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A new species of predatory *Scolothrips* (Thysanoptera, Thripidae) feeding on *Raoiella* mites (Tenuipalpidae) in Australia

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Abstract

Scolothrips ochoa **sp. n.** is described from Australia feeding on mites of the genus *Raoiella* (Tenuipalpidae). Apparently host-specific, this thrips is unusual within the Thripinae in lacking ocellar setae pairs I and II. Moreover, it differs from other *Scolothrips* species in lacking elongate pronotal midlateral setae, and by having antennal segments III–IV and V–VI broadly joined.

Key words: *Scolothrips ochoa*, *Raoiella*, Tenuipalpidae, predatory thrips

Introduction

The tenuipalpid acarine, *Raoiella indica*, is considered a pest of numerous species of Arecaceae, and thus represents a threat to the extensive horticultural trade in ornamental palms (Etienne & Flechtmann, 2006). The leaflets of affected plants become disfigured with scattered yellow spots on both surfaces, leading to strong yellowish discoloration of the entire leaf in severe infestations (Flechtmann and Etienne, 2004, 2005). Moreover, on certain Caribbean islands this mite species has been found damaging various species of banana trees (*Musa balbisiana, M. acuminata,* and *Musa x paradisiaca*) (Welbourn, 2007), and the pest can be expected to become more widely dispersed, both by the wind and on infested plants (Kane *et al.* 2005). For these reasons, it is important to look for potential natural enemies that might be deployed in integrated pest management strategies.

The new species of thrips described here was first observed as a predator of an un-named species of the mite genus *Raoiella* in 2008 by Ron Ochoa and Jenny Beard. These mite specialists found the thrips in association with two undescribed species of *Raoiella* at two widely separated sites in Australia: at Brisbane, Queensland, and south east of Perth, Western Australia. Moreover, during 1995 a single adult female was collected near Narrandera in New South Wales. With the encouragement of Jenny Beard we were able to study a population of the thrips feeding on one of these mite species, on the leaves of *Lophostemon suaveolens* (Myrtaceae) at The Gap, a western suburb of Brisbane. The tree was identified by the Queensland Herbarium and a voucher specimen lodged as – AQ747678. However, the host plant was a tall tree (Fig. 1), thus the mites and thrips were available to us only on foliage within reach from the ground. All stages of the mite including the egss, are bright red and shiny, and occur on the underside of leaves. The motile stages often have black patches internally, associated with feeding, and eggs are laid in clusters and have a long stipe (Figs 2, 6). Adult and larval thrips were observed to feed particularly on these eggs (Fig. 2) but also on the early instars (larvae and protonymphs) of the mites (Fig. 5). The thrips was not seen to feed on the deutonymphs or adults of the mite, possibly because the mites are too active. The body contents of the thrips larvae are conspicuously red, due to the pigments obtained from their mite prey, but the surface chitin of the larvae is almost without

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pigment. All life stages of the thrips have been observed on the *Lophostemon* leaves, from first instars through to pupae and adults (Figs 5–7). However, population numbers were always found to be low on the branches available for study. No males of the species have been seen.

Scolothrips Hinds

The genus *Scolothrips* currently includes 18 described species (Mound, 2010), and these are well known as predators of mites on various agricultural crops (Gilstrap, 1995). The common species, such as *S. sexmaculatus* Pergande, are white with small dark markings on the forewings, and are referred to as the 6-spotted thrips. In contrast, *S. asura* from eastern Asia and Australia is brightly coloured, with the head, pterothorax and abdominal segments VI–VIII brown in contrast to the white colour of the pronotum, legs and abdominal segments I–V and IX–X. Moreover, the brown areas have bright red internal pigments. Despite this, *S. asura* shares with the widespread white-bodied species the habit of mite predation, and also most details of the body structure. All members of the genus have six pairs of long and usually slightly barbed setae on the pronotum, also one pair of similar setae on the head arising between the ocelli, and a series of similar setae on the banded forewings. The purpose of this paper is to describe the new species of *Scolothrips* from Australia that has been found feeding on *Raoiella* mites. Although similar to *S. asura* in most character states, this species has a reduced cephalic chaetotaxy that is unique within the genus, and is also unusual within the family Thripidae.

