Pacific Insects 17 (1): 91-97 1 October 1976

A NEW GENUS AND TWO NEW SPECIES OF CHLOROPIDAE FROM HAWAII (Diptera)

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Abstract: Meijerella (type-species, *Oscinella cavernae* de Meijere), *M. flavisetosa* (Hawaii, Malaya, Marianas, Bonin Is.), and *Chloropsina citrivora* (Hawaii, injuring citrus seedlings) are described as new. A key is given to 5 species of *Meijerella* (*cavernae, inaequalis, pictinervis,* new combinations, and *flavisetosa,* plus an unnamed species).

Two new species of Chloropidae are described from the Hawaiian Islands to make the names available for use in the last volume of the "Diptera of Hawaii." A new genus is proposed for one of these and its congeners. From available records, one may judge that both species came from the Western Pacific or Southeast Asia. Both have been in Hawaii for a quarter century or more.

Genus MEIJERELLA Sabrosky, n. genus

Type-species: *Oscinella cavernae* de Meijere.

Eye densely short pubescent, large, long axis nearly vertical; frons broad in both sexes, parallel-sided, sloping in profile and much longer than face; frontal triangle dull, finely tomentose (pollinose); cheek narrower than 3rd antennal segment; vibrissal angle and frons only slightly projecting beyond eye in profile, face only slightly concave; facial carina present but paper-thin and low; oral opening nearly square; postgenal area narrow, posterolateral angle of head not developed; 3rd antennal segment small to moderate-sized, reniform or nearly so; arista microscopically pubescent; cephalic bristles short, including inner and outer verticals and erect ocellars and postverticals, the last convergent to tips or nearly so; orbital hairs erect and reclinate, 5–7 in each row distinct from frontal hairs; frontal triangle with 2 straight rows of hairs, almost in line with ocellar bristles, in addition to other hairs in posterior angles of triangle (FIG. 1). *Thorax* stocky, densely gray tomentose, with numerous fine hairs in piliferous punctures; mesonotum strongly convex; humeri large and strongly demarcated; scutellum broad, more or less flattened on disk, subtruncate apically, with 2 small but distinct tubercles at apicolateral angles (FIG. 2, 4); thoracic bristles: 1 + 1 notopleural, 1 postalar, 1 posterior dorsocentral, and 1 apical scutellar pairs of bristles, black, strong, spine-like, and outstanding; humeral bristles weak, whitish yellow, appressed and barely distinguishable from hairs; subapical scutellar setae short, weakly developed, only 1 or 2 pairs evident. *Legs* slender; hind tibia with a large, oval "sensory area." *Wing venation* of type common to *Oscinella* and *Conioscinella*: costa to end of 4th vein; 2nd costal sector longer than 3rd sector; basal 1/2 of 2nd vein straight, in line with radial sector, distally curving gently toward costa, thus overall 2nd vein gently concave anteriorly; marginal cell almost as broad as submarginal cell; discal cell moderately broad, and small crossvein (r-m) beyond midpoint of the cell.

The especially significant features of this genus are the 2 rows of hairs on the mesal area of the frontal triangle, the form of the scutellum (flattened, subtruncate, with a pair of small apical tubercles), the strong, spine-like, black thoracic bristles, and the absence of strong humeral and of posterior intraalar bristles. Duda (1930, 1934) referred the previously described species to his genus *Conioscinella* on the basis of the tomentose (pollinose) frontal triangle; however, *Conioscinella* typically has hairs limited to extreme sides of the frontal triangle, scutellum short, convex, rounded apically, and nontuberculate, apical scutellar bristles slender

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and long, slightly curved and convergent to or cruciate at tips, and thoracic bristles slender, bristle-like and not spine-like, with notopleurals 1 + 2.

