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Scirtothrips menai sp. n., a new species from Costa Rica, Central America (Thysanoptera, Terebrantia, Thripidae).

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Abstract: The genus *Scirtothrips* Shull 1909 is characterized by small, pale, active thrips with no more than 1500 µm in length that feed generally on young leaves. Most species feed on a few host plants, while others are polyphagous, and they can be serious pests of a variety of unrelated economical crops. The new species described here has the intercellular setae in position 1/2, pmII longer than I and III and pronotal striae widely separated as in *S. longipennis* Bagnall 1909 and *S. bounites* Mound & Marullo 1996, but different in several other characters as the antennal pattern of colour, the head colour, the striae in vertex, the striae between ocelli, the striae in pronotum, the development of the tergal medial pair of setae and the number of rows of microtrichia in abdominal tergal lateral thirds.

Key words: Thysanoptera, Thripidae, thrips, ultrastructure, *Scirtothrips menai*, new species, Costa Rica.

Resumen: *Scirtothrips menai* sp.n., una nueva especie de Costa Rica, América Central (Thysanoptera, Terebrantia, Thripidae). El género *Scirtothrips* Shull 1909 se caracteriza por thrips de pequeño tamaño, activos y de colores pálidos, con no más de 1500 µm de longitud que se alimentan generalmente de hojas jóvenes. La mayor parte de las especies se alimentan de unas pocas plantas hospederas, mientras que otras son polífagas, y pueden ser plagas importantes en una serie de cultivos de interés económicos no muy relacionados entre sí. La nueva especie descrita en este trabajo presenta las setas interocelares en posición 1/2, pmII más larga que la I y la III y las estrías del pronoto ampliamente separadas como en *S. longipennis* Bagnall 1909 y *S. bounites* Mound & Marullo 1996, pero se diferencia en una serie de caracteres como el patrón de coloración de la antena, el color de la cabeza, la región estriada en el vertex, las estrías entre los ocelos, las estrías del pronoto, el desarrollo de las setas tergaes mediales y el número de hileras de microtrichias en los tercios laterales de los tergos abdominales.

Palabras clave: Thysanoptera, Thripidae, thrips, ultraestructura, *Scirtothrips menai*, nueva especie, Costa Rica.

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Introducción

The genus *Scirtothrips* Shull 1909 is characterized by small, pale, active thrips with no more than 1500 µm in length that feed generally on young leaves. The majority of species feed on a few host-plants, others are polyphagous, and they can be serious pests of a variety of unrelated economical crops (Hoddle & Mound 2003). About 100 species are included in this genus with endemic ones in temperate and tropical areas (Johansen & Mojica-Guzmán 1998). Including 32 new species attacking *Persea americana* Mill. (avocado) and *Mangifera indica* L. (mango) have been described from Mexico (Johansen & Mojica-Guzmán 1998).

Species in this genus are economically important because several of them are serious agricultural pests of unrelated crops. They have demonstrated high invasive potential, and they are a

serious quarantine concern for many countries (Morse & Hoddle 2006). Non-pestiferous native species are of interest from the standpoints of biodiversity and evolutionary relationships with endemic host plants. Given the wide distribution of *Scirtothrips* species and the various biological features of this group, there is a recent high interest in understanding the validity of taxonomic characters used for separating species (Rugman-Jones *et al.* 2006). In this paper a new species from the highlands of Costa Rica associated with Ericaceae plants is described and illustrated.

***Scirtothrips* from Costa Rica**

Mound & Marullo (1996) described seven new species of *Scirtothrips* from Costa Rica. These authors suggested the possibility of several new species in this genus. Data collections do not indicate the presence of many more new species despite having sampled over 80 different host plants in the last 20 years, some monitored for several years, through the development of research projects at the University of Costa Rica and the National University.

Many previously described species in this genus are difficult to recognise because the type material is not in appropriate conditions for observation (Mound & Marullo 1996). Some new species described from material collected in Costa Rica are not very well prepared for observation as in the case of *S. astrictus* Mound & Marullo 1996. This species that is only known from the holotype remains a taxonomic problem. Hoddle *et al.* (2002) consider that in Costa Rica there is a new species of *Scirtothrips* replacing ecologically *S. perseae* Nakahara, 1997 from the North. However, other authors believe that it is a new species (Hoddle *et al.* 2002). The morphology of the Costa Rican populations is not consistent with either species.