Scolothrips ochoa sp. n.

Female macroptera. Body mainly brown with red internal pigment (Fig. 3); tarsi and apices of tibiae yellow; head, metanotum and abdominal segments brown, pronotum and mesonotum paler; abdominal segments III–VI with clear areas laterally, VIII–IX darkest; antennal segments IV–V much paler than remaining segments (Fig. 4); major setae hyaline, but dark on pigmented areas of forewings; forewings with two dark transverse bands.

Head wider than long, cheeks short and slightly incut behind large eyes. Ocellar triangle strongly elevated; ocellar setae pairs I and II, also postocular setae, absent; ocellar setae III long and finely barbed, arising within triangle; vertex transversely reticulate (Fig. 8). Compound eyes each with four pigmented facets ventrally; frons with seven pairs of setae; maxillary palps 2-segmented (Fig. 9).

Antennae 8-segmented (Fig. 10), with few or no microtrichia; segment I without paired dorso-apical setae; III–IV also V–VI broadly joined; III and IV each with forked sensorium.

Prosternal basantra without setae, ferna slender and widely separated, prospinasternum reduced to small median triangle (Fig. 13); meso and metafurca each with strong median spinula.

Pronotum transverse, surface transversely but irregularly reticulate (Fig. 8), with no discal setae; five pairs of long, barbed major setae present (anteromarginal, anteroangular, posteromarginal, and two pairs posteroangular); four pairs of minor, weakly barbed, setae present (two pairs of anteromarginals, one (or two) pair of posteromarginals, one pair of midlaterals).

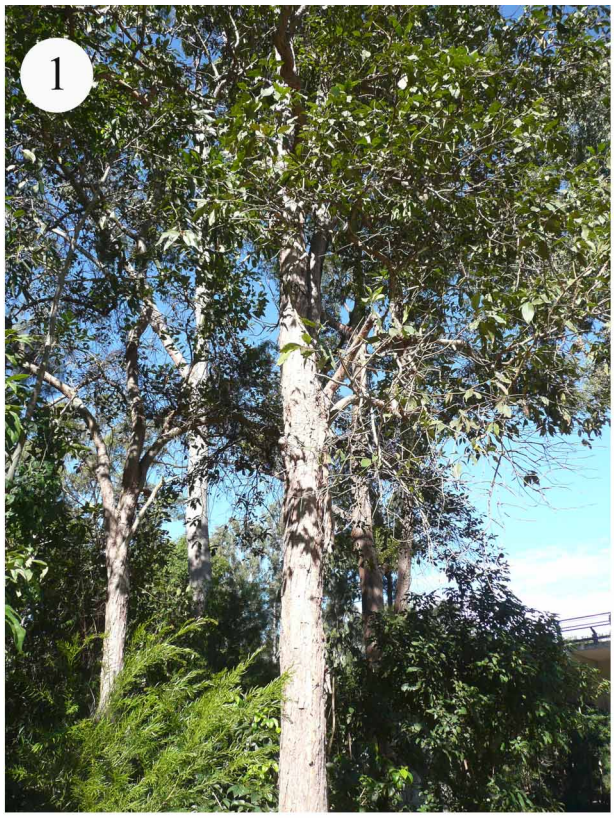
Mesonotum transversely striate/reticulate; no anterior campaniform sensilla; median setal pair arising near middle of sclerite, lateral pair small. Metanotum longitudinally and narrowly reticulate; median setal pair wide apart near lateral pair and at anterior margin; campaniform sensilla absent (Fig. 14).

Forewing relatively broad with apex pointed; dark areas finely tuberculate (Fig. 11); costal setae long with apices barbed, costal cilia small and present only medially; first vein with 10–11 long barbed setae in irregular continuous row, second vein with 6–8 long barbed setae; clavus with 3 veinal and 1 discal barbed setae; posteromarginal cilia strongly undulated.

