

in the absence of evidence of intergradation, and in view of the possibility of complete geographic isolation it seems best, meanwhile, to treat the animal as a full species.

Mr. Underwood describes the region of the type locality as open, sterile and rocky, and concerning the occurrence and habits of coyotes says: "They seem to prefer to make their dens amongst the rocks often within a league or so from cattle farms or haciendas where calves and chickens can be got. The natives resort to poison when they become too numerous. In several other parts of the country where conditions are analogous to the place where these were taken they are more or less abundant. They are very wary and difficult to shoot, but at times fall at night light hunting."

Specimens examined.—Three, all from the type locality.

ENTOMOLOGY.—*New neotropical empoascan leafhoppers*.¹ P. W. OMAN, Bureau of Entomology and Plant Quarantine. (Communicated by HAROLD MORRISON.)

This paper contains descriptions of 12 apparently new species of *Empoasca* from South America, Costa Rica, and Puerto Rico which the writer has encountered in the course of his work during the past few years. Since names have been requested for most of these it seems desirable to describe them at this time. Unless otherwise stated the illustrations accompanying these descriptions show a magnification of approximately 65 diameters.

***Empoasca peregrina* n. sp.**

Resembling *trifasciata* (Gillette), but longer, with a black spot on apex of vertex and lacking dorsal spines. Length 4.75 mm.

External characters: General ground color pale yellowish-white. Apex of vertex with a round black spot. Posterior margin of pronotum, all of scutellum, and adjacent margins of elytra piceous to fuscous. Elytra hyaline, with a transverse smoky vitta across middle and another just before apical cross-veins, beyond cross-veins faintly smoky. Form generally more slender than that of *trifasciata*.

Male internal structures (Fig. 1, A): Lateral processes slender, in ventral view bluntly rounded apically. Dorsal spines rudimentary. Styles strongly diverging distally. Aedeagus comparatively slender, with a short projection on posterior margin. Sternal apodemes very large, rather slender and parallel sided, reaching beyond middle of 6th segment.

Described from a single specimen, the holotype male, intercepted at the Plant Quarantine inspection house at Washington, D. C., Jan. 8, 1934, in cotton lint packing from Peru. Type, Cat. No. 51283, U. S. N. M.

***Empoasca rubraza* n. sp.**

Apparently resembling Osborn's species, *picta*, *decorata*, and *rubromaculata* in size and color but differing from them in color pattern, particularly in the two longitudinal red stripes on pronotum. Dorsal spines saber-shaped in lateral view. Length 3.1–3.3 mm.

¹ Received October 1, 1935.

External characters: Color bluish-green with contrasting red or orange-red marks. Face suffused with pale orange-red; vertex pale bluish-green with a pale orange dash next to each eye and a spot above each ocellus, these markings often irregular and poorly outlined. Pronotum with a bright orange-red stripe each side of median line, these slightly narrowed posteriorly. Elytra with elongate red stripes on each side of claval sutures, the claval stripe covering all but margins of clavus; costal submargin faintly orange tinged. Apical one-third of elytra subhyaline, veins pale and distinct. Vertex short, slightly produced medially; general form rather broad. Female genital segment impressed laterally about half way from base, posterior margin truncate or very slightly notched medially.

Male internal structures (Fig. 1, B-C): Lateral processes comparatively stout, apical portions sinuately curved, with tips directed caudad and inward. Dorsal spines broad in lateral view, slightly curved and sharply pointed; in general outline somewhat saber-shaped. Aedeagus short, portion for muscular attachment curved upward and then caudad; outline in lateral view very distinctive in the genus. Styles broadened before tips in ventral view; tips bent obliquely downward in lateral view. Sternal apodemes large, reaching beyond base of 5th segment.

Holotype male from Loreto, Prov. Misiones, Argentina, Nov. 29, 1931, A. A. Oglobin. Allotype female from the same locality, Dec. 6, 1931. Paratypes, 6 males and 13 females from the above locality and collector, taken on various dates from Nov. 25 to Dec. 10, 1931. There is also at hand 1 female from Huachi, Beni, Bolivia, September, W. M. Mann, Mulford Biological Exploration, 1921-22. Type, Cat. No. 51284, U. S. N. M.

