletcher, 1979a, b, 2008). Among them, *Ricania speculum* Walker and *R. sublimata* Jacobi were invaded to Korea recently (Choi et al., 2011; Mazza et al., 2014; Park and Jung, 2020).

To date, four genera and seven species have been recorded in Korea, including two invasive species (Hyun and Woo, 1969; Kim, 1961; Kwon et al., 1996; Lee, 1971; Matsumura, 1915; Mazza et al., 2014; Park and Jung, 2020). In this study, we reviewed eight species of the family Ricaniidae in Korea including a new record, *Ricania fumosa* (Walker, 1851). Diagnoses and redescriptions for each species have been provided with photographs of habitus, and male and female genitalia. New hosts of some taxa have been reported from Korea. A key to the species of Ricaniidae from Korea has also been provided.

## Material and methods

Photographs of habitus and measurements were taken using a Leica DMC2900 with Leica M165C microscope and LAS Interactive Measurements. All measurements are provided in millimeters (mm). The tegmina was cut off from the thorax, and was placed in 99% EtOH to remove wax layer and to observe the veins. For genital experiments, male and female genitalia were soaked in 10% KOH at room temperature for 8-10 hours. Following this, genitalia were placed on slide glasses with glycerin for dissection. Terminology is based on Bourgoin et al. (2015) for tegmina, Bourgoin (1988) and Bourgoin and Huang (1990) for the male genitalia, and Bourgoin (1993) for the female genitalia. Depository of the examined specimens is CNU (Laboratory of Systematic Entomology, Chungnam National University, Daejeon, Korea). Distribution and host plant with an asterisk (\*) indicate a new record. Abbreviations used for the material examined in Korea are as follows: [GG] Gyeonggi-do; [GW] Gangwon-do; [CB] Chungcheongbuk-do; [CN] Chungcheongnam-do; [GB] Gyeongsangbuk-do; [GN] Gyeongsangnam-do; [JB] Jeollabuk-do; [JN] Jeollanam-do; [JJ] Jeju-do (Is.).

**Systematic accounts**

**Order Hemiptera Linnaeus, 1758**

**Suborder Auchenorrhyncha Duméril, 1806**

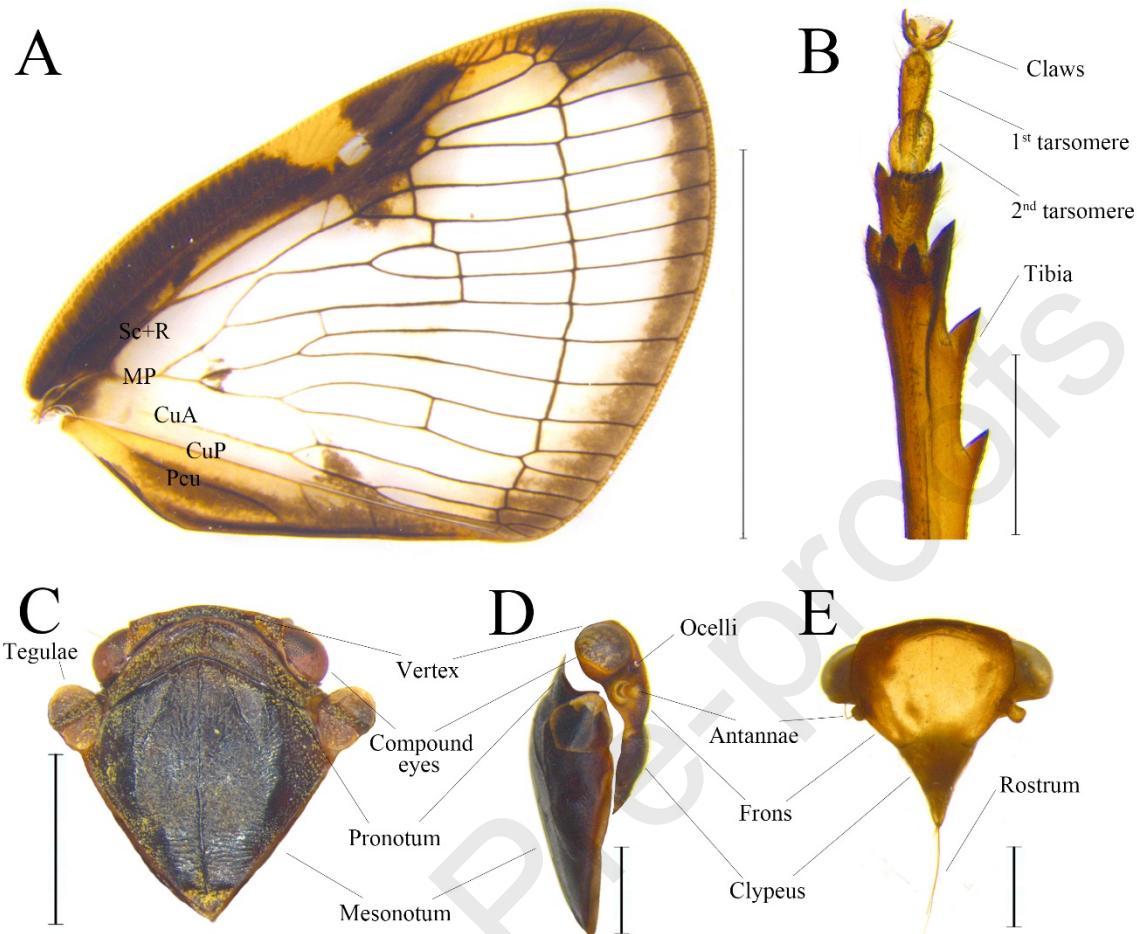
**Infraorder Fulgoromorpha Evans, 1946**

**Superfamily Fulgoidea Latreille, 1807**

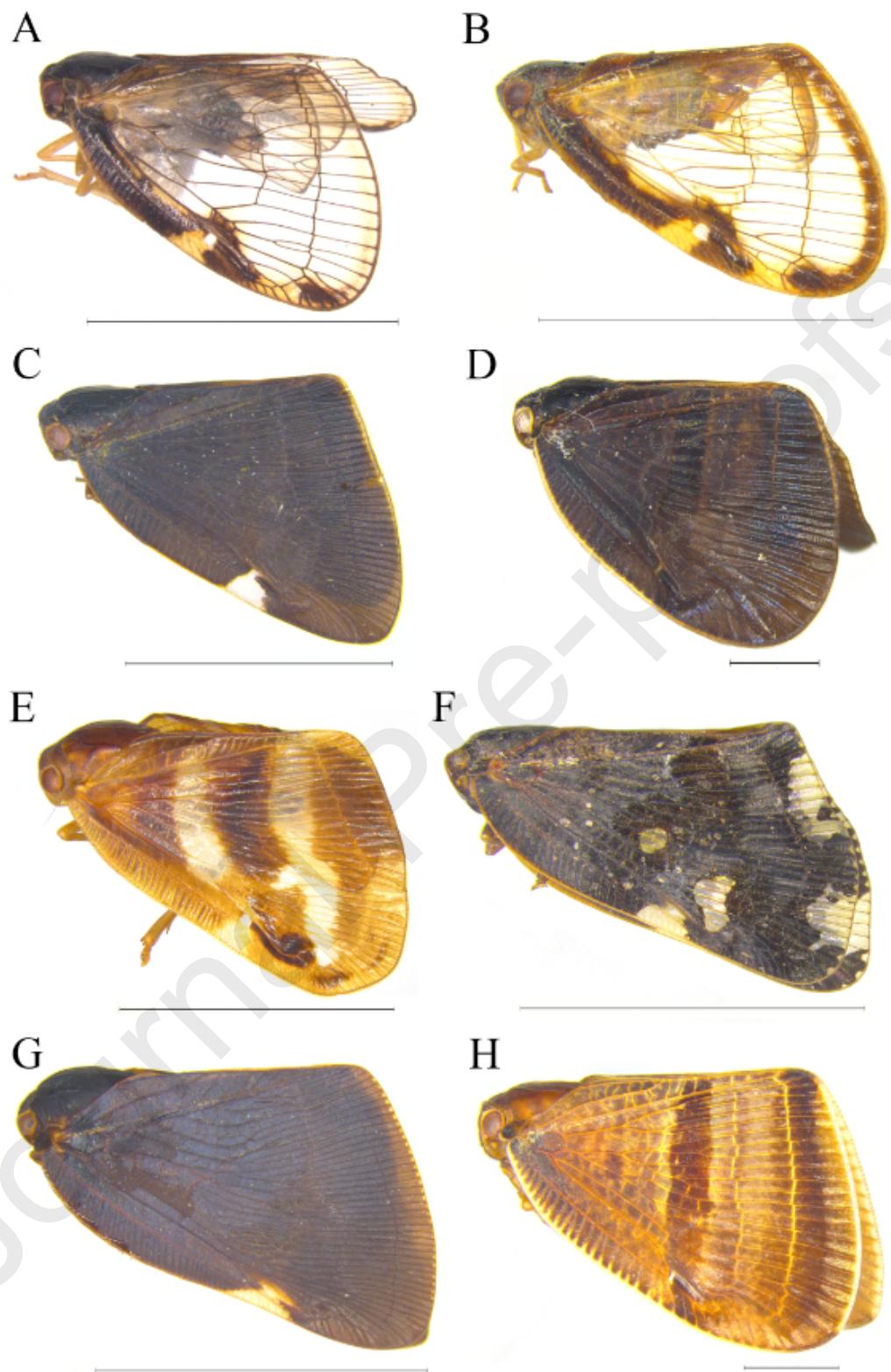
**Family Ricanidae Amyot and Audinet-Serville, 1843**

Type genus: *Ricania* Germar, 1818 (type designated by Muir, 1923: 235).