Meijerella also suggests *Aphanotrigonum* Duda [type-species, *A. trilineatum* (Meigen)], but the latter typically has 1 + 2 notopleural bristles, short but distinctly developed, black and spine-like humeral and posterior intraalar bristles, 2nd and 3rd veins widely diverging at base, the 2nd vein gently sigmoid, submarginal cell midway almost 2x the width of the marginal cell, the vibrissal angle produced and the face in profile deeply concave, and the postgenal area well developed, convex, wide in profile. The mesonotum is also broader and less convex than in *Meijerella.* Some species recently referred to *Aphanotrigonum,* such as *A. cinctellum* (Zetterstedt), differ in some of these characters, notably in having 1 + 1 notopleural bristles, but the produced vibrissal angle, well-developed postgenal area, and less convex mesonotum associate them with *Aphanotrigonum* and differentiate them from *Meijerella.*

Because of its particular combination of characters, *Meijerella* will not pass clearly to either *Conioscinella* or *Aphanotrigonum* in modern keys to genera but will key in the neighborhood of those 2. In some respects, it appears to be intermediate between the 2, but it is more closely related to the latter. Edwards' (1929) incorrect referrence of *cavernae* to *Tricimba* was probably a recognition of this, coming as it did at a time when the type-species of *Aphanotrigonum, A. trilineatum* (Meigen), was referred to the genus *Tricimba.*

The genus is dedicated to the respected Dutch dipterist, Professor J. C. H. de Meijere, who described a large number of genera and species from the East Indies.

Key to the species of *Meijerella*

1. Scutellum black, at least dorsally 2
   Scutellum broadly yellow apically, the apical scutellar bristles inserted on yellow tubercles 3
2. All tibiae and tarsi yellow ..... **inaequalis** (Becker)
   Legs black to brown-black except narrowly at knees and trochanters ..... **M. sp.** (Malaya)
3. Frontal triangle broad, dull black, sharply distinguished from rest of frons ..... **pictinervis** (Duda)
   Frontal triangle chiefly yellow, with a narrow, dull black median stripe or partial stripe, anterior to median ocellus 4
4. Scutellum (FIG. 2) with apical tubercles not conspicuously projecting, the bases of apical scutellar bristles well separated by a distance about equal to length of 1 bristle and over 1/2 (0.545) the length of scutellum; subapical scutellars black, not on conspicuous tubercles, each preceded basad by 1 or more black, short but bristle-like hairs; 3rd and 4th veins parallel ..... **cavernae** (de Meijere)
   Scutellum (FIG. 4) with apical tubercles conspicuously projecting, bases of apical scutellars not as widely separated, by only 0.70–0.80 x the length of 1 bristle and ca 0.40 x the length of scutellum; subapical scutellars yellow, each typically isolated on a distinct though small yellow tubercle; 3rd and 4th veins diverging ..... **flavisetosa**, n. sp.

Meijerella inaequalis (Becker), **n. comb.**

Oscinella inaequalis Becker, 1911, *Ann. Hist. Nat. Mus. Nation. Hung.* **9**: 164 (Formosa).
Oscinella paenultima Becker, 1911, *Ann. Hist. Nat. Mus. Nation. Hung.* **9**: 163 (Java).
Conioscinella inaequalis (syn.: *paenultima*): Duda, 1930, *Stettin. Ent. Ztg.* **91**:290.
Oscinella paenultima (syn.: *inaequalis*): Sabrosky, 1940, *Ann. Mag. Nat. Hist.* (11) **6**: 426.

This species has heavily gray tomentose thorax and mesonotum with 3 brown stripes, which are only occasionally indistinct. As described for the genus, and almost as described in detail for *flavisetosa* except as follows: Head chiefly yellow, frontal triangle dull, black, entirely heavily gray tomentose and thus clearly demarcated on the otherwise yellow frons; scutellum black dorsally and laterally, reddish below; apical scutellar tubercles small, black, only slightly projecting from margin of scutellum. The scutellum is not as distinctive as in the other species,

but *inaequalis* seems clearly associated with them by such characters as the chaetotaxy and wing venation, and the rows of hairs along the middle area of the frontal triangle.