***Empoasca perelegans* n. sp.**

A large species with two black spots on vertex and with elytral stripes of smoky-fuscous, except apically. Length 3.5-4 mm.

External characters: General ground color pale bluish green; specimens collected late in the season (September) yellow to white. Face with a red stripe from below each ocellus to apex of clypeus, the two fused apically. Vertex with a pair of round black spots on anterior margin near median line and a transverse red stripe posteriorly. Pronotum faintly and irregularly marked with red each side of median line except posteriorly. Claval veins and claval sutures marked with smoky-fuscous; similar stripes between veins of corium before cross-veins; elytra hyaline except for smoky-fuscous stripes. Form rather slender, vertex slightly produced medially. Posterior margin of female genital segment produced and rounded, with a faint notch medially.

Male internal characters (Fig. 1, D): Lateral processes slender and tapered to sharp points. Dorsal spines stout, bifurcate apically. Aedeagus ending in a rounded, lobe-like process; below this a pair of slender, curved processes arising from posterior margin. Styles strongly diverging distally in ventral view. Sternal apodemes relatively broad, reaching to base of 5th segment.

Holotype male, allotype female, and 3 male and 27 female paratypes from San Pedro de Montes de Oca, Costa Rica, May 2, 1934, collected from *Annona cherimola* by C. H. Ballou. Other paratypes, 9 females and 1 male, collected by Mr. Ballou at the same locality Sept. 16, 1933, from *A. cherimola* and *A. muricata*. Type, Cat. No. 51285, U. S. N. M. Paratypes in collection of C. H. Ballou. There are also specimens at hand from La Ceiba, Honduras, and Vicosá, Minas Geraes, Brazil.

