

A historical overview of the classification of the Neotropical tribe Zammarini (Hemiptera, Cicadidae) with a key to genera

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Abstract

An overview is given of the past century's confusions concerning some key characters within this Neotropical cicada tribe. The limits of the genera *Zammarina* and *Orellana* have been redefined and a comprehensive checklist is included for the tribe. An illustrated key to the genera of the tribe Zammarini (Hemiptera: Cicadidae) is provided; this is the first key to both males and females of this tribe. *Odopoea perspicua* Distant, 1905 is transferred from Zammarini to the African tribe Platyleurini to become *Casualna perspicua* (Distant, 1905), **comb. n.**

Resumen

Se presenta un resumen de las confusiones del siglo pasado sobre algunos caracteres importantes para la delimitación genérica de esta tribu de cigarras neotropicales. Se redefinen los límites taxonómicos de los géneros *Zammarina* y *Orellana* y se provee una lista exhaustiva de especies pertenecientes a la tribu. Se incluye una clave ilustrada para los géneros de la tribu Zammarini (Hemiptera: Cicadidae); esta es la primera clave para machos y hembras de esta tribu. *Odopoea perspicua* Distant, 1905 es transferida de Zammarini a la tribu africana Platyleurini tomando la nueva combinación *Casualna perspicua* (Distant, 1905).

Keywords

Zammarini, Hemiptera, Cicadidae, tarsomeres, Neotropical, identification key, taxonomy, Platyleurini

Introduction

The Neotropical tribe Zammarini (Hemiptera: Cicadidae), belongs to the subfamily Cicadinae, the latter characterized by the presence of tymbal covers. Zammarini are easily recognizable by their strongly produced pronotal flanges. Males of this tribe have a more or less bulbous tymbal cover, which is sometimes useful as a specific character.

Over the past century, the tribe Zammarini has been studied and discussed by several hemipterists, probably because these cicadas are relatively large, colorful, and possess unique, strongly produced pronotal flanges.

This paper is the first one in a series of papers dealing with the taxonomy of the tribe Zammarini, with the ultimate goal of publishing a monograph on the tribe based on morphological, molecular, ecologic, biogeographic and acoustic data.

History of the tribe

The tribe Zammarini was described by Distant (1905) under the “division” name Zammararia. Distant (1905) defined his Zammararia to consist of *Zammara* Amyot & Audinet Serville, 1843 (7 spp.), *Odopoea* Stål, 1861 (13 spp.), two new genera, *Orellana* and *Miranha*, which are based on respectively *Z. columbia* Distant, 1881 and *Z. imbellis* Walker, 1858, and two new species *Orellana brevis* and *Odopoea perspicua*. These 24 species attributed to 4 genera were catalogued a year later in Distant’s catalogue (1906a). In 1915, Van Duzee first used the tribal name Zammarini.

Distant (1912) described the genus *Uhleroides* as a new genus of Zammarini; *Uhleroides* is restricted to Cuba and Hispaniola. Without explanation, Kato (1932) transferred *Uhleroides* to the tribe Thophini. Moulds (2001) recently transferred *Uhleroides* back into Zammarini, based on the following characters: “the presence of transverse grooves towards the distal ends of the postclypeal ridges, an antennal plate that reaches almost to the eyes, fore wings which carry blotch-like infuscations at distal ends of apical veins 1–7 and at base of apical cells 2, 3 and 5, a narrow basal cell to the fore wing with veins M and CuA meeting the cell close together and a hind wing anal lobe that is narrow.”

Haupt (1918) and Delétang (1919) both described new genera within Zammarini (*Adusella* and *Edholmbergia*, respectively); however, both generic names were synonymized to *Odopoea* by Torres (1945). Distant (1920) described *Juanaria*, a monospecific Zammarini genus endemic to Cuba. Davis (1928, 1934) added two more genera to the tribe, *Borencona* (a monospecific genus endemic to Puerto Rico) and *Chinaria* (restricted to Mexico and the Dominican Republic).

The most recent generic addition to Zammarini was made by Boulard and Sueur (1996), who described the monospecific genus *Zammaralna* (a group endemic to Venezuela) as the “taxon frère de *Zammara*” [sister taxon to *Zammara*].