Mound & Marullo (1996) recorded 10 species from Costa Rica and seven of these were described as new species by these authors. Two big groups of species are segregated by the position of the interocellar setae. The species *oligochaetus* (Karny, 1926) and *astrictus* present these setae between the posterior ocelli and the others further forward. This last condition has two important variants: 1) interocellar setae wide apart (position 1/2, on the anterior margin of the ocellar triangle) and 2) interocellar setae close together. In the first case are recorded two species, *longipennis* (Bagnall, 1909) and *bounites* Mound & Marullo, 1996, and in the second group, the rest. The species *oligochaetus* and *longipennis* have never been recorded from Costa Rica, and *astrictus* and *bounites* were described by Mound & Marullo (1996) from material collected in Costa Rica. Another character used by these authors is the shape of posterior cilia that can be wavy or straight. Species as *euthyntus* Mound & Marullo, 1996 and *pteridis* Mound & Marullo, 1996 have the posteromarginal cilia of the fore wing straight. Species *bounites*, *manihoti* (Bondar, 1924), *ikelus* Mound & Marullo, 1996, *panamensis* Hood, 1935, *abditus* Mound & Marullo, 1996, and *lumarius* Mound & Marullo, 1996 all of them have the cilia wavy. The posteromarginal (pm) setae is another important character, the pmII well developed is recorded in *oligochaetus*, *euthyntus* and *bounites*. Other characters as the colour pattern, the number of rows and the number of setae in microtrichia fields, as the position and development of the abdominal tergal setae are characters used in the separation of species.

The new species described here has the interocellar setae in position 1/2, pmII longer than I and III and pronotal striae widely separated as in *longipennis* and *bounites*, but differs by several characters as the antennal colour pattern, the head colour, the striae in vertex and among ocelli, as the striae in pronotum, the development of the tergal medial pair of setae and the number of rows of microtrichia in abdominal tergal lateral thirds.

Materials and methods

Collect site. Volcán Irazú, 500 m from the principal crater, in West slope. On Ericaceae flowers, February 2009.

Specimens. Mounted in Hoyer medium. Material is deposited in the Colección de Thysanoptera, CIEMIC, UCR, San Pedro de Montes de Oca, San José, Costa Rica and the IBUNAM, México, México D.F.

The present description uses the nomenclature of morphological features proposed by Bhatti (1989).

Other material examined: four paratypes of the species *Scirtothrips bounites*.

SEM methodology. One adult female specimen was prepared for scanning electron microscopy (SEM) analysis. The methodology used is described by Sánchez-Monge *et al.* (2014) for treatment of microarthropod samples for ultrastructural observation at CIEMIC, UCR.

Optical methodology. A stereoscopic microscope Olympus SZ61 was used for mounting and preliminary identification of specimens. The slides prepared were clarified and observed with a binocular microscope Nikon SKe with micrometre. An Olympus IX51 was used for obtaining digitized images, for which the DP Controller programme was used to obtain digital images, and the Helicon Focus programme was used for photographs for publication.

Abbreviations used. CIEMIC: Centro de Investigación en Estructuras Microscópicas. UCR: Universidad de Costa Rica. CT: Colección de Thysanoptera. pm: posteromarginal setae. SEM: scanning electron microscopy.

Taxonomic section

Scirtothrips menai sp. nov. (Figs. 1-16)

Type locality. Volcán Irazú, Cartago, Costa Rica, 3432 m.

Type material.

Holotype: ♀ macropterous, Costa Rica, Cartago, Volcán Irazú (09°58'55"N, 83°50'57"O), lateral slopes near the principal crater, on Ericaceae leaves, 28-II-2008. Col. Axel P. Retana-Salazar (ARS 1208).

Paratypes: 2♀♀, same data as the holotype. 1 deposited in Colección de Thysanoptera (CT), Centro de Investigación en Estructuras Microscópicas (CIEMIC), Universidad de Costa Rica (UCR). 1 deposited in Collection of Thysanoptera of Mexico, IBUNAM.

Description.

Colour: Pale brown, ocellar crescent red, antennal segments dark brown (Fig. 1), wings shaded with brown, antecostal ridge dark brown in tergites but not in sternites, without tergal dark markings in abdominal segments or in the pronotum. Ommatidia colourless. Major setae dark brown. (Figs. 1-6).

Head: Wider than long. With striated sculpture. Ocellar triangle slightly sculptured and without reticulations, interocellar setae anterolateral to ocellar triangle, in position 1/2 (Figs. 3-4, 7-9). Postocular setae I 1,8-2 times as long as setae II (Figs. 3-4, 7-9). Mouth cone short and strong between coxae I.

Pronotum: Striae widely separated. Setae pmII at least 2,5 times as long as setae pmI and pmIII. Anteromarginal setae medial pair well developed. Discal setae well developed in two rows: first row with 6-7 setae, second row with 2 setae (Figs. 3-4, 8-9).

Mesonotum: Striae widely separated (Fig. 9). Three pairs of setae: one medial, one submedial, and one lateral pair. Submedial pair 1,2-1,3 times the distance between the medial setae wide apart. Lateral setae scarcely before the medial pair.

Metanotum: Metanotum apparently smooth in lateral thirds, lateral sculpture longitudinal reticulated and reticulated in the middle. Median setae arising at anterior margin (Fig. 10).