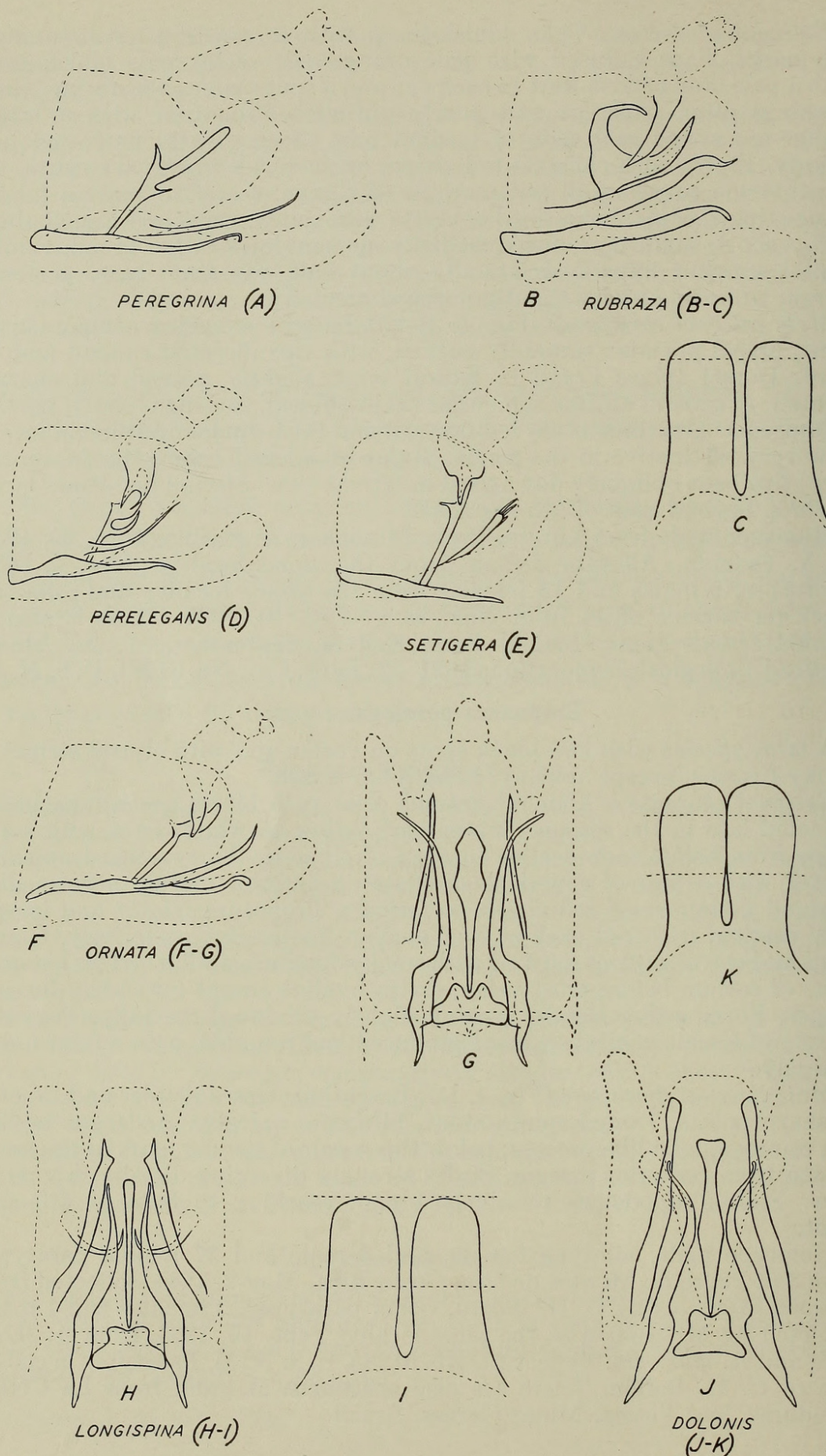


Fig. 1.—Internal structures of male. A, lateral view of genitalia of *Empoasca peregrina*. B, lateral view of genitalia; and C, sternal apodemes of *rubraza*. D, lateral view of genitalia of *perelegans*. E, lateral view of genitalia of *setigera*. F, lateral view; and G, ventral view, of genitalia of *ornata*. H, ventral view of genitalia; and I, sternal apodemes of *longispina*. J, ventral view of genitalia ($\times 100$); and K, sternal apodemes of *dolonis*.

***Empoasca setigera* n. sp.**

A comparatively robust species with the lateral processes bearing stout spine-like setae apically and the dorsal spines short. Length 3.3 mm.

External characters: Vertex, pronotum, and scutellum greenish-yellow, marked with white areas, the most constant of which are a median dash on vertex, a transverse row of spots on pronotum anteriorly, and spots on disk of scutellum. Elytra hyaline with a green tinge. Species comparatively broad; vertex short, slightly produced medially. Female genital segment truncate posteriorly.

Male internal structures (Fig. 1, E): Lateral processes short, nearly straight, each bearing several short, stout, spine-like setae on apex and inner margin before apex. Dorsal spines broad basally, abruptly narrowing to short, slender spines. Aedeagus slender. Sternal apodemes rudimentary.

Holotype male from Loreto, Prov. Misiones, Argentina, Nov. 29, 1931, A. A. Ogloblin. Allotype female from the same locality and collector, Dec. 12, 1931. Paratypes, 50 males and 5 females from the above locality and collector, taken on various dates from Nov. 25 to Dec. 18, 1931. Type, Cat. No. 51286, U. S. N. M.

***Empoasca ornata* n. sp.**

Pale green, marked with orange-red on head and thorax. More slender than *rubra*, n.sp., and without the bluish coloration. Length 3.7 mm.

External characters: General ground color pale green. Face irregularly marked with orange-red; vertex with a transverse band of the same color, interrupted on median line. Pronotum and scutellum irregularly washed with orange-red. Elytra hyaline, faintly mottled with smoky brown areas especially along dorsum. Vertex slightly produced medially, form more slender than that of *rubra*.

