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Short Communication

Two new records of the genus *Kamendaka* (Hemiptera: Auchenorrhyncha: Derbidae) from Korea with a key to the Korean species☆

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ABSTRACT

Two new records of the genus *Kamendaka* Distant, *K. aculeata* Yang & Wu and *K. annulata* Yang & Wu, are recorded from Korea for the first time. The morphological information, such as the diagnosis of male habitus and genitalia, is provided with photographs, and a key to the Korean species of the genus *Kamendaka* is presented.

Introduction

The family Derbidae Spinola (Hemiptera: Auchenorrhyncha: Fulgoromorpha) is one of the largest groups in the superfamily Fulgoroidea Latreille, comprising 166 genera and 1,713 species distributed worldwide (Bourgoin 2023). Some members of the family Derbidae are known as vectors of phytoplasmas (e.g. genera *Cedusa* Fowler and *Omolicna*: Fennah, Brown et al. 2006; Halbert et al. 2014). The genus *Kamendaka* Distant (Derbidae: Otiocerinae: Kamendakini) is distributed in the Afrotropical, Australasia, East Palearctic, and Indomalayan regions, comprising 78 species (Bourgoin 2023). In Korea, only two species have been recorded so far (Matsumura 1915; Park and Jung 2022).

In this study, *K. aculeata* Yang & Wu and *K. annulata* Yang & Wu are recorded in Korea for the first time. The diagnosis for each species are provided with photographs of the male habitus and genitalia. Also, a key to the Korean species of the genus *Kamendaka* is presented.

Material and methods

Photographs of habitus and measurements are taken by a Leica DFC480 with a Leica M165C microscope and LAS Interactive Measurements. All measurements are given in millimeters (mm). The forewing and wing were cut off from the thorax for observing veins. For genitalia preparation, female and male genitalia are soaked in 10% KOH at 70°C for 10 minutes until cleared. Then, genitalia were placed on glass slides with glycerin for dissection. Terminology is mainly based on Bourgoin and Huang (1990), Bourgoin (1993), and forewing venations for Bourgoin et al. (2015). The depository of the materials is CNU (Laboratory of Systematic Entomology, Chungnam National University, Daejeon, Korea). Distribution and host plant with an asterisk (*) indicate a new record.

Systematic accounts

Order Hemiptera Linnaeus, 1758
Suborder Auchenorrhyncha Duméril, 1806
Infraorder Fulgoromorpha Evans, 1946
Superfamily Fulgoroidea Latreille, 1807
Family Derbidae Spinola, 1839
Subfamily Otiocerinae Muir, 1917
Tribe Kamendakini Emeljanov, 1995

☆ Given his role as subject Editor, Sunghoon Jung had no involvement in the peer review of this article. Full responsibility for the editorial process for this article was delegated to Jong-Seok Park.

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Genus *Kamendaka* Distant, 1906 고려긴날개멸구속 (Korean name: Go-Ryeo-Gin-Nal-Gae-Myeol-Gu-Sok)
Type species: *Kamendaka spectra* Distant, 1906, by original designation.
Kamendaka Distant, 1906: 310; Metcalf, 1945: 155; Fennah, 1952: 152.
Eosaccharissa Kirkaldy, 1907: 126. (Synonymized by Muir, 1918: 240)
Nicertoides Matsumura, 1910: 134. (Synonymized by Muir, 1914: 48)
Kamandaka Muir, 1924: 30 (wrong spelling).

Diagnosis. This genus is distinguished by other genera in the tribe Kamendakini by forewing elongation, about three times as long as width, widest at the subapical margin; veins of forewing without sensory pits on CuA, Sc+R, dividing at almost medially (Figures 1D, 2D); frons and vertex expanded, carinae of frons not converging together; antennae without additional structure, longer than width, not reaching the dorsal margin of compound eyes (Figures 1C, 2C) (combined and modified from Emeljanov 1995 and Yang and Wu 1994). See Distant (1906) for the original descriptions of this genus also.

Kamendaka aculeata Yang & Wu, 1994 가시고려긴날개멸구 (신칭) (Korean name: Ga-Si-Go-Ryeo-Gin-Nal-Gae-Myeol-Gu)
(Figures 1A–D, 3A–G)
Kamendaka aculeata Yang & Wu, 1994: 150.

Diagnosis. Recognized by body generally brown, with markings irregularly striped (Figure 1A–B); frons with fuscous margins distinctly (Figure 1C); pygofer in caudal view, with process widely expanded medioventral margins (Figure 3B–C); aedeagus with pointed appendages on mediodorsal margins (Figure 3E–G).

This species resembles *K. annulata* Yang & Wu, 1994, in general features, but differs by the shape of medioventral process, expanded (Figure 3B–C), and aedeagus, mediodorsal margins well-developed (Figure 3E–G) (modified from Yang and Wu, 1994).