Following Distant’s (1905) raising of the tribe, additional new species were described by Distant (1906b, 1906c, 1912), Schmidt (1919), Goding (1925) Davis

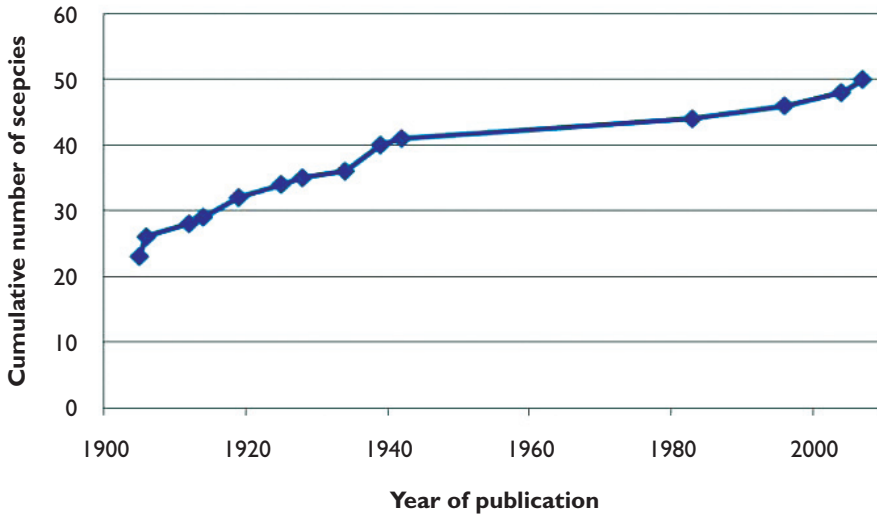


Figure 1. Accumulation of species / publication year for the tribe Zammarini, since Distant recognized the tribe in 1905.

(1928, 1934, 1939, 1942), Ramos (1983), Boulard and Sueur (1996) and Sanborn (2004, 2007, in press). For an overview, see Figure 1 and Checklist. Thus, at present, the tribe Zammarini consists of 9 genera and 50 described species: *Odopoea* (15 species), *Miranha* (1), *Zammara* (15), *Zammaralna* (1), *Juanaria* (1), *Borencona* (1), *Chinaria* (4), *Orellana* (5), *Uhleroides* (7).

Tarsomeres and head width: contradictions and confusions in the literature

The presence of 2 or 3 tarsomeres, a character that should be easy to evaluate, has led to considerable confusion within Zammarini. Within Cicadidae, a reduction of the number of tarsomeres is an unusual condition; indeed, within Zammarini, *Zammara* is the only genus with 2 tarsomeres instead of 3. Amyot and Audinet Serville (1843) originally described *Zammara* as having 2 or 3 tarsomeres; the type species, *Z. tympanum* (Fabricius, 1803), has 2 tarsomeres. The other species of *Zammara* described in this work, *Z. strepens*, was stated (erroneously) as having: “les tarsi distinctement de trois articles” [tarsi clearly three-jointed].

Distant (1881a) described *Z. columbia* as having 3 tarsomeres (in error). Later, Distant (1905) erected the genus *Orellana*, and assigned *Z. columbia* as the type species of this genus; oddly, he stated clearly in his generic description for *Orellana*: “tarsi two-jointed,” based on a type species that he previously described as having 3 tarsomeres. In this same publication, Distant described the species *Orellana brevis* as having “two-jointed tarsi.” One year later, Distant (1906a) transferred *Z. nigriplaga* Walker, 1858 to

the genus *Orellana* based on having the “head (including eyes) only about two-thirds the breadth of base of mesonotum” in contrast to “about as wide” for *Zammarara*.

Jacobi (1907) suggested that both Distant (1881a), and Amyot and [Audinet] Serville (1843) made errors in interpreting tarsomere morphology for respectively, *Orellana columbia* and *Zammarara strepens*. Jacobi implied that the errors might have been due to the “nicht ganz gutem lichte und geringeren optischen hilfsmitteln” [suboptimal lighting and inferior optical tools] than his “Zeisschen Binokularlupe mit 35facher vergrößerung.” [Zeiss dissecting microscope with 35× magnification]. He also transferred *O. nigriplaga* (Walker, 1858) back into *Zammarara*.

Subsequently, Distant (1914) transferred *Z. nigriplaga* and *Z. brevis*, again, into *Orellana*, based on the breadth of the head (as discussed above) and because these species supposedly have 2 tarsomeres, since he described the genus *Orellana* again as having tarsi “two-jointed.”