Male internal structures (Fig. 1, F-G): Lateral processes nearly straight, tips turned upward in lateral view. Dorsal spines blunt. Aedeagus relatively slender in lateral view, much broadened distally in ventral view. Styles strongly diverging posteriorly in ventral view; in lateral view apical portions twisted and tips somewhat knob-like. Sternal apodemes rudimentary.

Holotype male from near mouth of Rio Mapiri, Bolivia, September, Mulford Biological Exploration 1921-22. Type, Cat. No. 51287, U. S. N. M.

***Empoasca longispina* n. sp.**

A large species without definite markings but with unusually long dorsal spines. Pygofer with several short spine-like setae on posterior margins. Length 4 mm.

External characters: Color golden green without definite markings but head and portions of thorax with a granular appearance. Apical one-third of elytra hyaline. Vertex short, very slightly produced medially.

Male internal structures (Fig. 1, H-I): Lateral processes sharply pointed, nearly straight in lateral view; in ventral view slightly bowed inward, with a blunt tooth on inner margins before tips. Dorsal spines slender and tapering to sharp points, unusually long and extending first downward and slightly cephalad and mesad, tips curved caudad and slightly upward. Aedeagus slender. Styles slender apically. Posterior margins of pygofer each with about 5 short spines which vary considerably in size and are directed mesad and caudad. Sternal apodemes reaching base of 5th segment.

