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A new species of *Microledrida* Fowler from Curaçao (Hemiptera: Fulgoromorpha: Cixiidae)

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Abstract

As part of a review of the Auchenorrhyncha of the (former) Dutch Antilles, a new species in the genus *Microledrida*, *Microledrida malpaisa* **sp. nov.**, is described from Curaçao. The novel taxon differs from other species in the genus in colouration and form of its male genitalia, especially the shape of the anal tube and the number and shape of the spinal processes of the phallotheca. The records from Curaçao, a record from Panama, and iNaturalist records from Costa Rica comprise the southernmost records of the genus, which was hitherto not formally recorded south of Guatemala and Puerto Rico. An illustrated checklist and revised key to species are presented.

Key words: Caribbean, Cixiini, Dutch Antilles, planthoppers, true hoppers

Introduction

The Auchenorrhyncha fauna of the (former) Dutch Antilles is currently under investigation. This investigation is mainly based on material collected in the 20th century deposited in the Naturalis Biodiversity Center [RMNH; formerly Rijksmuseum van Natuurlijke Historie]. Additionally, recent collections from the Dutch Antilles (Aruba, Curaçao and Bonaire, part of the Leeward Antilles and Saba, St. Eustatius, and St. Martin which are part of the Leeward Islands) have been made that include numerous putatively new species, including a new species of *Microledrida* Fowler, 1904 from Curaçao.

Microledrida is a small, peculiar genus represented by six species from southern North America, Mesoamerica, and Puerto Rico (Bourgoin 2024). Published southernmost records are from Puerto Rico and Guatemala, while the genus reaches its northern limit in southwestern USA (Fig. 17) (Caldwell & Martorell 1951, Kramer 1983, Bartlett *et al*. 2014, Bourgoin 2024). Records further south are records not identified to species from Costa Rica (iNaturalist observations 33003688 and 26707097), Panama (see observations of *Microledrida* spp.), and Venezuela (Marco Gaiani, pers. comm.).

Little is known about the ecology of *Microledrida* species. Plant associations include Indian Cherry (*Cordia laevigata* Lam., as *Cordia nitida* Vahl ex West, Boraginaceae) for *M. arida* Caldwell (Caldwell & Martorell 1951); Easter lilies (*Lilium longiflorum* Thunb., Liliaceae), eggplant (*Solanum melongena* L., Solanaceae) and cotton (*Gossypium* sp., Malvaceae) for *M. flava* Metcalf (Kramer 1983), Christmas berry (*Heteromeles sp.*, Rosaceae), beets (*Beta* sp., Chenopodiaceae), cotton, and narrowleaf globemallow (*Sphaeralcea angustifolia* (Cav.) G. Don, Malvaceae) for *M. fuscata* Van Duzee (Kramer 1983) and two records from Bluewood condalia (*Condalia hookeri* M.C. Johnst, Rhamnaceae) for *M. cf. fuscata* (iNaturalist observations 146840520, 146770084). These plant associations belong to seven families: Boraginaceae (1 spp.), Liliaceae (1 spp.), Solanaceae (1 spp.), Malvaceae (2 spp.), Rosaceae (1 spp.), Chenopodiacea (1 spp.) and Rhamnaceae (1 spp.), although some might concern accidental or resting records. In general, *Microledrida* species seem to prefer to live on shrub-like vegetation. *Microledrida*

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nymphs have never been reported, though Cixiidae nymphs are generally subterraneous and feed on roots (e.g. Myers 1929, Tsai *et al*. 1976, Holzinger *et al*. 2002, Bowser 2014).

In the Neotropics, the tribe Cixiini is represented by five genera: *Cixiosoma* Berg, 1879 (3 species, all southern South America), *Cixius* Latreille, 1804 (297 species, of which ~23 are Neotropical), *Ferricixius* Hoch & Ferreira, 2012 (4 species, cavernicolous, all Neotropical), *Microledrida* Fowler, 1904 (6 species, of which 3 are Neotropical) and *Pachyntheisa* Fowler, 1904 (2 species, both around the transition zone between the Neotropical and Nearctic realms) (Bourgoin 2024).

Here we describe the new species of *Microledrida* from Curaçao. We also provide an amended genus description, an amended description of *Microledrida virida* Caldwell, 1945, a species checklist, an updated key to species, and all available specimen records.

Materials and methods

Specimen collection and deposition.

Specimens of *Microledrida* were examined from the following collections:

BMNH: The Natural History Museum, London, U.K.;
CASC: California Academy of Sciences, San Francisco, CA, USA;
CMH: Personal collection of M. C. de Haas, Ede, Netherlands;
RMNH: Naturalis Biodiversity Center, Leiden, Netherlands;
UDCC: University of Delaware Insect Research Collection, Newark DE, USA;
UKIC: University of Kentucky, Department of Entomology, Lexington, KY, USA;
USNM: Smithsonian Institution, National Museum of Natural History, Washington, DC, USA.

Specimens of all known *Microledrida* species have been studied. Label data of type specimens is quoted with "/" indicating a new line within a label, "//" indicating a new label, and comments in square brackets. Label data for non-type specimens is arranged from general to specific geographic locality, date, collector, and additional information including specimen barcode labels with added notes in square brackets.

Morphological study. Specimens of the novel taxon were studied under a Leica MZ7.5 stereomicroscope. For male terminalia, the abdomen with the genital segment was removed after softening the specimen in a relaxing chamber for 4 hours. The abdomen was then heated in water at 80°C for 20 minutes, after which the pygofer was separated from the abdomen and photographed. The aedeagus and parameres were subsequently disarticulated and photographed. Terminalia were photographed with a mirrorless camera (Sony A7 III) and a 20x microscope objective (Mitutoyo M Plan APO 20x) mounted on a motorized vertical focus stacking setup (MJKZZ ultra rail set) controlled by MJKZZ Focus stacking Studio software and lit by four LED panels (Neewer ZC - 10S). Whole specimens were photographed in the same way using a macro lens Laowa 25 mm f/2.8 2.5 - 5x. After examination, specimens and genitalia were glued on a specimen card.

Terminology. Morphological terms in general follow Bartlett *et al.* (2014), nomenclature of male genitalia follows Bourgoin (1988) and Bourgoin & Huang (1990). Forewing venation follows Bourgoin *et al.* (2015).

Systematics

Family Cixiidae Spinola, 1839

Subfamily Cixiinae Spinola, 1839

Tribe Cixiini Spinola, 1839

Genus *Microledrida* Fowler, 1904

Type species: *Microledrida asperata* Fowler, 1904, by monotypy

Diagnostic characters. Body strongly dorsoventrally flattened, vertex subtriangular, frons medially broader than long, pronotum as broad as head (incl. eyes). There are no American Cixiini that bear a close similarity to *Microledrida*.

Amended description. (modified after Kramer, 1983). Small, dorsoventrally flattened cixiids (3.2-4.0 mm). Head in dorsal view about as wide as pronotum, in lateral view comparatively flat and subtriangular, profile angulate (top of head declinate anteriorly), head projecting in front of eyes for distance approximately ½ to ¾ longest eye width; head apex in dorsal view rounded, bearing apical transverse carinae (with triangular lateral areolets defined between subapical and apical transverse carinae), apical areolet of head very small or absent; posterior margin of head broadly incised (often sinuate). Vertex broad and subtriangular, median carina distinct from posterior margin to head apex, subapical transverse carina elevated, converging at head apex. In frontal view, frons very broad, roughly pentagonal; lateral margins of frons foliately carinate and broadly rounded (widest near level of antennae, greatest width exceeding length on longitudinal midline), median carinae distinct (becoming obscure ventrally), not (or barely) forked at dorsal margin. Frontoclypeal suture broadly concave or sinuate; median ocellus small and relatively inconspicuous. Eyes longer than wide (ventrally emarginated above the antennae), projecting caudad. Antennae short, scape ring-like, pedicel bulbous, spheroid, about as tall as wide bearing many sensory placoids; flagellum elongate, bristle-like with bulbous base.

Pronotum at midlength about half length of vertex at midline, median carina distinct (lateral carinae curving laterally with lateal extreme hidden beneath eyes), posterior margin broadly concave. Length of mesonotum at midline exceeding cumulative length of pronotum + vertex; tricarinate. Hind tibiae with one or two distinct lateral spines before apex, spinulation 6(3+3)-6-6. Forewings deflexed at the nodal line, veins bearing prominent granulations with elongate setae prominent. Veinlet *icu* joins apex of clavus.

Male genitalia: Pygofer broad in lateral view, lateral margins of opening expanded caudally; medioventral process small and rounded, much wider than tall. Aedeagus relatively short and straight, endosoma of aedeagus greatly reduced, phallotheca elaborated with processes.

Remarks. The tribe Cixiini differs from other Neotropical tribes by the presence of three carinae on the mesonotum (vs. Pentastirini and Mnemosynini), wings broadly tectiform (not steeply tectiform, vs. Pintaliini), abdomen lacking lateral processes (vs. Bennarellini), tibiae of hind legs with lateral spines (vs. Oecleini) and forewings without granules within apical cells (vs. Mnemosynini).

In its general habitus, the genus *Microledrida* resembles the Caribbean delphacid genus *Neopunana* Asche, 1983, from which it is immediately separated by the absence of the stiff spine at the apex of the hind tibia, which is unique to the Asiracinae in the family Delphacidae, and the presence of three instead of five carinae on the mesonotum.