I erred in adopting *paenultima* over *inaequalis* on the basis of page precedence. Duda must be recognized as the first reviser. The development of brown color varies on the mesonotal stripes, abdomen, and femora in this wide-ranging species, and the variation apparently led Becker to recognize 2 species.

The habits of the larvae are not known precisely, but the following rearing records are available: "ex rotting *Amaranthus* stem tissue" (Rabaul, New Britain, 3.VII.1941, J. L. Froggatt), "Padi seedling" (Kuala Lumpur, Malaya, 1937, H. T. Pagden), and "reared from affected rice" (Thailand, Marcus C. Bordsen).

This is a widespread Indo-Australian species. I have numerous specimens of both sexes before me from Australia (Queensland) and Asia [Cambodia, China (Canton), India (Assam, Bengal), Malaya, Thailand], and from the Amami Islands, Austral Islands, Bismarck Archipelago (Manus, New Britain, New Ireland), Guadalcanal, Java, Marianas (Guam, Saipan, Tinian), New Hebrides, Okinawa, Palau Islands, Philippines (Balabu, Luzon, Palawan), Rapa, Samoa (American), Taiwan, Tonga, Truk Islands and Yap Islands. There is also a published record from Borneo (Sarawak).

Meijerella sp.

One specimen before me (from Serdang, Malaya, 27.III.1929, H. T. Pagden) was received for identification some years ago from the Commonwealth Institute of Entomology. Unfortunately it is headless, but the dark legs, black to brownish black except for knees narrowly and trochanters, indicate another species, apparently undescribed.

Meijerella pictinervis (Duda), **n. comb.**

Conioscinella pictinervis Duda, 1934, *Tijdschr. Ent.* 77: 103, 108 (Sumatra).

I have not seen the type, but Duda's characterization makes it clear that *pictinervis* is a species of *Meijerella,* with a scutellum like that of *cavernae* and *flavisetosa* but a black frontal triangle like that of *inaequalis.*

Meijerella cavernae (de Meijere), **n. comb.** FIG. 1–2

Oscinella cavernae de Meijere, *In:* Becker & de Meijere, 1913, *Tijdschr. Ent.* 56: 306 (Java).

I had examined the holotype of *cavernae* in Amsterdam some years ago, and through the kindness of Dr Theowald van Leeuwen I borrowed it for further study in connection with the present problem. The species differs from *M. flavisetosa,* chiefly in the characters of the scutellum and its bristles (FIG. 2). Otherwise the 2 are very similar, and the general habitus is the same: a stocky, gray thorax with 3 narrow brownish stripes on the mesonotum, scutellum apically yellow with a pair of short but distinct yellow tubercles, and thoracic bristles black, strong, straight, and spine-like.

In the literature are records of *"cavernae"* from the Philippines, Formosa, and Malaya. Only the last record (Edwards 1929, as *Tricimba*) has been checked, and that specimen proved to be a true *Tricimba,* which I described from the Batu Caves as *T. batucola.* The others might be true *cavernae,* or they might be *flavisetosa,* which is undoubtedly an immigrant into Hawaii from farther west in the Pacific.

Meijerella flavisetosa Sabrosky, **n. sp.** FIG. 4

Conioscinella sp., Wirth, 1946, *Proc. Hawaii. Ent. Soc.* 13: 21.

Stocky, gray thorax with 3 narrow brownish stripes, scutellum yellow apically with a pair of small but distinct yellow tubercles.