Tergites without craspedum; tergite I transversely reticulate (Fig. 15), II–VIII with sculpture markings only laterally and not extending to campaniform sensilla; median setae small and wide apart; VIII with neither comb nor craspedum. Suture between tergites and pleurotergites weakly developed, pleurosternites weakly

sclerotised. Tergite IX elongate (Fig. 12), without anterior pair of campaniform sensilla, mid-dorsal paired setae well developed; tergite X short with no longitudinal split.

Sternites reticulate laterally, with three pairs of marginal setae, no discal setae; sternite VII posterior margin eroded medially. Ovipositor well developed and serrated.



FIGURES 1–4. *Scolothrips ochoa* **sp. n. (1)** Host tree, *Lophostemon suaveolens*; **(2)** Adult female feeding on *Raoiella* egg; **(3)** Slide mounted adult female; **(4)** Female head and antennae.

Measurements of holotype female in microns. Body length 1150. Head, length 65; width 150; ocellar setae III 65. Pronotum, length 75; width 200; major setae 60–65. Forewing length 750. Tergite IX setae, S1 55; S2 75. Antennal segments I–VIII length 15, 30, 25, 18, 20, 48, 15, 15.

Male not known.

Larva II. In life with red-brown body contents (Fig. 5); cleared specimens with no cuticular pigment, except faintly grey at base of all femora and tibiae, and base of antennal segments I–IV. Major setae all long, weakly capitate and barbed; 2 pairs on head, 6 pairs on pronotum; thorax and abdominal tergites with finely tuberculate sculpture.

FIGURES 5–7. *Scolothrips ochoa* **sp. n. (5)** Larva feeding on larval *Raoiella*; **(6)** Pupa with *Raoiella* eggs and nymphal skins; **(7)** Four images from cine film of pupa and emerging adult (note white cast cuticle: (a) Start of filming; (b) at 6 minutes; (c) at 11 minutes; (d) at 94 minutes).