Key to *Microledrida* species (males) (in part based on Kramer, 1983)

1. Vertex green with three incomplete red stripes (Fig. 15A) . . . . . *Microledrida virida*
– Vertex mainly brown or orange-brown (e.g. Fig. 2C), without distinctive pale green and red colouration 2
2. Face unicolourous, entirely darkly mottled, shaded with brownish, or all pale (e.g., Fig. 10C) 3
– Face with middle portion transversely pale, upper and (to a lesser extent) lower portions darker (Figs. 9C, 14C) 5
3. Anal tube strongly asymmetrical: right lateral side apically with a distinctive anteroventrally directed appendage, left lateral side apically somewhat downcurved (fig. 11A-B) . . . . . *Microledrida asperata*
– Anal tube symmetrical, right lateral side without distinctive anteroventrally directed appendage 4
4. Anal tube in left lateral view comparatively short, its apical portion broadly blunt (Kramer 1983, fig. 55); phallotheca in lateral view with distally projecting process on ventral margin . . . . . *Microledrida flava*
– Anal tube in left lateral view elongated, its apical portion irregularly oval (Kramer 1983, fig. 68); phallotheca in lateral view without distally projecting process on ventral margin . . . . . *Microledrida fuscata*
5. Phallotheca with two relatively slender apical spines and one thicker spine near the middle on the left lateral or ventral side 6
– Phallotheca with two relatively slender apical spines, lacking a thicker spine near the middle (Caldwell & Martorell 1951, fig. 3a); Puerto Rico, Dominican Republic. . . . . *Microledrida arida*
6. Vertex with irregular orange stripes (Fig. 14A), anal tube relatively long, in lateral view apically deflexed (Kramer 1983, fig. 52), strong spine near the middle of phallotheca positioned at its left lateral side (Kramer 1983, fig. 53); USA: Texas; Mexico: Nuevo León . . . . . *Microledrida olor*
– Vertex without orange stripes (Fig. 2C), anal tube short, in lateral view with a straight apex (Fig. 5C), strong spine near the middle of phallotheca positioned at its ventral side (Figs. 6B, 7B); Curaçao . . . . . *Microledrida malpaisa* **sp. nov.**

***Microledrida malpaisa* sp. nov.**
(Figs. 1–7)

Material examined. Holotype ♂: “Curaçao, Malpais – Path and wetland / 12.170, -68.998, 28.IX.2022 / Leg. M. Speelman, J. Veldboom // Holotypus / Microledrida malpaisa sp. n. ♂”. In coll. RMNH.

Paratypes: "H.J. Mac Gillavry / Curaçao / Porto Marie hofje / 14-21.IV.1930”, 1♂ in coll. RMNH; “H.J. Mac Gillavry / Curaçao / Sint Kruis hofje / 21-27.IV.1930”, 2♀ in coll. RMNH; “Curaçao / leg. R.H. Cobben / Christoffel / 21-10 1956 // RMNH Leiden / ex. collectie / WAU 2010”, 2♂, 2♀ in coll. RMNH; “leg. R.H. Cobben / Hofje Groot Piscadera / 5/11 1956 / Curaçao // RMNH Leiden / ex. collectie / WAU 2010”, 1♀ in coll. RMNH; “Curaçao, Malpais – Path and wetland / 12.170, -68.998, 28.IX.2022 / Leg. M. Speelman, J. Veldboom”, 1♂ in coll. CMH; “Curaçao, CARMABI – Beach / 12.123, -68.969, 30.IX.2022 / Leg. M. Speelman, J. Veldboom”, 1♂ 2♀ in coll. RMNH; “Curaçao, 15.IX-3.X.2022 / Leg. M. Speelman, J. Veldboom”, 1♂ in coll. RMNH.

Additional material: “H.J. Mac Gillavry / Curaçao / Porto Marie hofje / 14-21.IV.1930 // Microledrida malpaisa”, 1 in coll. RMNH, only the head is left.

Diagnosis. Overall colouration brownish, forewings mainly hyaline, frons appearing tricoloured, with upper margin broadly brown. Aedeagus with three spinal processes, two relatively slender spines originating at the base of the flagellum and one thicker, recurved spine at the ventral side near the centre of the phallotheca. Anal tube short.

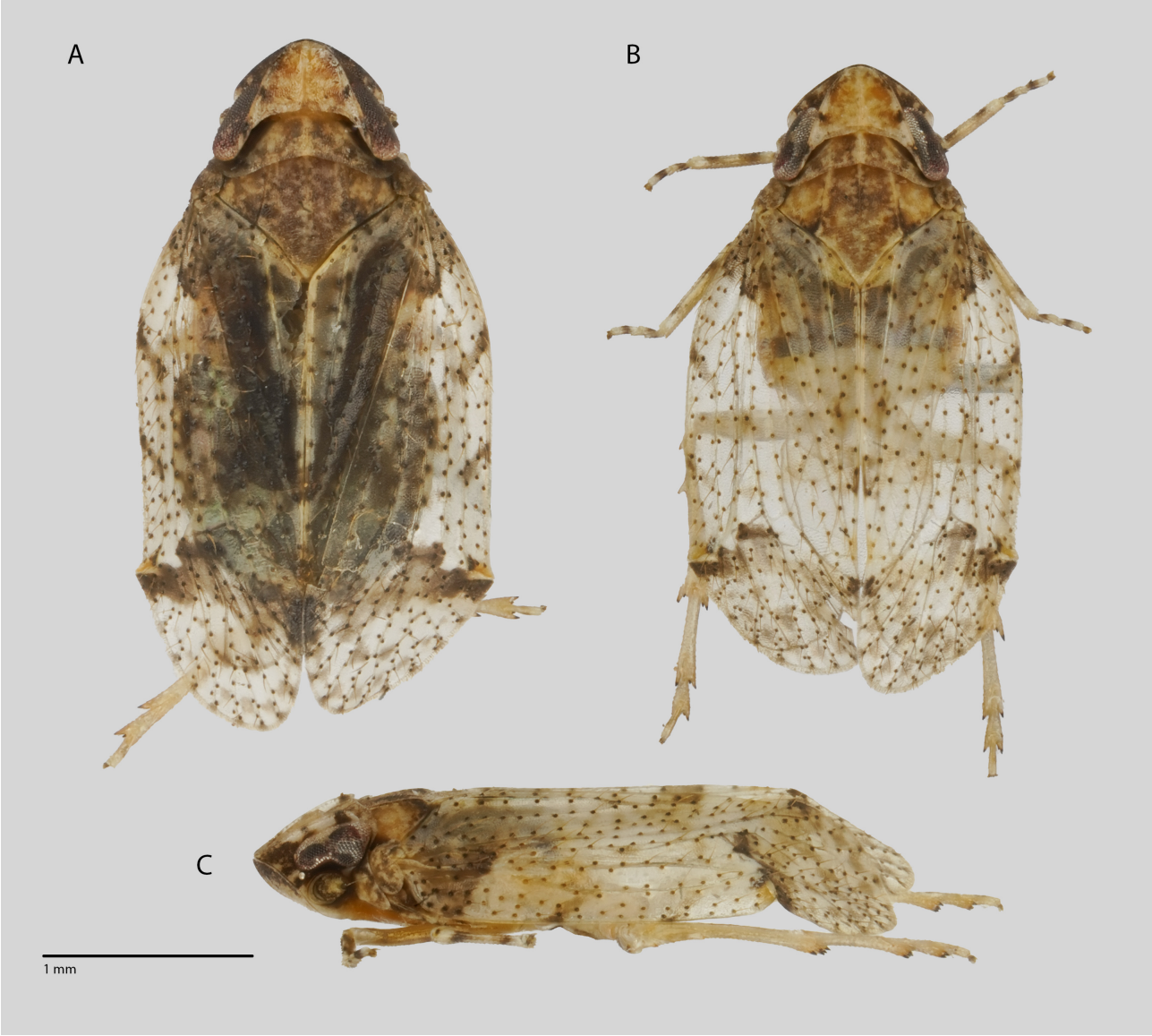

FIGURE 1. Habitus of *Microledrida malpaisa* **sp. nov.**, A) dorsal view, female (paratype), B) dorsal view, male (holotype), C) lateral view, male (holotype).

FIGURE 2. Head of *Microledrida malpaisa* **sp. nov.** (holotype), A) lateral view, B) frontal view, C) dorsal view, D) ventral view.

Description. *Measurements* Length: ♂ 2.96-3.28 (average 3.13) mm (n=6); ♀ 2.88-3.60 (average 3.26) mm (n=7).

Colouration. Ground colour of head (Fig. 2) and thorax brownish yellow, irregularly washed with brown and with unevenly placed pale maculations. Lateral vertex disc nearly orange, lateral carinae paler bearing 3 dark maculations on each side (one near posterior margin, second near midlength, distal near apical third). In lateral view, genae (including lateral areolets near head apex) brown, except whitish above eye (with brown maculation near posterior margin of head, and smaller marking near midlength). Frons tricoloured: dorsal margin brown, medially with a broad dirty white transverse band (lateral portions somewhat oblique so that band takes a broad, inverse "V" shape) and the ventral portion orange-brownish. Clypeus completely orange-brown. Antennae brown. Pronotum and mesonotum largely brown to dark-brown (with irregularly placed paler maculations). Forewings of male (Figs 1B, 3A) hyaline, veins concolourous and covered with brown granules; irregularly washed with fuscous at base of forewing, two dark irregular stripes in costal cell, and several spots along nodal line. In females (Fig. 1A), forewings more darkly and extensively marked, with clavus largely brown, several brown markings in the basal 2/3th of the forewing, and a brown band at the nodal line. In a single female paratype from Christoffel the brown colouration on the forewing is more extensive than in the other females: in addition to dark markings listed above, a broad brown band in the middle of the forewing is present and all brown markings are darker compared to other females. Forelegs

and middle legs with tibiae sordid yellow and two brown bands, tarsi white with brown bases. Hindlegs completely yellowish white.

Structure. Head (incl. eyes) as wide as pronotum (Fig. 2C). Head and thorax loosely covered in short, pale setae; longest setae on frons, body surface irregularly rugulose. Vertex in dorsal view strongly produced in front of eyes, subtriangular with anterior margin rounded and median carina complete (Fig. 2C); hind margin broadly concave, slightly incised medially; lateral carinae foliately raised (disc concavely depressed). Frons very broad, roundly pentagonal with lateral carinae laterally foliate (Fig. 2D). Median carina of frons and clypeus complete. Median ocellus small, lateral ocelli conspicuous just below anterior margin of eyes. Eyes obliquely elongate oval, ventrally emarginate above antennae (Fig. 2A). Antennae short, scape ring-like, pedicle bulbous bearing irregularly arranged sensory plaques, flagellum long setaceous with bulbous base. Rostrum reaching base of hind-coxae.

