

THE MEXICAN *FRANKLINIELLA DESERTILEONIDUM* WATSON SPECIES ASSEMBLAGE, IN THE "INTONSA GROUP" (INSECTA, THYSANOPTERA: THIRIPIDAE)

Roberto M. JOHANSEN

Instituto de Biología, UNAM. Departamento de Zoología, Laboratorio de Entomología.
Apartado Postal 70-153, 04510 Coyoacán México, D.F. MEXICO

RESUMEN

Se hace la revisión de la especie neovolcánica mexicana *Frankliniella desertileonidum* Watson, con base en un Paratipo y material nuevo. Lo anterior permitió la reconsideración de la también especie mexicana de la Sierra Madre Oriental *F. oneillae* Johansen, como una especie diferente y válida con respecto a *F. desertileonidum*. Con base en lo anterior, se adicionan tres especies nuevas de la Sierra Madre Oriental. La definición de cada especie, ha permitido el establecimiento de relaciones de afinidad con base en caracteres morfológicos compartidos, lo que las define y agrupa en un ensamble específico. Se incluyen ilustraciones morfológicas de todas las especies, de cabeza, antenas, tórax y abdomen.

Palabras Clave: Thysanoptera, Ensamble específico *Frankliniella desertileonidum*, Taxonomía, Nuevas especies, Distribución, México.

ABSTRACT

The review of the Mexican Neovolcanic species *Frankliniella desertileonidum* Watson was carry out herein, based in a Paratype, as well as new material. This allowed the reconsideration of *F. oneillae* Johansen from the Sierra Madre Oriental, as a different and valid species, with respect to *F. desertileonidum*. This supported the determination of three new more species from the Sierra Madre Oriental. All these elements derived in the stablishment of relationships supported with shared morphologic characters between the five species. This allowed the grouping in a specific assemblage. Morphologic illustrations of the head, antennae, thorax and abdomen of all the species, are included. **Key Words:** Thysanoptera, *Frankliniella desertileonidum* species assemblage, Taxonomy, New species, Distribution, Mexico.

INTRODUCTION

The genus *Frankliniella* was created by Karny (1910). Later, Hood (1925) divided the genus in four specific groups: "cephalica", "intonsa", "minuta" and "tritici"; this division was based in the morphology of the interocellar setae (pair III); the dorsal aspect of apex (produced or not) in antennal segment II; the morphology of the pedicel in antennal segment III; the chaetotaxy in the male tergite IX.

Moulton (1948), in his full revision of the genus *Frankliniella* followed the previous group division of Hood (*Loc. cit.*). However, the groups *cephalica* and *tritici* were treated as series in his Tritici-Cephalica group. He divided the "Intonsa group" in three series: "Intonsa", "Insularis" and "Tenuicornis". He introduced the interocellar setae position classification. In the Intonsa group (Intonsa series), he included 89 names (as species, varieties or forms); within this number, 25 were Mexican species.

Bryan and Smith (1956), created the first "specific complex" in their review of the *Frankliniella occidentalis* (Pergande) complex in California. Jacot-Guillarmod (1974) catalogued 151 World species: from them, 30 were Mexican.

Frankliniella oneillae was described by Johansen (1979). The later synonymy of *F. oneillae* under *F. desertileonidum* Watson, by Mound and Marullo (1996), together with the discovery (cf. Johansen & Mojica, 1996) of three related additional new Mexican species (from high mountains), made necessary this review, to allow a reconsideration of *Frankliniella oneillae* Johansen as a different and valid species with respect to *F. desertileonidum* Watson, and the final integration of the five species into a "species assemblage".

The definition of *Frankliniella desertileonidum* Watson and its four related species as a "specific assemblage" within the Intonsa Group, was possible by means of the recognition of several shared morphologic characters. One of the remarkable characters, is the lack of the postocular setae i (this fact is supported by the evidence found in the Holotype ♀ of *Frankliniella brevisaetaeonillae* (Fig. 4), which shows the complete left postocular setae row: i-iii, IV, whereas the right row lacks setae i: ii-iii, IV. This means that the postocular setae i once existed, as in most of the species in the Intonsa Group, but later it was lost), thus giving the formula: ii-iii, IV; the other important character is the fore wings color: dark chestnut-brown, with two clear transverse bands, one subbasal, the other apical. The lack of postocular setae i is a shared character with *Frankliniella aurea* Moulton; however, this species has clear yellow fore wings, body color is mainly yellow, like in *F. occidentalis* (Pergande). Since the species number in the Intonsa group is still increasing, the species assembling is a good classifying solution. The terms assemblage, complex and group are used here as neutral terms, according to Mayr and Ashlock (1991).

MATERIAL AND METHODS

The illustrations from adults of each of the species, are realistic microscopic interpretations that were done using a camera-lucida equipment and two magnifications: 400 and 1000 X.

DEPOSITORIES

CAS = California Academy of Sciences, San Francisco, California, United States of America
IBUNAM = Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F.

ABREVIATURES

Head

intocc = interocellar setae (pair III)

postoc = postocular setae i-iii, IV

Pronotum

AA = Major anteroangular setae

AM = Major anteromarginal setae

PA = Major posteroangular setae

am = minor anteromarginal setae

pm = minor posteromarginal setae

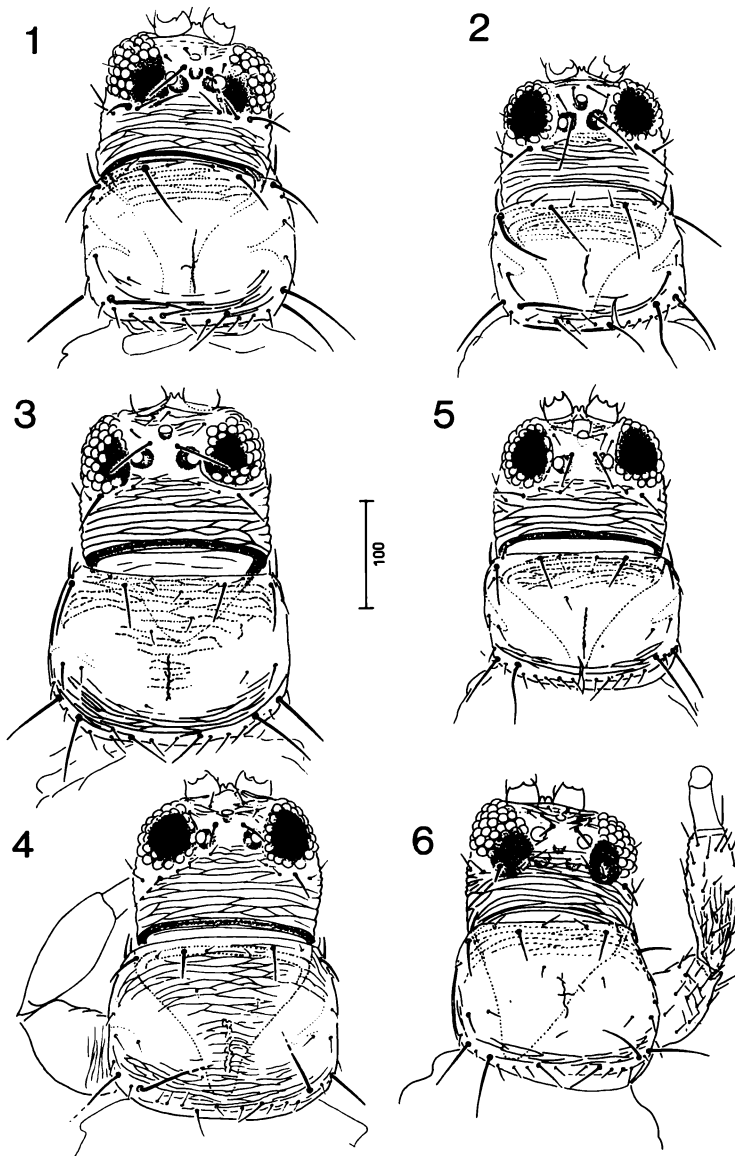
Abdomen

IX i, IX ii, IX iii = Tergite IX major caudal setae; X = Tergite X major subposteromarginal setae.