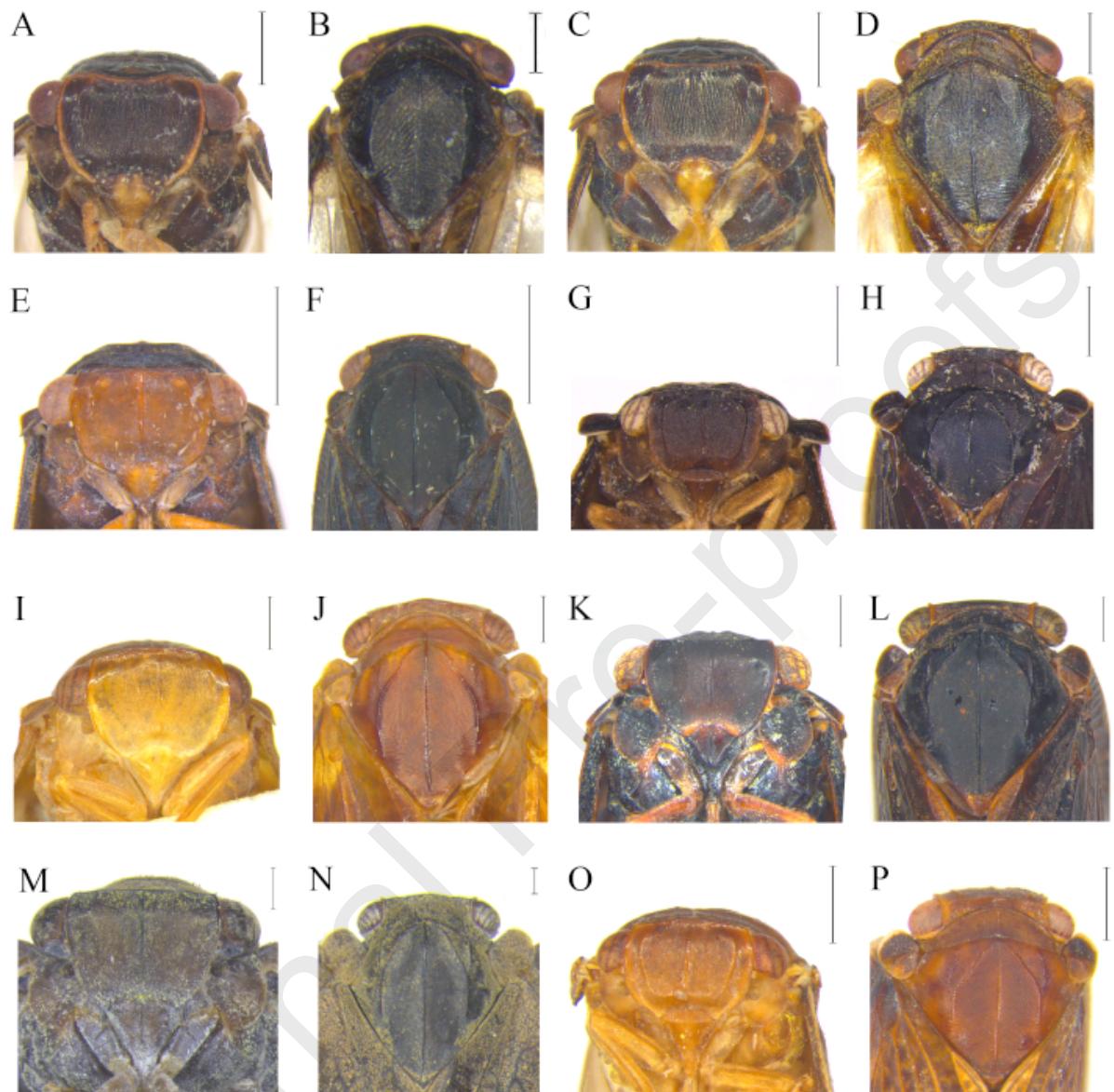
**Diagnosis.** Recognized by tegmina widely triangular or quadrate, corners of tegmina round (Fig. 1A); frons semicircular, round (Figs. 1D-E); length of pronotum shorter than mesonotum distinctly, mesonotum as long as wide (Fig. 1C); tarsus on hindlegs with spinosus spines except first, second tarsomere (Fig. 1B) (modified from Wilson, 2005).



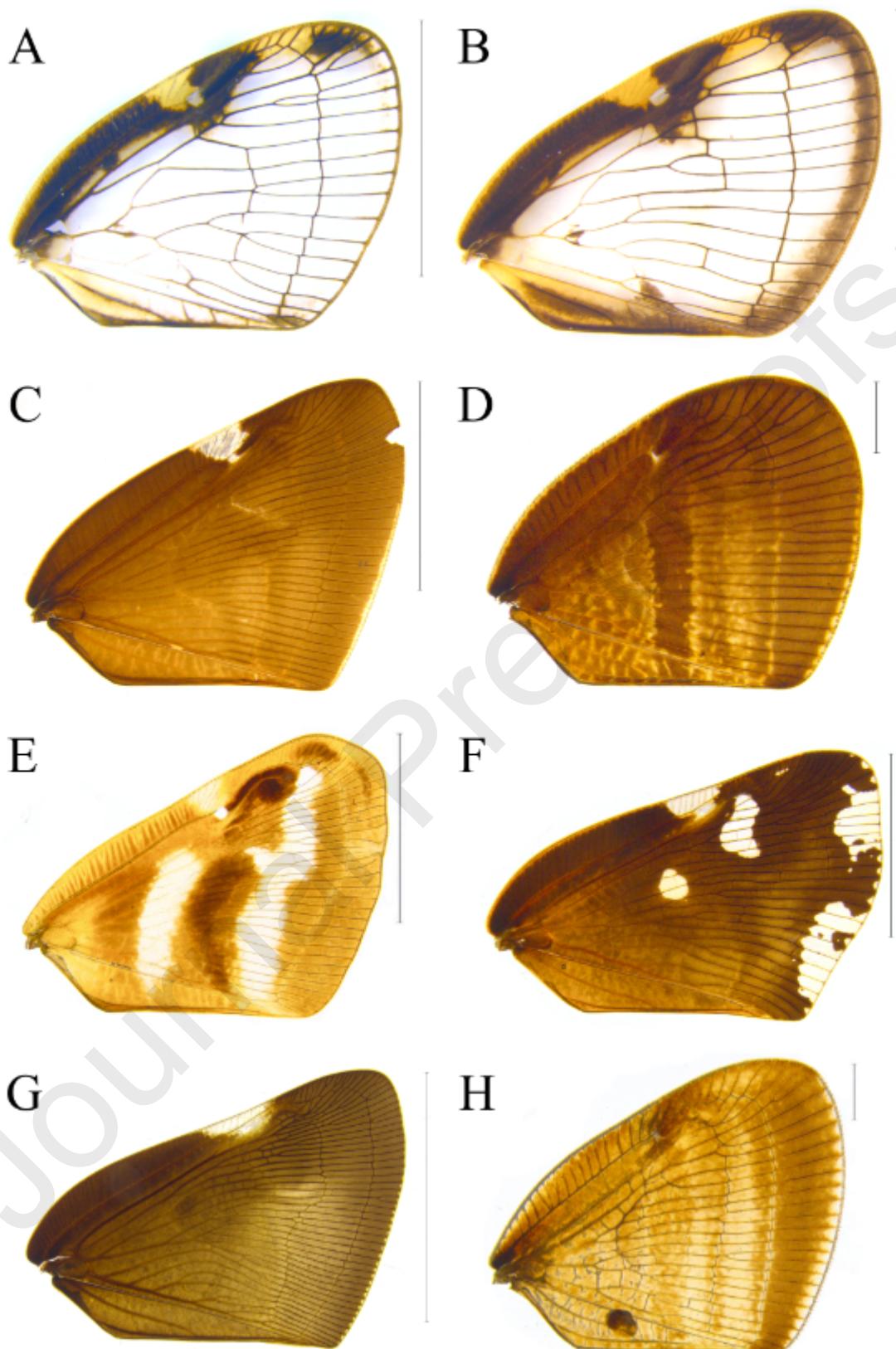
**Figure 1.** Diagnostic characters of family Ricanidae. A, C: *Euricania facialis*; B: *Ricania sublimata*; D: *R. speculum*; E: *R. simulans*. A: right tegmina, flattened; B: hind leg; C: dorsal habitus; D: Lateral habitus; E: frons. Scale bar: A: 5mm; B: 0.5mm; C-E: 1mm.



**Figure 2.** Left-lateral habitus of family Ricanidae from Korea. A: *Euricania clara*, B: *E. facialis*, C: *Pochazia albomaculata*, D: *Ricania fumosa*, E: *R. simulans*, F: *R. speculum*, G: *R. sublimata*, H: *R. taeniata*. Scale bar: A-C, E: 5mm; D-H: 1mm; F-G: 10mm.



**Figure 3.** Frons, ventral habitus and mesonotum, dorsal habitus of Ricaniiidae from Korea. A-B: *Euricania clara*, C-D: *E. facialis*, E-F: *Pochazia albomaculata*, G-H: *Ricania fumosa*, I-J: *R. simulans*, K-L: *R. speculum*, M-N: *R. sublimata*, O-P: *R. taeniata*. Scale bar: A-P: 0.5mm.



**Figure 4.** Right tegmina of Ricaniidae from Korea, flattened. A: *Euricania clara*, B: *E. facialis*, C: *Pochazia albomaculata*, D: *Ricania fumosa*, E: *R. simulans*, F: *R. speculum*, G: *R. sublimata*, H: *R. taeniata*. Scale bar: A-

C, E-F: 5mm; D, H: 1mm; G: 10mm.

### **Genus *Euricania* Melichar, 1898**

Type species: *Euricania ocella* (Walker, 1851) (=*Pochazia ocellus* Walker, 1851).

*Euricania* Melichar, 1898b: 393; Metcalf, 1955: 122.

**Diagnosis.** Differs from other genera by tegmina hyaline, veins contrasted with background distinctly; veins relatively sparse than other genera; veins Sc+R on tegmina dividing after middle of tegmina, not branched nearly basal cell (Figs. 2A-B; 4 A-B); clypeus with one median carinae (Figs. 3A, C) (modified from Fletcher, 2008; Bu and Liang, 2011).

### ***Euricania clara* Kato, 1932**

(Figs. 2A; 3A-B; 4A-B; 5A-G)

*Euricania clara* Kato, 1932: 228; Metcalf: 1955: 124; Lee, 1971: 135.

**Diagnosis.** This species distinguished by other species in the genus *Euricania* by tegmina without transverse stripes (Fig. 4A), processes of aedeagus shorter than peraindrium (Figs. 5D-F); general coloration of body fuscous; tegmina hyaline, posterior margins of tegmina concolorous with background (Figs. 2A; 4A); male phallic complex with aedeagus two pairs of curved spinous process; basal without any process, regularly round (5D-F); See Xu et al. (2006) and Ren et al. (2015) for diagnostic characters also.

**Redescription. Male.** COLORATION: General coloration of body fuscous, Vertex and pronotum concolorous with background. Frons fuscous, lateral and apical margins with yellowish band, margins concolorous with background (Figs. 3A-B). Tegmina hyaline, veins fuscous, costal margin with fuscous bands, yellowish marking in upper-middle and apical, anterior and posterior margins concolorous with background (Fig. 4A). Femora and tibiae light brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish wax layer slightly. STRUCTURE. **Head.** Head with compound eyes as wide as widest part of mesonotum. Vertex

narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin concave and angulated; lateral margins arcuate, curved to frontoclypeal suture; one median and two lateral carinae developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3A). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 5.9 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3B). Tegmina membranous, elongately-triangular; costal margin arcuate, anterior angle broadly rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R straight after leaving basal cell, MP dividing near basally, CuA branched almost middle (Fig. 4A). **Abdomen.** GENITALIA: Anal tube, posterior margin slightly concave, basal margin straight, lateral margins arcuate, anus placed in middle, paraproct not reaching the posterior margin (Fig. 5B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, posterior margin almost straight; postero-dorsal angle without process, caudo-dorsal angle angulated (Fig. 5C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin slightly convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 5G). Phallic complex, in lateral view, elongated; Periandrium width shorter than length. Basal part of periandrium rounded, without any additional structures. Apical part blunt, slightly concave, two lobes slightly angulated; Aedeagus shorter than periandrium, with two pair of short spinosus processes at apical, sclerotized; dorsal processes longer than ventral processes distinctly, curved to laterally, ventral processes curly, curved to lateral slightly (Figs. 5D-F). **Female.** Same as male in general features. **Abdomen.** GENITALIA: Xu et al. (2006) described detailed female genitalia with illustrations. See Kato (1932) for original description, Chou et al. (1985) also.

**Measurements (in mm).** Male (n=2). Body length: 5.46-5.49.

**Material examined.** [CN] 2♂♂. 28.VII.2015. Jisan-ri, Mokcheon-eup, Dongnam-gu, Cheonan-si. S.M. Oh.

**Distributions.** Korea (Lee, 1971), China (South, East, Northeast, Southeast), Japan (Xu et al., 2006).

**Hosts.** *Lycium chinense*, *Robinia pseudoacacia* (Chou et al., 1985), *Pueraria thunbergiana* (Lee and Kwon, 1979).

***Euricania facialis* (Walker, 1858)**

(Figs. 2B; 3C-D; 4B; 6A-N)

*Flatoides facialis* Walker, 1858: 100; Stål, 1862: 491; Wu, 1935: 112.*Euricania facialis* Melichar, 1898a: 259; Nast, 1972: 135; Lee and Kwon, 1979: 611.*Euricania ocellus facialis* Esaki, 1950: 324; Metcalf, 1955: 130; Fennah, 1956: 211.

