Two new species of the genus *Anufrievia* Dworakowska (Hemiptera, Cicadellidae, Typhlocybinae) from karst region of southwest China

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Abstract

Background

The leafhopper genus *Anufrievia* was established by Dworakowska with *A. rolikae* Dworakowska as its type species. They are widely distributed in China, North Korea, South Korea, Japan, Nepal, India, Indonesia, Thailand and Vietnam.

New information

Two new species, *A. ventricosa* sp. nov. and *A. unianxialis* sp. nov., found in the karst area of Guanling and Shibing City, Guizhou Province, China are described and illustrated. The key to the identification of the specie of this genus is given.
Keywords
Cicadellidae, Erythroneurini, taxonomy, morphology, new species

Introduction
The leafhopper genus *Anufrievia* belongs to the tribe Erythroneurini of Typhlocybinae and previously contained 35 species, including 27 species in China (Cao et al. 2018, Tan et al. 2021). In this study, two new species from the karst area of Guizhou Province, China are described and illustrated. The key to the identification of the species of this genus is given.

*Anufrievia* Dworakowska, 1970

*Anufrievia* Dworakowska 1970: 761; Chiang and Knight 1990: 195

Type species: *Anufrievia rolkae* Dworakowska 1970

Main characteristics of genus *Anufrievia* were described as follows. Body brown or yellow. Head slightly narrower than pronotum. Length of crown obviously shorter than inter-ocular width. Vertex moderately produced medially; anterior margin usually with small paired dark spots, sometimes absent. Pronotum broad, with anterior margin convex and posterior margin slightly concave. Scutellum with dark lateral triangles. Face without black spots anterodorsad of antennal pits. Anteclypeus pale, concolorous with rest of face or brown or black. Forewing with 4th apical cell small, not reaching apex of forewing, 2nd apical cell nearly rectangular and 1st apical cell broad. Hind-wing apex broadly rounded. Hind-wings' venation follows typical schemes for Erythroneurini taxa. Abdominal apodemes short, extended dorsomesad.

Male pygofer lobe with hind margin sleeked or truncated slightly, cephalo-ventral angle usually with macrosetae, sometimes absent and scattered with a few fine setae in outer lateral surface. Pygofer dorsal appendage movably articulated to pygofer lobe with ventral appendage absent. Subgenital plate broad basally, tapering to middle, subparallel-sided from middle to apex and rounded apically; with some macrosetae in mid-ventral part; row of stout setae along upper margin almost from subbase to apex. Style with shape of apex various, bifid, foot-shaped or otherwise modified. Aedeagus with aedeagal shaft tubular; gonopore sub-basal to subapical on ventral surface; with or without well-developed pre-atrial processes, dorsal apodeme well developed. Connective lateral arms long Y- or V-shaped.

Materials and methods
The specimen was collected by the sweeping-net method. Morphological terminology used follows Dietrich (2005) and Dworakowska (1993). An Olympus SZX16 dissecting microscope was used for observing and an Olympus BX53 stereomicroscope for drawing. A KEYENCE VHX-5000 digital microscope was used for taking habitus photos. Body
measurements are measured from the apex of the vertex to the tip of the forewing. Male specimens were selected under a stereoscope, the entire abdomen of the specimens was removed and soaked in 10% sodium hydroxide (NaOH) solution or 10% potassium hydroxide (KOH) solution for 15-20 hours. After that, the abdomen was rinsed with clean water, drained of the excess water with qualitative filter paper and transferred to a clean glass dripping with glycerine. All specimens examined were deposited in the collection of the School of Karst Science, Guizhou Normal University/State Key Laboratory Cultivation Base for Guizhou Karst Mountain Ecology Environment of China, Guiyang, China.

Taxon treatments

*Anufrievia ventricosa*, sp. n.

- ZooBank D493BC2C-A404-4FA4-855C-F86A785AF6AF

**Material**

**Holotype:**

- scientificName: *Anufrievia ventricosa*; order: Hemiptera; family: Cicadellidae; genus: *Anufrievia*; specificEpithet: *ventricosa*; country: China; stateProvince: Guizhou; county: Guanling; locationRemarks: "Guizhou, Guanling, 27. 9. 2020, coll. Zhouwei Yuan and Xiao Yang"; individualCount: "1"; sex: male; lifeStage: adult; collectionCode: Insects; basisOfRecord: Preserved Specimen

**Description**

Body brownish-black. Head milky yellow (Fig. 1A and D). Eyes pitch black. Face milky yellow, anteclypeus little darker than fronteclypeus (Fig. 1C and E). Pronotum light yellow with two sides black (Fig. 1A and D). Scutellum yellowish-brown, with dark basal triangles (Fig. 1A and D). Forewing brownish (Fig. 1A and C). Abdominal apodemes broad, extended to 4th sternite (Fig. 2C).

