





## New genus and new combination of Deltocephalinae (Insecta: Hemiptera: Cicadellidae)

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### Abstract

Based on study of the holotype of *Scaphytopius (Tumeus) rubidus* DeLong, 1980, it was determined that this species does not belong in any genus of the subfamily Deltocephalinae described so far. To accommodate this species, we describe and illustrate a new genus in the tribe Bahitini, *Anavilhanas* **gen. nov.**, and propose the new combination, *Anavilhanas rubida* (DeLong) **comb. nov.**

**Key words:** Neotropical, biodiversity, Bahitini, leafhopper, taxonomy

### Introduction

Deltocephalinae Dallas, 1870 is the most diverse subfamily of Cicadellidae, with more than 6,700 species (Zahniser & Dietrich 2013; Dai *et al.* 2017). Representatives of this group are distributed around the world and include almost 75% of all the leafhoppers considered vectors of phytopathogens infecting economically relevant plants (Nielson 1968; Redak *et al.* 2004; Wilson & Weintraub 2007).

The genus *Scaphytopius* Ball, 1931 is presently the largest New World deltocephaline genus and one of the largest worldwide, including more than 170 described species, distributed throughout the Nearctic and Neotropical regions (Zanol 2006; Zahniser & Dietrich 2013). The species of this genus can be distinguished by the overall color pattern, usually with irrorate markings, the angulately produced head, the broad gena characteristically lacking an incision and extended onto the dorsal surface of the head behind the eye, and a combination of characters of the male terminalia, such as the anteriorly produced valve and presence of paraphyses articulated between the connective and aedeagus in many species (Zahniser & Dietrich 2013).

*Scaphytopius (Tumeus) rubidus* DeLong 1980 was described based on one male specimen from the Rio Negro, in the Brazilian Amazonian region. DeLong's original description is short, and the drawings provided lack detail. After careful study of the holotype, we discovered that this species does not belong in the genus *Scaphytopius*, nor in any genus of the subfamily described so far. Therefore, we describe a new genus of Deltocephalinae, and propose a new combination for *S. (T.) rubidus*.

### Material and methods

The holotype of *S. (T.) rubidus* DeLong deposited in the Triplehorn Entomological Museum, Ohio State University, Columbus, Ohio, USA (OSUC) was observed under Olympus SZX12 and BH40 microscopes. Habitus photos were taken using a Canon EOS camera with 65 mm macro-zoom and genitalia preparations were photographed using a Jenoptik Arktur camera attached to an Olympus BH40 microscope. The male genitalia of the only available specimen were previously cleared by DeLong and stored in a glass microvial in glycerin, affixed to the specimen pin.

The terminology follows Zahniser & Dietrich (2013) for the body and Rakitov (1997) for the leg chaetotaxy.

## Results

### *Anavilhanas* gen. nov.

(Figure 1)

**Type-species:** *Scaphytopius (Tumeus) rubidus* DeLong, 1980

**Coloration:** Body white to stramineous dorsally and ventrally. Crown, pronotum and mesonotum heavily marked with symmetrical brown and orange spots and maculae. Forewing translucent, with diffuse brown and ochraceous markings and more or less well delimited round white spots, veins light brown.

**External morphology:** Head with anterior margin somewhat produced anteriorly in dorsal view; transocular width slightly greater than pronotum width; crown between eyes less twice eye width; coronal suture extended to midlength of crown; crown surface with fine longitudinal striations, distinctly depressed anteromedially; frontal region concave in lateral view; transition from crown to face angled; anterior margin of head shagreen; lateral frontal sutures evenly divergent dorsad of antennal pits, reaching ocelli; ocellus medium sized, very close to eyes, slightly ventrad of anterior margin of head; eye with mesal margin with very slight emargination adjacent to antennal base. Antennal ledge absent. Clypeal suture complete. Clypellus widening apically, following natural curve of gena, flat in lateral view. Gena slightly concave laterally below eye, not visible behind eye in dorsal view; single fine erect seta close to lateral frontal suture present. Lorum wider than clypellus near base, apex nearly reaching lower margin of face; maxillary sensillum closely adjacent to lorum slightly beyond midlength. Frontoclypeus shagreen, more than two times longer than wide, relatively flat in lateral view.

Pronotum sparsely punctate, without transverse striations, lateral margin very short with indistinct carina. Scutellum not elevated, exposed part of mesonotum and scutellum together approximately as long as pronotum.

Forewing rounded apically; macropterous; Costal margin with 3 extra reflexed veinlets basad of outer anteapical cell; inner apical cell closed; outer anteapical cell somewhat constricted near middle, divided by 2-3 extra r-m crossveins; inner anteapical cell closed; clavus with crossvein between A1 and claval suture and crossvein between claval veins, appendix narrow, restricted to anal margin. Hind wing venation complete, with R2+3 and M4+5 separate and connected by crossvein.