♂, ♀. *Head* yellow, only ocellar tubercle, a narrow median stripe on frontal triangle, median clypeal plate (anterior edge of oral opening), and back of head black; antenna orange-yellow, slightly brownish apically and on outer surface; arista brown; face, cheeks, orbits, and all cephalic bristles and hairs whitish yellow. Thorax black in ground color, heavily gray tomentose ("pollinose"), mesonotum with 3 narrow brown stripes; propleuron, and humerus in part reddish yellow; scutellum brown or brownish gray on basal 1/3 to 1/2, bright yellow apically; metanotum polished black; all thoracic bristles black, hairs whitish yellow. Abdomen dorsally shining dark brown to black, basally yellow except for posterolateral corners of tergum 1 + 2, hind margins of terga 4 and 5 and sometimes of 3 narrowly yellow, in ♂ brown bands on 4th tergum usually divided into 3 spots, the middle large and rounded; venter yellow. Legs, including fore coxae, chiefly yellowish, hind femur almost entirely blackish, and irregular areas black on outer surfaces of fore and mid femora. Wing hyaline, veins yellow, a rather conspicuous stigma formed by dark brown distal section of 1st vein (R_1) and opposing section of costa, with sometimes the penultimate sections of 3rd and 4th veins and both crossveins also brown. Halteres with yellow or whitish yellow knob and deep yellow stalk. *Eyes* densely pubescent; frons barely longer than broad, parallel-sided, 2x width of an eye and 1/2 width of head; frontal triangle not well differentiated from rest of frons, with a row of pale hairs on each side of a narrow median black stripe, almost in line with ocellar bristles (cf FIG. 1); cheek narrow, only 1/2 breadth of 3rd antennal segment; antenna small, 3rd segment shorter than broad, weakly reniform; arista micropubescent; all head bristles short and pale, including inner and outer verticals and erect postverticals and ocellars, both convergent to tips; a row of weak reclinate orbitals along each side of frons, the posterior 5 distinct from hairs. *Mesonotum* strongly convex, with numerous piliferous punctures, each a tiny dark spot in the dense gray tomentum, the punctures in somewhat irregular rows, more definite on median acrostical and dorsocentral lines; scutellum approximately as long as wide at base, flattened on disk, with a pair of distinct, conspicuously projecting apical tubercles (FIG. 4), bases of apical scutellar bristles separated by a distance less than 1/2 (ca 0.40) median length of scutellum and only 0.70–0.80 x the length of an apical bristle; chaetotaxy as described for genus; subapical scutellars pale, short, typically isolated on small but distinct yellow tubercles. *Legs* slender; "sensory area" on hind tibia large, oval. *Wing* with 2nd and 3rd veins slightly concave anteriorly, 3rd diverging from 4th which runs straight to apex of wing; length of 2nd to 4th costal sectors as 9:6:4; discal cell relatively short and broad, small crossvein opposite 2/3 length of cell; crossveins separated by a distance slightly greater than either penultimate section of 3rd vein or hind crossvein; anal area of wing well developed. *Length:* 1.5–2.5 mm.

Holotype ♂, Nuuanu Valley, Oahu, Hawaii, 20.I.1959, light trap, C. R. Joyce; allotype, Honolulu, Oahu, Hawaii, 15.XI.1960, C. R. Joyce. In the U.S. National Museum, Type No. 73368.

Paratypes: Malaya: ♂, Tahan River, George V National Park, Pahang, 5.XI.1959, light trap, H. E. McClure [U.S. Nat. Mus.]; ♂, Kuala Lumpur, 31.X.1936, H. T. Pagden, "decaying stem of Padi" [Commonwealth Inst. Ent., London].

Mariana Is.: ♀, Garapan-Sadog Tasi, Saipan, 5.V.1940, Yasumatsu & Yoshi [Kyushu Univ., Fukuoka, Japan]; ♀, Tinian I, 8.VI.1946, H. K. Townes [U.S. Nat. Mus.]; ♀, Inarajan, Guam, X.1957, N. L. H. Krauss; ♂, Mt Lamlam, Guam, X.1957, N. L. H. Krauss [B. P. Bishop Mus.].