Schmidt (1919) discussed Jacobi’s and Distant’s works and moved *Z. nigriplaga*, Walker 1858 and *O. brevis* Distant, 1905 (back) to *Zammarara* because both species have 2 tarsomeres. He also moved *Z. strepens* Amyot & Audinet Serville, 1843 to *Orellana* and described the new species *Orellana bigibba*; additionally, Schmidt suggested that the genus description for *Orellana* should be changed to “tarsen dreigliedrich” [tarsi three-jointed].

Goding (1925) based the separation of *Zammarara* and *Orellana* on Distant’s (1905) key to genera, namely “head (including eyes) only about two-thirds the breadth of base of mesonotum” for *Orellana* and “head (including eyes) about as wide as the breadth of base of mesonotum” for *Zammarara*. Based on this separation, Goding transferred *Z. nigriplaga* and *Z. brevis* again into *Orellana* and described two more species in the genus: *O. pulla* and *O. brunneipennis*, not mentioning the number of tarsomeres for either species.

Boulard (1975, 1976) treated *O. brevis*, *O. bigibba* and *O. columbia* as belonging to *Zammarara*, though without specifically transferring them back into *Zammarara*. It is not clear whether, in doing this, he intended not to recognize *Orellana* as a valid genus, since by transferring *O. columbia* (the type species of *Orellana*) back to *Zammarara*, *Orellana* would become a junior (subjective) synonym of *Zammarara*.

Boulard and Sueur (1996) praised Distant for his insight in the importance of the number of tarsomeres as a generic character, and gave the example where he [Distant] used it to separate *Miranha* (trimère) and *Orellana* (dimère). So it can be assumed that Boulard (1975, 1976) did not intend to synonymize the genus *Orellana* with *Zammarara*. Boulard and Sueur (1996) discussed the number of tarsomeres briefly when they erected the new genus *Zammaralna*, defining it in the following way: “Habitus de *Zammarara*, mais tarse à trois articles; nervures médiane et cubitale naissant du même angle de la cellule basale et poursuivant, juxtaposées, plus ou moins longuement (pas de tronc commun)” [Similar to *Zammarara*, but with 3 tarsomeres; median and cubital veins arising at the same angle from the basal cell and from there on juxtaposed, over a more or less long distance (no common base)].

Results

My research for the present paper proves that Jacobi (1907) was correct that the number of tarsomeres in the descriptions of *Orellana columbia* Distant, 1881 and *Zammara strepens* Amyot & Audinet Serville, 1843 are wrong and that in fact *Orellana columbia* has 3 tarsomeres, while *Zammara strepens* has 2 tarsomeres. Schmidt (1919) was also correct in that the genus description for *Orellana* should be changed to “tarsi three-jointed” (i.e. having 3 tarsomeres). Furthermore both *nigriplaga* and *brevis* should be transferred to *Zammara* because they each possess 2 tarsomeres. The species *bigibba* has 3 tarsomeres and therefore should stay in *Orellana*. I have not seen the types of *Orellana pulla*, Goding 1925 or *Orellana brunneipennis* Goding, 1925, nor specimens that belong to either of these species. Because the type specimens have not been located yet, the generic placement of the latter two species is tentative. This is especially so because Goding (1925) separated *Zammara* and *Orellana* based on the width of the head, a characteristic not valid to separate these genera. Distant (1905) described *Odopoea perspicua* and listed the type locality as “São Thomé”. After seeing pictures of the type, it is clear that this species is misplaced in Zammarini as it clearly belongs to the African tribe Platyleurini. This species is very closely related to *Canualna liberiana* (Distant, 1912), a species occurring on the island of São Thomé (M. Villet, personal communication). Distant erroneously thought that São Thomé referred to a location in Brazil, but instead this specimen is almost certainly from the African Island São Thomé, even more so because the collector was “Negreiros”, a painter born on that island. For the above reasons the species is transferred to *Canualna perspicua* (Distant, 1905), new combination.

Checklist of genera and species currently included within the tribe Zammarini.

In the following check-list only the type locality for each species is given, further distribution records will be discussed in future papers.