Redescription. Coloration. General coloration of body brown. Vertex concolorous, with apical margin slightly whitish carinae paler than background. Pronotum yellow-whitish, mesonotum brown, median and lateral carinae concolorous with background (Figure 1A–B). Frons brownish, slightly paler than background; lateral carinae paler than background, with margins fuscous visibly. Gena with fuscous stripes reaching anteroventral margin, slightly

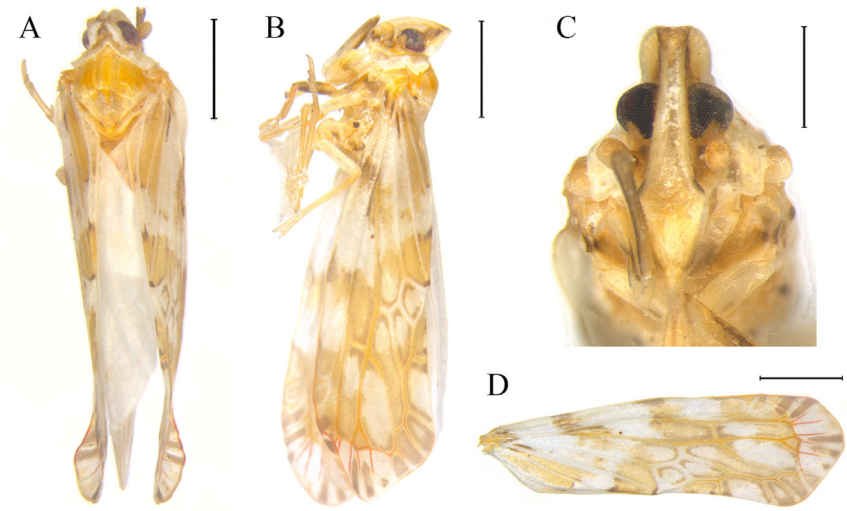

Figure 1. Photographs of the habitus of *Kamendaka aculeata* Yang & Wu, 1994: A, habitus, dorsal view; B, *ditto*, left-lateral view; C, frons, ventral view; D, forewing, flattened. <scale bar: 1.0 mm (A–B, D); 0.5 mm (C) >.

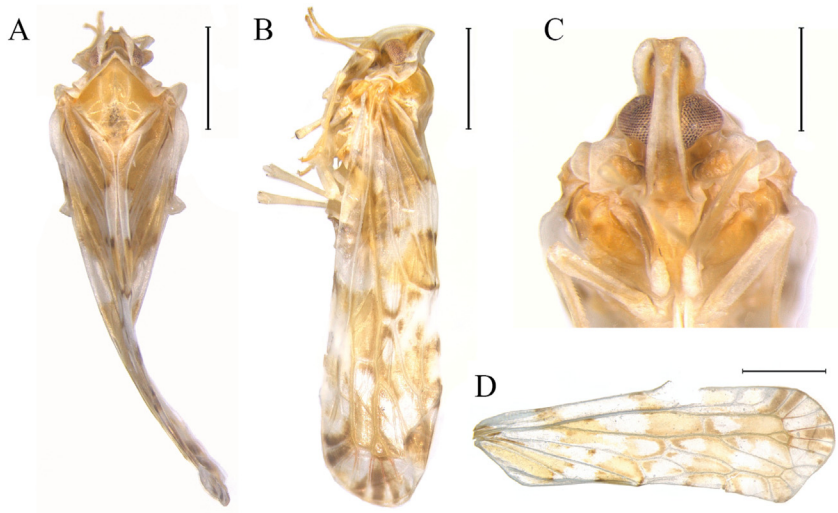

Figure 2. Photographs of the habitus of *Kamendaka annulata* Yang & Wu, 1994: A, habitus, dorsal view; B, *ditto*, left-lateral view; C, frons, ventral view; D, forewing, flattened. <scale bar: 1.0 mm (A–B, D); 0.5 mm (C) >.