**Diagnosis**

**Male genitalia**

Pygofer lobe broad, with five macroseta at cephalo-ventral angle of lobe and one macroseta at junction area with anal tube (Fig. 2A). Pygofer dorsal appendage broad at base, tapering towards apex. Subgenital plate slightly concave near middle area, with two macrosetae on outer surface (Fig. 2B). Style with two points at apex; pre-apical lobe small (Fig. 2C). Aedeagus with shaft almost straight and flat in lateral view, pair of long processes arising from base of shaft, surpassing gonopore; gonopore reaching 3/4 height of aedeagal shaft, on ventral surface; dorsal apodeme well developed (Fig. 2D and G). Connective Y-shaped, two lateral arms long and central lobe large; stem well developed (Fig. 2F).

**Measurement:** Male length (including wing) 2.9 mm.
Etymology

The specific epithet is derived from the Latin word “ventricosus”, referring to the connective central lobe well developed.

Taxon discussion

This species is similar to A. confluensa Tan, Jiang & Song, 2021 with similar shape of style and aedeagus, but can be distinguished by the five macrosetae at cephalo-ventral angle of lobe and one macroseta at junction area with anal tube; the aedeagus with pair of long processes arising from base of shaft and the connective central lobe well developed.

Figure 1. doi

Anufrievia ventricosa sp. nov. A Habitus, dorsal view; B Habitus, lateral view; C Habitus, ventral view; D Head and thorax, dorsal view; E Face; F Genital capsule, lateral view; G Genital capsule, ventral view.
Anufrievia unianxialis, sp. n.

- ZooBank [840D1AE6-EB79-4702-A8C3-092446B96CD4]

Material

**Holotype:**

- scientificName: *Anufrievia unianxialis*; order: Hemiptera; family: Cicadellidae; genus: *Anufrievia*; specificEpithet: *unianxialis*; country: China; stateProvince: Guizhou; county: Shiping; locationRemarks: Guizhou, Shiping, 27. 6. 2021, coll. Zhouwei Yuan and Jiang Jia; individualCount: 1; sex: male; lifeStage: adult; collectionCode: Insects; basisOfRecord: Preserved Specimen

Description

Body brownish-yellow (Fig. 3A). Head brownish-black (Fig. 3A and D). Eyes black. Face brownish, anteclypeus brownish and frontoclypeus centrally dark brown with brownish lateral margins (Fig. 3C and E). Pronotum brownish two sides black (Fig. 3A...
and D). Scutellum black in whole (Fig. 3A and D). Forewing faint brown (Fig. 3A and C). Abdominal apodemes broad, extended to 4\textsuperscript{th} sternite (Fig. 4C).

Figure 3. Anufrievia unianxialis sp. nov. A Habitus, dorsal view; B Habitus, lateral view; C Habitus, ventral view; D Head and thorax, dorsal view; E Face.

Figure 4. Anufrievia unianxialis sp. nov. A Subgenital plate; B Style; C Abdominal apodemes; D Aedeagus, ventral view; E Aedeagus, style and connective; F Connective; G Aedeagus, ventrolateral view.
Diagnosis

Male genitalia

Subgenital plate slightly concave near middle area, with three macrosetae on outer surface (Fig. 4A). Style with two points at apex; pre-apical lobe obvious (Fig. 4B). Aedeagal shaft almost straight and flat in lateral view, without any process; gonopore large, reaching 1/2 height of aedeagal shaft; dorsal apodeme small and pre-atrium well developed, as long as shaft (Fig. 4D and G). Connective M-shaped, two lateral arms long, central lobe small (Fig. 4F).

Measurement: Male length (including wing) 2.7 mm.

Etymology

The new species is named from the Latin word “unianxialis”, referring to the aedeagal shaft without serrated marginal lamellae apically.

Taxon discussion

This species is similar to A. crispata Tan, Jiang & Song, 2021, but can be distinguished by the aedeagal shaft without serrated marginal lamellae; without pair of small processes curved mesally under the gonopore and the connective with distinct central lobe.