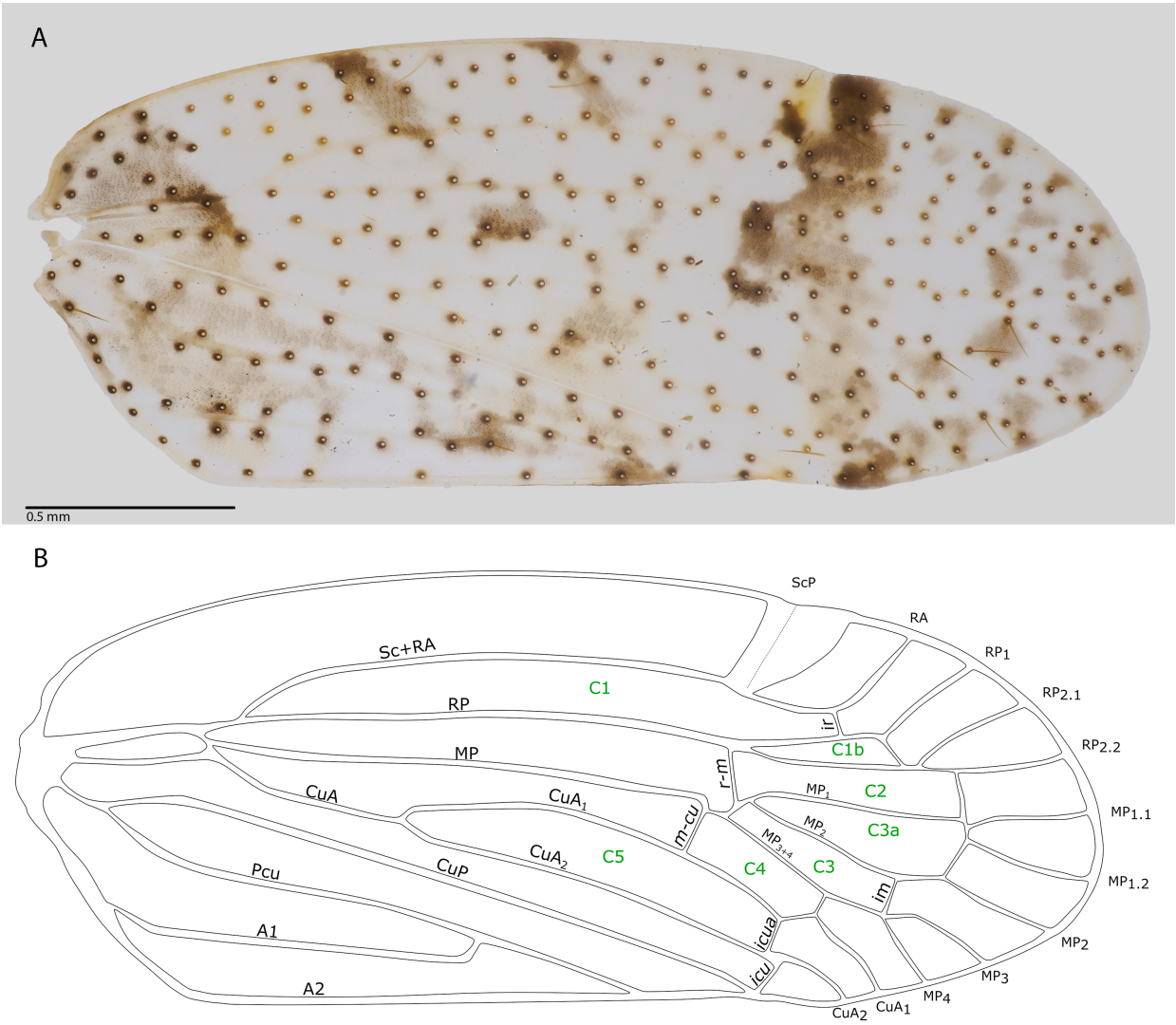

FIGURE 3. Right forewing of male *Microledrida malpaisa* **sp. nov.** (paratype); wing vein nomenclature follows Bourgoin et al. (2015); (black = veins, italics = crossveins, green = cells).

Pronotum length at midline about half of that of the vertex, bearing well-developed median carina, lateral carinae following contour of anterior margin of head, with lateral portions (in dorsal view) hidden beneath caudal portion of eyes (Fig. 2C); paradiscal region very narrow behind eye, broader at level of antenna, tapering to rounded ventrocaudal point. Tegulae large and conspicuous. Mesonotum (Fig. 2C) at midline about 1.3x length of vertex and pronotum combined, with median carina distinct anteriorly, becoming obsolete on scutellum (scutellum not distinctly separated from scutum). Lateral carinae, weakly diverging posteriorly, reaching posterior margin, distinct over entire length. Forewings (Fig. 3) elongate-oval, relatively broad and short, deflexed at nodal line with veins

indistinct, veins bearing conspicuous, evenly distributed, setose granules; branching pattern RA 1-branched, RP 3-branched, MP 5-branched, CuA 2-branched. Veinlet *icu* joins apex of clavus. Hind legs with two spines on lateral margin, both in the basal half of the tibiae; spinulation of hind leg: 6(3+3)-6-6.

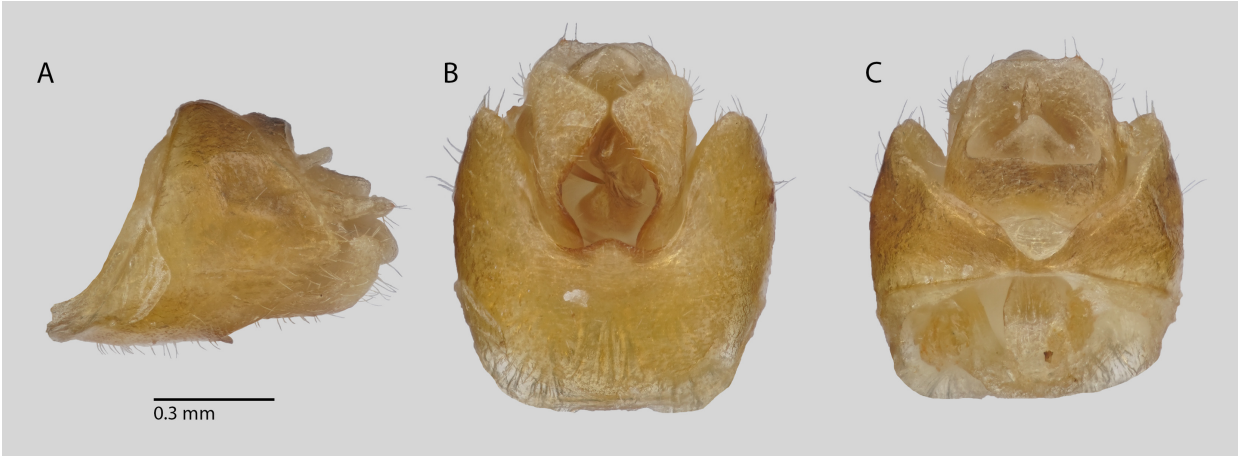

FIGURE 4. Male terminalia of *Microledrida malpaisa* **sp. nov.** (holotype), A) left lateral view, B) ventral view, C) dorsal view.

FIGURE 5. Male terminalia of *Microledrida malpaisa* **sp. nov.** (holotype), A) gonostylus laterodorsal (inner) view, B) gonostylus lateroventral (outer) view, C) anal tube lateral view, D) anal tube dorsal view.

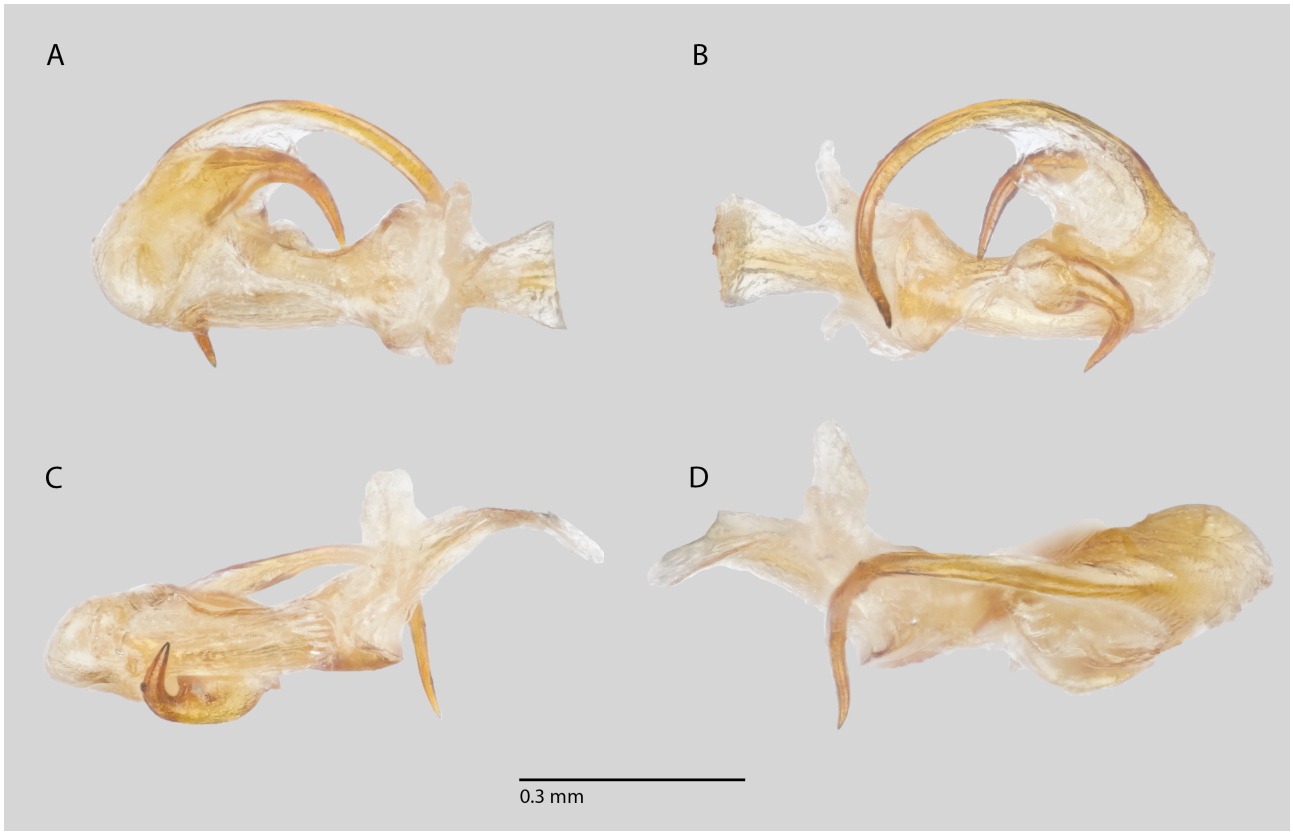

FIGURE 6. Genitalia of *Microledrida malpaisa* **sp. nov.** (holotype), A) dorsal view, B) ventral view, C) right lateral view, D) left lateral view.