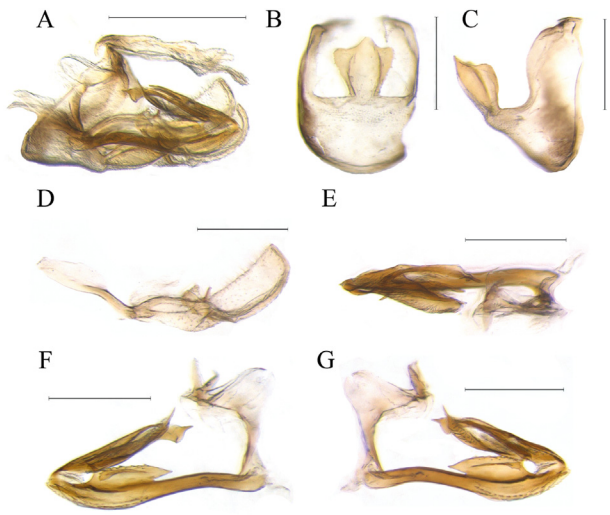

Figure 3. Photographs of the male genitalia of *Kamendaka aculeata* Yang & Wu, 1994: A, genitalia, lateral view; B, male pygofer, caudal view; C, *ditto*, lateral view; D, right gonostylus, lateral view; E, aedeagus, dorsal view; F, *ditto*, left-lateral view; G, *ditto*, right-lateral view. <scale bar: 0.5 mm (A); 0.3 mm (B–G) >.

brownish laterally; compound eyes fuscous (Figure 1C). Forewing with veins and margins paler than background, numerous markings, brownish stripes developed visibly, medial area with fuscous markings, and veins reddish (Figure 1D). Legs, tibiae, and tarsus are concolorous with background (Figure 1B).

Surface and vestiture. Forewing and body rough, sometimes covered with thin, whitish wax layer.

Structure Head. Head with compound eyes triangular, narrower than pronotum distinctly. Vertex at base concave, longer than width at midline, apex pointed, narrowing after compound eyes, lateral carinae well-developed, margins round, and median carina absent (Figure 1A–B). Frons expanded anteroventrally distinctly, protruding and rounded in lateral view; length of expanded part narrower than compound eyes; width narrow, widest at basal margin; lateral margins distinctly carinate, gradually broader at basal margin; median carinae absent. Postclypeus with median carina. Antennae short clavated. Eyes circular; ocelli absent, adjacent to eyes (Figure 1C).

Thorax. Pronotum narrow, shorter than width distinctly; anterior margin protruded to head medially; posterior margin concave at midline. Mesonotum as long as broad, convex angulated, distinctly longer than vertex, with median and lateral carina developed distinctly, not reaching posterior margins (Figure 1A–B). Forewing with sensory pits along costal veins regularly, Sc+R branched at almost branching of ScP; M dividing at median part of forewing; CuA without sensory pits, dividing almost medially; and CuP straight (Figure 1D).

Abdomen. Genitalia. Male. Pygofer in caudal view with process medioventrally well expanded; lateral view narrowed medially; process of ventral margin strongly protruded (Figure 3B–C). Gonostyli relatively blunt and symmetrical; inwardly curved, forceps-shaped; inner margins with spinosus processes; basal part slender and slightly curved (Figure 3D). Aedeagus asymmetrical, endosome complex, arising at apex. Mediodorsal margins expanded widely, pointed at anterior margin, and dorsal margins serrated; ventroapical margins serrated with numeral small teeth. Endosoma elongated, irregular lobe and three sclerotized processes: first process arising on the dorsal surface of endosoma, nearly surpassing apex, slender, and curved mesad; second process arising on the dorsal surface of endosoma, under first and third processes; third process, robust, arising on left lateral side of endosoma, longest (Figure 3E–G). See Yang and Wu (1994) for the original description also.

Measurements (in mm). Male (n=1). Body length: 5.14.

Material examined. 1♂, Hogeun-dong, Seogwipo-si, Jeju-do, Republic of Korea 14 x 2021 (JK Park).

Distributions. Korea (Jeju Island)*, Taiwan (Yang and Wu 1994).

Hosts. Eurya japonica (Pentaphylacaceae)*.

Kamendaka annulata Yang & Wu, 1994 고리고려긴날개멸구 (신칭)
(Korean name: Go-Ri-Go-Ryeo-Gin-Nal-Gae-Myeol-Gu)
(Figures 2A–D, 4A–G)
Kamendaka annulata Yang & Wu, 1994: 154.

Diagnosis. Recognized by body generally brown, with markings irregularly striped (Figure 2A–B); frons with brownish margins (Figure 2C); pygofer in caudal view, with process elongated medioventral margins (Figure 4B–C); aedeagus slightly serrated on mediodorsal margins (Figure 4E–G).

This species resembles *K. aculeata* Yang & Wu, 1994, in general features but differs by the shape of medioventral process elongated (Figure 4B–C), and aedeagus with mediodorsal margins not developed (Figure 4E–G) (modified from Yang and Wu, 1994).

Redescription. Coloration. General coloration of body brown. Vertex concolorous, with apical margin slightly whitish carinae paler than background. Pronotum whitish, mesonotum brown, with median and lateral carinae paler than background (Figure 2A–B). Frons brownish, with base and frontoclypeal suture distinctly brownish; lateral carinae paler than background, with brownish margins. Gena with brownish stripes reaching anteroventral margin, slightly brownish laterally; compound eyes brown (Figure 2C). Forewing with veins and margins paler than background, with numerous markings; brownish stripes developed visibly; medial area with fuscous markings (Figure 2D). Legs, tibiae, and tarsus are concolorous with background (Figure 2B).

