# The Confused Identity of Frankliniella williamsi (Thysanoptera: Thripidae)

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# The confused identity of *Frankliniella williamsi* (Thysanoptera: Thripidae)

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**Abstract**

Details of the variation in the pronotal chaetotaxy among the type specimens of *Frankliniella williamsi* Hood and *Frankliniella spinosa* Moulton (Thysanoptera: Thripidae) are provided. We reject the recent revalidation of *F. spinosa* and conclude that the corn thrips, *F. williamsi,* is a single, variable species.

Key Words: taxonomy; chaetotaxy; variation

**Resumen**

Se provee detalles de la variación en la quetotaxia del pronoto entre los especímenes tipo de *Frankliniella williamsi* Hood y *Frankliniella spinosa* Moulton (Thripidae Thysanoptera). Rechazamos la reciente revalidación de *F. spinosa* y concluimos que el trips del maíz, *F. williamsi*, es una sola especie variable.

Palabras Clave: taxonomía; quetotaxia; variación

Identifications provided by taxonomists underpin all biological studies, from morphology and physiology to ecology and conservation, and are particularly important when pests and disease vectors are involved. However, the value of this service is diminished if the taxonomy of the species concerned is unclear or based on insufficient data. One recent example involves the corn thrips, *Frankliniella williamsi* Hood (Thysanoptera: Thripidae), that breeds particularly on the leaves of the major crop plant *Zea mays* L. (Poaceae). This thrips is widespread in the USA, Central and South America at least as far south as Bolivia (Nakahara 1997), and in the Pacific from the Hawaiian Islands (Mound et al. 2016) to Southeast Asia and Australia (Moritz et al. 2009). In Hawaii, this pest has caused up to 100% loss of seed production, particularly through direct feeding damage to seedlings (Mau & Gusukuma-Minuto 1999). Moreover, it is one of several insects that vector Maize chlorotic mottle virus, which causes a serious disease on field corn crops in Hawaii (Cabanas et al. 2013), and it has also been associated with viruses affecting maize in Kenya (Wangai et al. 2012).

The claim by Johansen-Naime et al. (2013) that 2 distinct species are confused under the name *williamsi* thus has considerable economic implications. Hood (1915) described *williamsi* from 110 females and 24 males, collected from "Indian corn" in the vicinity of Washington DC, USA, between 31 Oct and 3 Nov 1914. Subsequently, Moulton (1936) described *Frankliniella spinosa* from 3 females and 2 males from corn at Cajeme, Mexico, on 10 May 1924, but Moulton (1948) subsequently synonymized the 2 species. Johansen-Naime et al. (2013) revalidated the original taxonomic designation of *spinosa* based on morphological differences, but reported that the 2 species coexist and reproduce on corn at sites in Mexico. That such 2 closely related species should share the same ecological space suggests that there are unresolved taxonomic concerns, and therefore the basis on which the decision to re-validate species status was re-examined.

## Structural Characters Used

Johansen-Naime et al. (2013) distinguished the 2 species on the basis of the following characters:

*Length of ocellar setae pair III*: The distinction between *spinosa* and *williamsi* was given by Johansen-Naime et al. (2013) as "interocellar setae" either 3–4 or 5–6 times the diameter of the posterior ocellus, respectively. However, the authors did not indicate whether they based this ratio on the transverse or longitudinal diameter of an ocellus, and in most slide-mounted specimens these diameters are commonly 10 microns and 15 microns, respectively. The ocellar setae pair III (interocellar setae) are approximately 50 microns long, but they stand erect on the dorsal surface of the head, and in slide-mounted specimens are displaced at an angle to the vertical (Fig. 1). In general, it is not possible to measure setal length with sufficient precision that it can be used as a ratio, especially in the case that the ocellar diameter was not defined.