Hawaiian Is.: 24 ♂♂, 45 ♀♀, various dates 1944–1969, from Hawaii (Akaka Falls, Hilo, Pepeekeo Forest Reserve, Forest N of Puu Kapu, Waipio), Kauai (Wailua, Waimea Valley), Maui (Makamakaole Valley), Molokai (Manawainui Valley), and Oahu (Ewa, Honolulu, Kaau Crater, Kaneohe, Manoa Valley, Mt Tantalus, Nut Ridge, Nuuanu Valley, Palolo Valley, Pupukea, Wailupe Valley, Wiliwilinui Ridge) [Univ. of Hawaii, B. P. Bishop Mus., U.S. Nat. Mus., Sabrosky and M. R. Wheeler collections].

Bonin Is.: Omura, Chichi Jima, 2–25.IV.1958, F. M. Snyder [B. P. Bishop Mus.].

From the number of specimens collected in relatively recent years, beginning with 5 taken in 1944, and most others through the 1950's and 1960's, one might easily have concluded that the species came into Hawaii during World War II. However, 1 example in the Bishop Museum was collected on 25.V.1919, Lanihuli, Oahu, O. H. Swezey.

Many (26) of the available specimens were taken in light traps and a few in banana bait traps. In addition to the rearing record associated with the paratype from Kuala Lumpur, Malaya, a paratype from Kaau Crater, Oahu, 12.XI.1969, S. L. Montgomery, was "reared ex fruit of *Touchardia:* Urticaceae." I suspect that the larvae are scavengers.

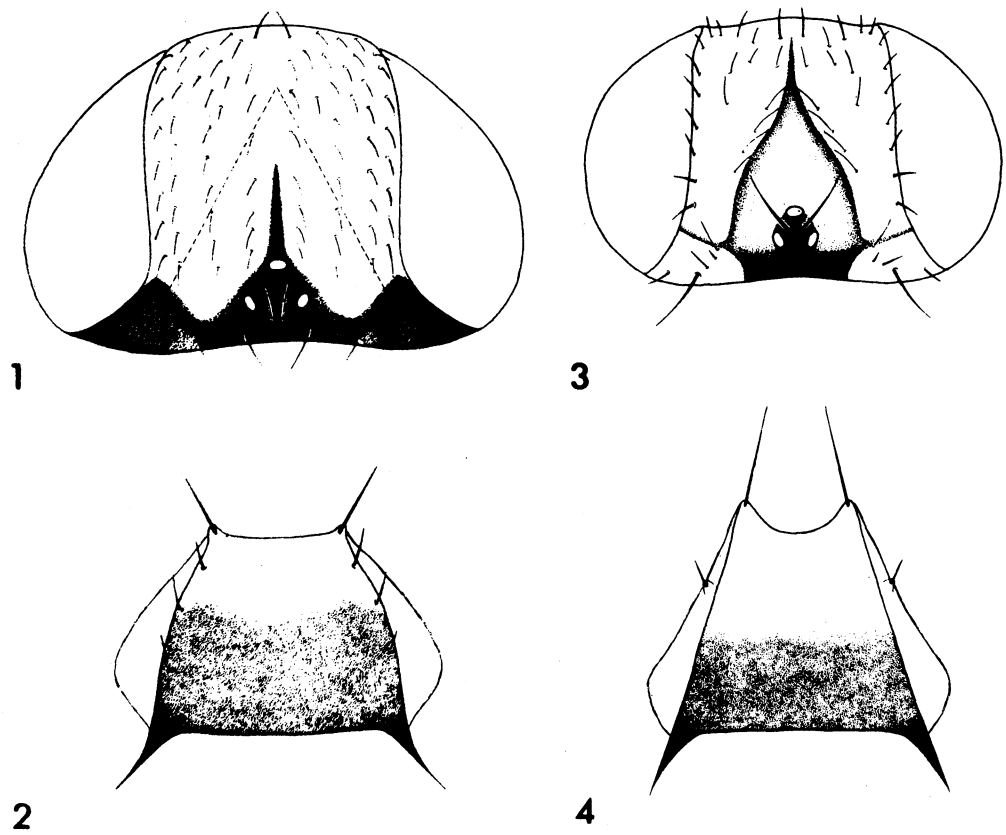

FIG. 1–4, 1, frons and 2, scutellum of *Meijerella cavernae;* 3, frons of *Chloropsina citrivora;* 4, scutellum of *Meijerella flavisetosa.* Drawings by Kathryn Conway.