Profemur with AM1 seta distinct and situated near ventral margin, intercalary row with 9 fine pale setae, AV1 resembling intercalary setae, basal setae very small, stout, poorly developed. Protibia cylindrical, rows AD and PD with 1 and 4 macrosetae, respectively. Mesofemur row AV setae very small and poorly visible except enlarged preapical seta. Hind femora, tibiae and tarsi missing from only available specimen.

**Male genitalia:** Pygofer incised past mid-length; with vertical irregular row of macrosetae on distal third; without processes. Segment X moderately long, sclerotized laterally. Valve short, subtriangular, anterior margin transverse. Subgenital plate subtriangular, lateral margin evenly convex in ventral view with short angulate apical projection, longer than wide, with sparse, fine setae; macrosetae absent. Connective articulated to aedeagus, anterior arms somewhat divergent, without processes, stem shorter than arms. Style preapical lobe broad and only slightly prominent; apophysis distad of preapical lobe robust, shorter than rest of style, indistinctly denticulate, apex curved slightly mesad. Aedeagus with two pairs of apical processes; gonoduct uniform, gonopore apical on dorsal surface between processes. Phragma membranous, without setae.

**Female genitalia:** Female unknown.

**Etymology:** The name, a feminine noun, is based on the type locality of the type species, near the Anavilhanas archipelago on the Rio Negro.

**Notes:** The new genus is similar to some genera of the tribe Bahitini, such as *Frequenamia* DeLong, 1947 and *Perubahita* Linnavuori & DeLong, 1978 which have a similar color pattern, the crown somewhat produced anteriorly, the transition of crown to face angled, and the aedeagus with apical processes. However, the new genus can be distinguished by its more slender body, the forewing with inner anteapical cell closed, and particularly the absence of macrosetae on the subgenital plates of the male genitalia. In overall body form, coloration, wing venation and leg chaetotaxy, the new genus is also similar to *Yungasia* Linnavuori, 1959 (tribe Athysanini), but differs in having a distinct preapical depression on the crown, in lacking false veins in the forewing brachial cell, in lacking teeth or processes on the male pygofer, and in lacking macrosetae on the male subgenital plates. It is here included in Bahitini based on the preapically depressed crown, presence of extra reflexed veins on the forewing

costal margin and distal processes of the aedeagus. This genus was not included in the recent phylogenomic analysis of Deltocephalinae (Cao *et al.* 2022) but the phylogeny indicates that Bahitini belongs to a larger lineage also comprising the endemic New World tribes Pendarini, Scaphytopiini and most endemic New World genera of Athysanini and Scaphoideini.

The new genus is described based on a single male specimen originally described by DeLong (1980) and incorrectly placed in *Scaphytopius* (*Tumeus*). It differs from *Scaphytopius* in having the gena emarginate below the eye and not extended behind the eye in dorsal view. The holotype is missing its hind legs and the tip of the right forewing. Most of the abdomen and parts of the genital capsule and genitalia are missing from the genitalia vial attached to the holotype specimen and the connective is broken into two halves along the stem. Nevertheless, DeLong's holotype is sufficiently preserved and different enough from previously known Neotropical Deltocephalinae to justify its placement in a new genus. It is redescribed below.

***Anavilhanas rubida* (DeLong, 1980) comb. nov.**

(Figure 1)

*Scaphytopius* (*Tumeus*) *rubidus* DeLong, 1980: 67 [sp.nov.].

**Type-locality:** Rio Negro, Amazonas State, Brazil.

**Length:** 5.0 mm.

**Coloration:** Crown (Fig. 1A) white, frontal region with a pair of dark brown maculae that broaden and merge posteriorly; discal region with large light brown macula and pair of orange spots; with dark brown stripe over coronal suture. Frontoclypeus (Figs. 1B, 1C) light brown, with two dark brown maculae near transition from crown to face, and several white spots near lateral margins. Pronotum (Figs. 1A, 1B) light brown, with several dark brown spots; lateral margins, a pair of maculae and a longitudinal stripe over midlength, white; apical margin, white. Scutellum and exposed part of mesonotum (Figs. 1A, 1B) light brown, with pair of orange maculae near basolateral angles; pair of maculae over basolateral angles, pair of maculae on basal margin, pair of lateral maculae on apical portion and macula on apex, white. Forewing (Figs. 1A, 1B) white, subhyaline, with light brown veins and several light and dark brown areas forming indistinct zig-zag pattern over clavus and posterior part of corium, several round white spots bordered with brown well delimited. Ventral surface of body stramineous, with light and dark brown maculae.

**External morphology:** Head (Figs. 1A, 1B) with medium length slightly longer than length next to eye; lateral frontal suture touching ventral margin of ocellus. Clypeal suture arcuate (Fig. 1C). Other characters as in generic description.