Identification keys

Key to males of Anufrievia from China (modified from Tan et al. 2021)

| Key | Description | Subkey 1 | Subkey 2 |
|-----|-------------|----------|----------|
| 1   | Pygofer dorsal appendage not bifurcate at apex | 2 |   |
|     | Pygofer dorsal appendage bifurcate at apex | 15 |   |
| 2   | Aedeagus with large dorsal apodeme | 4 |   |
|     | Aedeagus with small dorsal apodeme | 3 |   |
| 3   | Aedeagal shaft with serrated marginal lamellae apically | A. crispata Tan, Jiang & Song |   |
|     | Aedeagal shaft without serrated marginal lamellae apically (Fig. 4D) | A. unianxialis sp. nov. |   |
| 4   | Pre-atrial process not reaching gonopore | 5 |   |
|     | Pre-atrial process reaching or surpassing gonopore | 9 |   |
|   | Description                                                                 |   |
|---|-----------------------------------------------------------------------------|---|
|5  | Style without distinct apical and subapical teeth                           | 6 |
|–  | Style with distinct apical and subapical teeth                              | 7 |
|6  | Style with apex slim                                                       |   |
|–  | Style with apex triangular                                                  |   |
|7  | Pre-atrial process almost rectangular in ventral view, apex broad           |   |
|–  | Pre-atrial process narrowing apically, apex pointed                         |   |
|8  | Style with subapical tooth equal in length to apical tooth                  |   |
|–  | Style with subapical tooth shorter than apical tooth                        |   |
|9  | Aedeagal shaft with pair of apical processes                               | 10|
|–  | Aedeagal shaft without any apical processes                                 | 12|
|10 | Aedeagal apical processes arched medially in ventral view                   |   |
|–  | Aedeagal apical processes slightly curved in ventral view                   |   |
|11 | Aedeagal shaft with base slim, slightly wider than apex                     |   |
|–  | Aedeagal shaft with base broad, much wider than apex                        |   |
|12 | Connective central lobe well developed (Fig. 2F)                            |   |
|–  | Connective central lobe absent                                              |   |
|13 | Aedeagal shaft constricted sub-basally                                      |   |
|–  | Aedeagal shaft not constricted sub-basally                                  |   |
|14 | Style with apical tooth extremely small, aedeagal shaft straight            |   |
|–  | Style with apical tooth relatively long, aedeagal shaft curved dorsad       |   |
|15 | Aedeagal shaft with processes near middle                                   |   |
|–  | Aedeagal shaft without process near middle                                   |   |
|16 | Apex of style serrated at middle                                            |   |
|   | Description                                                                                         | Species and Authors                  |
|---|-----------------------------------------------------------------------------------------------------|--------------------------------------|
| 17| Upper tooth of pygofer dorsal appendage much shorter than lower one                                 | *A. bauhinicola* Dworakowska & Viraktamath |
| 18| Upper tooth of pygofer dorsal appendage subequal to or longer than lower one                      |                                      |
| 19| Upper tooth of pygofer dorsal appendage longer than lower one                                     | *A. expansa* Cao & Zhang             |
| 20| Ventral margin of aedeagal shaft protruded subapically in lateral view                           |                                      |
| 21| Ventral margin of aedeagal shaft straight subapically, in lateral view                           |                                      |
| 22| Apical tooth of style almost equal to subapical tooth                                              | *A. liubanus* Yang & Zhang           |
| 23| Apical tooth of style greatly shorter than subapical tooth                                         |                                      |
| 24| Aedeagal shaft processes relatively long, gonopore central                                        | *A. parisakazu* Cao & Zhang          |
| 25| Aedeagal shaft curved dorsad                                                                      | *A. falcata* Yang & Zhang            |
| 26| Aedeagal shaft straight                                                                           |                                      |
|   | Description                                      | Species                    |
|---|-------------------------------------------------|----------------------------|
| 26| Apex of style slender                           | *A. qinlingensis* Yang & Zhang |
|   | Apex of style foot-like                         |                            |
| 27| Aedeagal shaft with processes arising from subapex |                            |
|   | Aedeagal shaft with processes arising from apex |                            |
| 28| Apex of aedeagal shaft expanded                 | *A. forcipiformis* Yang & Zhang |
|   | Apex of aedeagal shaft narrow                   | *A. subapicifixa* Yang & Zhang |
| 29| Aedeagal shaft processes bent at right angle in ventral view | *A. roliake* Dworakowska |
|   | Aedeagal shaft processes straight or slightly curved in ventral view |                            |
| 30| Style without distinct apical and subapical teeth | *A. sufflata* Yang & Zhang |
|   | Style with distinct apical and subapical teeth   |                            |
| 31| Gonopore subapical                              | *A. wolongensis* Yang & Zhang |
|   | Gonopore central                                | *A. maculosa* Dworakowska   |

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