Wings: Forewing clavus with 3 veinal setae, second vein with 4 setae. First vein with 3 basal setae. Posterior cilia slightly wavy (Figs. 12, 15).

Abdomen (Figs. 11-14). Tergites IV-V with the median setae more than a third as long as the tergite length (Fig. 5). Distance between their bases scarcely the diameter of the setal socket (Fig. 4). Lateral microtrichial fields with 3 setae, pair I & II subequal in length. Lateral microtrichial field with 11-12 rows of microtrichias (Fig. 16). Tergite VIII without discal microtrichia medially, IX with many discal microtrichia, X with a median band of microtrichia. Sternites with microtrichia extending just mesad of setae B2. Sternites with two pairs of lateral discal setae in segments II-VI. Lateral apophysis of the ovipositor strongly developed (Fig. 5). Teeth of the marginal comb on tergum VIII long and regular, medial teeth 12-13 μm .

Measurements (holotype ♀ in μm): Body length 1200. Head length 100, width 175, postocular setae: I 22,5; II 12,5; III 17,5; IV 15; V 15; VI 12,5. Pronotum length 90, width 235. Anteromarginal setae: amI 25; am II 20; aa 15. Posteromarginal setae: pmI 25; pmII 60; pmIII 25; pmIV 15; pa 17,5. Pronotal discal setae 17-20. Mesonotal median setae 25; submedian 15-17,5; lateral 17,5. Metanotal median setae 32,5; external metanotal setae 32,5. Forewing length 810. Tergite V median setae length 25, distance between bases 5. Antennal segments I 22,5; II 35; III 47,5 (antennomeres 37,5; pedicel 5; collar 5); IV 40; V 40; VI 45; VII 7,5; VIII 12,5.

Variability in SEM and optical observations.

Studying insects like thrips with SEM, characters are showed more clearly as ornamentation. The SEM allows higher powers and detailed studies of the surface as in the case of *S. menai* sp. nov. where it is possible to determine the structure of the decorations, and chaetotaxy precisely, to observe details that are not readily observed in very small organisms with optical microscopy tools. However, the SEM measures should be treated with caution. Traditionally measurements were carried out on specimens prepared for optical observation, in which the preparation of specimens partially distorts the structure, altering the measurements obtained with respect to those made in SEM. This variation must be taken into account, therefore, in order to avoid confusion respect to the comparative material the measurements presented here have been taken in the mounted specimens for optical study.

Etimology.

Dedicated to Alexis Mena, friend and companion of the administration section who makes possible the advance of our research projects through his timely management.

Discussion.

The characters of this species place it close related with *longipennis* and *bounites*. Both of them have medial setae in abdominal terga close together and long, with wavy cilia. The species *longipennis* differs in the length of pmII is at most 30 μm and medial setae in V tergum at most 15 μm while the new species the pmII measures 60 μm and medial setae in V tergum measures 25 μm . Moreover many of the proportions as chaetotaxia are very similar to *bounites*, but differs from it in having poI very long more than 1,5 times the poII, the antennal colour is dark brown in segments II-VIII becoming darker towards the distal segments. The description of *bounites* is brief and absent of important morphological details and without good figures (Figs. 17-20). The four paratypes reviewed of this species have established other characters apart from the colour that allow to separate *bounites* from the new species described in this paper. These differences are the length of the discal setae, 10-13 μm in length in *bounites*, lateral fields of the abdominal terga with 9 lines of microtrichia, the medial marginal comb of the VIII tergum with long medial teeth with 15 μm in length.

Key to *Scirtothrips* species from Costa Rica (Adapted from Mound & Marullo 1996)