Cicadidae Latreille, 1802

Cicadinae Latreille, 1802

Zammarini Distant, 1905

Odopoea Stål, 1861: 616 ; Type species: *Tettigonia dilatata* Fabricius, 1775: 678

Adusella (Haupt, 1918: 84)

Edholmbergia (Delétang, 1919: 70)

azteca Distant, 1881b: 4 (Mexico)

cariboea Uhler, 1892:169 (Hispaniola)

degiacomii Distant, 1912: 644 (Espírito Santo, Brazil)

dilatata (Fabricius, 1775: 678), *Tettigonia* (Jamaica)

plena (Walker, 1850: 38), *Zammara* (Jamaica)

- cuncta* (Walker, 1850: 39), *Zammara* (Jamaica)
praxita (Walker, 1850: 40), *Zammara* (Unknown)
erato (Walker, 1850: 41), *Zammara* (Jamaica)
domingensis (Uhler, 1892: 172), *Odopoea* (Hispaniola)
diriangani Distant, 1881b: 5 (Chontales, Nicaragua)
funesta (Walker, 1858: 2), *Zammara* (North America)
insignifera Berg, 1879: 135 (Salta, Argentina)
jamaicensis Distant, 1881a: 629 (Jamaica)
lebruni (Distant, 1906b: 385), *Tettigades* (Patagonia)
minuta Sanborn, 2007: 2 (Colima, Mexico)
signoreti Stål, 1864: 59 (Mexico)
strigipennis (Walker, 1858: 3), *Zammara* (Haiti)
suffusa (Walker, 1850: 37), *Zammara* (Santo Domingo, [Dominican Republic])
vacillans (Walker, 1858: 3), *Zammara* (Santo Domingo, [Dominican Republic])
venturii Distant, 1906c: 150 (Argentina)
lebruni (Delétang, 1919: 16) *Edholmbergia* (Catamarca)
signata (Haupt, 1918: 84) *Adusella* (Catamarca, Argentina)
- Miranba** Distant, 1905: 381 ; Type species: *Zammara imbellis* Walker, 1858: 2
imbellis (Walker, 1858: 2), *Zammara* (Mexico)
- Zammara** Amyot & Audinet Serville, 1843: 468 ; Type species: *Tettigonia tympanum* Fabricius, 1803: 40
brevis (Distant, 1905: 382), *Orellana* (Colombia)
calochroma Walker, 1858: 4 (Cundinamarca, [Colombia])
erna Schmidt, 1919: 390 (Pucay, Ecuador)
eximia (Erichson, 1848: 616), *Cicada* (*Zammara*) (British Guiana)
hertha Schmidt, 1919: 386 (Chanchamayo, Peru(♂); Canelos, Ecuador (♀))
intricata Walker, 1850: 35 (Puerto Rico)
lichyi Boulard & Sueur, 1996: 106 (Aragua, Venezuela)
luculenta Distant, 1883: 187 (Unknown)
medialinea Sanborn, 2004: 367 (Aragua, Venezuela)
nigriplaga Walker, 1858: 4 (South America)
olivacea Sanborn, 2004: 365 (Providencia, Colombia)
smaragdina Walker, 1850: 33 (Unknown)
angulosa (Walker, 1850: 34), *Zammara* (Mexico)
smaragdula Walker, 1858: 4 (South America)
strepens Amyot & Audinet Serville, 1843: 469 (Brazil)
tympanum (Fabricius, 1803: 40), *Tettigonia* (Brazil)
- Zammaralna**, Boulard & Sueur, 1996: 110 ; Type species: *Zammaralna bleuzeni*, Boulard & Sueur, 1996: 110
bleuzeni Boulard & Sueur, 1996: 110 (Bolívar, Venezuela)
- Juanaria** Distant, 1920: 455 ; Type species: *Juanaria mimica* Distant, 1920: 456
poeyi (Guérin-Méneville, 1856: 178), *Cicada* (*Platypleura*) (Cuba)
mimica (Distant, 1920: 456), *Juanaria* (Cuba)
- Borencona** Davis, 1928: 31; Type species: *Borencona aguadilla* Davis, 1928: 31
aguadilla Davis, 1928: 31 (Yauco, Puerto Rico)
- Chinaria** Davis, 1934: 52; Type species: *Chinaria mexicana* Davis, 1934: 52
pueblaensis Sanborn, 2007: 5 (Puebla, Mexico)
mexicana Davis, 1934: 52 (Morelos, Mexico)
similis Davis, 1942: 178 (Guerrero, Mexico)