The *Frankliniella desertleonidum* Watson species assemblage

Diagnosis. Small species (females: 1.2-1.5 mm; males: 0.900-1.0 mm in length) in the *Intonsa* group. Body color predominantly dark chestnut-brown (yellow in tarsi), with abundant orange subhypodermal pigment. Antennal segments III-V yellow, sometimes darker in apex. Fore wings dark chestnut-brown, with two clear transverse bands: one at the base, the other at apex. Ocellar crescents orange to red. Body setae dark brown. Head (Figs. 1-7, 9) broader than long in anterior one half, middle or at base; occiput sculptured with open parallel striae, which become confluent at sides. Postocular setae formula: ii-iii, IV. Compound eyes ellipsoidal, slightly or not protruding. Antennal segments (Figs. 8, 10, 12, 14) typical in the group, III with slightly fungiform pedicel; III-V globose elongate; VI pyriform-elongate. Mouth-cone pointed, shorter to longer than dorsal length of head. Pronotum (Figs. 1-7, 9) smooth to sculptured with faint transverse and confluent striae specially in both anterior and posterior margins and at center. Mesonotum (Figs. 16-19) oblong-hexagonal, with transverse open striae, becoming confluent at sides and center. Metanotal scutum (Figs. 20, 22-23, 25) with fine transverse striae in anterior margin, followed by equiangular to elongate polygons, and fine striae in both sides; median setae pair in anterior margin. Tergite VIII (Figs. 21, 24, 26-27, 30, 32), with a complete posteromarginal comb. Male with a small circular to slightly ellipsoid glandular area in each of sterna II-VII (Figs. 28-29, 31).

Specific differential characters. The following color and morphologic characters are useful in determining species: antennal segments III-VI color. Body size and proportions. The interocellar setae (pair III) length. The pronotal surface and chaetotaxy. The meso- and metanotal size and sculpture. The pterosternum, specially the mesosternal plate.



Figures 1-6

Dorsal views of the head and pronotum of adults from *Frankliniella* spp. 1. *oneillae* Johansen Paratype ♀; 2. *Idem*, Paratype ♂ (head corrected). 3. *oneilleana* sp. nov. Holotype ♀. 4. *brevisaetaoneillae* sp. nov. Holotype ♀ (with left fore leg); 5. *Idem*, Paratype ♂; 6. *zacualtipana* sp. nov. Holotype ♀ (with right leg). Scale in μm , same (400 X) for all figures.

Comments. This species assemblage is different from the others in the Intonsa group, because of the fore wings peculiar color, and the postocular setae formula: ii-iii, IV. The lack of one or more postocular setae is a frequent character in the Minuta group, according to Sakimura and O'Neill (1979).

The five studied species, still have scarce specimens for study. *Frankliniella desertileonidum* Watson was described with only two adult females: Holotype and Paratype; only one subsequent female was added in this study. *Frankliniella oneillae* Johansen has the largest Type series: 10 adults (7 ♀♀, 3 ♂♂), and a subsequent collection of eight females. *Frankliniella brevisaetaeoneillae* is the second species known by adults of both sexes. However, *Frankliniella oneilleana* and *F. zacualtipana* are still known by their adult females.

Relations with others assemblages within the Intonsa group. The *Frankliniella desertileonidum* Watson species assemblage, is different from the other (with dark colored body and fore wings) in the Intonsa group, in the following characters: a) The lack of postocular setae i; b) The fore wings dark brown with two clear transverse bands: basal and apical. The *Frankliniella aurea* Moulton assemblage, also shares the character of lacking the postocular setae i, but it has a yellow body and winged species, more close to the *F. occidentalis* (Pergande) assemblage.

Key for separating the *Frankliniella desertileonidum* and *F. aurea* assemblages within the Intonsa group

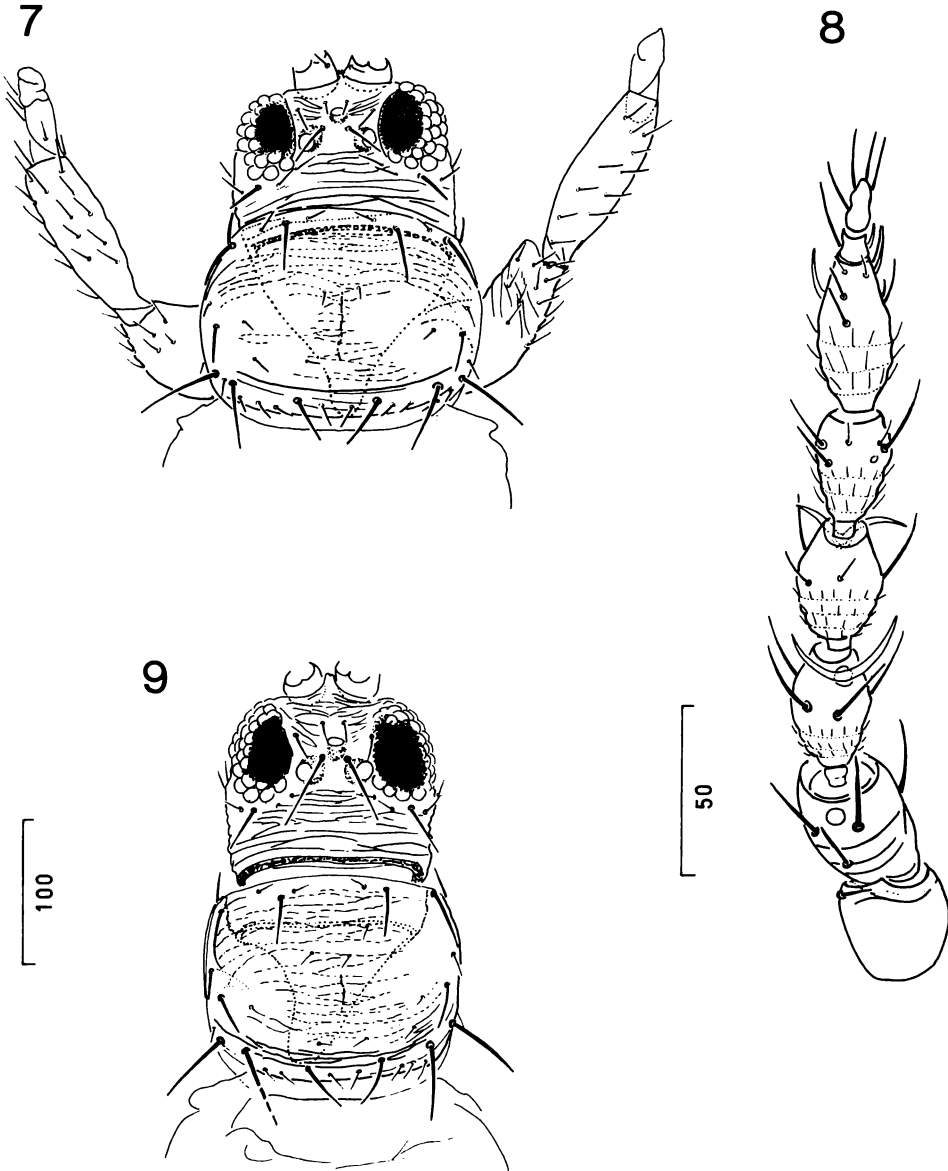
- 1 Postocular setae i wanting (ii-iii, IV, v-vi) 2
- Postocular setae i present (i-iii, IV, v-vi) the other assemblages
- 2 Fore wings and body predominantly clear yellow *F. aurea* assemblage
- Fore wings dark brown, with two clear transverse bands: basal and apical; body dark chestnut-brown *F. desertileonidum* assemblage