- | | |
|---|---------------------|
| 1a) Ocellar setae III in position 4, between the posterior ocelli, forewing cilia wavy, pmI, pmII and pmIII subequal in length, metanotal median setae arise at anterior margin, tergites III-V with 3 setae on lateral microtrichial areas, tergite IX without discal microtrichia, tergal antecostal ridges dark..... | <i>strictus</i> |
| 1b) Ocellar setae III forward..... | 2 |
| 2a) Median setae on tergites IV-V close together, if small then at least twice as long as the distance between their bases..... | 3 |
| 2b) Median setae on tergites IV-V small and far apart, distance between their bases at least twice their length..... | 6 |
| 3a) Posteromarginal cilia in wing I straight, ocellar setae III arise within the ocellar triangle, metanotum broadly reticulated in medial area..... | 4 |
| 3b) Posteromarginal cilia in wing I wavy, ocellar setae III arise on anterior margin of the in position 1/2, metanotum longitudinally reticulated in medial area, vein I in wing I with 4-5 setae on distal half, pronotal setae pmII more than 50 μm long, median setae on tergite V variable but always more than 15 μm long..... | 5 |
| 4a) Sculpture of pronotum closely striated, setae pm II elongate, antennal segment II dark brown, tergite IV with more than 8 rows of microtrichia in lateral areas, tergite VIII with a transverse row of microtrichia just behind antecostal ridge..... | <i>euthytus</i> |
| 4b) Sculpture of pronotum exceptionally wide apart, almost reticulate I the medial region, posteromarginal setae small, antennal segment II as pale as I, segment III dark, tergite IV with less than 5 rows of microtrichia, tergite VIII without discal microtrichia..... | <i>pteridis</i> |
| 5a) Pronotal discal setae 10-13 μm , 9 rows of tergal microtrichias in lateral thirds, medial teeth on posteromarginal comb on VIII tergum 15 μm | <i>bounites</i> |
| 5b) Pronotal discal setae 17-20 μm , 11-12 rows of tergal microtrichia in lateral thirds, medial teeth on posteromarginal comb on VIII tergum 12-13 μm long..... | <i>menai</i> sp. n. |
| 6a) Tergites IV-V with four setae on each lateral microtrichial area, tergite IX with numerous discal microtrichia on posterior half, VIII with several rows of microtrichia medially between antecostal ridge and median setae..... | 7 |
| 6b) Tergites IV-V with three setae on each lateral microtrichial area, tergite IX without discal microtrichia, VIII with or without few discal microtrichia..... | 9 |
| 7a) Sternites with antecostal ridge scarcely shaded, IV-VI not covered with microtrichia, usually with a clear area of sculptures lines mesad of marginal setae B1..... | <i>manihoti</i> |
| 7b) Sternites with antecostal ridge dark, covered with microtrichia..... | 8 |
| 8a) Ocellar setae III on anterolateral margins of ocellar triangle in position 1/2, body colour light Brown..... | <i>ikelus</i> |
| 8b) Ocellar setae III close together within the ocellar triangle, body colour mainly yellow..... | <i>panamensis</i> |
| 9a) Ocellar region without sculpture, vein II in wing I with 5 setae, pronotal setae pmII 1,5 times as long as pmI..... | <i>abditus</i> |
| 9b) Ocellar region with lines of sculpture, vein II in wing I with 8 setae, pronotal setae pmII and pmIII twice as long as pmI..... | <i>lumarius</i> |

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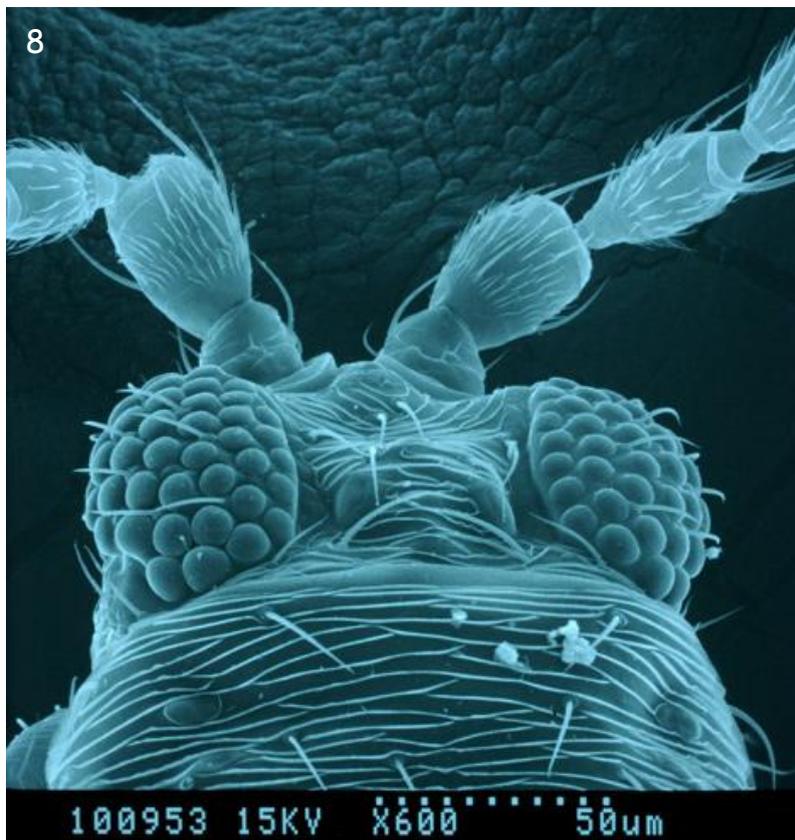
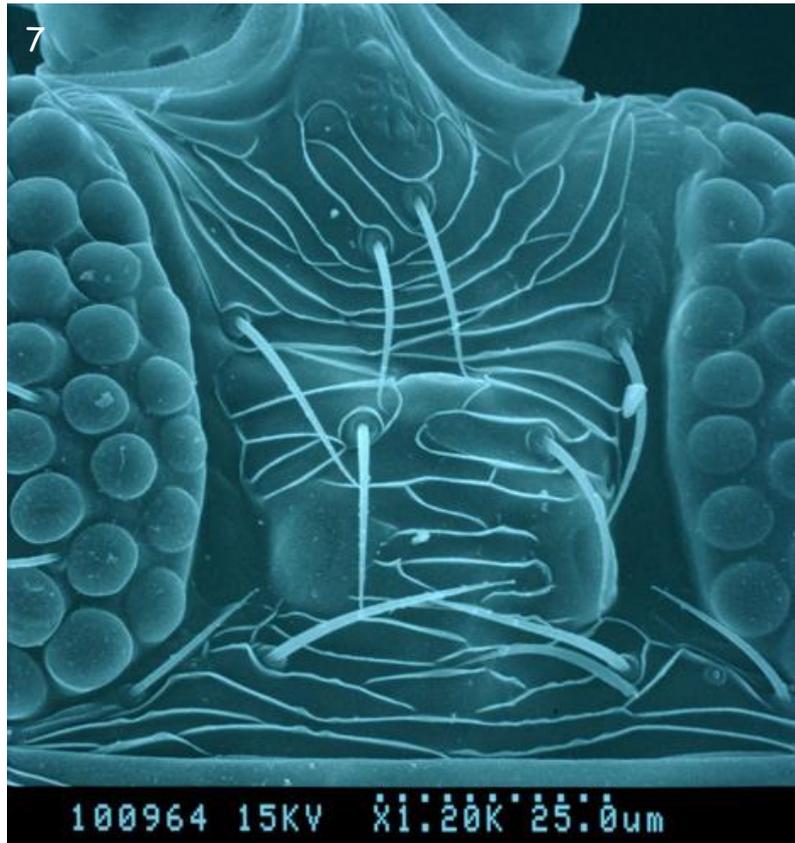