- vivianae* Ramos, 1983: 63 (La Estrella, Dominican Republic)
Orellana Distant, 1905: 381 ; Type species: *Zammaria columbia* Distant, 1881a: 628
bigibba Schmidt, 1919: 392 (Brazil)
*brunneipennis** Goding, 1925: 27 (El Oriente, Ecuador)
castaneamaculata Sanborn, 2010: ? (Magdalena[?], Colombia)
columbia (Distant, 1881a: 628), *Zammaria* (Medellin, Colombia)
*pulla** Goding, 1925: 25 (Ecuador)
Uhleroides Distant, 1912: 644; Type species: *Uhleroides cubensis* Distant, 1912: 645
chariclo (Walker, 1850: 146), *Cicada* (Cuba)
cubensis Distant, 1912: 645 (Cuba)
hispaniolae Davis, 1939: 292 (Santo Domingo, [Dominican Republic])
maestra Davis, 1939: 291 (Santiago de Cuba, Cuba)
sagrae (Guérin-Méneville, 1856: 178), *Cicada* (Cuba)
samanae Davis, 1939: 294 (Santo Domingo, [Dominican Republic])
walkerii (Guérin-Méneville, 1856: 179), *Cicada* (Cuba)

*= generic placement uncertain (possibly in *Zammaria*), due to not having seen any (type) specimens.

Platypleurini Schmidt, 1918

Canualna Boulard, 1985: 184; Type species: *Platypleura liberiana* Distant, 1912: 200
perspicua (Distant, 1905: 380), *Odopoea* (São Thomé)

Key to the genera of the tribe Zammarini

Below, the first key to both males and females for all (described) species within the Tribe Zammarini is provided.

There are several genera (*Plautilla* Stål 1865, *Procollina* Metcalf 1963, *Daza* Distant 1905, *Aragualna* Champagnet, Boulard & Gaiani 2000, *Onoralna* Boulard 1996) that are at present placed outside of Zammarini, which may prove to be members of the tribe. Currently molecular data and additional morphological data are being collected for each to help determine their taxonomic position within the Cicadidae.

1. Median (M) and anterior cubital (CuA) vein arising together from the basal cell (Figs 2 left, 4, 5); 2 or 3 tarsomeres, first tarsomere sometimes strongly reduced (Fig. 3)..... **2**
- Median (M) and anterior cubital (CuA) vein arising separately from the basal cell, separated by a distance of at least the width of either vein (Fig. 2 right); 3 tarsomeres, first tarsomere sometimes strongly reduced (Fig. 3 right) **4**
2. Two tarsomeres, first tarsomere sometimes only visible in ventral view (Fig. 3 left)..... **Zammaria**
- Three tarsomeres, first tarsomere sometimes only visible in ventral view (Fig 3 right) **3**

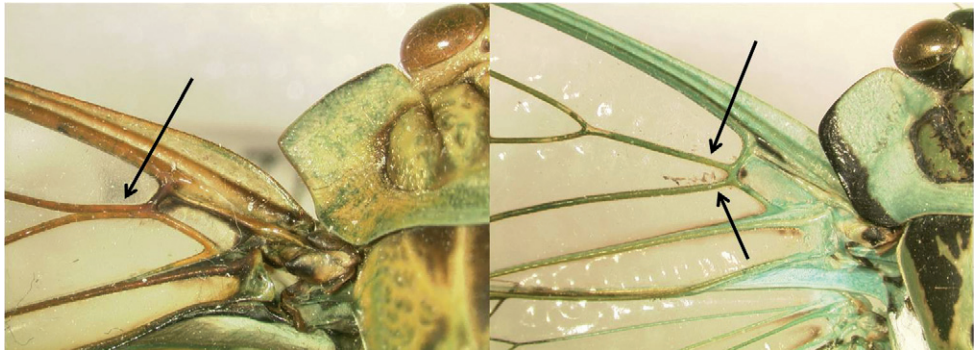


Figure 2. CuA and M veins arising together (left) or separate (right) from the basal cell.



Figure 3. Presence of 2 (left) or 3 tarsomeres (right).

- 3. M and CuA juxtaposed (Figs 2 left, 5); apical 1/3 to 1/2 of fore wing infuscated with wavy pattern of brown and grayish, basal half transparent *Zammaralna*
- M and CuA juxtaposed or fused (at least at base, Figs 2 left, 4 & 5); fore wing transparent with scattered infuscations or apical part infuscated but not with wavy pattern *Orellana*
- 4. Both fore and hind wings at least partly infuscated, hind wing sometimes only very small part of apical cells directly bordering apical margin **5**
- At least hind wing completely transparent, i.e., no infuscation present (except for vannal fold, jugum and apical wing margin in some species) (Fig. 4) **8**
- 5. Hind wing completely infuscated; fore wing completely opaque. (Restricted to Cuba) *Juanaria*
- Hind wing not completely infuscated; at least some areas of fore wing transparent **6**
- 6. Infuscations of fore wing restricted to apical 1/3rd, infuscations following veins of apical cells; infuscations of hind wing restricted to apical 1/4th (and vannal fold) *Odopoea* (in part)
- Infuscations present over whole length of fore wing, infuscations less restricted to wing veins; infuscations of hind wing at least present in apical wing margin and part of apical cells directly bordering apical margin **7**