The large size and lack of markings seem to make this species distinct

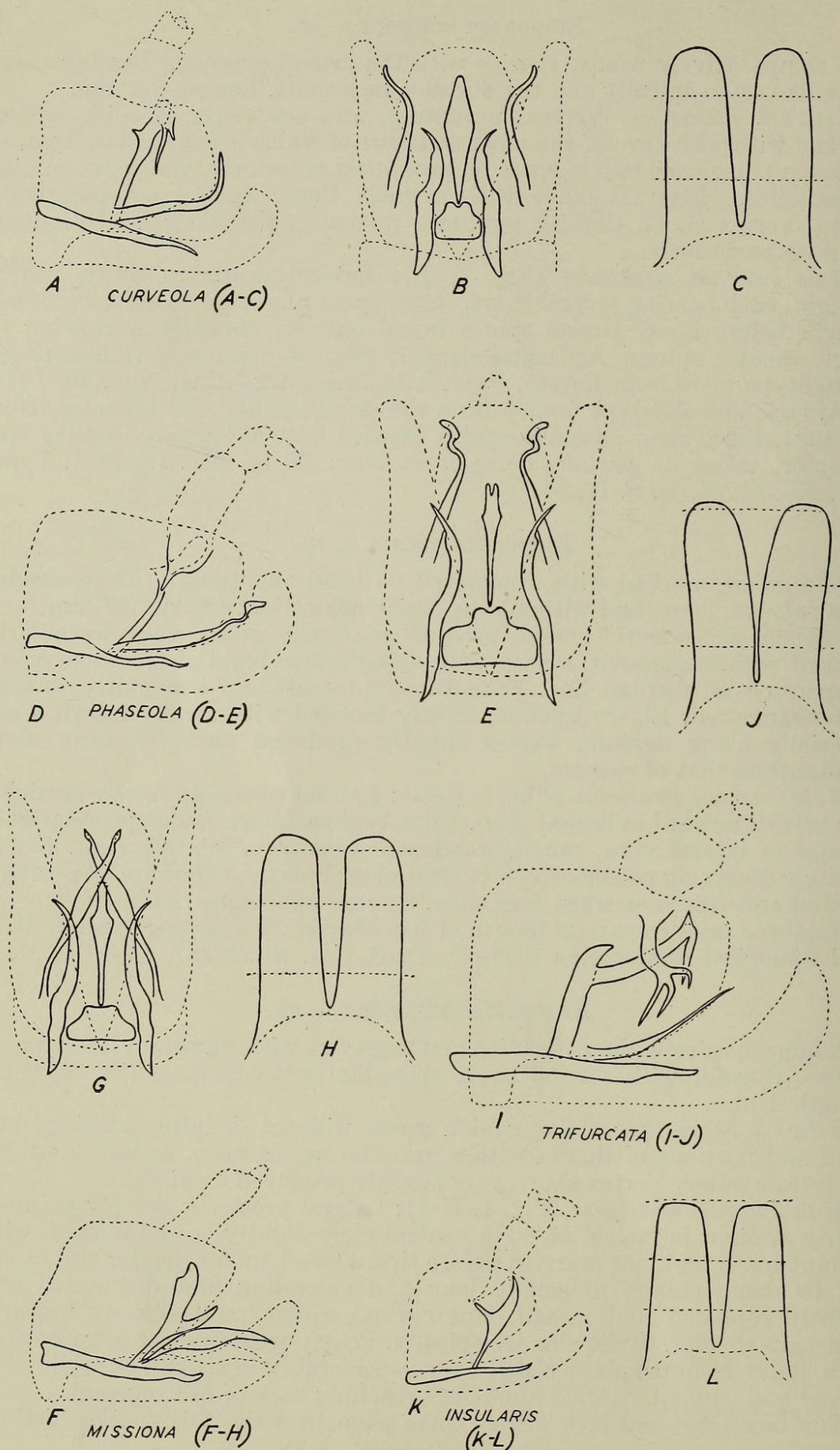


Fig. 2.—Internal structures of male. A, lateral view; and B, ventral view, of genitalia; and C, sternal apodemes of *Empoasca curveola*. D, lateral view; and E, ventral view, of genitalia of *phaseola*. F, lateral view; and G, ventral view, of genitalia; and H, sternal apodemes of *missiona*. I, lateral view of genitalia ($\times 100$); and J, sternal apodemes of *trifurcata*. K, lateral view of genitalia; and L, sternal apodemes of *insularis*.

from any of the South American forms described by Osborn. Structurally this species seems close to *salinarum* Berg,² but differs in coloration.

Holotype male from Loreto, Prov. Misiones, Argentina, Dec. 1, 1931, A. A. Ogloblin. Type, Cat. No. 51288, U. S. N. M.

***Empoasca dolonis* n. sp.**

A slender species with forked dorsal spines and subtruncate lateral processes. Length 3–3.2 mm.

External characters: Color pale green to pale golden green. Ocelli circled with white. Pronotum and scutellum with white areas; elytra with a pale golden dash along claval sutures basally. Species slender, vertex well produced and rather narrow. Female genital segment truncate posteriorly.

Male internal structures (Fig. 1, J–K): Lateral processes extending caudad and slightly upward; apices flattened dorso-ventrally, in ventral view obliquely subtruncate, upper surfaces slightly concave before apices. Dorsal spines forked, but in lateral view appearing as single spines. Aedeagus broad apically in lateral view. Styles more slender apically than is usual in the genus, in lateral view bowed upward just before apices which are directed downward. Sternal apodemes large, extending to middle of 5th segment.

Holotype male from Loreto, Prov. Misiones, Argentina, Nov. 25, 1931, A. A. Ogloblin. Allotype female with the same data but collected Nov. 29, 1931. Paratypes, 4 males and 12 females from the above locality and collector, taken on various dates from Nov. 27 to Dec. 18, 1931. Type, Cat. No. 51289, U. S. N. M.

***Empoasca phaseola* n. sp.**

A rather large, slender species without definite markings. Lateral processes sinuated apically and enlarged at tips. Length 4–4.25 mm.

External characters: Pale green to yellowish green with indefinite white areas on head and thorax. Elytra subhyaline before cross-veins, sometimes with faint golden stripes longitudinally; beyond cross-veins hyaline. Vertex well produced; general form comparatively slender. Posterior margin of female genital segment produced and rounded, with a faint notch medially.

Male internal structures (Fig. 2, D–E): Lateral processes relatively stout and straight basally, apically slender and strongly sinuated, apices enlarged and somewhat foot-shaped. Dorsal spines broad basally, abruptly tapered and ending in a slender finger-like process. Aedeagus simple, relatively slender. Sternal apodemes close together, reaching nearly to base of 5th segment, apices obliquely subtruncate.