Figs. 1-2. - *Scirtothrips menai* sp. n.

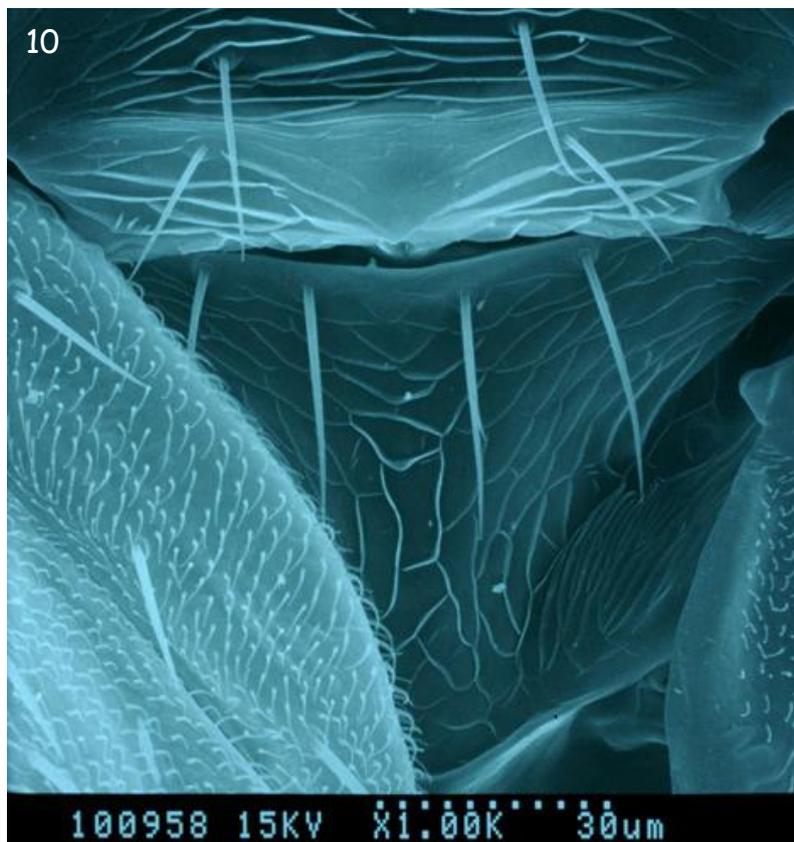
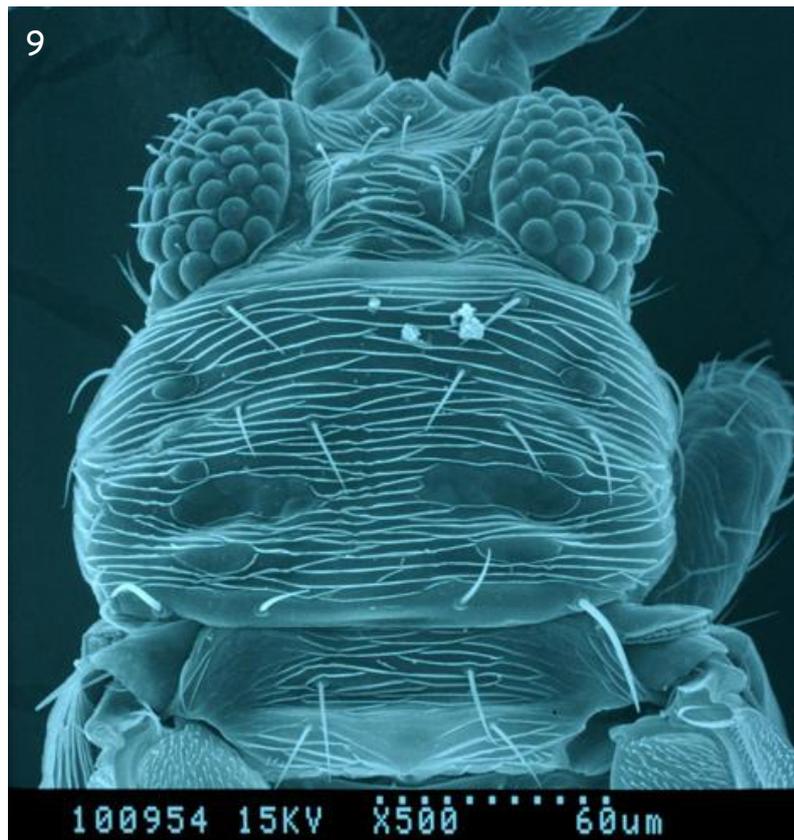
1. - Dorsal view of the antennae (paratype). 2. - Dorsal view of the head and antennae (holotype).