**Diagnosis.** This species distinguished by other species in the genus *Euricania* by tegmina with transverse stripes (Fig. 4B), lateral carinae of frons as long as median carinae (Figs. 3C-D); general coloration of body fuscous and hyaline tegmina; transverse markings on tegmina developed slightly, posterior margins of tegmina fuscous, contrast with background distinctly (Figs. 2B; 4B); male phallic complex with aedeagus two pairs of spinous process curved; basal with pair of short spinosus process symmetrically, round (Figs. 6D-F); female gonoplac triangular, produced upper (Fig. 6J); pregenital sternite roundly convex at median portion (Fig. 6N); See Xu et al. (2006) and Ren et al. (2015) for diagnostic characters also.

**Redescription. Male.** COLORATION: General coloration of body fuscous, Vertex and pronotum concolorous with background. Frons fuscous, lateral and apical margins with yellowish band, margins concolorous with background (Figs. 3C-D). Tegmina hyaline, veins fuscous, margins with fuscous bands, costal margin with yellowish marking in upper-middle and apical (Fig. 4B). Femora and tibiae light brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish wax layer slightly. STRUCTURE. **Head.** Head with compound eyes slightly less than widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin concave and slightly angulated; lateral margins arcuate, curved to frontoclypeal suture; one median and two lateral carinae developed from frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3C). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 5.1 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3D). Tegmina membranous, elongately-triangular; costal margin arcuate, anterior angle broadly

rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R straight after leaving basal cell, MP dividing near basally, CuA branched twice at middle (Fig. 4B). **Abdomen.** GENITALIA: Anal tube, posterior margin slightly concave, basal margin slightly straight, lateral margins arcuate, anus placed in middle, paraproct reaching the posterior margin (Fig. 6B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, posterior margin almost straight; postero-dorsal angle without process, caudo-dorsal angle angulated (Fig. 6C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin slightly convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 6G). Phallic complex, in lateral view, elongated; Periandrium width shorter than length. Basal part of periandrium rounded, with a pair of short spinosus processes. Apical part blunt, slightly concave, two lobes round; Aedeagus shorter than periandrium, with two pair of short spinosus processes at apical, sclerotized; dorsal processes longer than ventral processes distinctly, curved to laterally, ventral processes curly, curved to laterally (Figs. 6D-F). **Female.** Same as male in general features; GENITALIA: Pregenital sternite with lateral lobes well developed, median portion narrow; anterior margin convex; posterior margin concave at median portion (Fig. 6N). Anal tube lateral margins convex, basal margin slightly wider than upper, posterior margin flat, anus placed after midlength, paraproct surpassing the posterior margin of anal tube (Fig. 6I). Gonoplac triangular, posterior margin bearing with blunt and short teeth, postero-ventral partly membranous (Fig. 6J). Gonapophysis VIII partly flattened, tapering apicad; dorsal margin slightly convex, with sharp apex and well visible teeth at posterodorsal margin; endogonocoxal process narrower and as long as gonaphophysis VIII, membranous (Fig. 6K). Gonapophysis IX with posterior connective lamina sclerotized, gonospiculum bridge oval caudo-dorsally, slightly blunt ventrodorsally (Fig. 6L-M). See Walker (1858) for original description, Melichar (1898a) and illustrations for Xu et al. (2006) also.

**Measurements (in mm).** Male (n=10)/Female (n=5). Body length: 4.92–5.62/5.84–6.30.

**Material examined.** [CB] 1♂. 29.VIII.1987. Chungcheongbuk-do. J.R. Hong; [CN] 1♂. 3.X.2017. Gung-dong,

Yuseong-gu, Daejeon. Y.E. Shin; 1♀. 12.VI.2014. Sin-dong, Yuseong-gu, Daejeon. S.M. Oh; 1♀. 17.VII.2013.

Gung-dong, Yuseong-gu, Daejeon. M.J. Kim; 1♀. 15.IX.2014. Gung-dong, Yuseong-gu, Daejeon. M.S. Jung; 1

♀. 23.IX.2014. Gung-dong, Yuseong-gu, Daejeon. S.A. Kwon; [GG] 1♂ 2.IX.2017. Howon 1-dong, Uijeongbu-

si. H.W. Jang; [GW] 5♂♂ 2♀♀. 9.VII.2014. Gaojak-ri, Nam-myeon, Yanggu-gun. S.M. Oh & H.D. Lee.

**Distributions.** Korea (Hyun and Woo, 1969), China (South, East, Northeast, Southeast), Japan, Taiwan, Oriental region (Chou et al., 1985).

**Hosts.** *Diospyros* spp., *Morus* spp. (Kwon and Huh, 2001), *Camellia sinensis*, *Citrus* sp., *Robinia pseudoacacia* (Chou et al., 1985), *Quercus acutissima*\*.

### Genus *Pochazia* Amyot and Audinet-Serville, 1843

Type species: *Pochazia fasciata* (Spinola, 1839) (=*Flata fasciata* Spinola, 1839).

*Euryptera* Gray, 1832:260; Guérin-Méneville, 1834: 466. (Synonymized by Amyot and Audinet-Serville, 1843).

*Pochazia* Amyot and Serville, 1843:528; Metcalf, 1955: 11.

*Pachazia* Girard, 1885: 861 (wrong spelling).

*Porchazia* Ashmead, 1889: 4 (wrong spelling).

**Diagnosis.** Differs from other genera with tegmina relatively triangular than other genera, tegmina shaped relatively pointed at apical (Fig. 2C); veins on tegmina forming densely in precostal area; precostal area round, flat relatively, not convex (Fig. 4C); clypeus with one median carinae (Fig. 3E) (modified from Bu and Liang, 2011).

### *Pochazia albomaculata* (Uhler, 1896)

(Figs. 2C; 3E-F; 4C; 7A-N)

*Ricania albomaculata* Uhler, 1896: 277; Melichar, 1923: 129.

*Pochazia obscura albomaculata* Melichar, 1898a: 213.

*Pochazia albomaculata* Matsumura, 1905: 53; Esaki, 1932: 1802; Metcalf, 1955: 15.

**Diagnosis.** This species distinguished by other species in the genus *Pochazia* by tegmina fuscous, costal area with whitish markings distinctly (Fig. 4C); general coloration of body brownish to fuscous, markings of tegmina

whitish on precostal area (Figs. 2C; 4C); male phallic complex with aedeagus two pairs of waved long spinous process, dorsal processes shorter than ventral processes (Figs. 7D-F); pygofer with spinous process to caudal distinctly (Fig. 7C); female gonoplac triangular, produced upper slightly (Fig. 7J); pregenital sternite flat medially (Fig. 7N).

**Redescription. Male.** COLORATION: General coloration of body fuscous, Vertex and pronotum concolorous with background. Frons brown, lateral margins darker than background (Figs. 3E-F). Tegmina fuscous, veins concolorous with background, costal margin with whitish marking in upper-middle, surpassing Sc vein (Fig. 4C). Femora and tibiae brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish to brown wax layer. STRUCTURE. **Head.** Head with compound eyes as wide as widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin flat; lateral margins arcuate, curved to frontoclypeal suture; one median and two lateral carinae developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3E). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 5.4 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3F). Tegmina membranous, triangular; costal margin slightly arcuate, anterior angle broadly rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R straight after leaving basal cell, MP dividing near basally, CuA branched four times to middle (Fig. 4C). **Abdomen. GENITALIA:** Anal tube, posterior margin concave, basal margin slightly concave, lateral margins arcuate, anus placed in middle, paraproct not reaching the posterior margin (Fig. 7B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, posterior margin slightly concave; postero-dorsal angle with visual spinosus process, caudo-dorsal angle angulated (Fig. 7C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 7G). Phallic complex, in lateral view, elongated, slightly narrow at middle; Periandrium width shorter than length. Basal part of periandrium rounded, slightly narrow at middle, without any additional structures. Apical part blunt, flat; Aedeagus shorter than periandrium, with two pair of processes at apical, sclerotized, elongated to anteriorly; dorsal processes shorter than ventral processes distinctly, ventral processes slightly waved

and curved to ventrally (Figs. 7D-F). **Female.** Same as male in general features. **Abdomen.** GENITALIA: Pregenital sternite with lateral lobes well developed, median portion narrow; anterior margin flat; posterior margins straight (Fig. 7N). Anal tube lateral margins convex, basal margin slightly wider than upper, posterior margin concave, anus placed after midlength, paraproct not surpassing the posterior margin of anal tube (Fig. 7I). Gonoplac triangular, posterior margin bearing with blunt and short teeth, postero-ventral partly membranous (Fig. 7J). Gonapophysis VIII partly flattened, tapering apicad; dorsal margin convex irregularly, with sharp apex and well visible teeth at posterodorsal margin, spinosus process developed to anteriorly; endogonocoxal process narrower and as long as gonaphophysis VIII, membranous (Fig. 7K). Gonapophysis IX with posterior connective lamina sclerotized, gonospiculum bridge elongated, oval caudo-dorsally, slightly blunt ventrodorsally (Fig. 7L-M). See Uhler (1896) for original description and Melichar (1898a) also.

**Measurements (in mm).** Male (n=1)/Female (n=4). Body length: 6.91/6.99–7.18.

**Material examined.** [JJ] 1♂ 4♀. 15.VIII.2019. Seonheul-ri, Jocheon-eup, Jeju-si. J.K. Park.

**Distributions.** Korea (Jeju Is.) (Kwon et al., 1996), Japan (Uhler, 1896).

**Hosts.** *Quercus glauca*\*.

#### Genus *Ricania* Germar 1818

Type species: *Ricania fenestrata* (Fabricius, 1775) (=*Cicada hyalina* Fabricius, 1775).

*Ricania* Germar, 1818: 221; Melichar, 1923a: 126; Metcalf, 1955: 40.

*Richania* Spinola, 1839: 395 (wrong spelling).

*Rhymania* Agassiz, 1848: 941 (wrong spelling).

*Bicana* Kato, 1933c: 11 (wrong spelling).

*Rycania* Schulze et al., 1936: 3081 (wrong spelling).

*Ricahia* Li, 1940: 254 (wrong spelling).

**Diagnosis.** Differs from other genera with tegmina relatively quadrate than other genera, tegmina shaped rounded at apical; veins on tegmina forming densely in precostal area; precostal area round, slightly or distinctly convex (Figs. 2D-H; 4D-H); clypeus with one median carinae (Figs. 3G, I, K, M, O) (modified from Bu and Liang, 2011).

***Ricania fumosa* (Walker, 1851)\***

(Figs. 2D; 3G-H; 4D; 8A-G)

*Flatoides fumosus* Walker, 1851: 414; Dohrn, 1859: 65.*Ricania fumosa* Stål, 1862: 491; Atkinson, 1886: 55; Distant, 1906: 382; Metcalf, 1955: 59; Yang, 1989: 179.*Ricania proxima* Melichar, 1898a: 226; Schmidt, 1905: 193 (Synonymized by Distant, 1906: 382).

**Diagnosis.** This species distinguished by other species in the genus *Ricania* by tegmina fuscous, apical processes of aedeagus not sclerotized (Fig. 4D); general coloration of body fuscous, markings of tegmina sinuated, not visible (Fig. 2D); male phallic complex with two pair of process, dorsal processes obclavate, bent to downward at median portion, ventral processes curved twice to caudally (Figs. 8D-F); See Yang (1989) for diagnostic characters also.