TAXONOMIC LIST

- 1. *Frankliniella brevisaetaeoneillae* sp. nov.
- 2. " *desertileonidum* Watson
- 3. " *oneillae* Johansen
- 4. " *oneilleana* sp. nov.
- 5. *zacualtipana* sp. nov.

Key to the species in the *Frankliniella desertileonidum* species assemblage

- 1 Pronotum with a median transverse row of one to four setae, and one or two median subposteromarginal setae 2
- Pronotum without any median transverse and subposteromarginal setae *F. oneillae* Johansen
- 2 Intercellar setae (pair III) very long (4.0 times of an ocellar diameter) 3
- Intercellar setae (pair III) short (0.35-2.3 times of an ocellar diameter) 4



Figures 7-9

Dorsal views of *Frankliniella desertileonidum* Watson. 7. Paratype ♀ head, pronotum and fore legs; 8. *Idem*, right antenna. 9. ♀ head (corrected) and pronotum. Scale in μm , same (400 X) for figures 7, 8; same (1000 X) for figure 9.

- 3 Tergite IX setae IX i-iii longer than tergite VIII. Occipital sculpture strong. Antennal segment III longer than VI *F. oneilleana* sp.nov.
- Tergite IX setae IX i-iii shorter than tergite VIII. Occipital sculpture somewhat faint. Antennal segment III shorter than IV. *F. desertileonidum* Watson
- 4 Anteocellar setae (pairs I-II) shorter than ocelli. Interocellar setae (pair III) reduced (0.35-1.0 times of an ocellar diameter) and almost subequal to postocular IV, both shorter than pronotal posteromarginal ii. Antennal segment VI dark brown with a clear subbasal ring *F. zacualtipana* sp. nov.
- Anteocellar setae (pairs I-II) longer than ocelli. Interocellar setae (pair III) moderately long (2.0-2.3 times of an ocellar diameter), subequal or longer than postocular IV, both much longer than pronotal posteromarginal ii. Antennal segment VI dark brown, clear yellow in basal one third *F. brevisaetaeoneillae* sp. nov.

***Frankliniella brevisaetaeoneillae* sp. nov.**

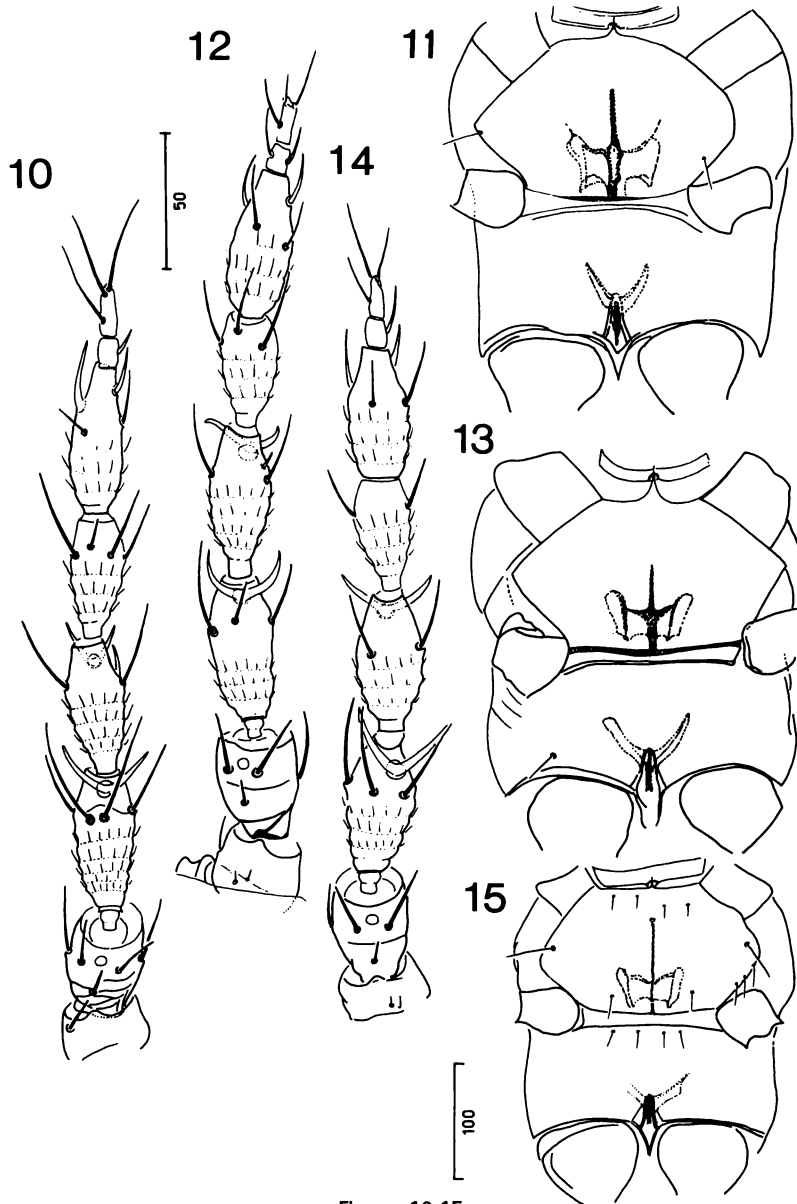
(Figs. 4-5, 11, 14, 20-21, 31-33)

Frankliniella sp. 2 (near *oneillae* Johansen); Johansen & Mojica, 1996: 264.

Female. Body with typical coloration: dark chestnut-brown, except: antennal segments III-V yellowish-white, VI yellow in basal one third, the rest dark brown. Fore tibiae dark brown, lighter in apex. All tarsi yellow. Fore wings dark brown, clear whitish in basal one fifth and apex; hind wings white, with a dark brown median longitudinal vitta. Body setae blackish-brown. Ocellar pigment red. Head in dorsal aspect (Fig. 4), broader (1.5 times) than long at middle, and with convex cheeks; occiput sculptured with parallel open striae, confluent at sides. Chaetotaxy as follows: anteocellars (pairs I-II) slightly longer than ocelli; interocellars (pair III) shorter than postocular IV. Antennal segments (Fig. 14) III-IV slightly shorter than VI. Mouth-cone longer than dorsal length of head. Pronotum (Fig. 4) broader (1.37 times) than long; its surface sculptured with transverse and confluent striae in both anterior and posterior margins and at center; chaetotaxy as follows: major anteroangulars and anteromarginals short: slightly longer than posteromarginals ii; inner posteroangulars longer than outers; median transverse row with one to three; one or two subposteromarginals. Pterothorax; mesonotum (Fig. 18), metanotum (Fig. 23). Tergites VIII-X (Fig. 24), posteromarginal comb in VIII, with shorter microtrichia at middle.