Surface and vestiture. Forewing and body rough, sometimes covered with thin, whitish wax layer.

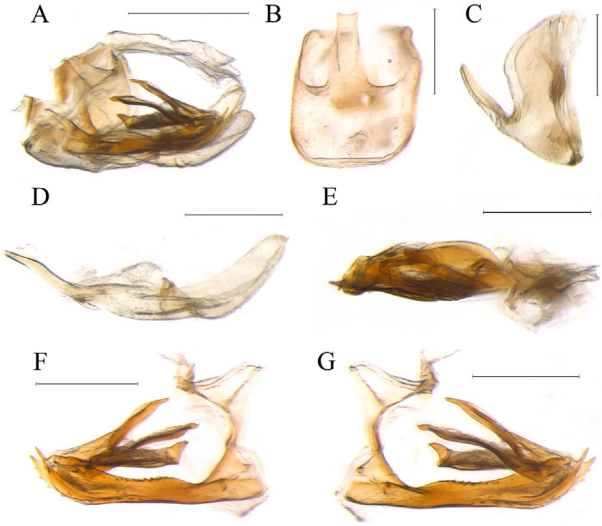

Figure 4. Photographs of the male genitalia of *Kamendaka annulata* Yang & Wu, 1994: A, genitalia, lateral view; B, male pygofer, caudal view; C, *ditto*, lateral view; D, right gonostylus, lateral view; E, aedeagus, dorsal view; F, *ditto*, left-lateral view; G, *ditto*, right-lateral view. <scale bar: 0.5 mm (A); 0.3 mm (B–G) >.

Structure. Head. Head with compound eyes triangular, narrower than pronotum distinctly. Vertex at base concaved, longer than width at midline, apex distinctly pointed, narrowing after compound eyes, lateral carinae well-developed, margins round, and median carina absent (Figure 2A–B). Frons expanded anteroventrally distinctly, protruding and rounded in lateral view; length of expanded part narrower than compound eyes; width narrow, widest at basal margin; lateral margins distinctly carinate, gradually broader at basal margin; median carinae absent. Postclypeus with median carina. Antennae short clavated. Eyes circular; ocelli absent, adjacent to eyes (Figure 2C).

Thorax. Pronotum narrow, shorter than width distinctly; anterior margin protruded to head medially, posterior margin concave at midline. Mesonotum as long as broad, convex angulated, distinctly longer than vertex, with median and lateral carina developed distinctly, not reaching posterior margins (Figure 2A–B). Forewing with sensory pits along costal veins regularly, Sc+R branched at almost branching of ScP, M dividing at median part of forewing, CuA without sensory pits, dividing at almost medially, CuP straight (Figure 2D).

Abdomen. Genitaila. Male. Pygofer in caudal view with process medioventrally elongated and widest at basal; lateral view narrowed medially; process of ventral margin strongly elongated (Figure 4B–C). Gonostyli relatively pointed symmetrical; inwardly curved forceps-shaped; inner margins with short spinosus processes; basal part slender and slightly curved (Figure 4D). Aedeagus asymmetrical, endosome complex, arising at apex. Mediodorsal margins serrated with numeral small teeth; ventroapical margins with also serrated with teeth, relatively bigger than medioventral teeth. Endosoma elongated, irregular, with three sclerotized processes: first process arising on the dorsal surface of endosoma, nearly surpassing apex, slender, curved mesad, and strongly bent at apical; second process arising on the dorsal surface of endosoma, upper third process; third process, robust, arising on left lateral side of endosoma, longest (Figure 4E–G). See Yang and Wu (1994) for the original description also.

Measurements (in mm). Male (n=2). Body length: 4.83-4.86.

Material examined. 2♂♂, Gung-dong, Yuseong-gu, Daejeon, Republic of Korea 27 viii 2022 (GH Jang).

Distributions. Korea*, Taiwan (Yang and Wu 1994).

Hosts. Unknown.

Key to the Korean species of genus *Kamendaka* Distant

1. General coloration of forewing hyaline, with markings spotted or serrated……....2
   – General coloration of forewing whitish, with markings irregularly fuscous……..*K. jejuensis* Park and Jung
2. Forewing with reddish markings, uniformly serrated....……....3
   – Forewing with yellowish markings, spotted…… …...……*K. koreana* Matsumura
3. Pygofer with a broad process, protruded laterally…… ……..……..…*K. aculeata* Yang and Wu*
   – Pygofer with narrow process, not protruded laterally…… ……*K. annulata* Yang and Wu*

Declaration of Competing Interest

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.

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