**Redescription. Male.** COLORATION: General coloration of body fuscous, Vertex and pronotum concolorous with background. Frons fuscous, lateral margins slightly lighter than background (Figs. 3G-H). Tegmina fuscous, veins concolorous with background, costal margin yellowish, fuscous markings slightly striped; markings visible without wax layer (Fig. 4D). Femora and tibiae brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish wax layer. STRUCTURE. **Head.** Head with compound eyes slightly more than widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin flat; lateral margins arcuate, curved to frontoclypeal suture; one median and two lateral carinae developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3G). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 3.1 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3H). Tegmina membranous, elongately-triangular; costal margin arcuate, anterior angle broadly rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened median; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R curved almost straight after leaving basal cell, MP dividing near basally, CuA branched at middle (Fig. 4D). **Abdomen.** GENITALIA: Anal tube, posterior margin concave, basal margin concave, lateral margins slightly arcuate, anus placed in middle, paraproct surpassing the posterior

margin (Fig. 8B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins slightly narrower than ventral margins, posterior margin almost straight; postero-dorsal angle without process, caudo-dorsal angle not angulate (Fig. 8C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin slightly convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 8G). Phallic complex, in lateral view, elongated, median part wider than basal and apical; Periandrium width shorter than length, expanded laterally. Basal part of periandrium a pair of blunt process developed. Apical part blunt, median concave; Aedeagus shorter than periandrium, with two pair of processes at apical; dorsal processes flat membranous inversely clavated process developed dorsally, curved to dorsally at median part, ventral processes sclerotized, each process with pointed at apex, slightly curved to apex ventrally (Figs. 8D-F). **Female.** Same as male in general features. **Abdomen.** GENITALIA: Yang (1989) described detailed female genitalia with illustrations. See Walker (1851) for original description and Yang (1989) for illustrations also.

**Measurements (in mm).** Male (n=2). Body length: 3.78-3.81.

**Material examined.** [CB] 1♂, 26.VIII.2018. Pung-dong, Chungju-si. J.K. Park; [CN] 1♂. 12.VII.2015. Gung-dong, Yuseong-gu, Daejeon. S.M. Oh, light trap.

**Distributions.** Korea\*, China (East, Southeast) (Melichar, 1898a, 1923), Japan (Esaki, 1932), Taiwan (Yang, 1989), Southeast Asia (Melichar, 1898a, Metcalf, 1955).

**Hosts.** Poaceae crops (Chou et al., 1985).

**Remarks.** Yang (1989) reported this species from Korea, we confirmed its occurrence in the Korean Peninsula.

### *Ricania simulans* (Walker, 1851)

(Figs. 2E; 3I-J; 4E; 9A-N)

*Pochazia simulans* Walker, 1851: 431.

*Ricania simulans* Stål, 1862: 491; Melichar, 1898a: 224. Schumacher, 1915: 139; Yang, 1989: 188.

*Ricania japonica* Melichar, 1898a: 224, 1898b: 224; Lee and Kwon: 1979: 612 (Synonymized by Yang, 1989: 188).

*Orosanga japonica* Fennah, 1971: 605; Kwon and Huh, 2001: 303; Hayashi and Fujinuma, 2016: 354.

**Diagnosis.** This species distinguished by other species in the genus *Ricania* by tegmina brown, two hyaline stripes contrast with background distinctly (Fig. 4E); general coloration of body brownish, hyaline markings of tegmina striped twice and fuscous markings on costal area distinctly (Figs. 2E; 4E); male phallic complex with aedeagus, a pair of membranous processes, a pair of long spinous process curved symmetrically (Figs. 9D-F); female gonoplac triangular, produced upper slightly (Fig. 9J); pregenital sternite with one blunt process upper medially (Fig. 9N); See Yang (1989) for diagnostic characters also.

**Redescription. Male.** COLORATION: General coloration of body brown, Vertex and pronotum concolorous with background. Frons yellowish, lateral margins slightly darker than background (Figs. 3I-J). Tegmina brown, concolorous with background, costal margin with fuscous marking in apical, hyaline markings striped twice (Fig. 4E). Femora and tibiae brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish to brown wax layer, variations between population. STRUCTURE. **Head.** Head with compound eyes as wide as widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin convex; lateral margins arcuate, curved to frontoclypeal suture; one median carinae developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3I). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 4.1 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3J). Tegmina membranous, elongately-triangular; costal margin arcuate, anterior angle broadly rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R branched twice after leaving basal cell, MP dividing near basally, CuA branched at middle (Fig. 4E). **Abdomen. GENITALIA:** Anal tube, posterior margin nearly flat, basal margin straight, lateral margins arcuate, anus placed in middle, paraproct not reaching the posterior margin (Fig. 9B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, posterior margin slightly convex; posterior-dorsal angle with small spinous process, caudo-dorsal angle angulated (Fig. 9C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin slightly convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 9G). Phallic complex, in lateral view, elongated, slightly narrow at middle; Periandrium width shorter than length. Basal part of periandrium rounded, with a pair of short spinosus

processes. Apical part blunt, median slightly concave; Aedeagus shorter than perianthium, with two pair of processes at apical dorsally, a pair of processes sclerotized long, each process with pointed at apex, slightly curved at apex laterally, a pair of flat membranous process developed dorsally, upper median lateral fold of perianthium convex (Figs. 9D-F). **Female.** Same as male in general features. **Abdomen.** GENITALIA: Pregenital sternite with lateral lobes well developed, median portion narrow; anterior margin slightly convex; posterior margin straight with slightly convex at median portion (Fig. 9N). Anal tube lateral margins slightly convex, basal margin slightly wider than upper, posterior margin concave, anus placed after midlength, paraproct not surpassing the posterior margin of anal tube (Fig. 9I). Gonoplac triangular, posterior margin with blunt and short teeth, postero-ventral partly membranous (Fig. 9J). Gonapophysis VIII partly flattened, tapering apicad; dorsal margin slightly convex, with sharp apex and well visible teeth at posterodorsal margin; endogonocoxal process narrower and as long as gonapophysis VIII, membranous (Fig. 9K). Gonapophysis IX with posterior connective lamina sclerotized, gonospiculum bridge short, slightly blunt ventrodorsally (Figs. 9L-M). See Walker (1851) for original description, Melichar (1898a) and Esaki (1950) also.

**Measurements (in mm).** Male (n=6)/Female (n=10). Body length: 4.36–5.31/5.98–6.84.

**Material examined.** [GN] 4♂♂ 7♀♀. 1.VIII.2019. Sodong-ri, Irun-myeon, Geoje-si. J.K. Park, E.J. Kim & S.B.

Choi; 1♀. 12.VII.2017. Sojeong-ri, Buksang-myeon, Geochang-gun. E.J. Kim; [JJ] 2♂♂ 3♀♀. 28.VIII.2017.

Gonae-ri, Aewol-eup, Jeju-si. J.K. Park & E.J. Kim.

**Distributions.** Korea (Kim, 1961), China (South, East, Northeast, Southeast) (Melichar, 1898a), India (Walker, 1851), Japan (Yang, 1989), Taiwan (Melichar, 1898a; Metcalf, 1955).

**Hosts.** 12 families, 18 species are recorded. See detail hosts for Karataş et al. (2020).

#### *Ricania speculum* (Walker, 1851)\*

(Figs. 2F; 3K-L; 4F; 10A-N)

*Flatoides speculum* Walker, 1851: 406.

*Flatoides perforatus* Walker, 1851: 407.

*Ricania malaya* Stål, 1854: 247; Walker, 1858: 331.

*Ricania speculum* Stål, 1862: 491; Walker, 1870: 147; Melichar, 1898a: 223.

**Diagnosis.** This species distinguished by other species in the genus *Ricania* by tegmina fuscous, tegmina with six whitish markings, hind markings reaching hind margins distinctly (Fig. 4F); general coloration of body fuscous, markings of tegmina spotted, hyaline on precostal, posterior and median area distinctly (Figs. 2F; 4F); male phallic complex with aedeagus two pairs of long spinous curved process (Figs. 10D-F); female gonoplac flat spatulate, curved upper slightly (Fig. 10J); pregenital sternite with one long process upper medially (Fig. 10N); See Yang (1989) for diagnostic characters also.

**Redescription. Male.** COLORATION: General coloration of body fuscous, Vertex and pronotum concolorous with background. Frons fuscous, lateral margins lighter than background distinctly (Figs. 3K-L). Tegmina fuscous, veins darker than background, hyaline markings in middle to hind margin (Fig. 4F). Femora and tibiae brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish to brown wax layer. STRUCTURE. **Head.** Head with compound eyes slightly more than widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex without median carina, anterior to posterior margins curved. Frons widest in middle, upper margin flat; lateral margins arcuate, curved to frontoclypeal suture; one median carina developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3K). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 8.4 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae straighted with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3L). Tegmina membranous, elongately-irregular triangular; costal margin slightly arcuate, anterior angle broadly rounded, slightly convex medially, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R almost straight leaving basal cell, MP dividing near basally, CuA branched nearly basal cell (Fig. 4F). **Abdomen.** GENITALIA: Anal tube, posterior margin concave, basal margin slightly straight, lateral margins arcuate, expanded visually, anus placed in middle, paraproct not reaching the posterior margin (Fig. 10B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, posterior margin slightly convex; postero-dorsal angle without process, caudo-dorsal angle angulated (Fig. 10C). Genital styles thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded

and surpassing the posterior margin of process (Fig. 10G). Phallic complex, in lateral view, elongated; Periandrium width shorter than length. Basal part of periandrium rounded without any additional structures. Apical part blunt, median slightly concave; Aedeagus shorter than periandrium, with two pair of spinosus process sclerotized, asymmetrical curved to dorsally, each process pointed at apex (Figs. 10D-F). **Female.** Same as male in general features. **Abdomen.** GENITALIA: Pregenital sternite with lateral lobes well developed, median portion narrow; anterior margin with one long process distinctly; posterior margin straight with slightly concave at median portion (Fig. 10N). Anal tube lateral margins convex, basal margin slightly wider than upper, posterior margin concave, anus placed after midlength, paraproct not surpassing the posterior margin of anal tube (Fig. 10I). Gonoplac flat spatulate, posterior margin bearing with blunt and short teeth, postero-ventral partly membranous (Fig. 10J). Gonapophysis VIII partly flattened, tapering apicad; dorsal margin convex, concave at anterior margin distinctly, with sharp apex and well visible rough teeth at posterodorsal margin; endogonocoxal process narrower and as long as gonaphophysis VIII, membranous (Fig. 10K). Gonapophysis IX with posterior connective lamina sclerotized, gonospiculum bridge elongated, oval caudo-dorsally, slightly blunt ventrodorsally (Figs. 10L-M). See Walker (1851) for original description and Yang (1989) also.

**Measurements (in mm).** Male (n=1)/Female (n=3). Body length: 8.64/12.37–13.64.

**Material examined.** [CN] 2♀♀. 22.IX.2019. Gung-dong, Yuseong-gu, Daejeon. J.K. Park; 1♂. 23.IX.2019.

Gung-dong, Yuseong-gu, Daejeon. J.K. Park; 1♀. 22.IX.2019. Gung-dong, Yuseong-gu, Daejeon. E.J. Kim.

**Distributions.** Korea (Excluding Jeju Is.)\*, China (South, East, Northeast, Southeast) (Atkinson, 1886), India (Kirkaldy, 1913), Indonesia (Melichar, 1898a), Italy (Mazza et al., 2014), Japan (Yang 1989), Malaysia (Schmidt, 1905), Myanmar (Melichar, 1898a), Philippines (Walker, 1851), Singapore (Atkinson, 1886), Sri Lanka (Melichar, 1898a), Vietnam (Fennah, 1978); combined from Bourgoin (2021) and Metcalf (1955).

**Hosts.** 29 families, 34 species are recorded. See detail hosts for Mazza et al. (2018).

**Remarks.** *R. speculum* in Korea was reported by Mazza et al. (2014) and by Lim et al. (2015). We confirmed this species in the Korean Peninsula based on male and female specimens collected from South Korea.