Holotype male, allotype female, and 3 male and 30 female paratypes from San Pedro de Montes de Oca, Costa Rica, Oct. 21, 1933, collected from *Phaseolus vulgaris* by C. H. Ballou. Type, Cat. No. 51290, U. S. N. M. Paratypes in collection of C. H. Ballou.

***Empoasca trifurcata* n. sp.**

Indistinguishable externally from small examples of *fabae* (Harris), but with the lateral processes straight and slender and the dorsal spines trifurcate. Length 3 mm.

External characters: Color pale green; head and thorax marked with the usual yellowish and white areas. Vertex slightly produced medially.

Male internal structures (Fig. 2, I–J): Lateral processes extending caudad

² *Hemiptera Argentina*, p. 274. 1879.

and slightly upward, gradually tapering from bases to slender, sharp-pointed apices. Dorsal spines stout, each terminating in three slender, pointed processes, of which the posterior two are bent. Aedeagus stout, extending upward, then obliquely upward and backward, and terminating in a finger-like spine which extends downward and slightly to the right. Sternal apodemes very long, reaching base of 6th segment; apices bluntly rounded.

Holotype male from Loreto, Prov. Misiones, Argentina, Nov. 29, 1931, A. A. Ogloblin. Paratype, 1 male with the same data, but collected Dec. 14, 1931. Type, Cat. No. 51291, U. S. N. M.

***Empoasca curveola* n. sp.**

Externally indistinguishable from *trifurcata*, n. sp., but with the lateral processes strongly curved and comparatively stout. Length 3 mm.

Male internal structures (Fig. 2, A-C): Lateral processes of nearly uniform width throughout, slightly stouter basally and bluntly pointed apically, in lateral view with apical one-third bent upward, in ventral view apical one-half curved obliquely outward but with extreme tips bent caudad. Dorsal spines forked basally, each with a short, sharp spine from inner margin and a longer, slender spine directed downward and curved slightly inward. Aedeagus slightly broadened apically in lateral view, margins sinuately curved. Sternal apodemes reaching middle of 5th segment, tapering slightly from bases to apices, apices rounded.

Holotype male and 2 male paratypes from Caseros, Prov. Buenos Aires, Feb. 3, 1927, C. F. Henderson. Other paratypes, 2 males collected by Mr. Henderson at Las Heras, Prov. San Juan, Dec. 10, 1926. Type, Cat. No. 51292, U. S. N. M.

***Empoasca missiona* n. sp.**

Externally indistinguishable from *trifurcata* but with the lateral processes swollen at middle and the dorsal spines obsolete. Length 3 mm.

Male internal structures (Fig. 2, F-H): Lateral processes slender basally, gradually becoming stouter to middle and tapering to apices, which are pointed in lateral view, but constricted on inner margins and obliquely truncate in ventral view. Dorsal spines rudimentary. Aedeagus in lateral view with a curved extension from posterior margin, this consisting of two thin structures which can be seen to diverge apically when viewed from caudal aspect. Sternal apodemes reaching nearly to middle of 6th segment.

Holotype male from Loreto, Prov. Misiones, Argentina, Dec. 14, 1931, A. A. Ogloblin. Type, Cat. No. 51293, U. S. N. M.

***Empoasca insularis* n. sp.**

Superficially identical with *trifurcata*, but slightly smaller and without distinct dorsal spines or lateral processes. Female genital segment with posterior margin slightly produced and rounded, faintly notched medially. Length 2.5-2.75 mm.

Male internal structures (Fig. 2, K-L): Lateral processes and dorsal spines rudimentary. Aedeagus simple but relatively stout. Styles slightly turned upward apically in lateral view, in ventral view diverging posteriorly. Sternal apodemes unusually large, reaching to base of 6th segment.

Holotype male, allotype female, and 6 male and 4 female paratypes from Rio Piedras, Puerto Rico, May 20, 1932, collected by M. D. Leonard on *Annona* (spelled *Anonia*) *diversifolia*. Type, Cat. No. 51294, U. S. N. M.



1936. "New neotropical empoascan leafhoppers." *Journal of the Washington Academy of Sciences* 26, 34–40.

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