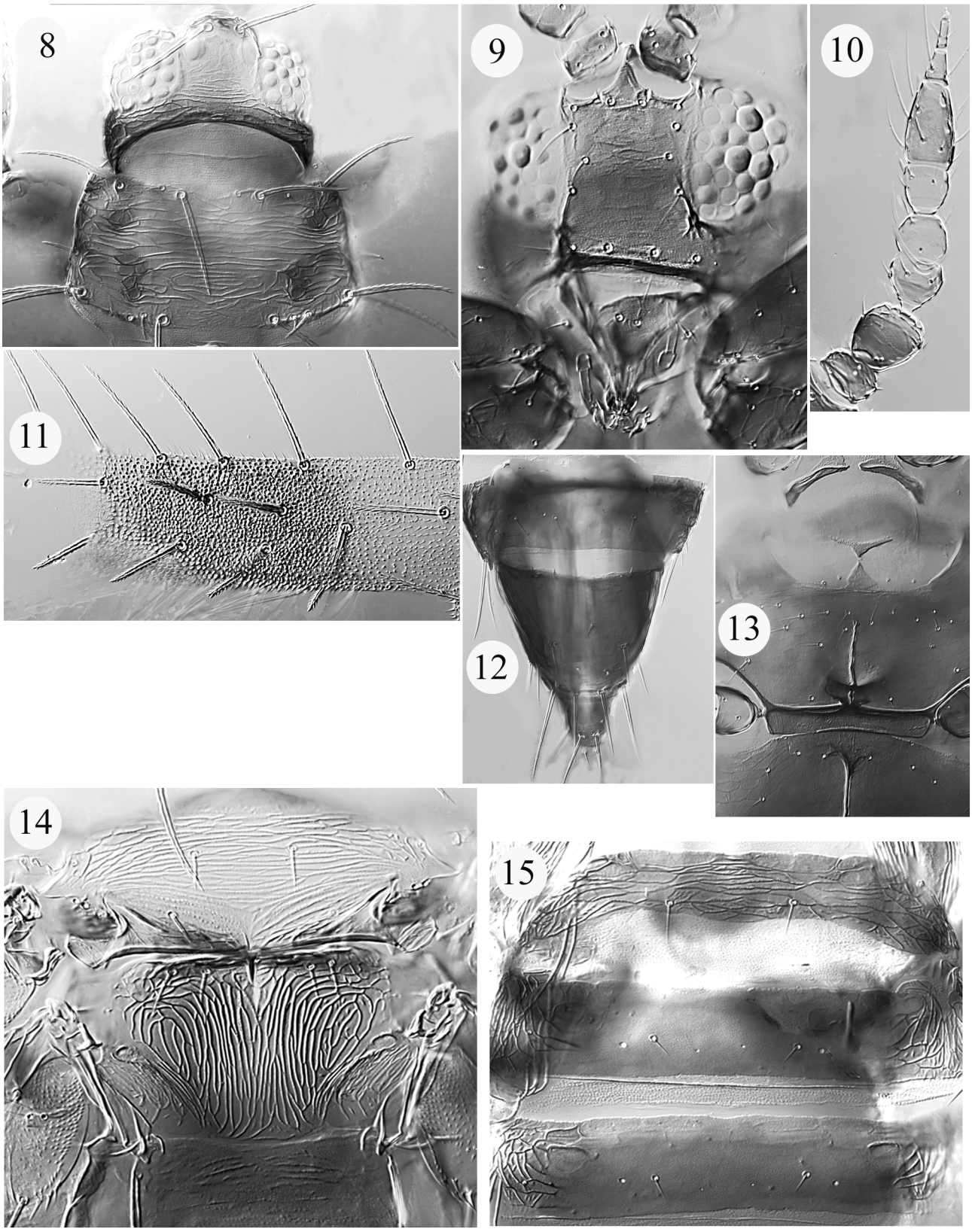
Specimens studied. Holotype female, **Australia, Queensland**, Brisbane, The Gap, Walton Bridge Reserve, from *Lophostemon suaveolens* (Myrtaceae) in association with an unidentified *Raoiella* species, 14.vi.2009 (D.J.Tree 945).

Paratypes: 2 females taken with holotype, also 3 larvae; same locality, 2 females with one larva, *Lophostemon confertus*, 16.v.2009 (Jenny Beard); same locality, 1 female from *Lophostemon confertus*, 15.v.2008 (Beard & Ochoa). **Western Australia**, 27km north of Narrogin, 1 female from *Eucalyptus wandoo* (Myrtaceae), 9.v.2008 (Beard & Ochoa). **New South Wales**, 20km west of Narrandera, 1 female from *Callitris glaucophylla* (Cupressaceae), 25.iv.1995 (LAM 2647).