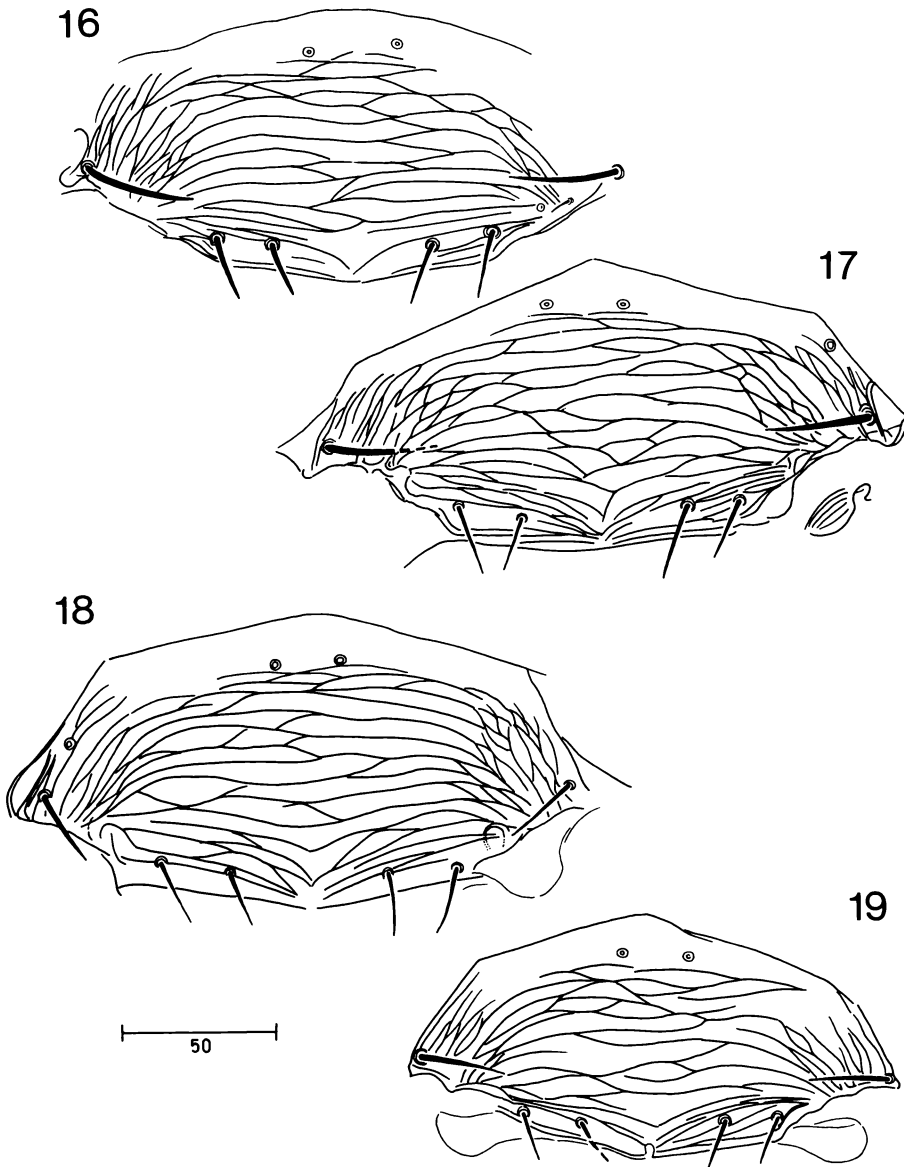
Measurements (Holotype ♀ in μm). Body length: 1.4 mm.

Head dorsal length: 100. Width at eyes: 144, behind eyes: 146, middle: 152, basal: 150. Chaetotaxy, intocc: 20; postoc: ii: 10, IV: 30. Compound eyes, length: 60, width: 46. Ocelli, fore: 10, hind: 14. Antennal segments, length (width): I 22 (28), II 30 (24), III 40 (22), IV 42 (20), V 36 (16), VI 44 (18), VII 8 (6), VIII 12 (4). Thorax; pronotum, length: 134; width at middle: 184. Chaetotaxy, major setae: AA 40, AM 26; PA, outer: 50, inner: 56; minor setae, am: 10; pm i: 12, ii: 30, iii: 10. Mesothorax, width: 220; metathorax, width: 246. Fore wings, width at base: 80, middle: 50; veins chaetotaxy, fore: 20, hind:



Figures 10-15

Dorsal views of right antennae; Figs. 11, 13 & 15 ventral views of pterosterna of adults from *Frankliniella* spp. 10. *oneillae* Johansen Paratype ♀, 11. *Idem*. 12. *oneilleana* sp. nov. Paratype ♀; 13. *Idem*. 14. *brevisaetaeoneillae* sp. nov. Holotype ♀. 15. *desertileonidum* Watson ♀. Scales in μm , same (400 X) for figures 11, 13, 15; same (1000 X) for figures 10, 12, 14.



Figures 16-19

Dorsal views of mesonota of adults from *Frankliniella* spp. 16. *oneillae* Johansen Paratype ♀. 17. *oneilleana* sp. nov. Holotype ♀. 18. *brevisaetaoneillae* sp. nov. Holotype ♀. 19. *desertileonidum* Watson ♀. Scale in μm , same (1000 X) for all figures.

15. Abdomen; width at segment IV: 378. Tergite IX setae, IX ii: 140. Tergite X setae, X i: 116.

Male (Figs. 5, 31-32). Virtually as adult female, but smaller and slender. Pterothorax light brown; fore tibiae are yellow in both ends, whereas middle and hind tibiae only in distal end. Head (Fig. 5) broader in posterior one half; pronotum (Fig. 5) more smooth at center.

Measurements (Paratype ♂ in μm). Body length: 0.900 mm.

Head dorsal length: 100. Width at eyes: 130, behind eyes: 130, middle: 140, basal: 140. Chaetotaxy, intocc: 30; postoc: ii 6, IV 26. Compound eyes, length: 60, width: 40. Ocelli, fore: 10, hind: 12. Antennal segments, length (width): I 20 (24), II 30 (22), III 40 (18), IV 38 (18), V 30 (16), VI 34 (18), VII 10 (8), VIII 12 (6). Thorax; pronotum, length: 120; width at middle: 164. Chaetotaxy, major setae: PA, outer: 50, inner: 60; minor setae, pm i: 12, ii: 28, iii: 12. Mesothorax, width: 190; metathorax, width: 40. Fore wings vein chaetotaxy, fore: 17, hind: 14. Abdomen; width at segment IV: 220. Tergite IX setae, IX i: 26, IX ii: 80.

Material examined: Holotype ♀; paratypes: 3 ♀♀, 1 ♂. MEXICO; NUEVO LEON: Cerro El Potosí (Sierra Madre Oriental), 8 km NW of 18 de marzo, 2200 m.; 26-VII-1977; beating *Pinus* and *Quercus* foliage (A.N. García), in IBUNAM.