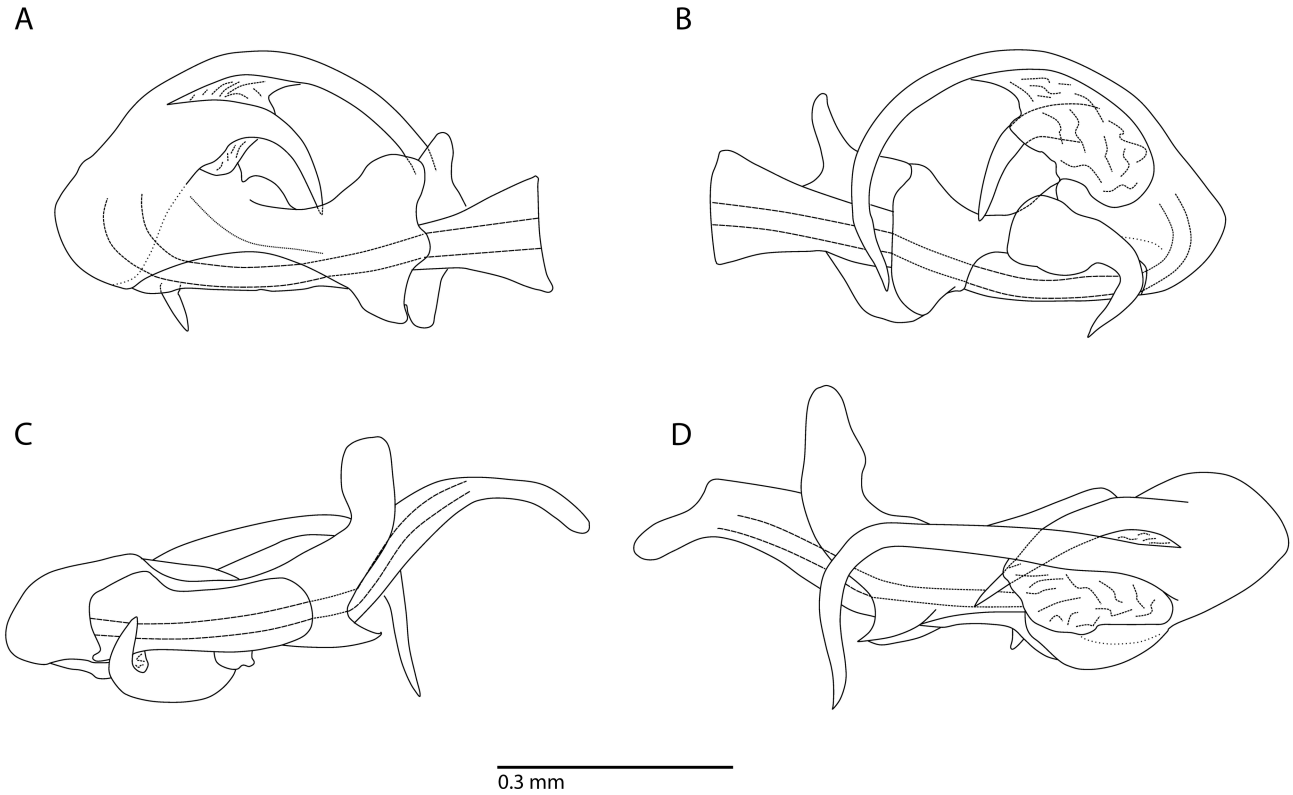

FIGURE 7. Line art of genitalia of *Microledrida malpaisa* **sp. nov.** (holotype), A) dorsal view, B) ventral view, C) right lateral view, D) left lateral view.

Male terminalia. Pygofer in lateral view (Fig. 4A) broadest near the middle, dorsal part narrow, midventral portion projected caudally; medioventral process of pygofer (ventrocaudal view, Fig. 4B) short (wider than tall), obtusely rounded, lateral lobes broad and about ¾ length of gonostyli. Gonostyli relatively simple, club-shaped (ventrocaudal view, Fig. 4C), widest subapically, apices obliquely truncate, in widest view (Figs. 5A, 5B), pediform. Phallotheca (Figs. 6-7) tubular, nearly straight, right lateral side of phallotheca open (right lateral view, Figs. 6C, 7C), leaving the aedeagus visible; ventral part of phallotheca medially with a strong, recurved spine, apically directed dorsad; base of endosoma (dorsal view), phallotheca bearing two elongate processes, both directed left-laterad, then curving and directed right-laterad; the dorsal process shorter, broad at the base, and slender at the apex; the ventral process is longer, slender throughout, at apex curved ventrally. Anal tube (Fig. 5D) short and broad, in dorsal view posterior margin straight (or incised); in lateral view strongly decurved near middle and narrowing towards apex; paraproct short, stout and conical.

Distribution. Curaçao (Fig. 17).

Biology. No host associations are available. The species was collected in low and sparse vegetation in 2022 (Fig. 8).

Etymology. The specific epithet '*malpaisa*' refers to the location where part of the type-material was collected: the Ramsar site 'Malpais/Sint Michiel'. The Spanish word 'malpais' translates to 'badland', referring to the arid environment of this landform. Those arid landscapes seem to be the preferred habitat of *Microledrida* species.

Remarks. The most similar species are *Microledrida arida* from Puerto Rico from which the novel taxon differs mostly in the male terminalia where the phallotheca bears three spines (versus two spinal processes in *M. arida*), and *Microledrida olor* from southern North America from which the novel taxon is easily distinguished in the colouration of the vertex (with irregular orange stripes in *M. olor* versus without such stripes in *M. malpaisa* **sp. nov.**) and the apex of the anal tube (deflexed in *M. olor* versus straight in *M. malpaisa* **sp. nov.**).

One specimen collected by H.J. Mac Gillavry in 1930 is not included in the type-series, because of the poor state of the specimen.

FIGURE 8. Habitat of *Microledrida malpaisa* **sp. nov.**, Malpais, photo: M. Speelman.

***Microledrida arida* Caldwell, 1951**
(Fig. 9)

Material examined. Types. Holotype: "MuertosIdPR / XII-11-47 / JSCaldwell // Microledrida / HOLOTYPE / arida [red paper] // JSCaldwell / Collection / 1959 // Microledrida / arida ♂ / det 49 Holotype / JSCaldwell (1 male, USNM). Paratypes: GuanicaPR/IX-25-47/Caldwell//Paratype [red paper] // JSCaldwell/ Collection /1959 // UDCC_TCN 00102999 [2D barcode label]; P.R. Acc. No. / Cabo Rojo, P.R./ 9-26-47 19 // Caldwell / Martorell / Collectors // Paratype [red paper] // Microledrida / arida // UDCC_TCN 00102998 [2D barcode label].

Additional Material: Dominican Republic, San Pedro de Macorís, Sept. 1950, Papaya, JS Caldwell Collection 1959 (1♂, USNM, Det. Kramer).

Identification. Caldwell & Martorell (1951).

Distribution. Caja de Muertos Island and mainland Puerto Rico (Caldwell & Martorell, 1951); Dominican Republic.

Remarks. A specimen collected from the Dominican Republic determined as *M. arida* by Kramer was studied, extending the known range of the species. This specimen differs from Caldwell's illustration (Caldwell & Martorell 1951, plate 3) in the width of the endosoma, which is almost spine-like in the Dominican Republic specimen (but broad in the original illustration).