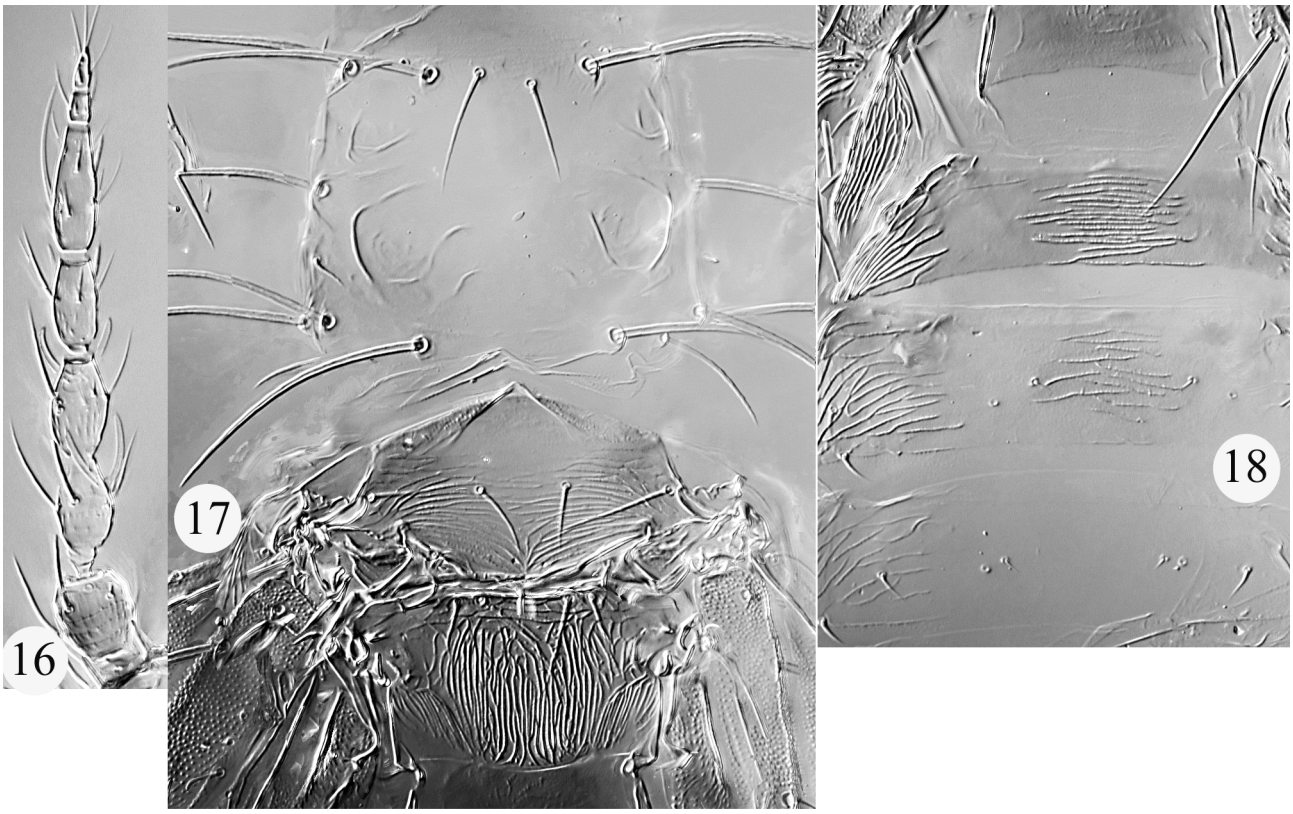
Relationships. Adult females of this new species share most character states with the other species of *Scolothrips*. Moreover, the body colour, and the sculpture of the metanotum and first abdominal tergite are similar to that of *S. asura* (Figs 17–18). The major structural differences from previously described *Scolothrips* species are (1) loss of the two pairs of pre-ocellar setae, (2) reduction of the paired pronotal midlateral setae, and (3) compact form of the antennal segments (cf. Figs 10, 16). Although these character state differences are striking, most details of the body structure, the long barbed setae, the fasciate forewings, as well as the biology of this species as a mite predator, are strikingly similar to those found in the other *Scolothrips* species. It seems more likely that *S. ochoa* evolved within this genus, rather than that it is sister-genus to *Scolothrips* or even more distantly related. We therefore conclude that a new genus is not warranted.

Acknowledgments

We are grateful to Ron Ochoa and Jenny Beard for drawing our attention to this remarkable thrips species and its interesting biology, also for their advice on the manuscript. The holotype is in the Australian National Insect Collection, Canberra, paratypes are also deposited in the QDPC collection, Brisbane.



FIGURES 8–15. *Scolothrips ochoa* **sp. n.** female illuminated with Differential Interference Contrast **(8)** Head & pronotum; **(9)** Ventral surface of head; **(10)** Antenna; **(11)** Forewing dark area; **(12)** Tergites VIII–X; **(13)** Thoracic sternites; **(14)** Meso and metanota; **(15)** Tergites I–III.



FIGURES 16–18. *Scolothrips asura* female. **(16)** Antenna; **(17)** Pro, meso and metanota; **(18)** Tergites I–III.

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