Comments. Adults of *Frankliniella brevisaetaeoneillae* sp. nov. and *F. zacualtipana* sp. nov., have the shortest interocellar and postocular IV setae in the assemblage. However, *brevisaetaeoneillae* is a more robust species; the interocellar setae are longer than posteromarginal ii; the antennal segment VI is clear yellow in basal one third; the pronotum is more sculptured. Alternatively, in *zacualtipana* the interocellar setae are very reduced and shorter than posteromarginal ii; the antennal segment VI is dark brown with a clear subbasal ring; the pronotum is smooth at center.

***Frankliniella desertileonidum* Watson**

(Figs. 7-9, 15, 19, 25-26, 33)

Frankliniella desertileonidum Watson, 1942: 45

Frankliniella desertileonidum Watson; Moulton, 1948: 74, 99

Frankliniella desertileonidum Watson; Jacot-Guillarmod, 1974: 743

Frankliniella desertileonidum Watson; Johansen & Mojica, 1996: 264

Frankliniella desertileonidum Watson; Mound & Marullo, 1996: 136

Female redescription based in one Paratype ♀ and one non Type ♀.

Body with typical coloration, except: antenal segments, III completely whitish-yellow or darkened with brown in apical one third; IV yellowish-white; V completely yellow or darkened with light brown in apical one half; VI dark brown with a clear sub-basal ring. Legs; all femora with yellow trochanters; fore tibiae yellow in both ends; hind tibiae yellow in distal end. All tarsi yellow. Fore wings dark brown, clear in basal one fifth and in apical two fifths. Ocellar pigment red. Head in dorsal aspect (Figs. 7, 9) broader (1.26 times) than long at

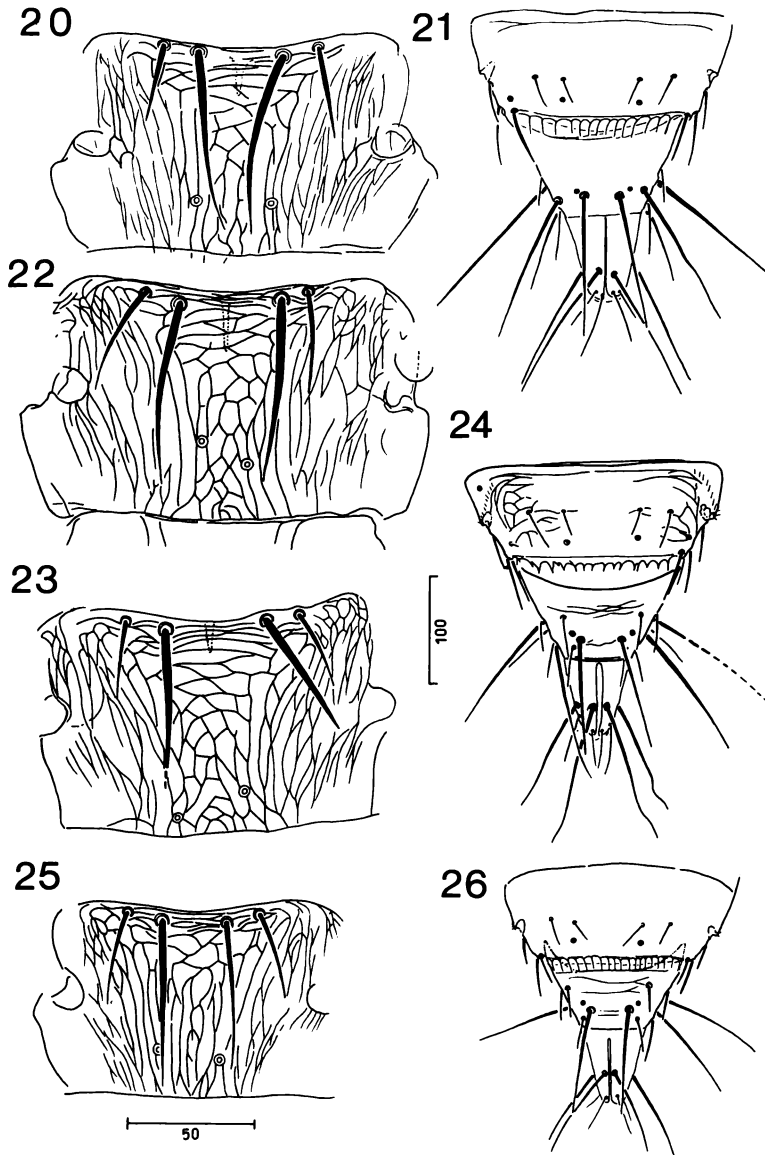
middle, and narrower towards base; occiput sculptured with fine parallel striae, confluent at sides. Chaetotaxy as follows: antecellars (pairs I-II) longer than ocelli; interocellars (pair III) long (3.5-4.0 times of an ocellar diameter). Antennal segments (Fig. 8) IV and VI subequal in length, and shorter than III. Mouth-cone as long as dorsal length of head. Pronotum (Figs. 7, 9) broader (1.23 times) than long; its surface sculptured with fine, transverse and confluent striae; chaetotaxy as follows: anteroangulars longer than anteromarginals; inner posteroangular longer than outer; minor setae: two anteromarginals; a median transverse row of two to three setae; a pair of median transverse subposteromarginals. Pterothorax; mesonotum (Fig. 19), metanotum (Fig. 25); pterosternum (Fig. 15). Abdomen; tergite IX major caudal setae, shorter than tergite VIII (Fig. 26).

Measurements (♀ in μm). Body length: 1.1 (Type)-1.2 mm.

Head dorsal length: 100. Width at eyes: 124, behind eyes: 120, middle: 126, basal: 120. **Chaetotaxy:** intocc: 40; postoc: i-ii: 12, IV 30. Compound eyes, length: 62, width 40; ocelli, fore: 10, hind: 14. Antennal segments, length (width): I 20 (26), II 36 (22), III 44 (18), IV 38 (18), V 32 (16), VI 38 (18), VII 8 (6), VIII 10 (4). Thorax; pronotum, length: 130; width at middle: 160. Chaetotaxy, major setae: AA 30, AM: 28; PA, outer: 46, inner: 50; minor setae, am: 14; pm i: 14, ii: 34, iii: 14. Mesothorax, width: 180; metathorax, width: 220. Fore wings, width at base: 80, middle: 40; veins chaetotaxy, fore: 19, hind: 14. Abdomen; width at segment IV: 240. Tergite IX setae, IX i 86, IX ii: 94. Tergite X setae, X i: 80.

Material examined. Paratype ♀. MEXICO; DISTRITO FEDERAL: Desierto de los leones; 16-VIII-1938; by sweeping herbs (J.R. Watson), in CAS. MORELOS: Sierra de Ajusco, on road Méx-142 (Xochimilco-Oaxtepec), km 48, 2500 m.; 3-V-1985; 1 ♀ in ground litter (*Pinus-Quercus-Arbutus* Forest); (Roberto M. Johansen), in IBUNAM.

