



Systematics, Morphology and Biogeography

## A new species of the sharpshooter genus *Onega* Distant, 1908 (Hemiptera: Cicadellidae: Cicadellini) from Ecuador and Peru

 André Luis Diniz Ferreira<sup>a,\*</sup>, Pedro W. Lozada<sup>b</sup>, Daniela Maeda Takiya<sup>a</sup>
<sup>a</sup> Universidade Federal do Rio de Janeiro, Instituto de Biologia, Departamento de Zoologia, Rio de Janeiro, RJ, Brazil

<sup>b</sup> Universidad Nacional Mayor de San Marcos, Museo de Historia Natural, Departamento de Entomología, Lima, Peru


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## ABSTRACT

*Onega* comprises nine valid species distributed in South American countries, Bolivia, Colombia, Ecuador, Paraguay and Peru, commonly at high altitudes. The genus has as diagnostic characteristics the transition crown-frons with transversal carina; crown and superior portion of frons with concavities; pronotum wider than transocular width of head; and paraphysis, when present, as a median esclerite. The present paper describes *Onega musa* sp. nov., from Ecuador and Peru, which can be distinguished from other *Onega* species by: body mostly yellow, with brown maculae distributed on dorsum; posterior margin of male pygofer serrate, with long microsetae on the basiventral margin; aedeagus with shaft bisinuate with dorsal acute preapical process; female sternite VII with posterior margin slightly convex; and first valvula of ovipositor with 38 noncontiguous teeth. Intraspecific morphological variations are discussed.

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## Introduction

Cicadellidae are one of the most diverse families of Hemiptera, distributed in all zoogeographic regions (Nielson and Knight, 2000), with approximately 22,000 species described, approximately 5000 of them recorded from the Neotropical Region (Forero, 2008). Members of Cicadellidae are commonly referred to as leafhoppers, insects having a large variety of color patterns and sizes, ranging from large (22 mm) to very small (only 3–5 mm) (Young, 1968; Mejdalani, 1998). This diverse group is a paraphyletic assemblage and proposals for its higher-level classification are varied, as reflected in the number of subfamilies included, ranging from nine to over 50 (Nault and Rodriguez, 1985; Dietrich et al., 2017). The Cicadellinae subfamily is very diverse, with approximately 340 genera and 2000 species. Cicadellinae representatives, commonly referred to as sharpshooters, often have heads with a swollen appearance, which may be related to their xylem sap specialization (Mejdalani, 1998; Young, 1968). The subfamily is currently divided into two tribes: Cicadellini and Proconiini. Cicadellini currently comprises 1200 species divided into more than 170 genera in the New World.

In the Cicadellini, *Onega* was described by Distant (1908) based on the type-species *Onega avella* Distant, 1908. Currently, the genus

includes nine valid species that share the following diagnostic characteristics: crown-frons transition with transverse carina; apex of crown and superior portion of frons with concavities; and pronotum much wider than transocular width of head (Young, 1977; Takiya and Cavichioli, 2004). *Onega* species occur in high altitudes, between 850 and 2800 m a.s.l., of Andean South American countries. *Onega* belongs to the *Paromenia* generic group, which was proposed by Young (1977) in his review of the Cicadellinae of the New World. For the proposal of generic groups, Young (1977) took into consideration several morphological similarities of genera, which may have little relationship to their phylogeny. Nevertheless, Cavichioli (1992), in his unpublished doctoral dissertation, recovered several close relationships proposed by Young (1977) in a phylogenetic analysis of the *Paromenia* generic group. In his study, *Onega* was recovered as monophyletic and sister to a species of the non-monophyletic *Paromenia*.

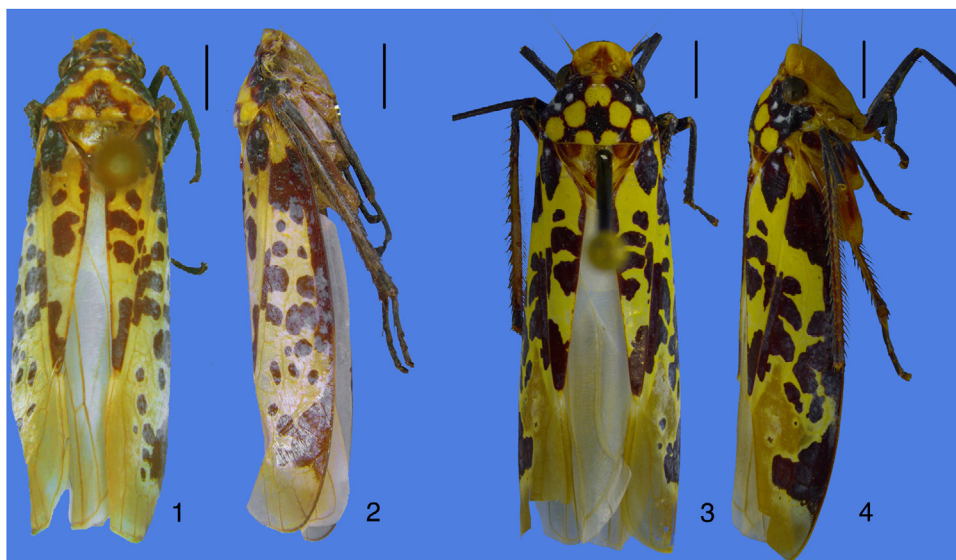
In the present paper, a new species of *Onega* based on female and male specimens from Ecuador and Peru were described.