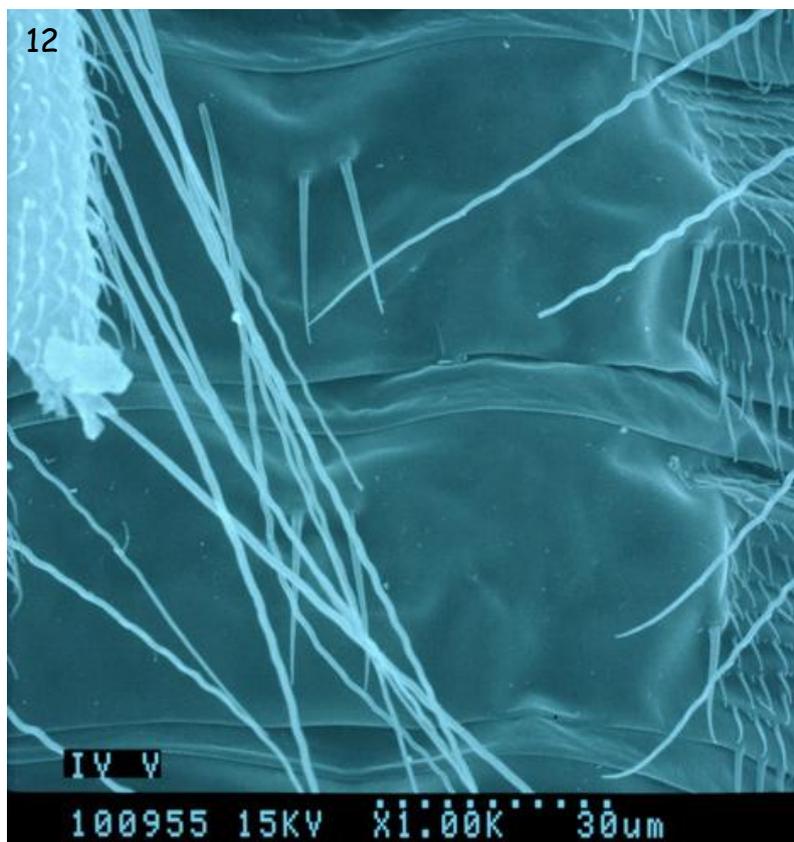
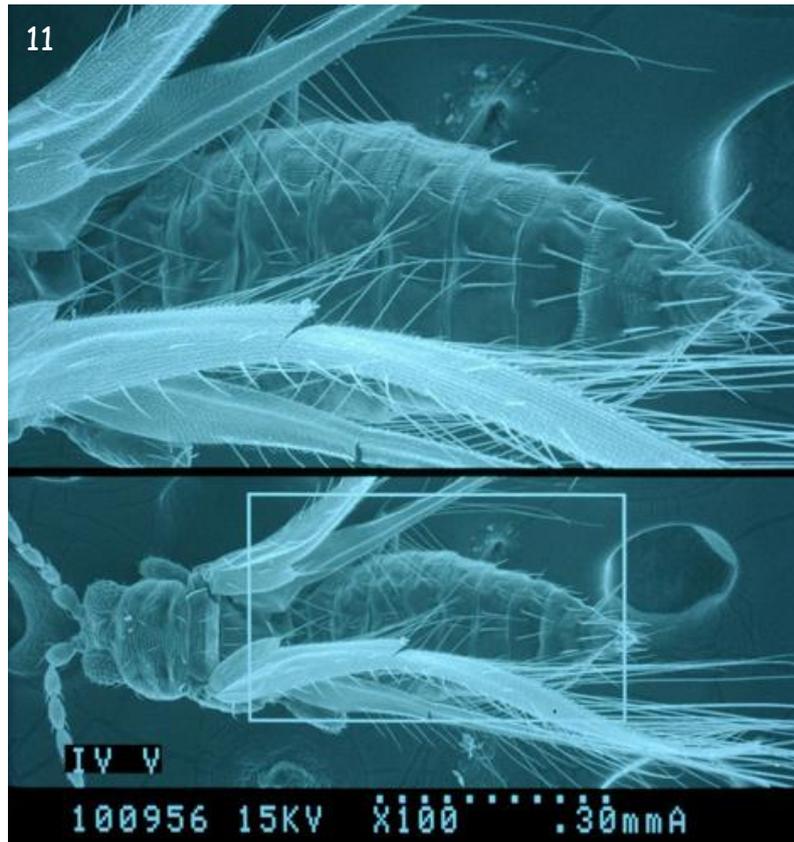
Figs. 3-6. - *Scirtothrips menai* sp. n.
3.- Dorsal view of head and pronotum (holotype).
4.- Dorsal view of head and pronotum (paratype).
5.- Abdomen dorsal view (holotype).
6.- Abdomen ventral view (holotype).