This species is very similar to *M. cavernae,* differing chiefly in the characters used in the key. The consistency of these characters in the long series before me, representing a number of localities, leads me to recognize *flavisetosa* as a distinct species.

One large female, Kedah Peak, Malaya 1000 m (3300 ft), 10.III.1928, at light, H. M. Pendlebury [Brit, Mus., Nat. Hist.], may belong here, but all femora are black except at the knees, and the specimen has not been included in the type-series. This specimen also shows an extra, strong black bristle latered of 1 of the apical scutellar bristles, undoubtedly an aberration. A similar aberration was noted in 1 of the Oahu specimens, which has an extra tubercle and strong black bristle almost in the midline at the apex of the scutellum.

Chloropsina citrivora Sabrosky, **n. sp.** FIG. 3

Chlorops (sens. lat.) sp.? Hardy, 1952, *Proc. Hawaii. Ent. Soc.* **14**: 408, 472 (Oahu, bait traps). – Davis, 1958, *Proc. Hawaii. Ent. Soc.* **16**: 339–40 (Hilo, Hawaii).

Yellow, shining, with predominantly reddish mesonotal stripes, and long, slightly thickened, white arista.

♂, ♀. Chiefly yellow, shining, face, cheeks, and palpi whitish yellow, ocellar tubercle and a broad median stripe on occiput black, an indefinite streak along each side of frontal triangle brown to blackish; 3rd antennal segment infuscated at apex and on outer surface; arista white, basal segment yellow. Mesonotal stripes reddish, the median stripe shining black on anterior slope of thorax, opposite the median black stripe of occiput, and lateral stripes infuscated on their mesal margins posterior to mesonotal suture; small spot on humerus, long oval spot on mesopleuron, and metanotum polished black; scutellum lightly browned on disk. Abdomen shining brown above, paler toward base, yellow on sides and narrowly at apex, in ventral aspect a brown stripe on each side along extreme margins of terga. Wings clear, veins brown. All bristles and hairs black. *Eyes* bare; frons parallel-sided, length and width approximately equal; frontal triangle (FIG. 3) at base well separated from eyes, about 3/5 width of frons, sides slightly convex, apex narrowly acuminate, surface smooth and polished, without punctures or hairs; in profile, eye very large, occupying most of side view of head, cheek linear, frons slightly projecting anterior to eye but vibrissal angle weak and inconspicuous, not at all projecting; face flat, carina undeveloped; antenna large, its length over 1/2 that of frons, 3rd segment 1.3 x as long as broad; arista long, 2x the antennal length, densely white pubescent, appearing slightly thickened; chaetotaxy: strong but short outer verticals and moderately long and divergent ocellars, inner verticals and postverticals short, weak, and hair-like; about 3 rows of frontal hairs anteriorly, on each side innermost row paralleling but well separated from frontal triangle. *Mesonotum* shining, but shine interrupted by numerous, moderately coarse piliferous punctures; scutellum more or less flattened on disk, with numerous hairs like mesonotum; 1 + 2 notopleural (upper posterior shorter than others), 1 postalar, 1 posterior dorsocentral, and 1 apical scutellar pairs of bristles distinctly but not strongly developed, the humerals and subapical scutellars barely distinct from hairs. *Legs* slender; "sensory area" on hind tibia linear to indistinct. *Costa* extending to slightly beyond end of 3rd vein; 2nd costal sector barely longer than 3rd sector (ca 1.25 x); branching of radial sector well before end of 1st vein, opposite a point about midway between humeral crossvein and end of 1st vein; 3rd vein weakly bisinuate to straight; discal cell long and narrow, small crossvein (r-m) opposite basal 1/3 of cell, distance between crossveins nearly 2x that of ultimate section of 5th vein; apical cell unusually wide, almost equal to combined widths of marginal and submarginal cells, the marginal unusually narrow, only 1/2 width of submarginal cell. Length: 2–2.5 mm.