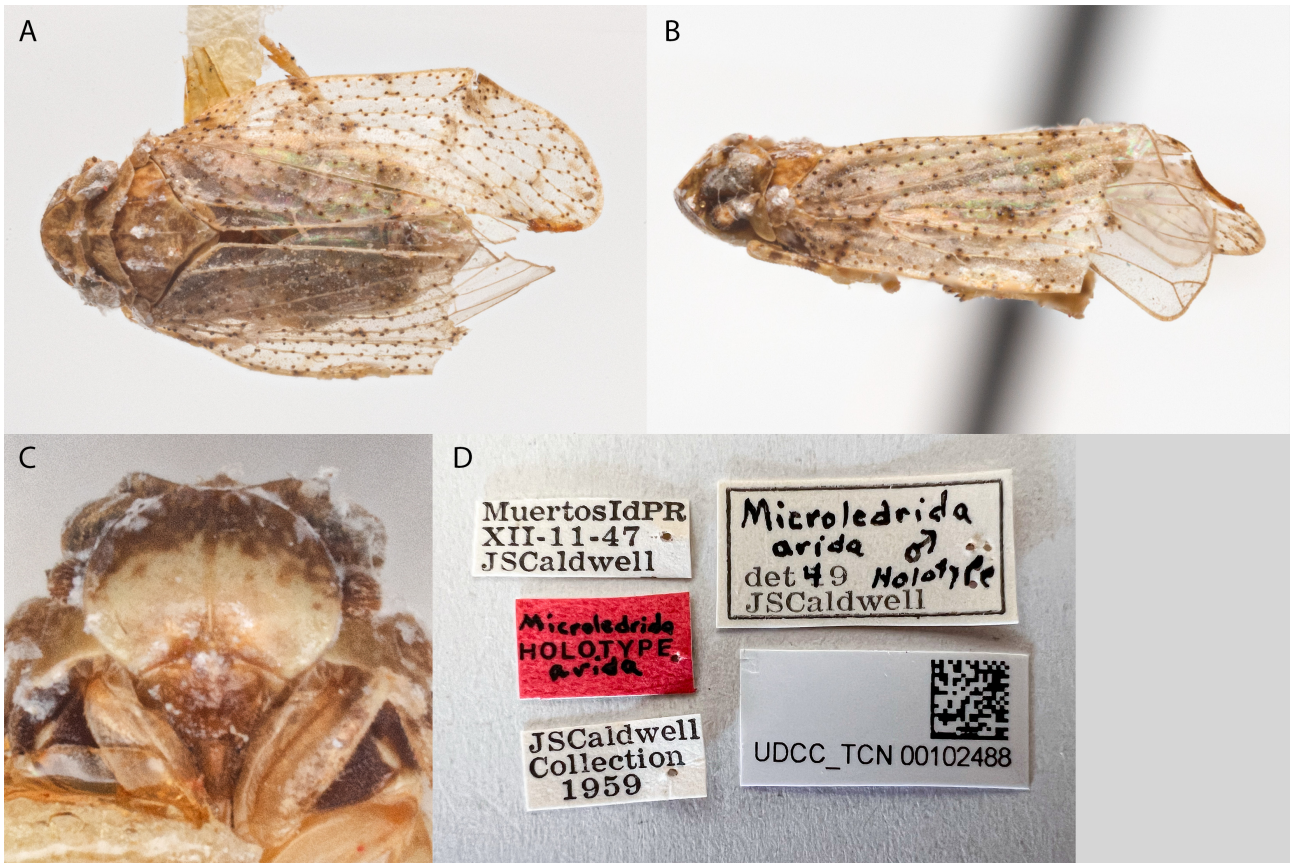

FIGURE 9. Habitus of *Microledrida arida* (holotype, male), A) dorsal view, B) frontal view, C) lateral view, D) labels.

***Microledrida asperata* Fowler, 1904**
(Figs. 10, 11)

Material examined. Lectotype: Chilpancingo, / Guerrero, / 4600 ft / Aug. H.H. Smith // ♂ // B.C.A. Homopt.I. / Macroledrida [sic] / asperata, Fowl. // Microledrida / asperata / Fowler TYPE ♂ [handwritten] // LECTOTYPE ♂ / Microledrira / asperata Fowler / By J.P. Kramer // NHMUK015981666 [2D barcode label] (1♂, BMNH).

Additional material: ("True Asperata or N.Sp." [handwritten label by Kramer]): Mexico, Morales, Cuernavaca, 25.IX.1945, JS Caldwell Collection 1959, UDCC_TCN 00102990 (1♂, USNM); Durango, Tlahualilo [de

Zaragoza], 4.IX.1928, P.A. Glick, 10 ft. alt, M57, UDCC_TCN 00102997 (1♂, USNM, Det. P.W. Oman); same except 13.IX.1928, 3,000 ft alt. UDCC_TCN 00102996 (1♂, USNM); Campeche, Campeche, 14.VII.1959, NLH Krauss (1♀, USNM). ("asperata of Cald[well]," [handwritten label by Kramer]); Mexico, Sonora, Hacienda Nainari, 10.VIII.27, M.B. 244, JS Caldwell Collection 1959, AMNH_IZN 00300686 [2D barcode] (1♂, USNM); same except 19.III.27, M.B. 209, AMNH_IZN 00300685 (1♂, USNM); Durango, Tlahualilo [de Zaragoza], 13.IX.1928, P.A. Glick, 500 ft. alt, M157, AMNH_IZN 00300684 [2D barcode] (11♀, USNM).

Identification. Kramer (1983).

Distribution. Mexico (Campeche, Durango, Guerrero, Morales, Sonora).

Remarks. *Microledrida asperata* was described from an unspecified number of specimens from Chilpancingo in Guerrero, Mexico. The terminalia were subsequently illustrated by Kramer (1983, figs. 49-51), who designated a lectotype. Kramer (1983) studied *M. asperata* to clarify the identity of the species and determine whether it occurred in the U.S. Kramer (1983) also studied additional specimens of *M. asperata* but did not report the locality data. Among these, he informally grouped the specimens into two forms. The typical form (Figs 10-11; those matching the lectotype designated and illustrated in Kramer 1983) appears from the available material to be primarily continental, while the aberrant form is known from a specimen collected on Isla Maria Magdalena, Nayarit, Mexico (referred to here as the 'insular form').

FIGURE 10. Habitus of *Microledrida asperata* (male), A) dorsal view, B) frontal view, C) lateral view, D) labels.

The insular form primarily differs from the typical form in features of the male terminalia. In the insular form, the medioventral process of the pygofer is acutely pointed (as opposed to obtusely rounded) and the subapical process of the phallotheca is bifurcate (as opposed to undivided). Additionally, the phallothecal and endosomal processes of the two forms differ notably in length, though their position is overall consistent. The insular form differs in external habitus from the typical form in that the upper half of the frons bears a dark brown band (as opposed to being entirely yellow), the mesonotum is medio-anteriorly fuscous within the lateral carinae (as opposed to relatively pallid with two sublateral dark spots), and the forewings are nearly immaculate (in contrast with dark markings near the base of the wing). These differences are worth further examination to ascertain whether or not the insular form is an example of intraspecific variation or a new species of *Microledrida*.

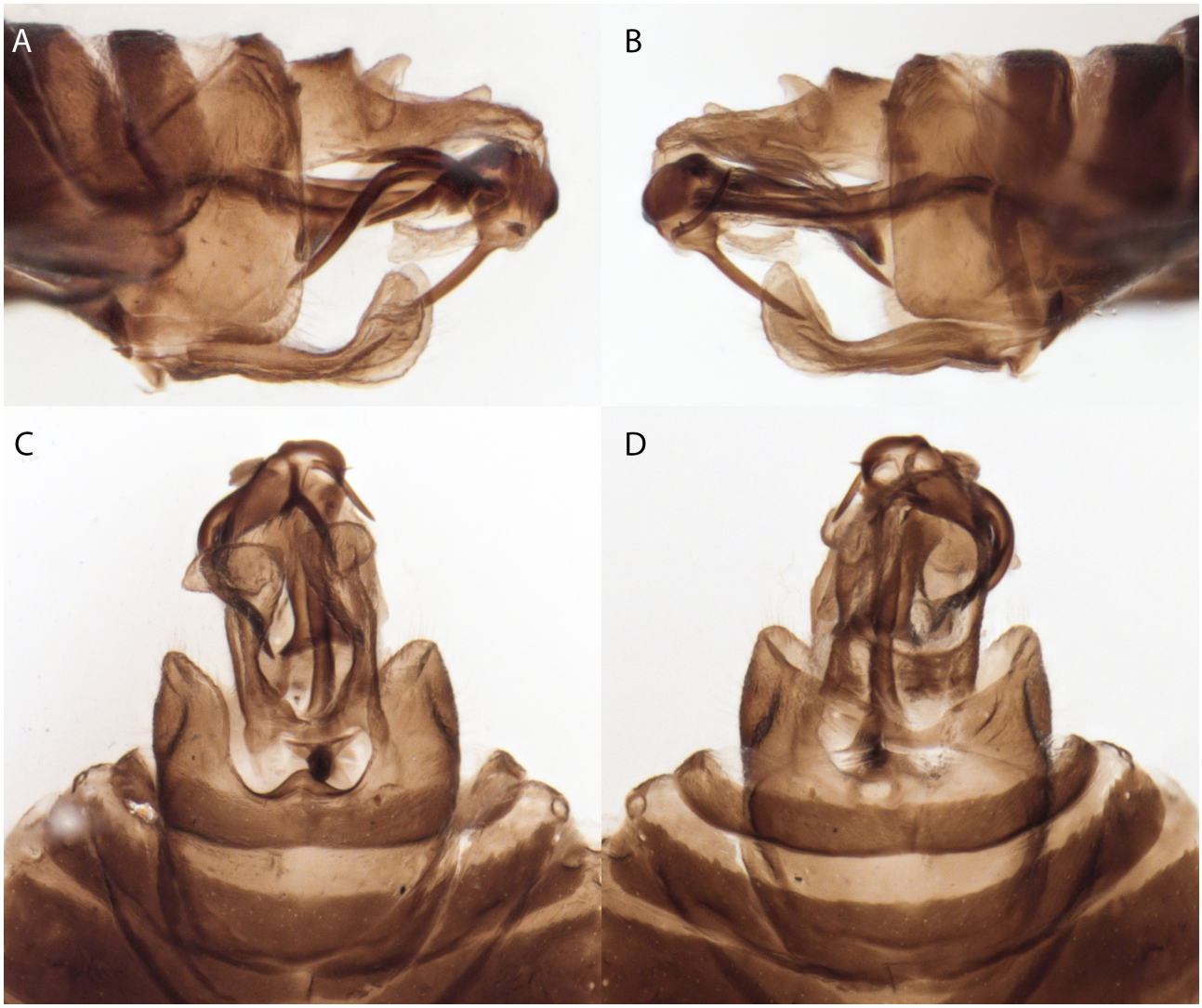

FIGURE 11. Male terminalia of *Microledrida asperata*, A) left lateral view, B) right lateral view, C) ventral view, D) dorsal view.

Microledrida flava **Metcalf, 1923**
(Fig. 12)

Material examined. USA: Texas, Cameron Co., Brownsville, Sabal Palm Grove, 4.V.1983, C.W. & L. O'Brien & G. Marshall (1♂, 1♀, UDCC, barcodes UDCC_TCN 00000775, UDCC_TCN 00000776 respectively); Mexico: Campeche, 22mi. NE. Campeche, 5.VIII.1974, C.W. & L. O'Brien & Marshall (1♀, CASC, CASENT 8472749).

Identification. Metcalf (1923); Kramer (1983).

Distribution. Mexico (Tamaulipas), USA – Texas (Bartlett *et al.* 2014).

Microledrida fuscata **Van Duzee, 1914**
(Fig. 13)

Material examined. Lectotype: "San Diego Co., / 3-11-'14 Cal / E.P.VanDuzee // LECTOTYPE fuscata [red paper] // LECTOTYPE Microledrida / fuscata Van D. / [designated] By J.P. Kramer // EPVanDuzee / Collection" (1♂, CASC, CASTYPE 2253). Paralectotype: Same information as lectotype, plus "Fuscata figs. 58-60" [yellow paper], AMNH_IZN 00300689 [2D barcode] (1♂, USNM).