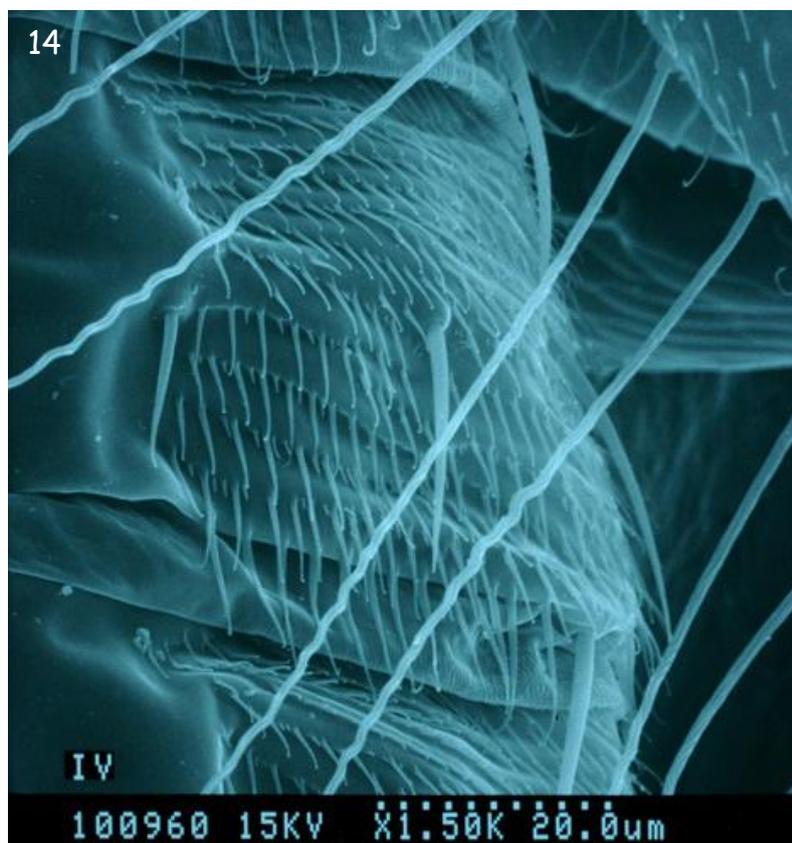
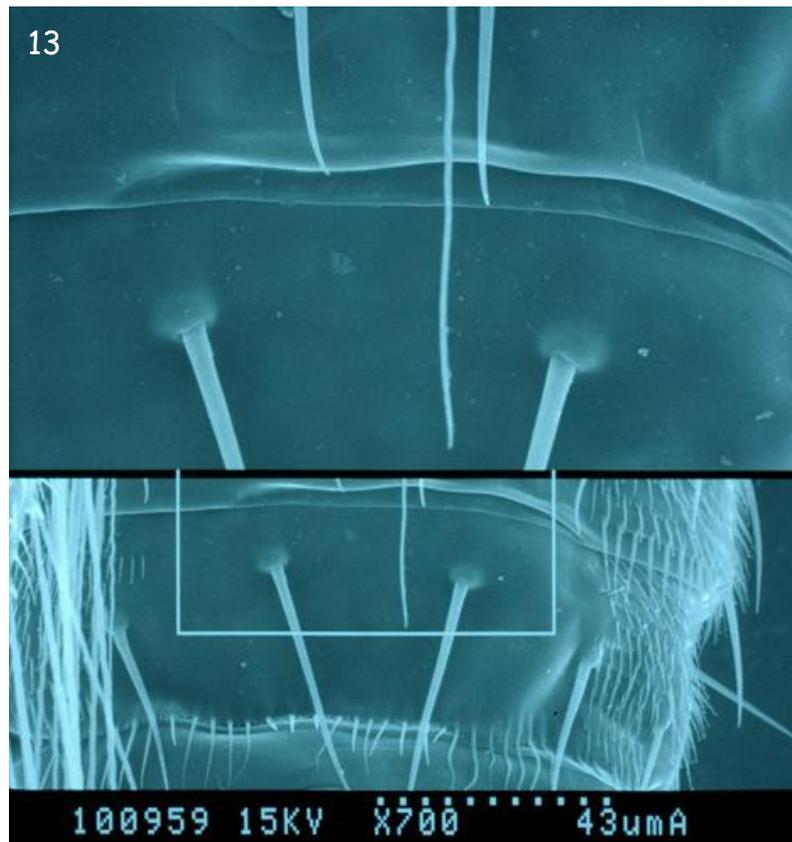
Figs 7-8. - *Scirtothrips menai* sp. n.
 7. - SEM dorsal view of ocellar triangle.
 8. - SEM dorsal view of head.