Comments. Since the original collection by Watson in 1938, no further specimens were added during the following period of 47 years, until this review. The original description was based in two female adults: Holotype and Paratype. A third adult female was also collected in the Volcanic Range and it was included in this review. As figures (7, 9) show, some variation in the length of the interocellar setae (pair III) is evident. A comparison between the measurements given by Watson (1942) in his original description against the new female, show some variation in the antennal measurements. Watson (*Loc. cit.*) did not included the postocular setae ii-iii in his illustration of the species. *Frankliniella desertileonidum* Watson, is different from the other species in the assemblage, because it is the smallest species. Because of its very long interocellar setae (pair III), it is close to *Frankliniella oneilleana* (in this character both species differ from the pair *F. brevisaetaeoneillae* and *F. zacualtipana*, both bearing the shortest interocellar setae in the assemblage). However, it is different from *F. oneilleana* besides the smaller body size, in the following characters: tergite IX caudal setae IX i-iii are shorter than tergite VIII; the antennal segment III is shorter than VI. Alternatively, *F. oneilleana* is a larger species, with tergite IX caudal setae IX i-iii longer than tergite VIII, and the antennal segment III is longer than VI.



Figures 20- 26

Dorsal views of metanotal scutum; Figs. 21, 24, 26 Dorsal views of tergites VIII-X of adults from *Frankliniella* spp. 20. *oneillae* Johansen Paratype ♀; 21. *Idem.* 22. *oneilleana* sp. nov. Holotype ♀. 23. *brevisaetaoneillae* sp. nov. Holotype ♀; 24. *Idem.* 25. *desertileonidum* Watson ♀; 26. *Idem.* Scales in μm , same (400 X) for figures 21, 24, 26; same (1000 X) for figures 20, 22-23, 25.

***Frankliniella oneillae* Johansen sp. revalidation**

(Figs. 1-2, 10-11, 16, 20-21, 28-29, 33)

Frankliniella oneillae Johansen, 1979: 71 (for 1977!)

Frankliniella oneillae Johansen; Johansen & Mojica, 1996: 264

Frankliniella oneillae Johansen; synonym of *F. desertileonidum* Watson, by Mound & Marullo, 1996: 136.

Material examined. Holotype ♀, Allotype ♂; paratypes: 6 ♀♀, 2 ♂♂. MEXICO; HIDALGO: Meseta de Zacualtipán (Sierra Madre Oriental), 6 km SW of Zacualtipán, 2600 m.; 30-X-1976; on underside of *Senecio roldana* leaves, inside of *Pinus patula* Schl. et Cham. Forest (Roberto M. Johansen), in IBUNAM. *Idem et ibidem*, 3 km S of Zacualtipán, 2050 m.; 21-X-1979; 8 ♀♀ on underside of *Senecio roldana* leaves, inside of *Pinus patula* Schl. et Cham. (Roberto M. Johansen), in IBUNAM.

Comments. Johansen (1979) in his original description of the species, included illustrations of the head, thorax and abdomen from the adults of both sexes; he pointed out the characteristic color of antennal segments III-VI and of fore wings; moreover, the lack of postocular setae i in the head, was illustrated. This is the best known and defined species in the assemblage because of the available adult specimen number of both sexes. Mound and Marullo (1996) synonymized this species under *Frankliniella desertileonidum* Watson. This is a subjective taxonomic decision, due to an excess of generalization judgement of the case.

Frankliniella oneillae Johansen is herein considered as a valid species, because of the following reasons: 1. The larger size and proportions of females: 1.6 mm in *oneillae* vs. 1.1-1.2 mm in *desertileonidum*. 2. The head is not narrowed at base in dorsal outline in *oneillae*, whereas it is in *desertileonidum*. 3. The antennal segments III-VI are longer in *oneillae*. 4. The pronotal surface in *oneillae* is almost smooth (except in fore margin), and almost completely striate in *desertileonidum*. 5. The pronotum of *oneillae* always lacks the median transverse setae row, and the subposteromarginal median pair; in *desertileonidum*, there is a median transverse row of two to three setae, and the median subposteromarginal pair is present. 6. The tergite IX major caudal setae IX i-iii are longer than tergite VIII in *oneillae*, and much shorter than tergite VIII in *desertileonidum*. 7. None of these species are sympatric and synchronic. They occur in different regions: *oneillae* in the Sierra Madre Oriental, whereas *desertileonidum* is a true Neovolcanic species.

***Frankliniella oneilleana* sp. nov.**

(Figs. 3, 12-13, 17, 22, 27, 33)

Frankliniella sp. 1 (near *oneillae*) Johansen & Mojica, 1996: 264.

Female. Body dark chestnut-brown, becoming clearer in abdominal segments I-VII, as well as fore tibiae. Antennal segments: II dark chestnut-brown, yellow in apical one third; III-IV whitish-yellow; V white; VI whitish in basal one half, the rest dark brown. Trochanters and all tarsi yellow. Fore wings dark brown, clear-white in basal one fifth and apical two fifths; hind wings white, with a dark brown median longitudinal vitta. Ocellar crescents red. Body

setae dark brown. Head in dorsal aspect (Fig. 3), broader (1.40 times) than long at middle, but slightly broader at base; cheeks moderately sinuous; occiput sculptured with open and parallel striae, which become confluent at both sides. Antennal segments (Fig. 12), III longer than IV and VI. Mouth-cone shorter than the dorsal length of head. Pronotum (Fig. 3), broader (1.44 times) than long; almost smooth at both sides, but anterior margin with fine transverse and confluent striae, that form a triangle with the vertex towards the posterior margin, which has strong transverse striae; chaetotaxy as follows: major setae, anteroangulars longer than anteromarginals (which are shorter than interocellars); outer posteroangular shorter than inner; minor setae: 2-3 anteromarginals; 2-3 forming a median transverse row; 1-2 or none subposteromarginals. Pterothorax; mesonotum (Fig. 17), metanotum (Fig. 22); pterosternum (Fig. 13) with short mesofurcal spinula. Tergites VIII-X (Fig. 27); tergite IX with major caudal setae IX i-iii much longer than tergite VIII.

Measurements (Holotype ♀ in μm). Body length: 1.4-1.5 mm.

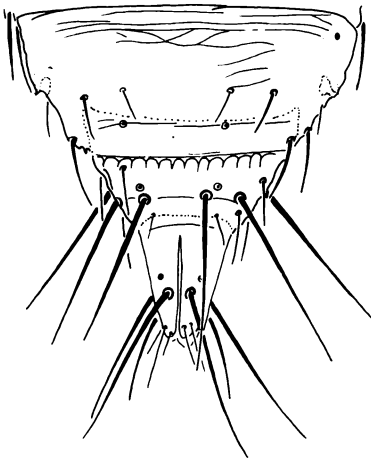
Head dorsal length: 112. Width at eyes: 144, behind eyes: 146, middle: 156, basal: 158.

Chaetotaxy, intocc: 42, postoc: ii-iii 16, IV 34. Compound eyes, length: 60, width: 50. Ocelli, fore: 14, hind: 12. Antennal segments, length (width): I 28 (20), II 24 (30), III 50 (22), IV 44 (20), V 34 (19), VI 46 (18), VII 8 (8), VIII 14 (6). Thorax; prothorax, length: 138; width at middle: 200. Chaetotaxy, major setae: AA 44, AM 32; PA, outer: 38, inner: 66; minor setae, am: 10; pm i: 14, ii: 30-32, iii: 16. Mesothorax, width: 230; metathorax, width: 300. Fore wings, width at base: 90, middle: 46; veins chaetotaxy, fore: 16, hind: 14. Abdomen; width at segment IV: 360. Tergite IX setae, IX i: 110, IX ii: 122. Tergite X setae, X i: 120.