Holotype ♂, and allotype, Hilo, Hawaii, VIII.1958, D. E. Hardy, reared from larvae boring in roots of citrus seedlings. In the U.S. National Museum, Type No. 73369.

Paratypes, Hawaiian Islands: 8 ♂♂, 8 ♀♀, same data as holotype; 2 ♀♀, Aliamanu, Oahu, 30.I.1962, light trap, C.R. Joyce; 3 ♂♂, 1 ♀, Maunawili, Oahu, XII.1950, ex bait trap, P. Gow [Univ. of Hawaii, Bishop Mus., U.S. Nat. Mus.]

Other material examined, teneral and not included in type-series: 12 ♂♂, 9 ♀♀, duplicating above data except for 1 ♀, Maunawainui Valley, Molokai, VII.1952, D. E. Hardy, and 2 ♀♀, Hilo, Hawaii, 24.X.1957, "ex roots of citrus," H. Nakao.

The specimens reared by Nakao were the basis of the report by Davis (1958), and the bait-trapped specimens of the first record of the species in the Hawaiian Islands (Hardy 1952a, b).

Inasmuch as no endemic chloropids are known from the Hawaiian chain, I assume that this species also is an immigrant, probably from the Western Pacific or from the Orient. I have seen 2 specimens that resemble it, 1 from India and 1 from Ceylon, both undoubtedly congeneric and closely related, and even possibly considered conspecific except for a few details. In both examples, the apex of the frontal triangle is acute or at most short acuminate, not long acuminate as in *citrivora*, and the innermost rows of frontal hairs are very close to the sides of the triangle and in 1 case are inserted on the margins of the triangle itself. In both, the upper posterior notopleural bristle is short, weak, and hair-like, so much so that the notopleural formula appears to be 1 + 1. The specimen from Ceylon also has a quadrate black spot in the anteroventral angle of the pteropleuron, thus appearing to extend the mesopleural stripe, and the small crossvein is farther out on the discal cell. These seem like small differences, but the consistency of the comparable characteristics in the Hawaiian series leads me to conclude that the latter represents a distinct species.

In the most recent key, by Duda (1934), the species would key out—albeit not very well—to *Chlorops antennata* Becker, a species with shining red stripes and thickened white arista that

shares the same habitus. However, Becker's species (type examined) shows a distinct although narrow cheek, 1/3 the breadth of 3rd antennal segment, and a row of hairs on each side of the frontal triangle. I know of no other species with which to compare *citrivora.*

Generic limits in the Chloropinae are poorly defined and not well understood, and the new species is only tentatively assigned to *Chloropsina.* The species usually referred to this genus have chiefly black thorax and black palpi, but color characters cannot be depended upon for generic distinctions. I am more impressed by the wing venation, thickened white arista, and linear cheek.

Davis (1958), at a meeting of the Hawiian Entomological Society on 9 Dec. 1957, reported that this species was reared from larvae found in the roots of injured, nursery-grown, rough-skin lemon seedlings from Hilo, Hawaii. The collector, Mr Nakao, reported that "approximately 85 percent of those in 100 flats were affected and that out of 600 seedlings in cans about 60 percent were affected." Also, "Dr. Hardy stated that the larvae were working in live tissue and obviously damaging the roots." Subsequently Hardy wrote to me that he had "examined the roots carefully and have found the larvae actively boring between the epidermis and the woody portion and apparently doing severe damage to the seedlings." Rarely have published rearing records of chloropids been based on such direct examination.

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