### ***Ricania sublimata* Jacobi, 1916**

(Figs. 2G; 3M-N; 4G; 11A-N)

*Pochazia sublimata* Schumacher, 1915: 137; Esaki, 1932: 1801.

*Ricania sublimata* Jacobi, 1916: 303.

*Ricania (Ricanula) sublimata* Melichar, 1923: 130.

*Ricania sublimbata* Kato, 1933c: 7 (wrong spelling).

*Ricanula sublimata* Metcalf, 1955: 101; Yang, 1989: 195.

**Diagnosis.** This species distinguished by other species in the genus *Ricania* by tegmina fuscous, costal area with whitish markings (Fig. 4G), apical processes of aedeagus long, almost reaching half of length (Fig. 4G); general coloration of body fuscous (Fig. 2G), markings of tegmina whitish on precostal area (Fig. 4G); male phallic complex with aedeagus three pairs of spinous process curved symmetrically (Figs. 11D-F); female gonoplac blunt, slightly produced upper (Fig. 11J); pregenital sternite with two blunt process at upper margins medially (Fig. 11N); See Yang (1989) and Park and Jung (2020) for diagnostic characters also.

**Description.** See Jacobi (1916) for original description, illustrations for Yang (1989) and Park and Jung (2020) for redescription of this species basis on Korean specimen.

**Measurements (in mm).** Male (n=10)/Female (n=10). Body length: 10.08–12.41/11.58–14.01.

**Material examined.** [CB] 7 nymphs. 24.VI.2019. Jichon-ri, Yanggang-myeon, Yeongdong-gun. J.K. park, sweeping; 2♀♀. 25.X.2018. Yullyang-dong, Sangdang-gu, Cheongju-si. J.K. Park, sweeping; 10♂♂ 10♀♀. 24.IX.2019. Goejeong-ri, Ochang-eup, Cheongwon-gun. G.H. Kim, yellow sticky trap; 3♂♂ 1♀. 18.VII.2018. Deokchon-ri, Daegang-myeon, Danyang-gun. J.K. Park, sweeping. [CN] 10♂♂ 10♀♀. 1.IX.2018. Gung-dong, Yuseong-gu, Daejeon. J.K. Park, light trap; 10♂♂ 10♀♀. 4.VII.2019 Seongyeon-ri, Cheongso-myeon, Boryeong-si. J.K. Park, J.H. Kim & M.J. Kang, sweeping; 10♂♂ 10♀♀. 16.VIII.2019. Jiryang-ri, Boksu-myeon, Geumsan-gun. J.K. Park, light trap; 10♂♂ 10♀♀. 6.VIII.2019. Dong-ri, Mokcheon-eup, Dongnam-gu, Cheonan-si. J.K. Park & E.J. Kim, light trap; 10♂♂ 10♀♀. 16.IX.2019. Wanpo-ri, Hwayang-myeon, Seocheon-gun. G.H. Kim, yellow sticky trap; 10♂♂ 10♀♀. 16.IX.2019. Sinnong-ri, Munsan-myeon, Seocheon-gun. G.H. Kim, yellow sticky trap. [GB] 3♂♂ 5♀♀. 2.VIII.2018. Sineum-ri, Gaepo-myeon, Yecheon-gun. J.K. Park & Y.J. Kim, sweeping; 3 nymphs. 2.VIII.2018. Ocheon-ri, Homyeong-myeon, Yecheon-gun. J.K. Park & Y.J. Kim, sweeping; 2 nymphs. 2.VIII.2018. Gopyeong-ri, Yecheon-eup, Yecheon-gun. J.K. Park & Y.J. Kim, sweeping; 1♂.

1.VIII.2018. Osin-ri, Bomun-myeon, Yecheon-gun. J.K. Park, sweeping; 10♂♂ 10♀♀. 4.IX.2019. Odong-ri, Hamchang-eup, Sangju-si. G.H. Kim, yellow sticky trap. [GW] 1♂ 2♀♀. 24.X.2019. Gacheon-ri, Anheung-myeon, Hoengseong-gun. J.K. Park & J.M. Bae, sweeping; 1♂ 1♀. 14.VIII. 2018. Jindong-ri, Girin-myeon, Inje-gun. J.K. Park, M.J. Kang & E.J. Kim, sweeping; 6♀♀. 14.IX.2017. Bangjeol-ri, Yeongwol-eup, Yeongwol-gun. J.K. Park, E.J. Kim & H.K. Ji, sweeping; 4♀♀. 14.IX.2017. Mapyeong-dong, Samcheok-si. J.K. Park, sweeping; Hoenggye-ri, Doam-myeon, Pyeongchang-gun. J.K. Park, E.J. Kim & H.K. Ji, sweeping; 10♂♂ 10♀♀. 4.IX.2019. Daean-ri, Heungeop-myeon, Wonju-si. J.K. Park, yellow sticky trap; 10♂♂ 10♀♀. 4.IX.2019. Nampyeong-ri, Bukpyeong-myeon, Jeongseon-gun. G.H. Kim, yellow sticky trap. [GN] 2♀♀. 1.VIII.2019. Sodong-ri, Irung-myeon, Geoje-si. J.K. Park, E.J. Kim & S.B. Choi, sweeping; 10♂♂ 5♀♀. 31. VIII.2019. Bukbu-dong, Jinhae-gu, Changwon-si. J.K. Park, E.J. Kim & S.B. Choi, sweeping; 10♂♂ 10♀♀. 23.VIII.2019. Doksan-ri, Naedong-myeon, Jinju-si. G.H. Kim, yellow sticky trap; 10♂♂ 10♀♀. 23.VIII.2019. Yongsan-ri, Myeongseok-myeon, Jinju-si. G.H. Kim, yellow sticky trap. [GG] 10♂♂ 10♀♀. 3.VIII.2018. Gyeongseo-dong, Seo-gu, Incheon. J.K. Park & E.J. Kim, sweeping; 1♂ 3♀♀. 23. VIII.2019. Songsan-myeon, Hwaseong-si. J.K. Park, J.H. Kim & J.M. Bae, sweeping; 10♂♂ 10♀♀. 13.VIII.2018. Jikdong-ri, Soheul-eup, Pocheon-si; 1♂ 2♀♀. 8. VIII.2017. Ssangji-ri, Gosam-myeon, Anseong-si, Gyeonggi-do. J.K. Park, sweeping; 10♂♂ 10♀♀. 23.VII.2019. Dongchon-ri, Seoun-myeon, Anseong-si. G.H. Kim, yellow sticky trap. [JB] 10♂♂ 10♀♀. 16. VII.2019. Woljeon-ri, Geumgu-myeon, Gimje-si. J.K. Park, M.J. Kang & J.M. Bae, sweeping; 3 nymphs. 21.VI.2018. Hyoja-dong, Wansan-gu, Jeonju-si. J.K.Park & E.J. Kim, sweeping; 10♂♂ 10♀♀. 23.VIII. 2019. Junggil-ri, Seongsu-myeon, Jinan-gun. G.H. Kim, yellow sticky trap; 10♂♂ 10♀♀. 23.VIII.2019. Uiam-ri, Sanggwan-myeon, Wanju-gun. G.H. Kim, yellow sticky trap. [JN] 10♂♂ 10♀♀. 17.23.IX.2017. Yongbong-dong, Buk-gu, Gwangju. M. Roca-Cusachs; 10

♂♂ 10♀♀. 24.IX.2019. Usan-ri, Jangpyeong-myeon, Jangheung-gun. G.H. Kim, yellow sticky trap; 10♂♂ 10♀♀.

24.IX.2019. Bongnim-ri, Jangpyeong-myeon, Jangheung-gun. G.H. Kim, yellow sticky trap; 10♂♂ 10♀♀.

24.IX.2019. Jeopjeong-ri, Yongsan-myeon, Jangheung-gun. G.H. Kim, yellow sticky trap.

**Distributions.** Korea (Excluding Jeju Is.) (Park & Jung, 2020), China (South, East, Northeast, Southeast) (Chou & Lu, 1977), Japan (Kato, 1933c), Taiwan (Schumacher, 1915).

**Hosts.** 21 families, 39 species are recorded in Korea. See detail hosts for Choi et al. (2017).

### *Ricania taeniata* Stål, 1870

(Figs. 2H; 3O-P; 4H; 12A-N)

*Ricania taeniata* Stål, 1870: 766; Melichar, 1898b: 386; Matsumura, 1915: 157.

*Bicania taeniata* Kato, 1933a: 11 (wrong spelling).

**Diagnosis.** This species distinguished by other species in the genus *Ricania* by tegmina brown, fuscous stripes contrast with background (Fig. 4H); general coloration of body brownish, fuscous markings on tegmina striped twice distinctly (Figs. 2H; 4H); male phallic complex with aedeagus, a pair of long spinous processes curved ventrally, symmetrical (Figs. 12D-F); female gonoplac blunt, produced upper slightly (Fig. 12J); pregenital sternite convex, produced upper medially (Fig. 12N).

**Redescription. Male.** COLORATION: General coloration of body brown, Vertex and pronotum concolorous with background. Frons light brown, lateral margins slightly darker than background (Figs. 3O-P). Tegmina brown, veins lighter than background, fuscous markings striped twice; markings invisible without wax layer (Fig. 4H). Femora and tibiae light brown. SURFACE AND VESTITURE: Tegmina and body generally covered with thin whitish to yellow wax layer, variations between population. STRUCTURE. **Head.** Head with compound eyes slightly less than widest part of mesonotum. Vertex narrower than pronotum, all margins carinated; disc of vertex with median carina, anterior to posterior margins curved. Frons widest in middle, upper margin slightly convex; lateral margins arcuate, curved to frontoclypeal suture; one median and two lateral carinae developed frons to clypeus. Frontoclypeal suture arcuate. Compound eyes oval, ocelli present (Fig. 3O). **Thorax.** Pronotum longer than vertex in midline; disc of pronotum with median carina, anterior and posterior margins arcuate. Mesonotum about 3.4 times longer than cumulative length of vertex and pronotum in midline; median carina reaching posterior

margin; lateral carinae not connected basally, almost reaching posterior margins; anterolateral carinae fused with lateral carinae, surpassing the lateral angles of mesonotum (Fig. 3P). Tegmina membranous, elongately-triangular; costal margin arcuate, anterior angle broadly rounded, posterior margin almost straight. Precostal area with veins forming densely, a little wider than costal cell and a little widened apically; basal cell small, widely rounded; veins Sc+R, MP, and CuA leaving basal cell separated. Sc+R straight after leaving basal cell, MP dividing basally, CuA branched three times to middle (Fig. 4H). **Abdomen.** GENITALIA: Anal tube, posterior margin concave, basal margin slightly straight, lateral margins convex, anus placed in middle, paraproct surpassing the posterior margin (Fig. 12B). Pygofer, in lateral view, higher than wide distinctly; dorsal margins narrower than ventral margins, postero margin almost straight; posterior-dorsal angle without process, caudo-dorsal angle angulated (Fig. 12C). Genital styles slightly thick, in lateral view longer than wide distinctly, with a spine-like process at the end of dorsal margin; upper margin slightly convex, lower margin almost straight; ventral margin in caudo-dorsal angle widely rounded and surpassing the posterior margin (Fig. 12G). Phallic complex, in lateral view, median part wider than basal and apical; Periandrium with width as long as length, expanded laterally. Basal part of periandrium with a pair of blunt process developed. Apical part blunt, median concave; Aedeagus shorter than periandrium, with a pair sclerotized curved to ventrally, each process pointed at apex (Figs. 12D-F). **Female.** Same as male in general features; coloration of body lighter than male generally. **Abdomen.** GENITALIA: Pregenital sternite with lateral lobes developed, median portion narrow; anterior margins convex slightly; posterior margin straight with slightly flat at median portion (Fig. 12N). Anal tube lateral margins flat, basal margin slightly as wide as upper, posterior margin slightly concave, anus placed after midlength, paraproct surpassing the posterior margin of anal tube distinctly (Fig. 12I). Gonoplac triangular, posterior margin with blunt and short teeth, postero-ventral partly membranous (Fig. 12J). Gonapophysis VIII partly flattened, tapering apicad; dorsal margins convex, with sharp apex and well visible teeth at posterodorsal margin; endogonocoxal process narrower and shorter than gonaphophysis VIII, membranous (Fig. 12K). Gonapophysis IX with posterior connective lamina sclerotized, gonospiculum bridge short, oval caudo-dorsally, slightly blunt ventrodorsally (Figs. 12L-M). See Stål (1870) for original description and Esaki (1932) also.