*Pronotal subposteromarginal setae*: One or 2 pairs of setae that occur posteromedially on the pronotum of *Frankliniella* species (Fig. 1). Johansen-Naime et al. (2013) stated that in *williamsi* only 1 pair of pronotal subposteromarginal setae is present, whereas in *spinosa* 2 pairs are present. This distinction was based on a study of the type series of *spinosa*, 3 male and 3 female paratypes of *williamsi*, and a large number of specimens from Mexico. The number and position of these setae is a critical part of the claim that the species are distinct, and Johansen-Naime et al. (2013) further claimed that there is no variation in setal arrangement, with the presence of 1 pair or 2 pairs consistent. However, this is contrary to the experience of the present authors, in which intraspecific variation in the position and number of subposteromarginal pronotal setae is common in *Frankliniella* species; therefore, the entire type series of *williamsi* and *spinosa* was re-examined.

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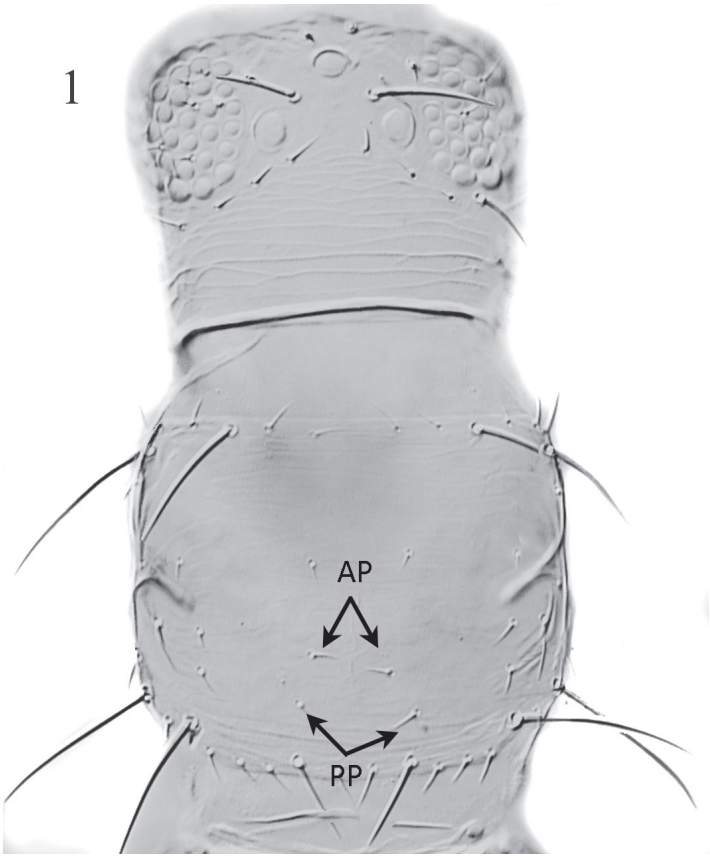