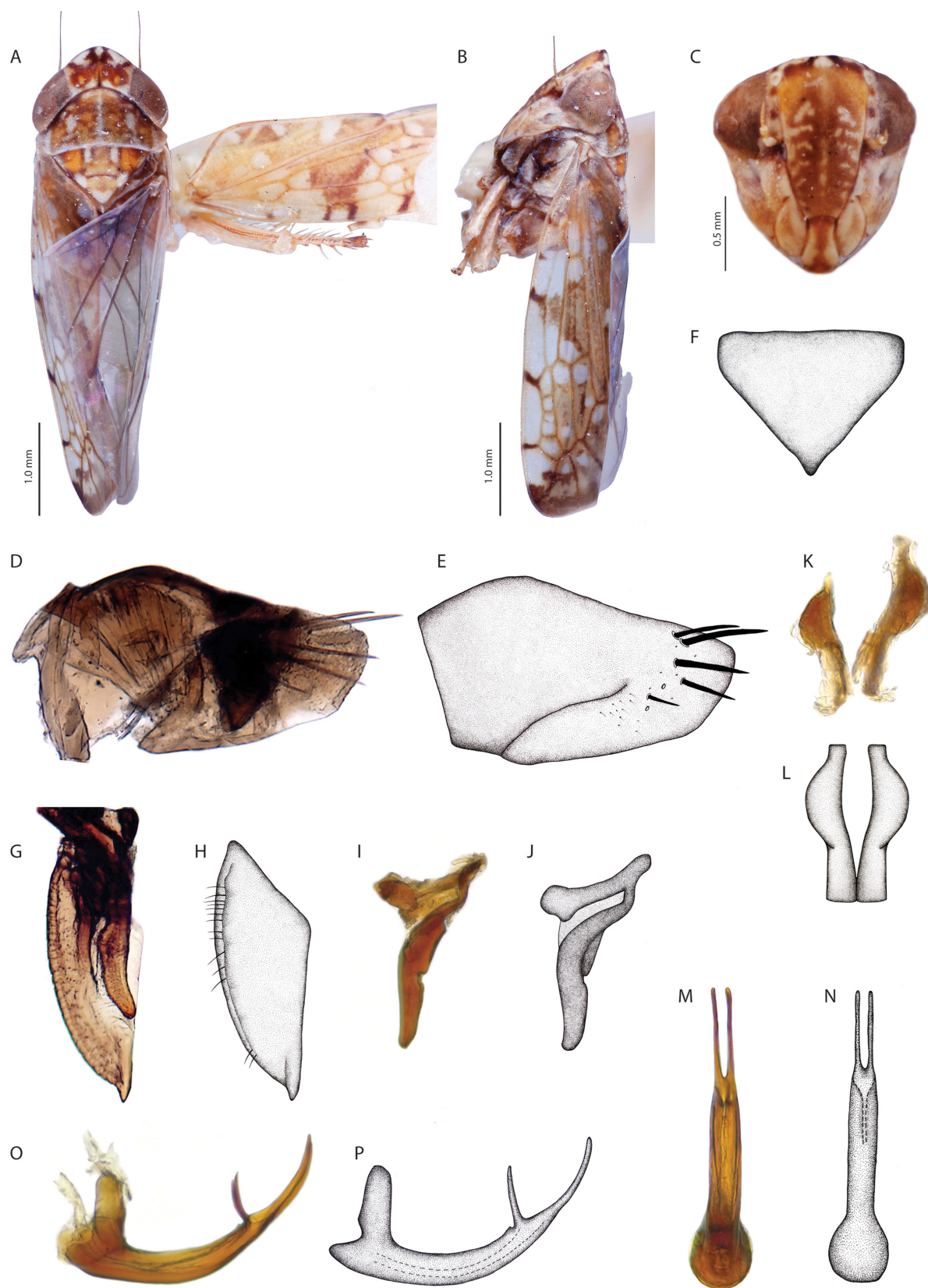
**Male genitalia:** Pygofer (Figs. 1D, 1E) posterior margin slightly angled. Valve (Fig. 1F) subtriangular. Subgenital plate (Figs. 1G, 1H) without macrosetae; with several thin microsetae on outer lateral margin; apex acuminate; reaching apex of pygofer. Style (Figs. 1I, 1J) apex slightly sinuate. Connective (Fig. 1K, 1L) with anterior arms only slightly divergent, roundly expanded laterally. Aedeagus (Figs. 1M, 1N, 1O, 1P) with dorsal apodeme short, columnlike, shaft tubular, with two pairs of apical spinelike processes; basal pair shorter and nearly straight and extended dorsad almost perpendicular to shaft in lateral view; distal pair longer, slightly curved in lateral view, parallel in caudal view; gonopore on dorsal surface between anterior and posterior distal processes.