**Measurements (in mm).** Male (n=2)/Female (n=6). Body length: 3.76–3.79/4.08–4.20.

**Material examined.** [CN] 2♂♂ 1♀. 22.VIII. 2016. Seongbuk-ri, Sunseong-myeon, Dangjin-si. S.M. Oh & H.D.

Lee; 2♀♀. 12.VII. 2015. Gung-dong, Yuseong-gu, Daejeon. S.M. Oh, light trap; 1♀. 15.IX. 2015. Gung-dong,

Yuseong-gu, Daejeon. M.S. Jung; 1♀. 18.VII. 2015. Gung-dong, Yuseong-gu, Daejeon. W.D. Lee; 1♀. 16.IX.

2014. Gung-dong, Yuseong-gu, Daejeon. Y.S. Kim; [JB] 1♀. 11.VII. 2016. Simgok-ri, Seolcheon-myeon, Muju-gun. S.M. Oh.

**Distributions.** Korea (Matsumura, 1915), China (South, East, Northeast, Southeast) (Wu, 1935), India (Kato, 1933b), Indonesia (Melichar, 1898a), Japan (Matsumura, 1910), Malaysia (Kato, 1933b), Philippines (Stål, 1870), Taiwan (Matsumura, 1910), Thailand (Melichar, 1898a); combined from Bourgoin (2021) and Metcalf (1955).

**Hosts.** *Citrus* sp., *Oryza sativa*, *Saccharum officinarum*, Poacea (Chou et al., 1985).

#### Key to the species of family Ricanidae from Korea

1 Veins R of tegmina dividing twice after basal cell distinctly, general coloration of tegmina hyaline (Figs. 4A-B)

... 2

- Veins R of tegmina dividing twice nearly basal cell, general coloration of tegmina brownish or fuscous (Figs. 4C-H) ... 3

2 Posterior margin of tegmina not darker than background, markings of lateral margins disconnected (Fig. 4A) ...

*Euricania clara* Kato, 1932

- Posterior margin of tegmina darker than background, markings of lateral margins extended (Fig. 4B) ...

*Euricania facialis* (Walker, 1858)

3 Tegmina triangular, angular points relatively pointed (Fig. 4C); process of pygofer developed spinosus distinctly (Fig. 7C) ... *Pochazia albomaculata* (Uhler, 1896)

- Tegmina relatively quadrate, angular points not pointed, blunt; process of pygofer developed weakly or not ...

4

4 Body size relatively small, less than 10mm; paraproct surpassing posterior margin (Figs. 8B; 12B) ... 5

- Body size big, over than 10mm; paraproct not reaching posterior margin ... 6

5 General coloration of body fuscous, patterns of tegmina developed weakly (Fig. 2D); phallic complex with developed curved membranous process apically (Figs. 8D-F) ... *Ricania fumosa* (Walker, 1851)\*

- General coloration of body brown, patterns of tegmina developed fuscous (Fig. 2H); phallic complex with developed curved spinosus process laterally (Figs. 12D-F) ... *Ricania taeniata* Stål, 1870

- 6 Patterns of tegmina developed striped or spotted distinctly (Figs. 4E-F) ... 7
- Patterns of tegmina not developed, whitish markings in precostal area (Fig. 4G); male anal tube oval (Fig. 11B), aedeagus curved laterally, not branched (Figs. 11D-F) ... *Ricania sublimata* Jacobi, 1916
- 7 Patterns of tegmina striped, contrasted with background distinctly (Fig. 4E); male phallic complex with a pair of membranous process apically; aedeagus with spinosus processes long (Figs. 9D-F) ... *Ricania simulans* (Walker, 1851)
- Patterns of tegmina spotted, contrasted with background distinctly (Fig. 4F); male phallic complex with a pair of spinosus process apically; aedeagus curved irregularly (Figs. 10D-F) ... *Ricania speculum* (Walker, 1851)\*

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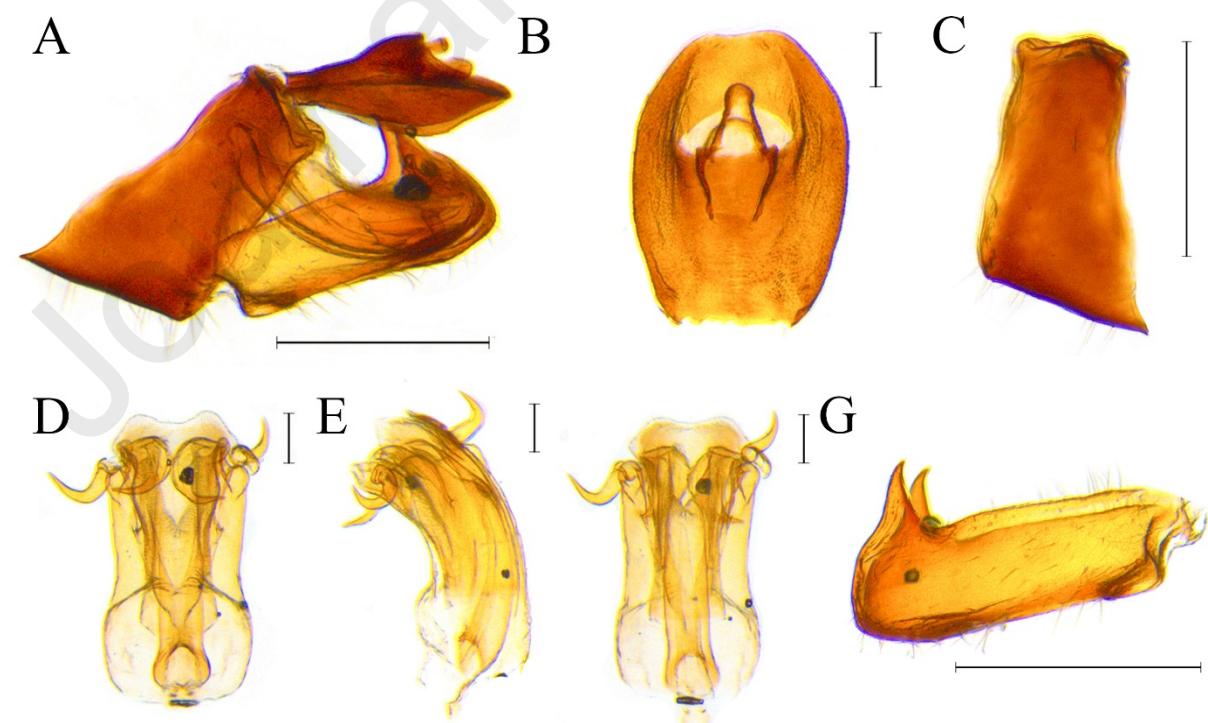
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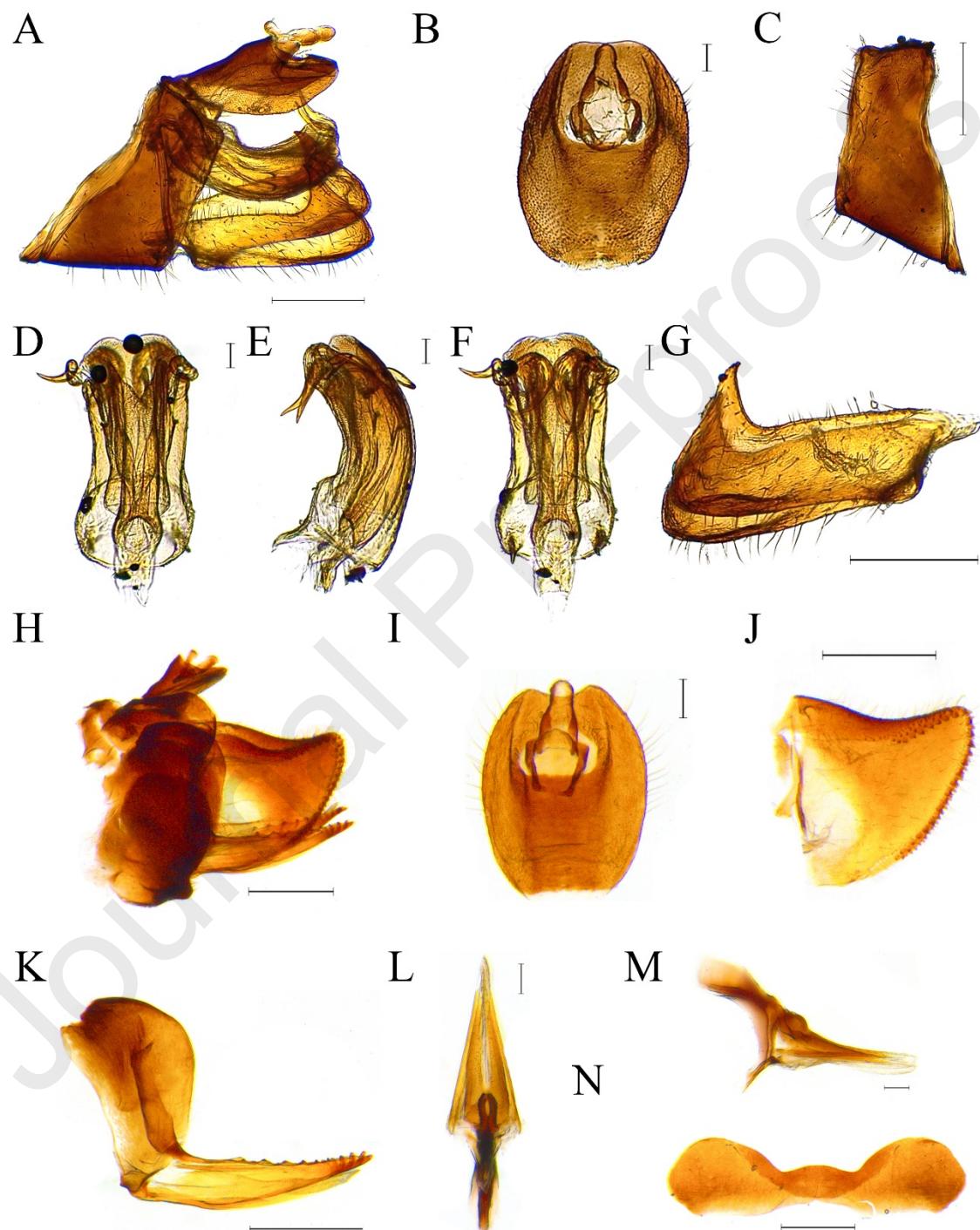
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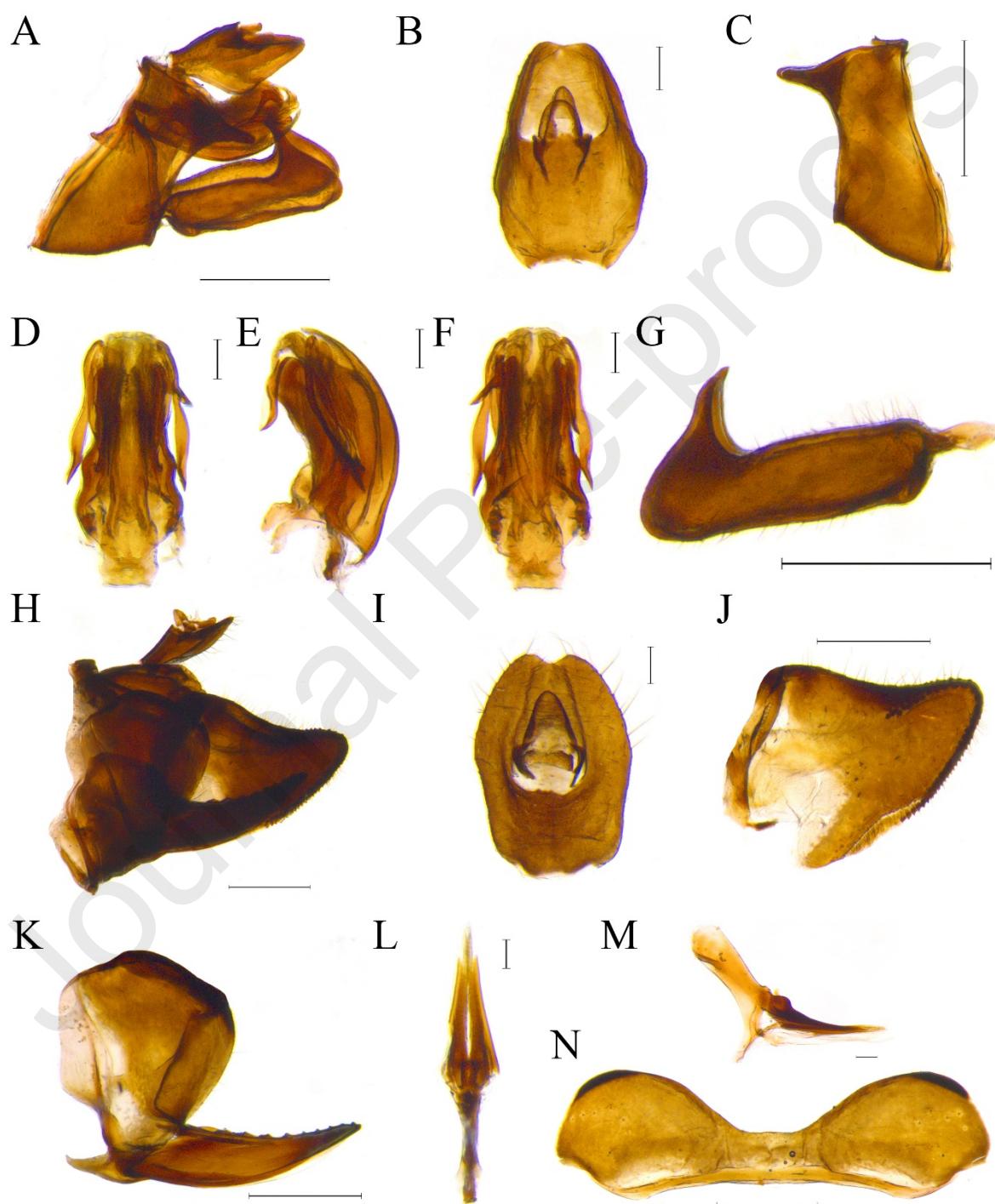
**Figure 5.** Photographs of male genitalia of *Euricania clara*: A. male genitalia, lateral view; B. male anal segment,

caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view. scale bar: A, C, G: 0.5mm, B, D-F, I: 0.1mm.



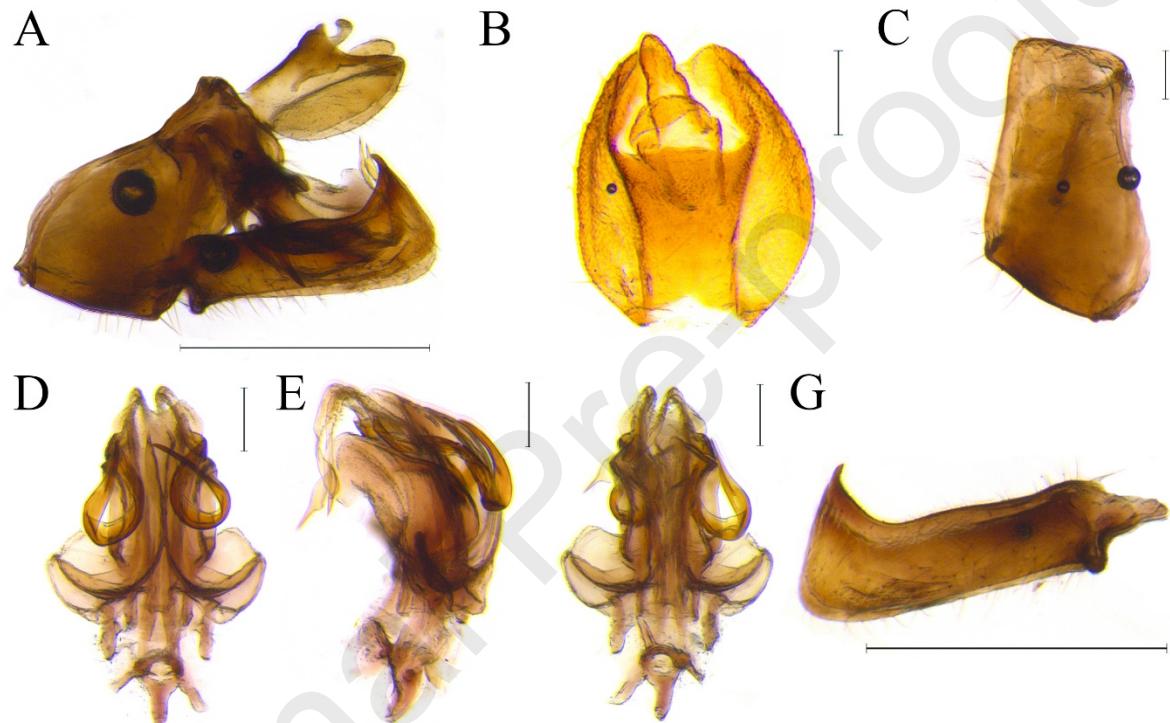
**Figure 6.** Photographs of male and female genitalia of *Euricania facialis*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex,

lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.