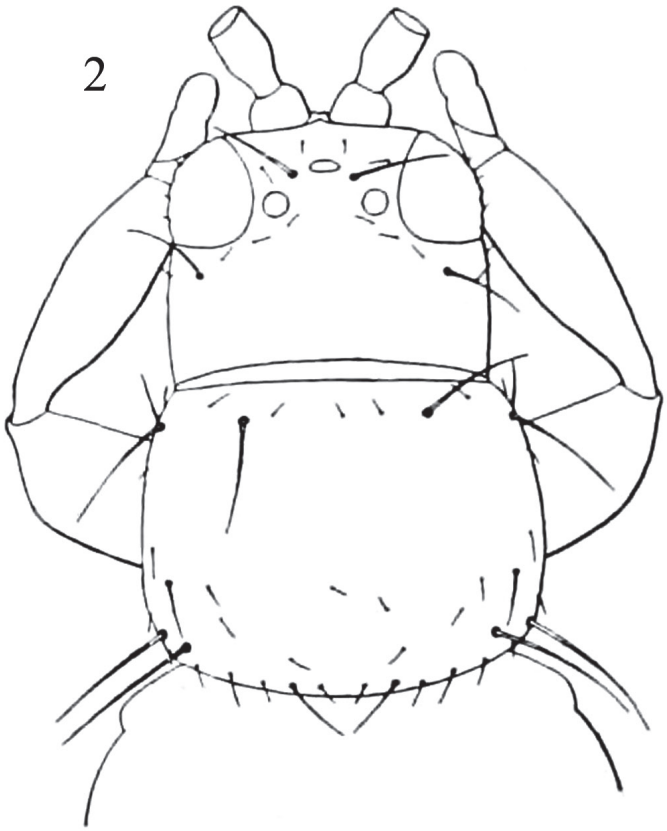


**Figs. 1 and 2**. *Frankliniella williamsi*, head and pronotum. **1**. Female from Queensland, Australia; arrows indicate anterior (AP) and posterior (PP) pronotal subposteromarginal pairs of setae. **2.** Original illustration from Hood (1915).

## Results

The setal patterns of the specimens examined are shown in Table 1. The slide-mounted holotype female of *spinosa* is poor, and an anterior pair of setae is not visible due to a transverse fold in the integument at that point. The "allotype" male of *spinosa* has 1 seta of the anterior pair, and although 1 paratype has all 4 setae, the remaining 3 paratypes have varied combinations (E, G, I in Table 1). The holotype of *williamsi* has an asymmetric arrangement, with 1 seta of the anterior pair present, and the paratypes show a wide range of patterns in the arrangement of the 2 pairs of setae. Ten specimens in the series have only the posterior pair, 40 have all 4 setae present, and 14 have all 4 setae absent.

## Conclusions

Johansen-Naime et al. (2013) stated of *williamsi* that "en el pronoto solo existe un par medio de sedas sub-posteromarginales, este hecho fue illustrado por Hood (1915)" [on the pronotum, there exists a single pair of subposteromarginal setae, as was illustrated by Hood (1915)]. However, the illustration provided by Hood (1915) actually shows 4 such setae (Fig. 2), and the original specimens from which Hood described *williamsi* exhibit a combination of states of the 2 pairs of setae. As the number and position of both the anterior and posterior pairs of subposteromarginal setae is variable amongst the type series of both *williamsi* and *spinosa*, we conclude that there is insufficient

**Table 1.** Pattern of presence (X) or absence (0) of subposteromarginal setae (Pspm) pair 1 and pair 2 from the type series of *Frankliniella williamsi* and *F. spinosa*. Number of specimens examined: *F. williamsi* = 103; *F. spinosa* = 6. Questionable combination due to a fold in the integument where pair 1 should be is indicated by *.

| Character Combination | A | B | | C | D | | E | F | G | | | | H | | I | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pspm Pair 1 | XX | XX | XX | XX | 0X | X0 | 00 | 00 | 0X | 0X | X0 | X0 | X0 | 0X | 00 | 00 |
| Pspm Pair 2 | XX | X0 | 0X | 00 | XX | XX | XX | 00 | 0X | X0 | 0X | X0 | 00 | 00 | X0 | 0X |
| Holotype of *williamsi* | | | | | | 1 | | | | | | | | | | |
| "Allotype" of *williamsi* | | | | | 1 | | | | | | | | | | | |
| Holotype of *spinosa* | | | | | | | 1* | | | | | | | | | |
| "Allotype" of *spinosa* | | | | | 1 | | | | | | | | | | | |
| Paratypes of *williamsi* (*n* = 101) | 40 | 6 | 2 | | 8 | 5 | 10 | 14 | 4 | 2 | 2 | 0 | 1 | 1 | 1 | 3 |
| Paratypes of *spinosa* (*n* = 4) | 1 | | | | | | 1 | | | | 1 | | | | 1 | |
| Total of each combination | 41 | 6 | 2 | | 10 | 6 | 12 | 14 | 4 | 2 | 3 | 0 | 1 | 1 | 2 | 3 |

morphological evidence to conclude that the specimens represent 2 species, and that there is only a single species of corn thrips.

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