## Material and methods

Specimens studied herein are deposited at the following collections: Coleção Entomológica Prof. José Alfredo Pinheiro Dutra, Rio de Janeiro (DZR); Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima (MUSM); and Carnegie Museum, Pittsburgh, EUA (CMNH).

\* Corresponding author.

E-mail: [andreluis-df@hotmail.com](mailto:andreluis-df@hotmail.com) (A.L. Ferreira).



**Figs. 1–4.** *Onega musa* sp. nov.: (1–2) holotype; (1) dorsal habitus; (2) lateral habitus; (3–4) paratype from Ecuador; (3) dorsal habitus; (4) lateral habitus. Scale bars = 2 mm.

Preparation of genital structures mostly follows Oman (1949). The abdomen (1) was removed for dissection; (2) placed in warm 10% KOH until the structure was clear; (3) washed for 5–10 min in distilled water, in addition to washing impurities blocking the view of structures; (4) placed on a concave slide with glycerin for observation and illustration; (5) pencil-sketched using a camera lucida coupled to a Zeiss Stemi SV 6 stereomicroscope; and (6) stored in a small vial with glycerin pinned below the specimen. Photos of dorsal and lateral habitus of specimens were taken with a Leica DFC 450 digital camera coupled to a Leica M205C stereomicroscope in different focal planes and assembled with the LAS Core V4.6 program. Photographs were edited in Adobe® Photoshop® CS6.

Morphological terminology follows mainly Young (1968, 1977), but terminology for head structures follows Hamilton (1981), and that for the female genitalia follows Nielson (1965), with the exception of the third valvulae, which are treated herein as gonoplocs, as suggested by Mejdalani (1998).

#### Valid *Onega* species

- O. avella* Distant, 1908. Ecuador and Paraguay
- O. bracteata* Young, 1977. Bolivia, Ecuador, Colombia, and Peru.
- O. fassli* Young, 1977. Colombia, Ecuador, and Paraguay.
- O. freytagi* Takiya and Cavichioli, 2004. Colombia and Ecuador.
- O. krameri* Takiya and Cavichioli, 2004. Ecuador.
- O. musa* Ferreira, Lozada & Takiya sp. nov. Ecuador and Peru.
- O. orphne* Takiya and Cavichioli, 2004. Ecuador.
- O. sanguinicornis* (Latreille, 1811). Ecuador.
- O. stella* Distant, 1908. Ecuador.
- O. stipata* (Walker), 1851. Ecuador.

#### *Onega musa* sp. nov. Ferreira, Lozada & Takiya (Figs. 1–12)

**Length:** males 14.4–14.6 mm, females: 14.4–15.9 mm.

**Diagnosis:** Body mostly yellow, with brown maculae distributed on crown, pronotum, and forewings. Concavity on frons only on superior fourth. Posterior margin of male pygofer serrate; with long microsetae at basiventral margin. Aedeagus with shaft bisinuate, with elongate preapical dorsal process (bifurcate or not) and apical acute sinuous process extending beyond gonopore.