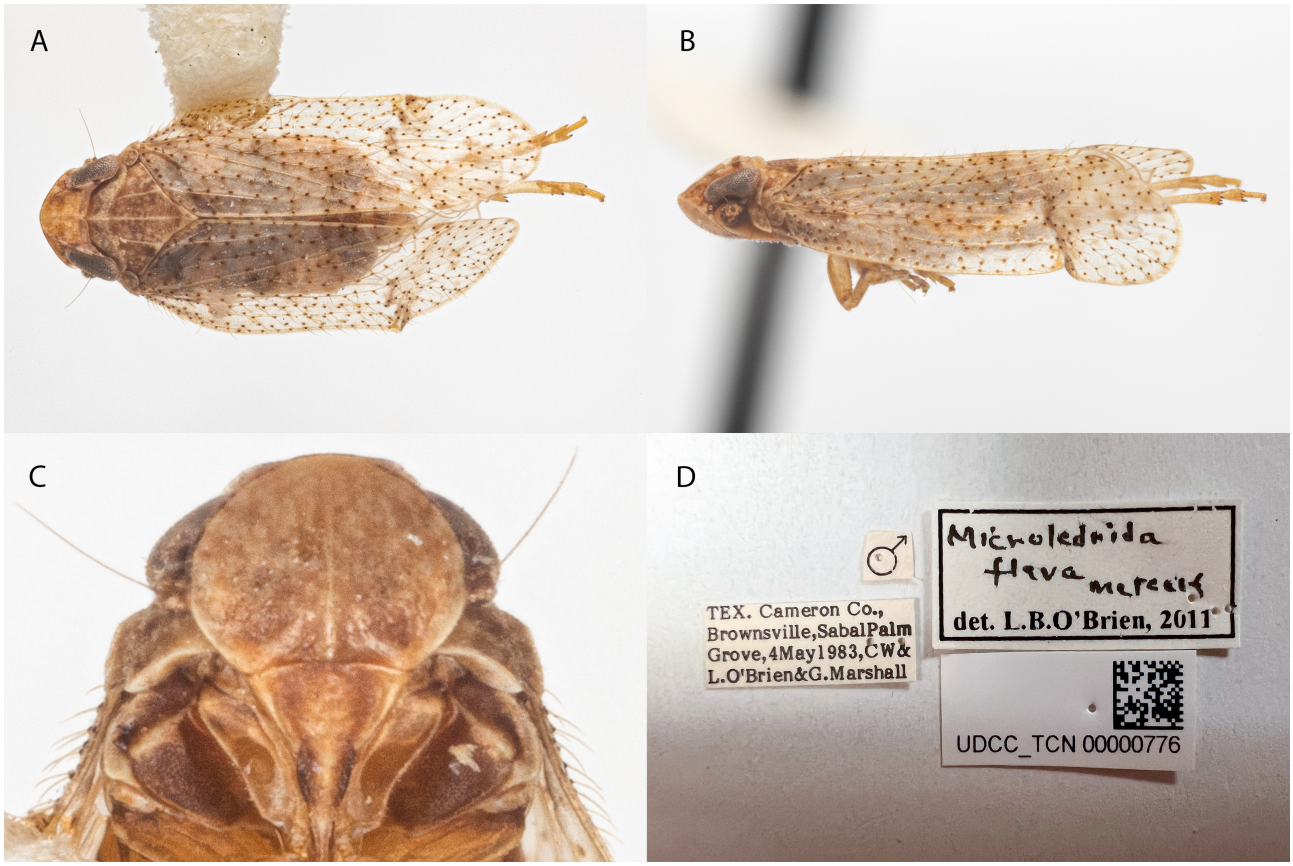

FIGURE 12. Habitus of *Microledrida flava* (male), A) dorsal view, B) frontal view, C) lateral view, D) labels.

Additional material: USA: Arizona, Yarnell Hts., 27.VIII.1935, E.D. Ball, (1♂, 1♀; UDCC, barcode UDCC_TCN 00003435, UDCC_TCN 00003436, respectively); Same, 20.VIII.1929 (1♀, USNM, barcode AMNH_IZC 00300687); Santa Cruz Co., Patagonia, 31.540223, -110.731370, 19.VIII.2018, Jason T. Botz (photographs of a specimen by Salvador Vitanza, gender not recorded). Texas, Dimmit Co., Catarina, 3.VI.1953. P.W. Oman (2♀, USNM); Cameron Co., Brownsville, 2.I.1932, E.D. Ball, Fuscata figs. 61-63 [yellow paper] AMNH_IZN 00300688 [2D barcode] (1♂, USNM). Mexico: Hidalgo; None or Unknown; Mexico City Area; 1940s (1♂, UKIC).

Identification. Van Duzee (1914); Kramer (1983).

Distribution. Mexico (Baja California, Sonora), USA (Arizona, California, Texas) (Bartlett *et al.* 2014).

Remarks. The studied material of *M. fuscata* exhibits high variation, both in the external habitus and male terminalia. This is evident also from Kramer's (1983: 34) assessment of the species, where forms from San Diego County, CA (the lectotype) and Brownsville, TX were illustrated. The illustrated specimens from these localities differ greatly in the form of the phallothecal processes. Additionally, material studied from Yarnell, AZ (determined by Lois O'Brien) was compared to the lectotype; this form differs greatly in colouration. Morphological study of the taxa of the southwestern U.S. is needed to determine whether M. fuscata represents a single species or rather several reproductively isolated taxa.

Microledrida olor Kramer, 1983

(Fig. 14)

Material examined. Mexico, Nuevo León, 17 mi. S. Linares, 1300', 24.VI.1971, L. & CW O'Brien (1♂, 1♀, UDCC, barcodes UDCC_TCN 00105071, UDCC_TCN 00105072 respectively).

Identification. Kramer (1983).

Distribution. USA (Texas) (Bartlett *et al.* 2014); Mexico (Nuevo León).

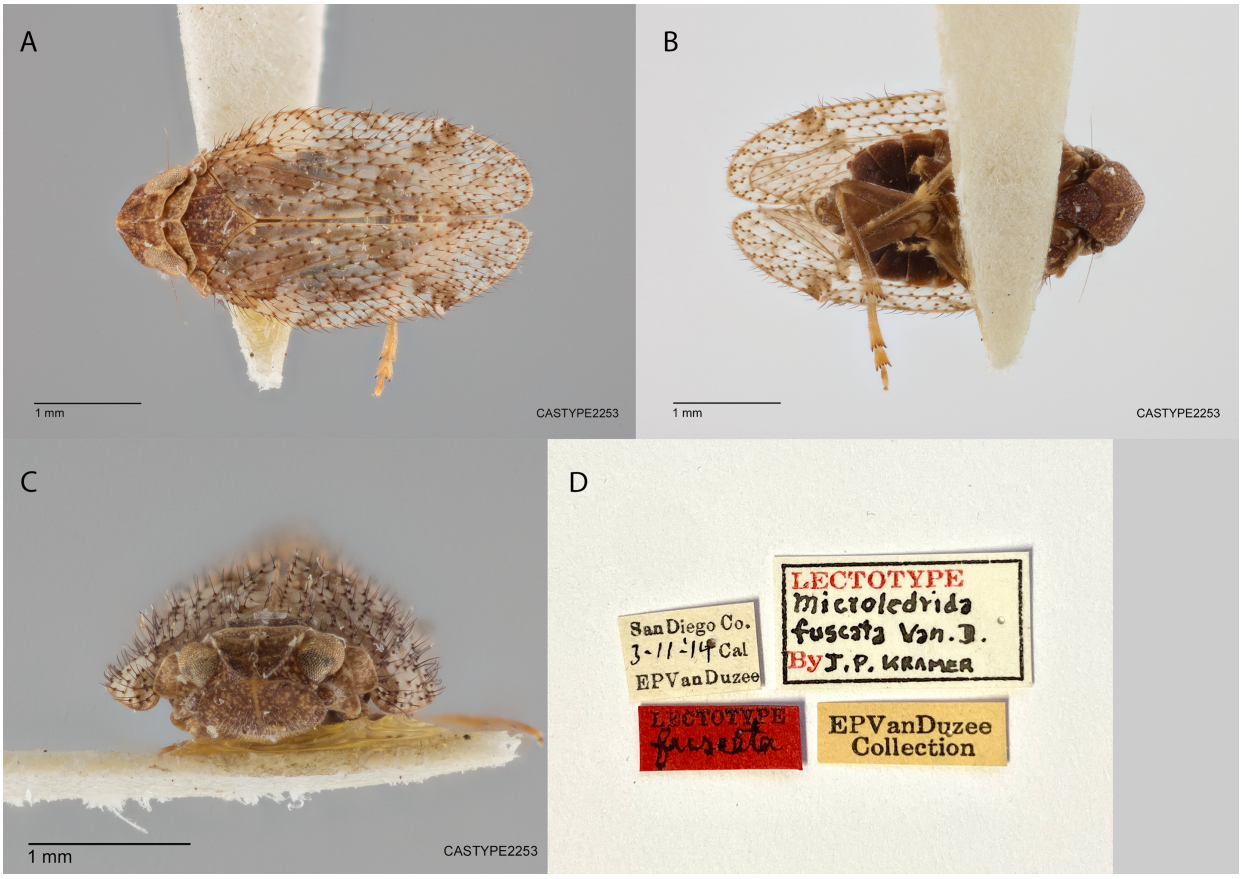

FIGURE 13. Habitus of *Microledrida fuscata* (lectotype, male), A) dorsal view, B) frontal view, C) lateral view, D) labels.