**Material examined:** Holotype male “Rio Negro, marg. esq./ abaixo. I. Anavilhana/ AM, 20-21.IV.1967/ Exp. Perm. Amaz; HOLOTYPE/ *Scaphytopius*/ (*Tumeus*)/ *rubidus* DeLong; OSUC 0169237.” (OSUC).

**Notes:** The exact location of the type locality is uncertain. The specimen label apparently refers to the left bank (“marg. esq.”) of the Rio Negro below (“abaixo”) the Anavilhanas Archipelago in Amazonas State, Brazil.

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**FIGURE 1.** *Anavilhanas rubida* new comb., male holotype. A, Dorsal habitus; B, Lateral habitus; C, Head, frontal view; D: Pygofer, lateral view (photograph); E: Pygofer, lateral view (drawing); F: Valve, ventral view; G: Subgenital plate, ventral view (photograph); H: Subgenital plate, ventral view (drawing); I: Style, dorsal view (photograph); J: Style, dorsal view (drawing); K: Connective, dorsal view (photograph); L: Connective reconstructed, dorsal view (drawing). M: Aedeagus, caudal view (photograph); N: Aedeagus, caudal view (drawing); O: Aedeagus, lateral view (photograph); P: Aedeagus, lateral view (drawing).



## References

- Cao, Y., Dietrich, C.H., Zahniser, J.N. & Dmitriev, D.A. (2022) Dense sampling of taxa and characters improves phylogenetic resolution among deltocephaline leafhoppers (Hemiptera: Cicadellidae: Deltocephalinae). *Systematic Entomology*, 47 (3), 430–444.  
<https://doi.org/10.1111/syen.12540>
- Dai, W., Zahniser, J.N., Viraktamath, C.A. & Webb, M.D. (2017) Punctulini (Hemiptera: Cicadellidae: Deltocephalinae), a new leafhopper tribe from the Oriental region and Pacific Islands. *Zootaxa*, 4226 (2), 229–248.  
<https://doi.org/10.11646/zootaxa.4226.2.4>
- DeLong, D.M. (1947) A new genus (*Frequenamia*) and species of Mexican leaf hopper related to *Mesamia* (Homoptera, Cicadellidae). *Bulletin of the Brooklyn Entomological Society*, 42, 63–64.
- DeLong, D.M. (1980) New genera and species of Mexican and South America Deltocephaline leafhoppers (Homoptera, Cicadellidae, Deltocephalinae). *Revista Peruana de Entomología*, 23 (1), 63–71.
- Linnavuori, R. (1959) Revision of the Neotropical Deltocephalinae and some related subfamilies (Homoptera). *Annales Zoologici Societatis Zoologicae Botanicae Fennicae Vanamo*, 20 (1), 1–370.
- Linnavuori, R. & DeLong, D.M. (1978) Neotropical leafhoppers of the *Bahita* group (Homoptera: Cicadellidae: Deltocephalinae). A contribution to the taxonomy. *Brenesia*, 14–15, 109–169.
- Nielson, M.W. (1968) The leafhopper vectors of phytopathogenic viruses (Homoptera, Cicadellidae). Taxonomy, biology, and virus transmission. *U.S. Department of Agriculture Technical Bulletin*, 1382, 1–386.
- Rakitov, R.A. (1997) On differentiation of the cicadellid leg chaetotaxy (Homoptera: Auchenorrhyncha: Membracoidea). *Russian Entomological Journal*, 6, 7–27.
- Redak, R.A., Purcell, A.H., Lopes, J.R.S., Blua, M.J., Mizell, R.F. & Andersen, P.C. (2004) The biology of xylem fluid feeding insect vectors of *Xylella fastidiosa* and their relation to disease epidemiology. *Annual Review of Entomology*, 49, 243–270.  
<https://doi.org/10.1146/annurev.ento.49.061802.123403>
- Wilson, M.R. & Weintraub, P.G. (2007) An introduction to Auchenorrhyncha phytoplasma vectors. *Bulletin of Insectology*, 60 (2), 177–178.
- Zahniser, J.N. & Dietrich, C.H. (2013) A review of the tribes of Deltocephalinae (Hemiptera: Auchenorrhyncha: Cicadellidae). *European Journal of Taxonomy*, 45, 1–211.  
<https://doi.org/10.5852/ejt.2013.45>
- Zanol, K. (2006) Catalogue of the neotropical (including north of Mexico) Deltocephalinae (Hemiptera, Cicadellidae). Part I—Athymanini and Deltocephalini excluded 1. *Acta Biologica Paranaense*, 35 (3–4), 89–161.  
<https://doi.org/10.5380/abpr.v35i0.6869>