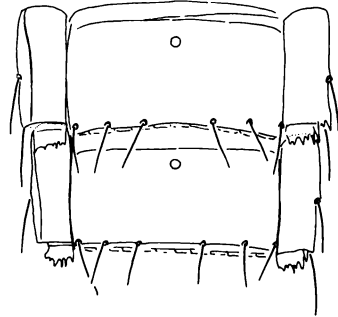
Material examined. Holotype ♀, Paratype ♀. MEXICO; VERACRUZ: Sierra Madre Oriental-Volcanic Range, on road Méx-150, km 124, 1990 m.; 21-I-1977; by beating herbaceous inside of *Quercus-Pinus* Forest (Ernesto Barrera), in IBUNAM.

Comments. *Frankliniella oneilleana* sp. nov., is different from the adults of *F. oneillae* Johansen, because in the last species the pronotum lacks completely the median transverse setae row and the median subposteromarginal setae pair. From the adults of *F. brevisaetaeoneillae* and *F. zacualtipana*, because in these species the head is narrower at base, and the interocellar setae (pair III) are short, whereas in *F. oneilleana* the head has a broad base, and the interocellar setae are longer than major pronotal anteroangular and anteromarginal setae. Finally, *F. desertileonidum* Watson is a much smaller species than *F. oneilleana* with different antennal segment VI color (white in basal one half, whereas in *F. desertileonidum* is dark brown, with a clear sub-basal ring). The antennal segments III-VI are longer in *F. oneilleana*, as well as the tergite IX major caudal setae IX i-iii which are much longer than tergite VIII; in *F. desertileonidum*, the antennal segments are shorter, as well as the tergite IX major caudal setae IX i-iii which are shorter than tergite VIII. Etymology this species (as well as *F. brevisaetaeoneillae*) is named honouring the great Northamerican thysanopterist Dr. Kellie O'neil formerly in the U.S. Department of Agriculture.

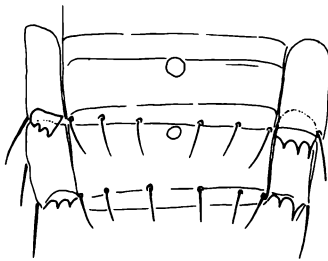
27



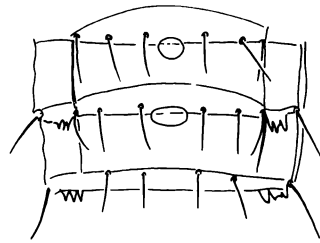
28



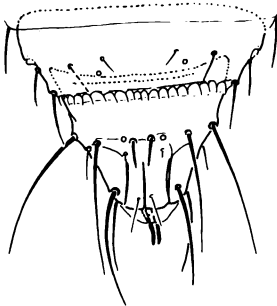
31



29

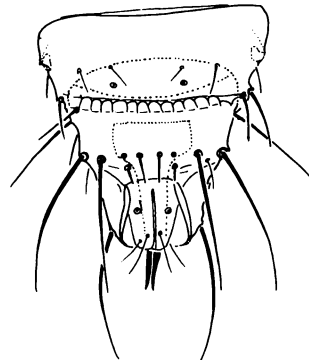


32



30

100



Figures 27- 32

Dorsal views of tergites VIII-X; Figs. 28-29, 31 ventral views of male sternite VI-VII each showing the glandular area. 27. *oneilleana* sp. nov. Holotype ♀. 28. *oneillae* Johansen Allotype ♂; 29. *Idem*, Paratype ♂; 30. *Idem*, Paratype ♂. 31. *brevisaetaeoneillae* sp. nov. Paratype ♂; 32. *Idem*. Scale in μm , same (400 X) for all figures.

Frankliniella zacualtipana sp. nov.

(Fig. 6, 33)

Female. Body color dark chestnut-brown, with abundant orange subhypodermal pigment, except: antennal segments, II dark brown, yellow in apical end; III yellow; IV yellow, light brown in apical one third; V yellow, light brown in apical one half; VI yellow in basal one sixth, the rest dark brown. Fore tibiae yellowish-brown, darker in both sides and basal third; all trochanters and tarsi yellow. Fore wings dark brown clear-white in basal one fifth and apical one third; hind wings white, with a dark brown median longitudinal vitta. Ocellar pigment orange. Body setae brown. Head in dorsal aspect (Fig. 6), broader (1.58 times) than long at middle, narrower towards base. Chaetotaxy as follows: antecellars (pairs I-II) shorter than ocelli; interocellars (pair III) very reduced (1.0-1.3 times of an ocellar diameter), subequal to postocular IV, but shorter than pronotal posteromarginal ii. Antennal segments (like in Fig. 8): longer than IV-VI. Mouth-cone almost reaching posterior margin of prosternum, and much longer than the dorsal length of head. Pronotum (Fig. 6), broader (1.37 times) than long; its surface almost smooth, but sculptured with transverse and confluent striae in anterior and posterior margins; chaetotaxy as follows: anteroangulars slightly longer than anteromarginals; outer posteroangular shorter than inner; minor setae: two anteromarginals; four forming a curved transverse row; 1-2 median subposteromarginals. Pterothorax; mesonotum (like in Fig. 17); metanotum (like in Fig. 23); pterosternum (like in Fig. 13). Tergites VIII-X (like in Fig. 24); tergite IX with major caudal setae IX i-iii longer than tergite VIII.

Measurements (Holotype ♀ in μm). Body length: 1.5 mm.

Head dorsal length: 86. Width at eyes: 132, behind eyes: 130, middle: 136, basal: 130. Chaetotaxy, intocc: 10-16, postoc: ii-iii 14, IV 26. Compound eyes, length: 56, width: 46. Ocelli, fore: 10, hind: 12. Antennal segments, length (width): I 26 (26), II 36 (22), III 50 (20), IV 40 (22), V 30 (16), VI 42 (18), VII 8 (8), VIII 14 (6). Thorax; prothorax, length: 122; width at middle: 168. Chaetotaxy, major setae: AA 30, AM 24; PA, outer: 40, inner: 50; minor setae, am: 12; pm i: 12, ii: 28, iii: 10. Mesothorax, width: 200; metathorax; width: 240. Fore wings, width at base: 50, middle: 40; veins chaetotaxy, fore: 19, hind: 15. Abdomen; width at segment IV: 306. Tergite IX setae, IX i: 94, IX ii: 116. Tergite X setae, X i: 112, X ii: 92.

Material examined. Holotype ♀. MEXICO; HIDALGO: Sierra de Zacualtipán (Sierra Madre Oriental), Ixtlahuaco, 1480 m.; 11-V-1980; by beating herbaceous (including compositae and umbelliferous) in orchard (Roberto M. Johansen), in IBUNAM.

Comments. See comments in *Frankliniella brevisaetaeoneillae*. *F. zacualtipana* sp. nov., is the only species in the assemblage with very short antecellar setae (pairs I-II), which are shorter than ocelli, but also the very reduced interocellar setae (pair III) is distinctive. Etymology: from Nahuatl language, Tzacualtipan, tzacualli = cloister; pan = in, upon "upon the cloister"; from latin, ana = feminine.