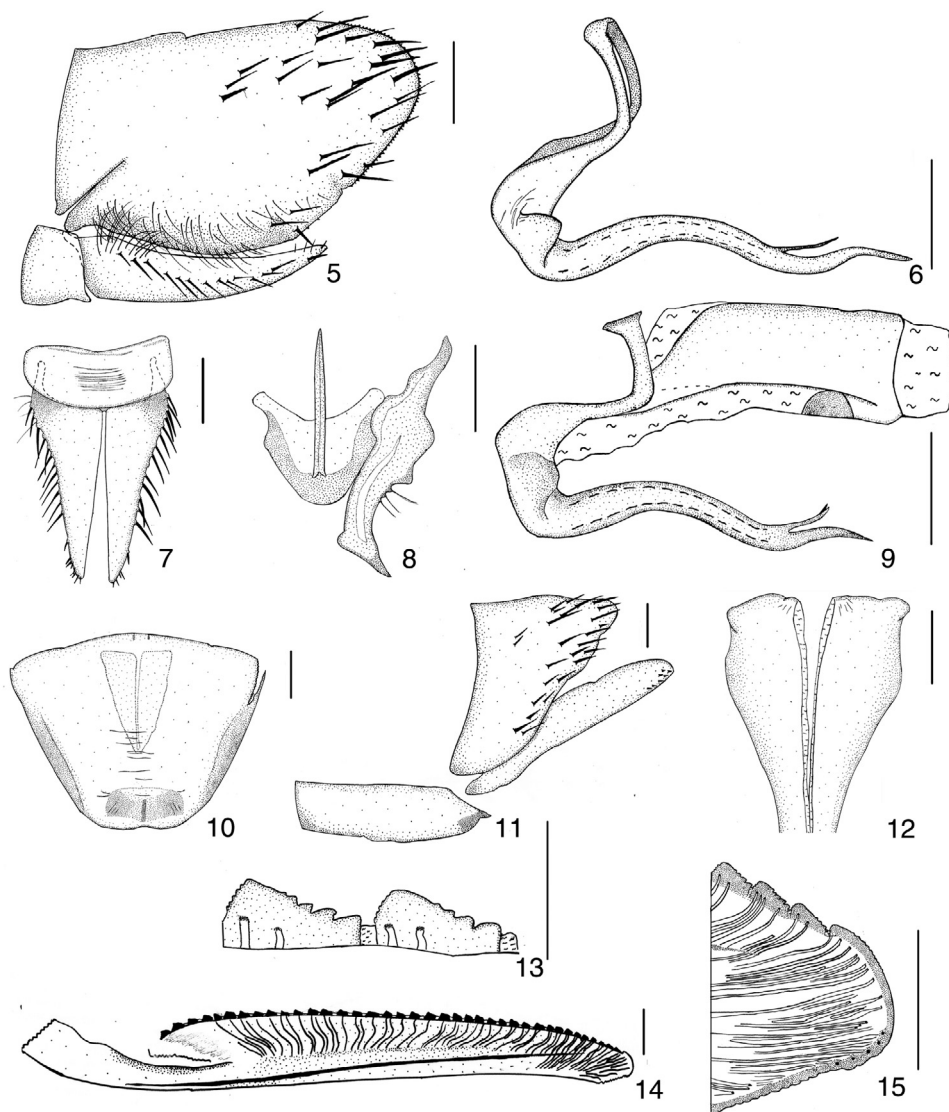
**Coloration:** Crown yellow; margins besides eyes dark brown; median macula dark-brown (Fig. 1). Face yellow, except pairs of

maculae on frons at bases of antennae and on genae, light brown (Fig. 2). Pronotum reddish-brown (Fig. 1) with five spots mostly confluent arranged as a “V” on disc and two semi-circular maculae on posterior margin, bright yellow (Fig. 1). Mesonotum bright yellow; lateral basal angles and apical spot, reddish-brown (Figs. 1–3). Forewing mostly bright yellow, with several irregular reddish-brown (Figs. 1 and 2) areas; apex translucent (Figs. 1–3). Hind wing translucent white (Figs. 1–4). Thoracic pleura mostly yellow with few light brown maculae. Legs mostly dark brown (Figs. 2–4). Abdomen mostly red.

**External morphology:** Crown with median length 3/5 interocular and slightly less than 2/5 transocular width; apical and lateral concave areas on crown not confluent (Fig. 1). Frons mostly flattened, concave only on superior fourth (Fig. 2). Pronotum with posterior margin slightly concave (Fig. 1) or straight (Fig. 3). Forewing with most of corium with plexus of veins, absent on apical, brachial, and costal cells; clavus with crossveins between claval veins (Figs. 1 and 2). Hind legs with femoral setal formula 2:1:1; first tarsomeres with length approximately equal to combined length of distal ones. Other external characters as in generic description (Young, 1977).

**Male genitalia:** Pygofer moderately produced; posterior margin rounded and serrate; without processes; macrosetae dispersed throughout posterior 2/3; long microsetae restricted to basiventral margin (Fig. 5). Subgenital plate extending slightly posterior to midlength of pygofer; fused basally; with uniseriate macrosetae and fine setae basiventrally (Fig. 6). Connective approximately V-shaped; dorsal keel strongly sclerotized and elongate, extending anteriorly. Style extending posteriorly beyond apex of connective; apex broad and foot-shaped (Fig. 7). Aedeagus with dorsal apodemes robust; shaft elongate and bisinuate, in lateral view, with a non-bifurcated dorsoapical process above the gonopore (Fig. 8); apex with apical acute sinuous process extending beyond gonopore. Paraphyses absent (Fig. 8).