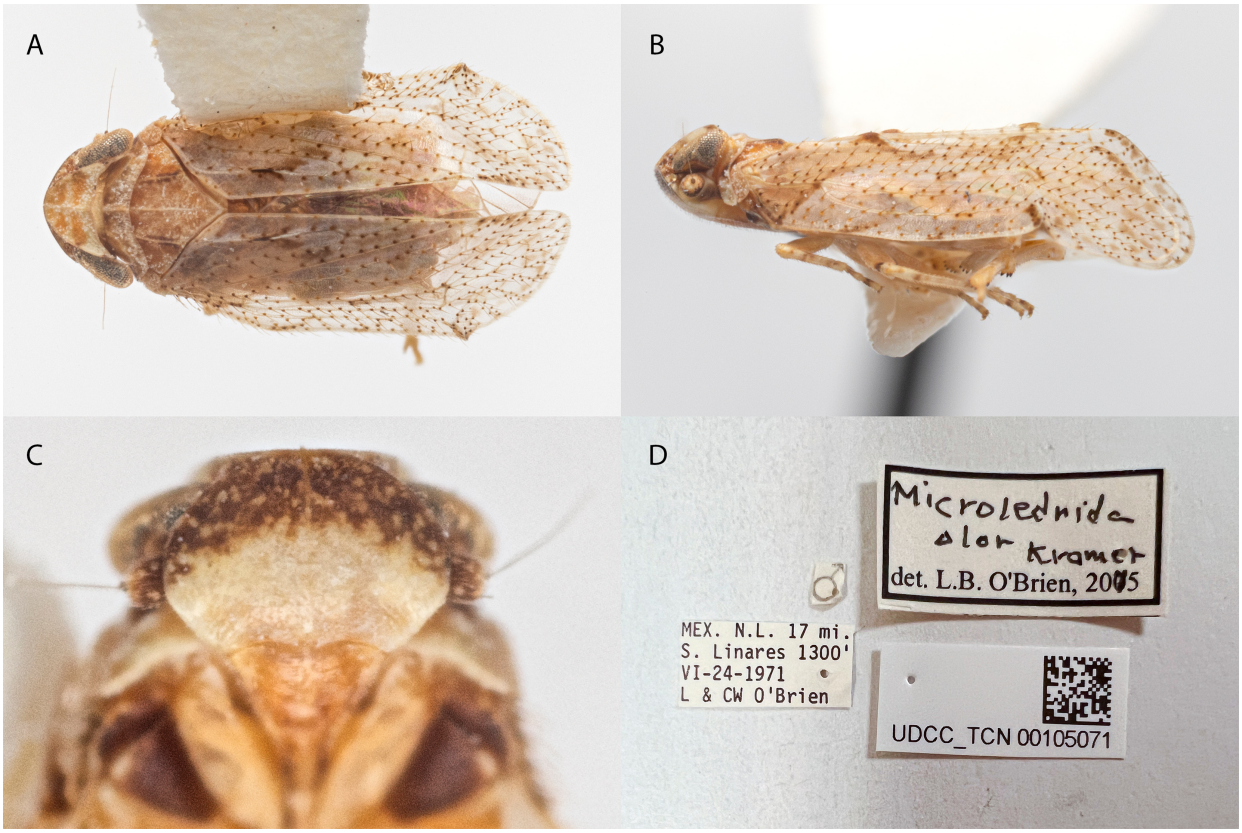

FIGURE 14. Habitus of *Microledrida olor* (male), A) dorsal view, B) frontal view, C) lateral view, D) labels.

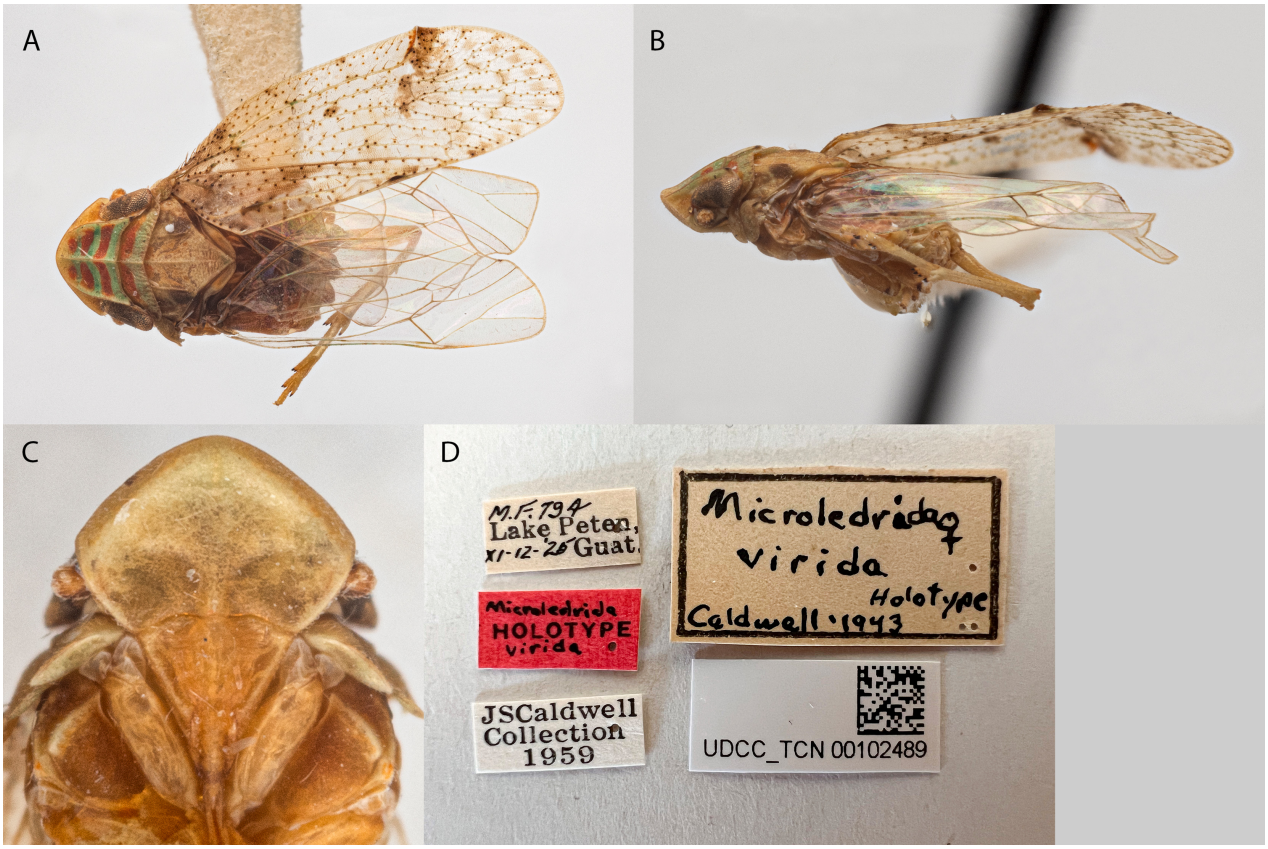

FIGURE 15. Habitus of *Microledrida virida* (holotype, female), A) dorsal view, B) frontal view, C) lateral view, D) labels.

Microledrida virida Caldwell, 1945

(Figs. 15, 16)

Material examined. Types. Holotype: "M.F. 794 / Lake Peten / XI-12-'25 Guat. // Microledrida / HOLOTYPE / virida [red paper] // JSCaldwell / Collection / 1959 // Microledrida ♀ / virida / holotype / Caldwell '1943 [handwritten] // UDCC_TCN 00102489 [2d barcode label]" (1♀, USNM).

Additional material: Belize, Cayo District, nr. Teakettle Bank, Pook's Hill, 17 09.257M, 88 51.091W, 279ft, 6.VII.2003, CRBartlett (1♂, 1♀, UDCC). Mexico, Veracruz, 9 mi N. Tempoal, 50' [elevation], 29.XII.1963, [L.] & C.W. O'Brien (3♂, 1♀, USNM); Campeche, 13.8 miles E Escarcega, 22.VIII.2013, Schaffner, J. Weaver; T. P. Friedlander, Catalog X0597485 (1♀, TAMU).

Amended diagnosis. Vertex bearing conspicuous pattern of three reddish-orange transverse stripes (the first two medially incomplete; Figs. 15A) alternating with pale greenish-blue. Face largely uniform tan (Figs. 15C). Pronotum bearing anterior transverse reddish-orange stripe trailed by pale greenish-blue (Figs. 15A). Rest of body shades of tan and brown. Forewings mainly of weak brown infuscation with dark brown markings in clavus, along nodus in leading margin of wing and proximal portion of remigium; apical cells each with faint brownish spots near middle.

Amended description. *Male terminalia*. Pygofer in lateral view broadest near the middle (anterior margin sinuate, relatively linear; caudal margin broadly arched), narrowest dorsally abruptly expanded to widest point at dorsal third, then narrowing slightly to medioventral process, projected at medioventral process; medioventral process of pygofer (ventrocaudal view) short (much wider than tall), bluntly acute, lateral lobes of pygofer broad, more than double height of medioventral process. Gonostyli simple, basal half slender, margins nearly parallel-sided, weakly downcurved distally, distal portion abruptly expanded into broad pediform expansion (with short rounded ventral heel and elongated dorsal toe, narrowly rounded), apex obliquely truncate. Phallotheca tubular, straight, about as long as gonostyli, irregular in cross-section, apex bearing two large, elongated projections, shorter projection (in ventral view) extended from right ventral side, directed retrorsely, apex J-hooked; second process from

dorsal side (=endosoma), broad at base, narrowing to elongated process, serpentine, extended retrorsely, adpressed to phallotheca, apex exceeding phallotheca base. Anal tube in dorsal view short and broad (broadest proximally narrowing distally), in dorsal view with posterior margin truncate, in lateral view apex decurved into pair of short processes at lateroventral angles of anal tube; paraproct short and conical.

Identification. Caldwell (1945) and supplementary description of the male genitalia above.

Distribution. Guatemala (Caldwell, 1945), Belize, Mexico (Campeche) (see 'studied material' above).