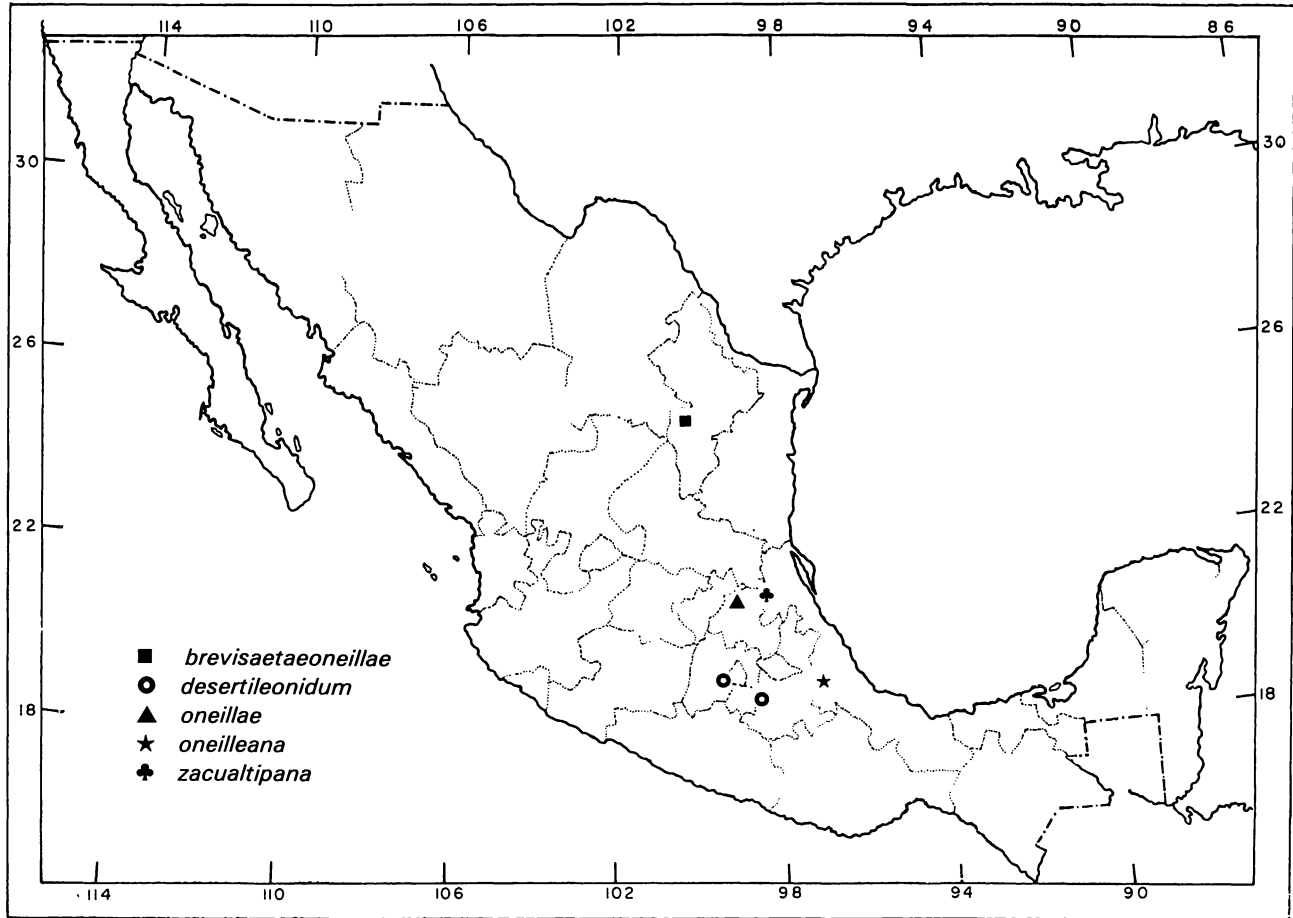


Figure 33
M A P

Geographic distribution. The *Frankliniella desertileonidum* species assemblage, has a recent distribution in Mexico, in two main regions (Fig. 33) as follows: a) Sierra Madre Oriental (1500-2600 m.) four species: *F. brevisaetaeoneillae* sp. nov., *F. oneillae* Johansen, *F. oneilleana* sp. nov. and *F. zacualtipana* sp. nov. b) Volcanic Range (2500 m.) one species: *F. desertileonidum* Watson.

Some ecologic data. Up to the present time, only adults of the species in the *Frankliniella desertileonidum* Watson assemblage are known. They live in *Quercus-Arbutus-Pinus* Forest litter, in herbaceous or, in the underside of *Senecio roldana* leaves, where they make many punctures, which become extensive damaged areas.

ACKNOWLEDGEMENTS

The author is very grateful, to the following colleagues and institutions for their participation in this work: Dr. Vincent F. Lee, Department of Entomology, California Academy of Sciences, San Francisco, California, United States of America, for the kind loan of the *Frankliniella desertileonidum* Paratype. From the Instituto de Biología, UNAM.: Ernesto Barrera-Vargas for his collection of *F. oneilleana* material, in Veracruz. Alfonso N. García, for his collection of *F. brevisaetaeoneillae* material, in Nuevo León. Aurea Mojica-Guzmán for all her kind support in field and laboratory work.

LITERATURE CITED

- Bryan, D.E. & R.F. Smith, 1956. The *Frankliniella occidentalis* (Pergande) Complex in California (Thysanoptera: Thripidae). *University of California Publications in Entomology*, 10: 359-410.
- Hood, J.D. 1925. New species of *Frankliniella* (Thysanoptera). *Bulletin Brooklyn Ent. Soc.*, 80 (2): 71-82 + plate.
- Jacot-Guillarmod, C.F. 1974. Catalogue of the Thysanoptera of the World (part 3). *Annals Cape Prov. Mus. (nat. Hist.)*, 7 (3): 317-976.
- Johansen, R.M. 1979. Una nueva especie mexicana de *Frankliniella* Karny (Thysanoptera: Thripidae), de la Sierra Madre Oriental. *Anales Inst. Biol. Univ. Nac. Autón. México, Ser. Zool.*, 49 (1): 227-280 (for 1977 !)
- Johansen, R.M. & A. Mojica-Guzmán, 1996. *Thysanoptera*. In: *Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacia una síntesis de su conocimiento*. Eds. J. Llorente, A.N. García & E. González-Soriano. Instituto de Biología, Facultad de Ciencias, UNAM. & Comisión Nacional para el conocimiento y uso de la Biodiversidad, México: 245-273.
- Karny, H.H. 1910. Neue Thysanopteren der Wiener Gegend. *Mitt. Nat. Ver. Univ. Wien*, 2: 41-57.
- Mayr, E. & P.P. Ashlock, 1991. *Principles of Systematics Zoology*, 2nd Ed. Mc Graw-Hill, Inc., New York: 475 pp.

- Moulton, D.** 1948. The genus *Frankliniella* Karny, with keys for the determination of species (Thysanoptera). *Revista de Entomología (Rio de Janeiro)*, 19 (1-2): 55-114.
- Mound, L.A. & R. Marullo**, 1996. *The thrips of Central and South America: An Introduction (Insecta: Thysanoptera)*. Memoirs on Entomology International, Vol. 6. Associated Publishers, Gainesville, Florida, 487 pp.
- Sakimura, K. & K. O'Neill**, 1979. *Frankliniella*, redefinition of genus and revision of Minuta Group species (Thysanoptera: Thripidae). *United States Department of Agriculture, Tech. Bull: No. 1572*: 1-49.
- Watson, J.R.** 1942. Two new *Frankliniella* from Mexico (Thysanoptera). *The Florida Entomologist*, 25 (3): 43-46.

Recibido: 10 de noviembre 1997

Aceptado: 11 de mayo 1998