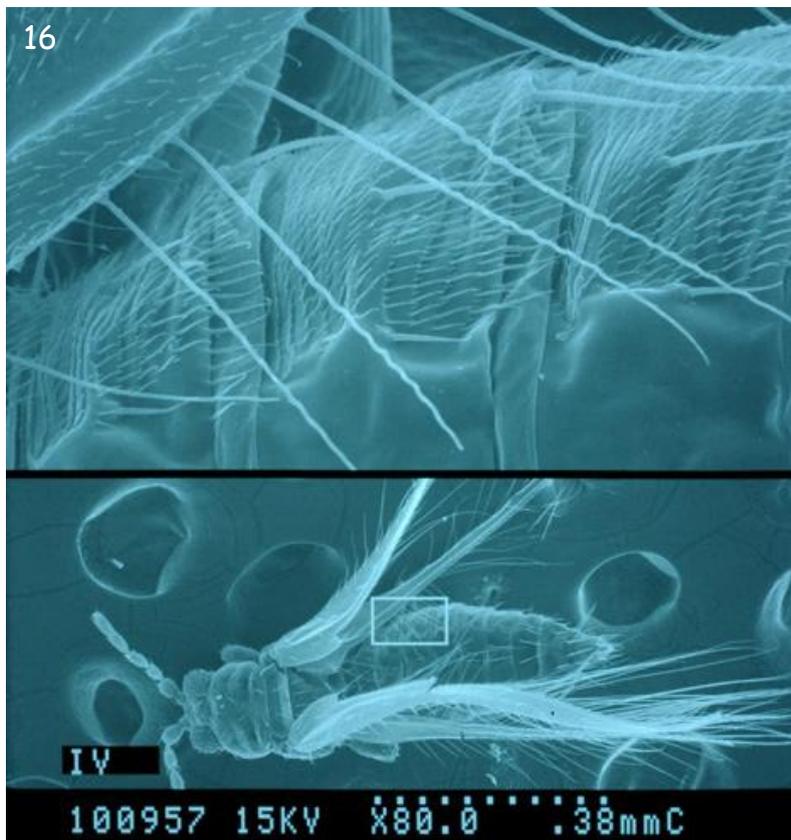
Figs 9-10.- *Scirtothrips menai* sp. n.
9.- SEM dorsal view of head and pronotum.
10.- SEM dorsal view of metanotum.



Figs 11-12.- *Scirtothrips menai* sp. n.
 11.- SEM dorsal view of abdomen.
 12.- SEM dorsal view of abdominal terga IV-V.



Figs 13-14.- *Scirtothrips menai* sp. n.
13.- SEM dorsal view of abdominal tergum VIII.
14.- SEM dorsal view of the lateral area of microtrichias in abdominal tergum IV.



Figs 15-16.- *Scirtothrips menai* sp. n.

15.- SEM dorsal view of the wavy cilia in wing I.

16.- SEM dorsal view of the lateral area of microtrichia in terga IV-V showing the discal setae in this area.



Figs. 17-20. - *Scirtothrips bounites*.
17. - Habitus, dorsal view (paratype).
18. - Head and pterothorax (paratype).
19. - Head and pronotum, dorsal view (paratype).
20. - Antennae, dorsal view (paratype).