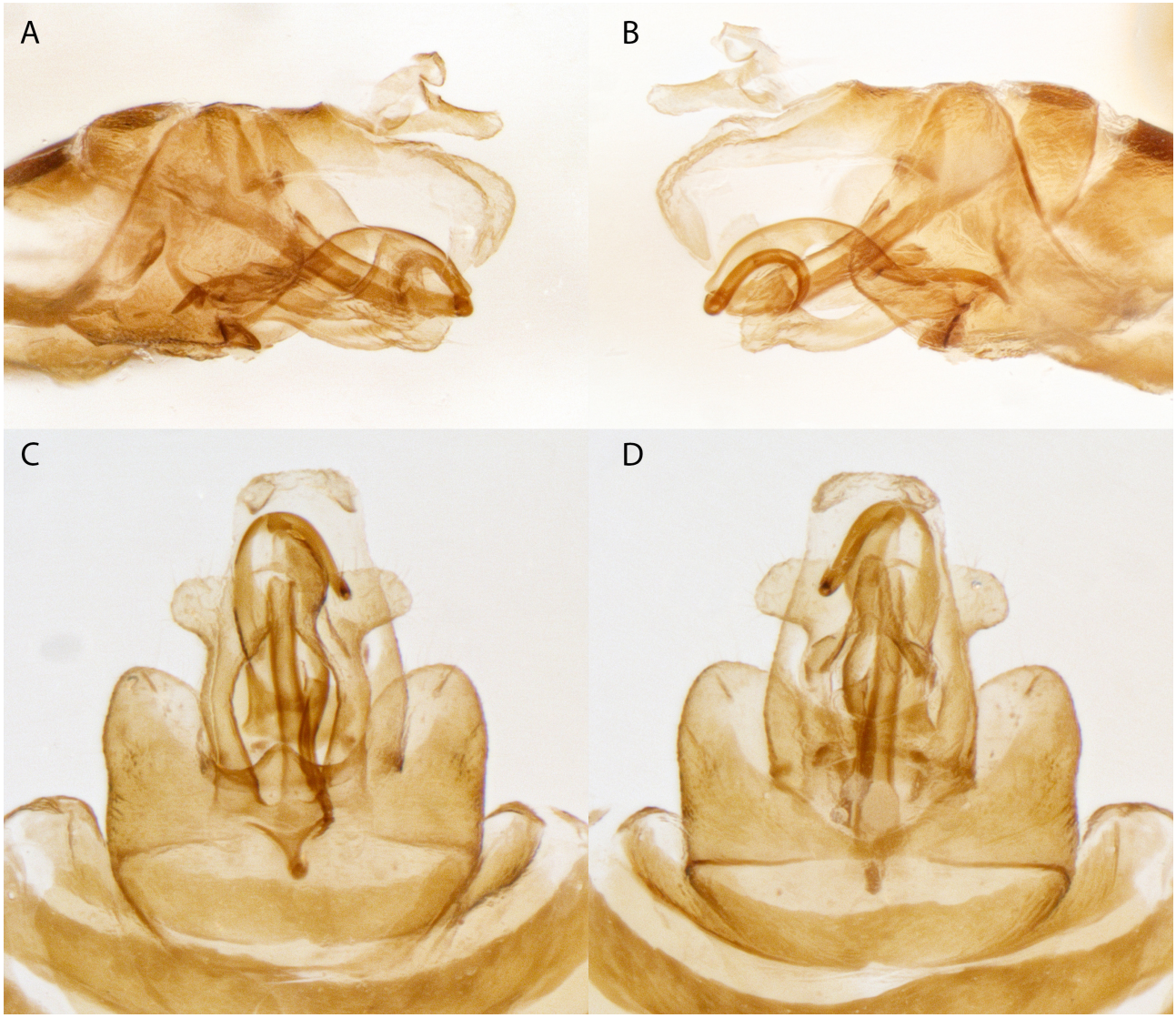

FIGURE 16. Male terminalia of *Microledrida virida*, A) left lateral view, B) right lateral view, C) ventral view, D) dorsal view

Microledrida spp.

Material examined. Antigua, St. John, XII 1967, NLHKrauss, UDCC_TCN 00102536 (1♂, USNM). Costa Rica, San Jose. Paso Ancho de San Sebastian, 19.VII.1936 C.H. Ballou, on Malpighia glabra &c CR# 69; "CR69 Fulgoroid on Malpighia glabra L. and Trichilia havanensis Jacq. P.Q.S.S., Costa Rica, July 19, 1936. CHBallou [handwritten]", UDCC_TCN 00102991 (1♀, USNM). Mexico., Morelos, Cuernv.-Acap. Rd [presumably Mexican Federal Highway 95D], 22.VIII.1936, Ball & Stone, UDCC_TCN 00102993 (1♀, USNM); Sonora, 3mi. N. Hermosillo, 25.V.1961, Howden & Martin, UDCC_TCN 00102994 (1♀, USNM); Durango, Tlahualilo [de Zaragoza], 6.IX.1928, P.A. Glick, 500 ft. alt, M98, UDCC_TCN 00102992 [2D barcode] Microledrida / asperata / Fowler / Oman [folded] (1♀, USNM). Panama, Panamá Oeste Province, Nueva Gorgona, 16.IX.1952, FS Blanton (1♀, USNM).

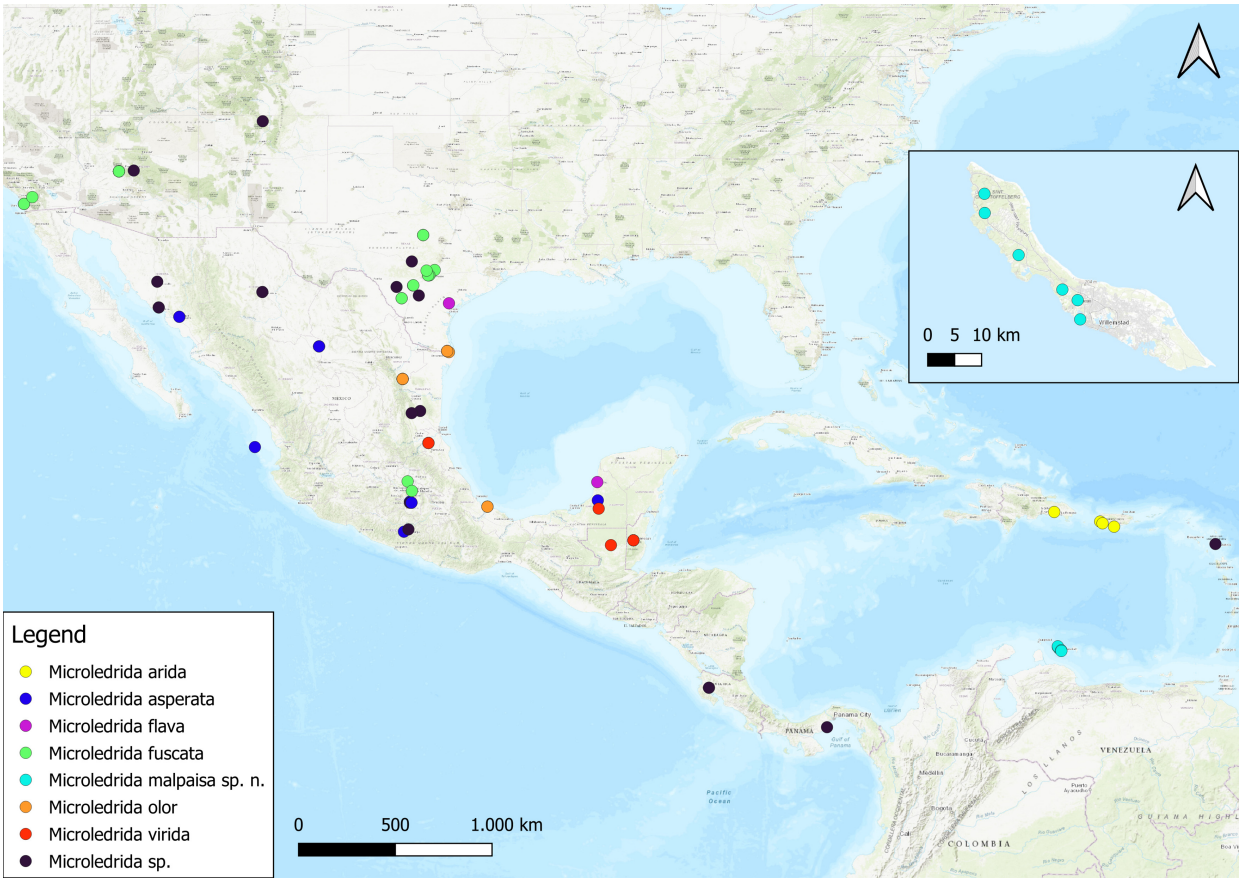

FIGURE 17. Distribution of *Microledrida* species; map insert shows Curaçao with collection locations for *Microledrida malpaisa* **sp. nov.**

Remarks. A number of unidentified *Microledrida* specimens have been seen which are here listed to complement the distribution of the genus (Fig. 17).

Discussion

While the genus *Microledrida* is easily recognized, specimens are infrequently found and are sparsely represented in institutional collections. *Microledrida malpaisa* **sp. nov.** represents the genus' southernmost records, which had not previously been recorded south of Puerto Rico and Guatemala. Records from Antigua, Costa Rica, Panama, and Venezuela indicate a wider distribution and probably additional undescribed species. Our understanding of this genus would benefit from more efforts at field collection and additional reporting of specimens in existing collections.

A possible reason for the scant representation of *Microledrida* in collections could be the habitat preferences of the members of this genus. *Microledrida malpaisa* **sp. nov.** was collected in a sparsely vegetated area, and it is conceivable that individuals display a cryptic way of life, perhaps hiding during the day from hot temperatures and radiation. Intensified field sampling and ecological studies to assess host associations and life history are mandatory to understand the current distribution patterns.

Microledrida is an unusual genus of cixiids. It has not been included in recent work on the systematics of the Cixiidae (e.g., Luo *et al*. 2024) so its phylogenetic relationships remain unclear. Luo *et al.* (2024) noted that "the most distinctive character of the oecleinian lineage is the *icu* veinlet joining the clavus apex, versus *icu* veinlet reaching wing margin significantly distad of clavus in all other Cixiidae". In *Microledrida* spp., the *icu* veinlet joins the clavus apex (Fig. 3), while the genus is currently placed in the cixiinian lineage. The higher taxonomy of *Microledrida* is outside the scope of this paper and should be subject for further study.

Acknowledgements

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