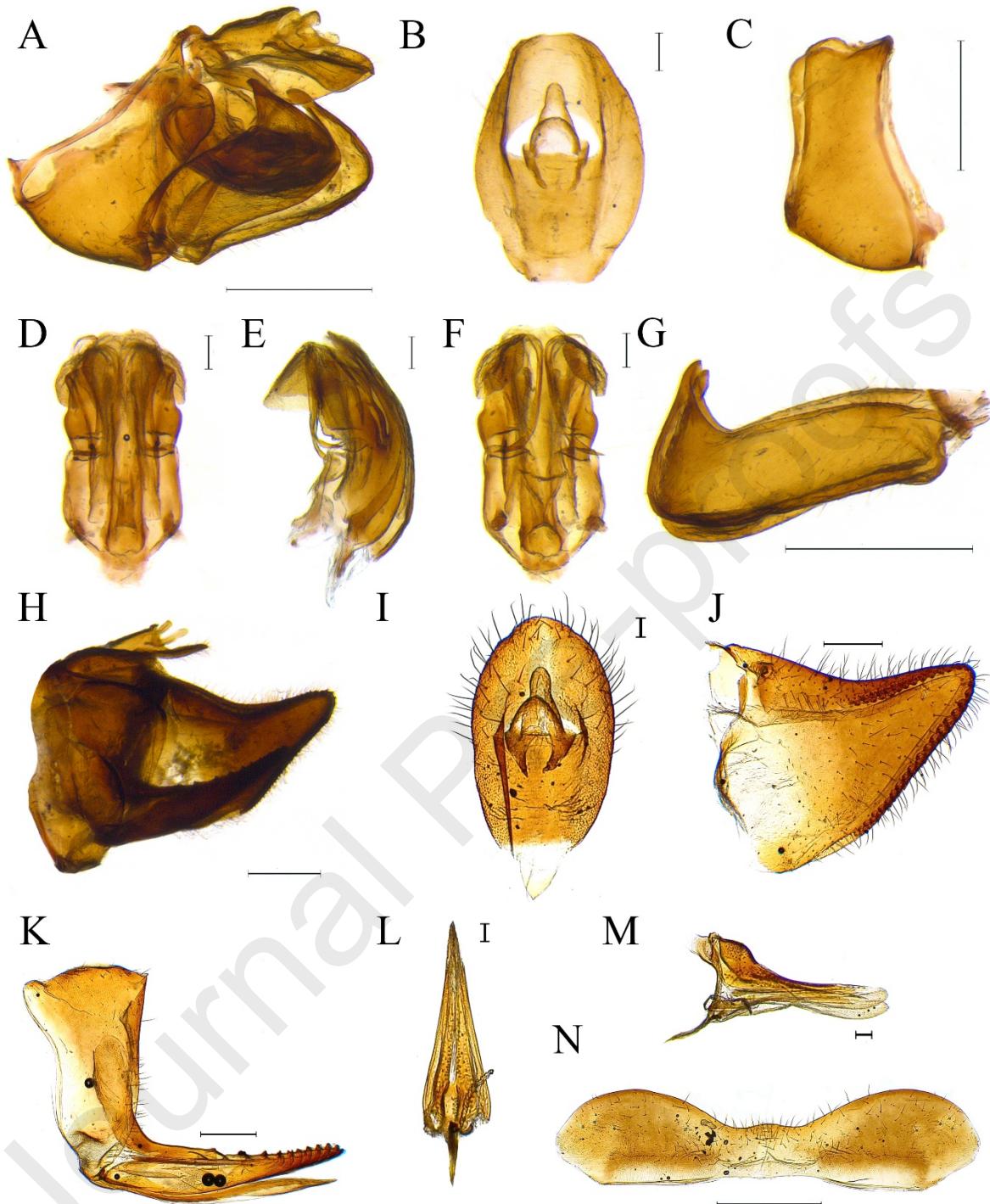


**Figure 7.** Photographs of male and female genitalia of *Pochazia albomaculata*: A. male genitalia, lateral view;

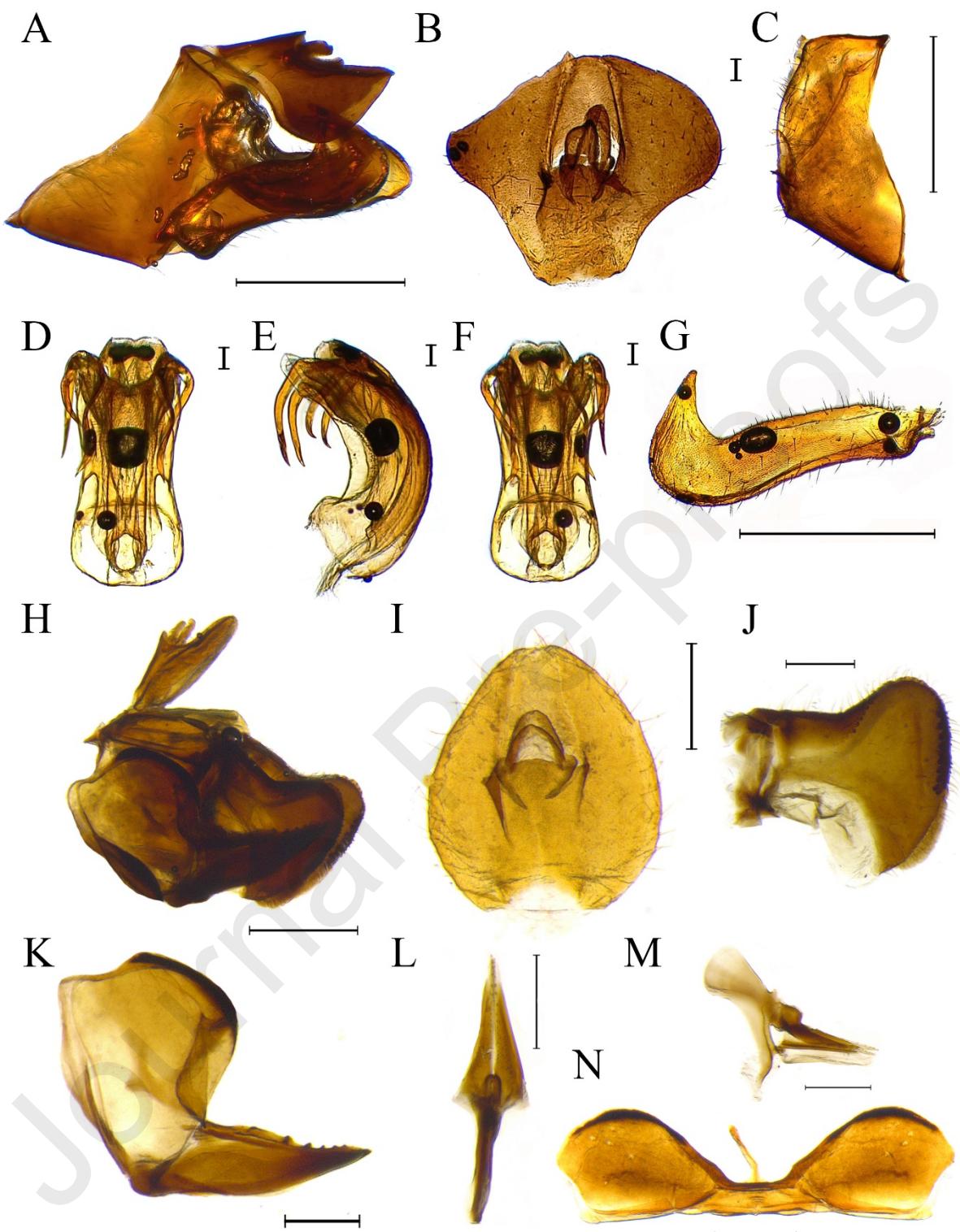
B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.



**Figure 8.** Photographs of male genitalia of *Ricania fumosa*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view. scale bar: A, G: 0.5mm, B-F, I: 0.1mm.

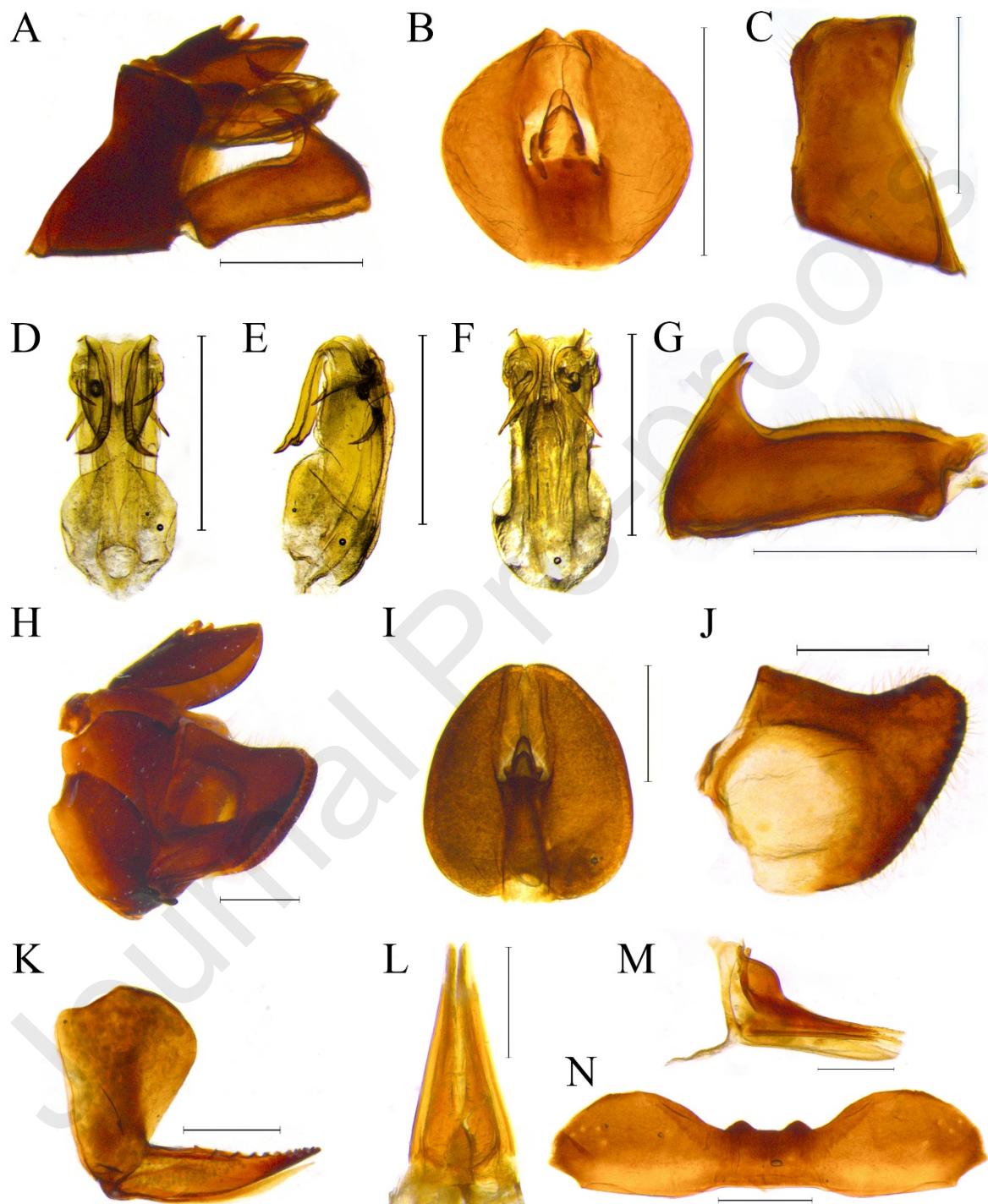


**Figure 9.** Photographs of male and female genitalia of *Ricania simulans*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.



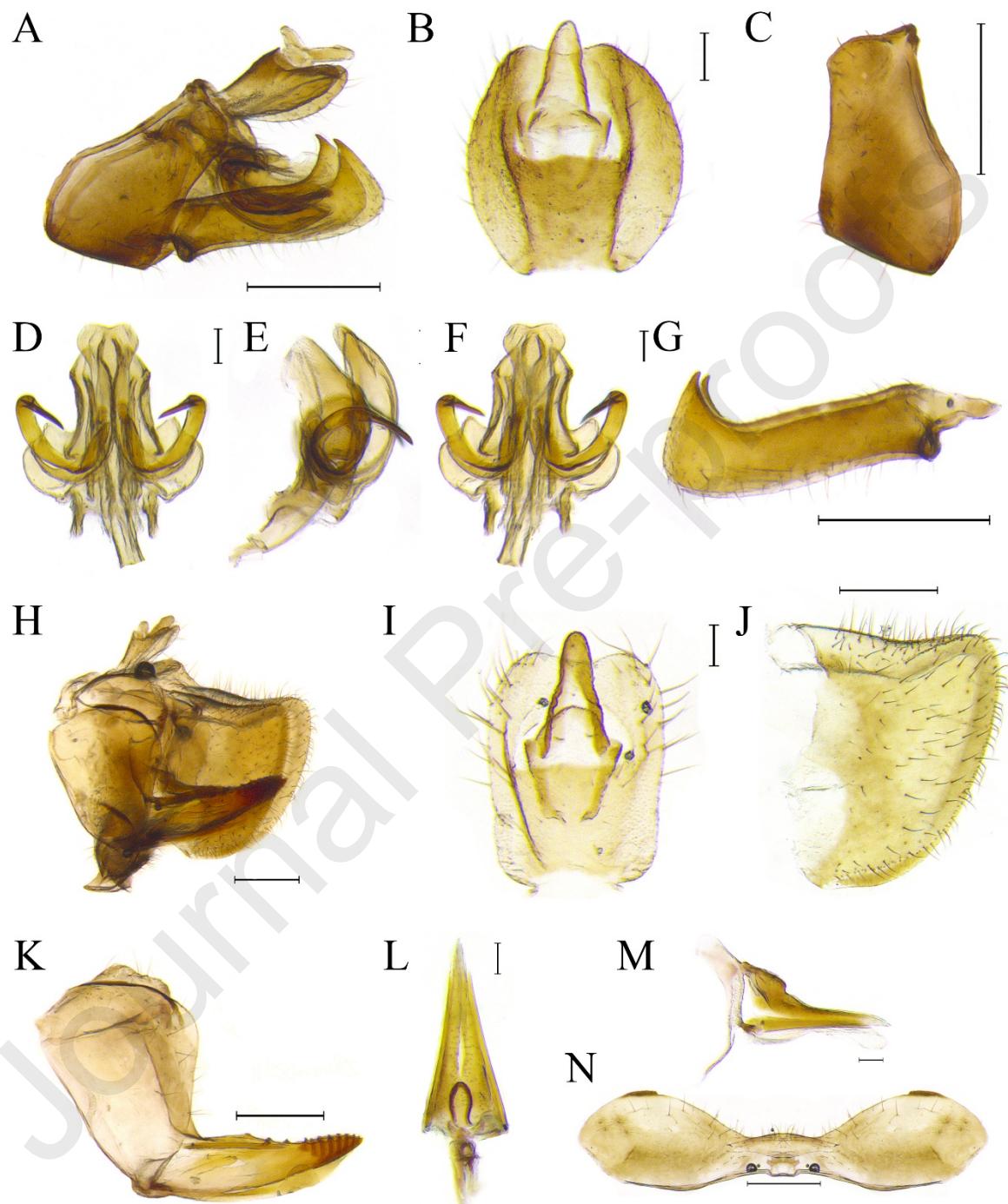
**Figure 10.** Photographs of male and female genitalia of *Ricania speculum*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L. magnification of process; M. magnification of gonopophysys VIII; N. magnification of process.

view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.



**Figure 11.** Photographs of male and female genitalia of *Ricania sublimata*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.

view; L. gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A–K, N: 1.0mm, L–M: 0.5mm (modified from Park & Jung, 2020).



**Figure 12.** Photographs of male and female genitalia of *Ricania taeniata*: A. male genitalia, lateral view; B. male anal segment, caudal view; C. male pygofer, lateral view; D. phallic complex, ventral view; E. phallic complex, lateral view; F. phallic complex, dorsal view; G. genital styles, lateral view; H. female genitalia, lateral view; I. female anal segment, caudal view; J. gonoplac, lateral view; K. gonopophysys VIII and process, lateral view; L.

gonapophysis IX, dorsal view; M. gonapophysis IX, lateral view; N. pregenital sternite, flattened. scale bar: A, C, G-H, J-N: 0.5mm, B, D-F, I: 0.1mm.

**Declaration of interests**

- The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
- The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

We confirm that this work is original and has not been published elsewhere nor is it currently under consideration for publication elsewhere. All authors have approved the manuscript and agree with submission and know of no conflicts of interest associated with this script.

**Graphical abstract**



## Highlights

- The family Ricanidae (Hemiptera: Fulgoroidea) in Korea is taxonomically reviewed.
- Eight species are recognized with a new record, *Ricania fumosa* (Walker, 1851).
- Confirmed that *R. speculum* (Walker, 1851), is now being distributed in Korea.
- A key to the Korean species of the family Ricanidae is also presented.