**Female genitalia:** Sternite VII with posterior margin with shallow median emargination; transverse striations on disc (Fig. 10). Internal abdominal sternite VIII forming simple membranous plate. Pygofer with few macrosetae distributed dorsally on apical third (Fig. 11). First valvula, in ventral view, with base truncate and lateral preapical concavities (Fig. 12). Second valvula bearing 38 non-contiguous teeth (Fig. 14); teeth with denticles distributed on anterior and posterior margin (Fig. 13); apex broadly rounded



**Figs. 5–15.** *Onega musa* sp. nov.: (5–9) male genitalia; (5) pygofer, valve, and subgenital plate, lateral view; (6) valve and subgenital plates, ventral view; (7) style and connective, ventral view; (8) aedeagus holotype, lateral view; (9) aedeagus of paratype from Ecuador, lateral view; (10–16) female genitalia; (10) sternite VII, ventral view; (11) sternite VII, pygofer, and gonoplac, lateral view; (12) bases of first valvulae of ovipositor, ventral view; (13) denticles from median portion of shaft of second valvula of ovipositor, lateral view; (14) second valvula of ovipositor, lateral view; (15) apex of second valvula of ovipositor, lateral view. Scale bars: 0.5 mm (5–12); 0.2 mm (14); 0.1 mm (13–15).

(Fig. 15). Gonoplac with apex narrowly round; few microsetae on apical margin (Fig. 11).

**Variation of paratypes:** The general coloration of the Ecuadorian paratype varies in having the yellow tone much brighter; dorsal areas darker brown; median crown macula reddish-brown; frons completely yellow; and pronotum discal spots not confluent (Figs. 3 and 4). In the male genitalia, the Ecuadorian paratype have subgenital plates with lateral macrosetae absent at basal third and aedeagus with dorsoapical process bifurcate and shorter apical process (Fig. 9). Peruvian paratypes may also have bifurcate dorsoapical process. Furthermore, the Ecuadorian paratype has a sclerotized round area on the ventral margin of segment X of anal tube.

**Distribution:** PERU, Cajamarca Department and ECUADOR, Zamora Chinchipe Province.

**Material examined:** Holotype, 1 male, “Peru, CA: Cajamarca/06” 8’ 78° SL 2300 m/18. X. 1998/J. Grados”, MUSM. Paratypes: 2 males and 4 females, same data of holotype, MUSM; 1 male and 1 female, same data of holotype, DZRJ; 1 male, “ECUADOR:

Zimbora – Chinchipe/Via Valladolid – Yngana/2460 m, 10 August 1993, E./Tapia, G. Onore, C. Young”, CMNH.

**Etymology:** The specific epithet, in apposition, is in allusion to the similarity of the color pattern of the described species with a ripe banana, fruit belonging to the genus *Musa* L.

**Notes:** The new species is very distinct of other *Onega* by its striking coloration (yellow with brown maculae) and its aedeagal shape with a unique dorsoapical process. The new species keys to couplet 7 in Takiya and Cavichioli (2004)’s key to species of *Onega*, but it will not proceed further.

## Discussion

In *Onega*, intraspecific variation of the color pattern has been recorded previously by Takiya and Cavichioli (2004), where authors described color variation of specimens from Ecuador of *O. fassli* from those from Colombia and Paraguay. The same is herein reported for *O. musa* sp. nov. based on specimens from Peru and Ecuador. The general yellow tone is more vibrant in the

Ecuadorian specimen and dorsal maculae are darker (dark-brown), although median crown macula is lighter (reddish-brown). In addition to color variation, specimens from Peru and Ecuador vary in the extension of the apical process of the aedeagus, which is longer in Peruvian specimens. Another intriguing variation found in the aedeagus is that the preapical dorsal process can be bifurcated, slightly bifurcated, or not bifurcated, and this varies also in Peruvian specimens collected in the same event.

Finally, the female genitalia have several structures that can be useful for species identification of sharpshooters (Mejdalani, 1998). In *Onega*, shapes of the sternite VII and second valvulae are important to differentiate species. The sternite VII of *O. musa* sp. nov. is somewhat similar to that of *O. sanguinicollis*, but it can be differentiated by the concavity on the apex, absent in the latter. The second valvulae of *Onega* were firstly described in detail in the latest review of the genus (Takiya and Cavichioli, 2004), and the number of dorsal teeth varied between 43 and 45. *O. musa* sp. nov. has 38 teeth and is the species known to have the least number of teeth.

#### Conflicts of interest

The authors declare no conflicts of interest.

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