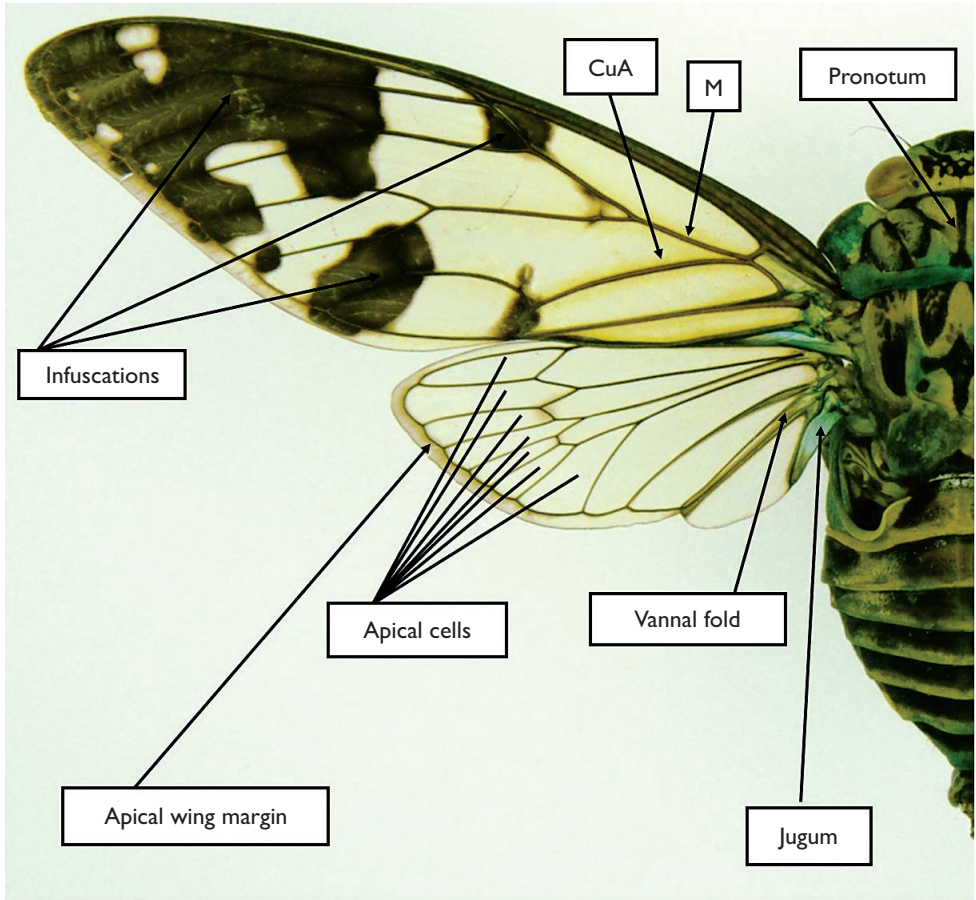


Figure 4. Hind wing terminology following Moulds (2005).

- 7. Infuscations of hind wing only present in apical wing margin and part of apical cells directly bordering apical margin (and vannal fold). (Restricted to Mesoamerica)..... ***Miranha***
- Infuscations of hind wing present both at apical wing margin (and vannal fold), and at central internal edges of basal cells. (Restricted to Mexico and Dominican Republic) ***Chinaria***
- 8. Width of pronotal flange (Fig. 5) less than half diameter of eye (restricted to Cuba, Haiti and Dom. Rep.) ***Uhleroides***
- Width of pronotal flange (Fig. 5) at least half diameter of eye **9**
- 9. Veins of fore wing evenly striped; width of pronotum (at widest point, including flanges) more than 1.7 times width of head including eyes. (Restricted to Puerto Rico)..... ***Borencona***
- Veins of fore wing evenly colored, not striped; width of pronotum (at widest point, including flanges) less than 1.5 times width of head including eyes....
..... ***Odopoea*** (in part)



Figure 5. Pronotal flange; bracket indicates width of pronotal flange.

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