

# ZOOTAXA

1020

**The genus *Thrips* (Thysanoptera, Thripidae)  
in Australia, New Caledonia and New Zealand**

LAURENCE A. MOUND & MASAMI MASUMOTO



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Auckland, New Zealand

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(*Zootaxa* 1020)

64 pp.; 30 cm.

22 July 2005

ISBN 1-877407-22-4 (paperback)

ISBN 1-877407-23-2 (Online edition)

FIRST PUBLISHED IN 2005 BY

Magnolia Press

P.O. Box 41383

Auckland 1030

New Zealand

e-mail: [zootaxa@mapress.com](mailto:zootaxa@mapress.com)

<http://www.mapress.com/zootaxa/>

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ISSN 1175-5326 (Print edition)

ISSN 1175-5334 (Online edition)

## The genus *Thrips* (Thysanoptera, Thripidae) in Australia, New Caledonia and New Zealand

LAURENCE A. MOUND<sup>1</sup> & MASAMI MASUMOTO<sup>2</sup>

<sup>1</sup>Honorary Research Fellow, CSIRO Entomology, GPO Box 1700, Canberra, ACT 2601, Australia, and Scientific Associate, Natural History Museum, Cromwell Road, London [e-mail: laurence.mound@csiro.au].

<sup>2</sup>Yokohama Plant Protection Station, Shin'yamashita, 1-16-10, Yokohama, 238-0801, Japan  
[e-mail masumotom@pps.go.jp]

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## Abstract

The genus *Thrips* includes about 280 species worldwide. An identification key is provided to 41 from the Australian Region. Of these, 33 (including 7 new species) are recorded from Australia, 5 (including 1 new species) are known only from New Zealand, and 3 (including 1 new species) are known only from New Caledonia. Two species-groups are defined: the “*Thrips obscuratus* species-group” comprising 8 species from New Caledonia and New Zealand, and the “*Thrips seticollis* species-group” comprising 6 species from the southern half of Australia. A further group, the “*Thrips orientalis* species-group” involves 12 species in South East Asia, and four of these are recorded from Australia. In the temperate areas of this continent there are 5 species that are clearly introduced subsequent to European settlement. From Australia’s northern tropical area 18 species are recorded here, but as most of these are known also from Asian or Pacific territories some may have been introduced either through human activities or naturally on winds. The Australian Plague Thrips is recognised as comprising two species, the essentially southern *T. imaginis* and a closely related new species, *T. safrus*, usually north of Latitude 27°. For all 41 species host-plant and distribution details are included, as well as morphological diagnoses.

**Key words:** Australian endemics, thrips, invasive species, taxonomy, identification key

## Introduction

The fauna of Australia is commonly portrayed as unique, with emphasis placed on those Gondwanan elements that have been isolated on this continent for more than 40 million years. However, the derivation of the present-day fauna of this continent is complex. For example, although the native Australian mammal fauna is sometimes considered to comprise primarily marsupials, the *terrestrial* endemic mammal fauna of this continent actu-

ally comprises 40% eutherians (<http://www.deh.gov.au/biodiversity/abrs/online-resources/fauna/afd/group.html>), and this faunal element, primarily of rodent species, has presumably radiated subsequent to invasions from the Indonesian archipelago over long periods of time. Similarly, the insect group considered here, the Thysanoptera, includes many taxa that may be Gondwanan in origin (Crespi *et al.*, 2004), although the northern Australian thrips fauna has very close relationships to that of Indonesia (Austin *et al.*, 2004; Mound 2004). These relationships are not necessarily historical, because present-day wind systems seem to be responsible for transporting thrips from parts of Papua New Guinea onto the Australian mainland, particularly during December through February, although experimental evidence for this is lacking. Moreover, human trading over many centuries has presumably introduced Indonesian species into Australia, and the ever expanding use of air craft in the horticultural trade increases the probability of further such introductions.

The purpose of this paper is primarily to provide a means of identifying the 33 species of *Thrips* that are here recognized from Australia. However, to facilitate the identification of quarantine interceptions the species of New Zealand and New Caledonia are also included. The rich thrips fauna of Indonesia, and its relationships to the fauna of northern Australia, require considerable further study (Mound 2005).

### Faunal relationships

The genus *Thrips* is the most species-rich genus in the order Thysanoptera, with almost 280 species worldwide in many different ecosystems. Until now, the diversity of this genus in Australia has been considered small in relation to other parts of the world, with only 20 species listed in the most recent printed Australian catalogue (Mound, 1996a). In contrast, from Europe zur Strassen (2003) identified 71 species, of which 35 are known from Britain (Mound *et al.*, 1976); from North America Nakahara (1994) recognized 62 species; and from the Old World tropics between Pakistan and the Pacific 91 species are included in keys provided by Palmer (1992). No member of the genus is known to be native to the Neotropics, with only a single specimen of the genus recorded from south of the USA-Mexico border (Mound & Marullo, 1996), although Roberto Johansen (*in litt.* 2004) has indicated that there are undescribed native *Thrips* species in Mexico. From sub-saharan Africa, about 20 species of *Thrips* are listed, but no means of identifying these is available other than the scattered original descriptions.

A total of 41 species is considered in this paper (Table 1). Three of these are known only from New Caledonia, and five only from New Zealand, and these eight species comprise the *Thrips obscuratus* species-group (Mound, 2005). The remaining 33 species have all been found in Australia, but deciding how many of these are endemic and how many might have been introduced by winds or human activities is difficult. Five species have clearly been introduced since European settlement: four from the northern hemisphere (*T. nigropilosus*, *T. tabaci*, *T. trehernei*, *T. vulgatissimus*) with one originally from southern

Africa (*T. simplex*). Six species are here recognized as an endemic group across southern Australia, the *Thrips seticollis* species-group (*T. excaelatus*, *T. knoxi*, *T. pallisetis*, *T. seticollis*, *T. tomeus* and *T. wellsae*), and a further four species are considered native to Australia on the basis of their host associations (*T. australis*, *T. imaginis*, *T. safrus*, *T. setipennis*). In contrast, of the 18 species recorded here from the northern parts of Australia, 12 are known also from Indonesia and the Oriental Region, three have wider distributions among the Pacific islands, and three new species are closely related in structure to Oriental species and will probably prove to have more extensive distributions to the north of Australia.

**TABLE 1.** *Thrips* species in the Australian region.

<b>Australia-Oriental</b>	<b>Australia-Pacific</b>	<b>Australian endemics</b>	<b>Australian exotics</b>	<b>New Caledonia</b>	<b>New Zealand</b>
<i>orientalis</i> group		<i>seticollis</i> group		<i>obscuratus</i> group	<i>obscuratus</i> group
<i>extensicornis</i>		<i>excaelatus</i>		<i>bianchii</i>	<i>austellus</i>
<i>malloti</i>		<i>knoxii</i>		<i>diana</i>	<i>coprosmae</i>
<i>orientalis</i>		<i>pallisetis</i>		<i>insignis</i>	<i>martini</i>
<i>parvispinus</i>		<i>seticollis</i>			<i>obscuratus</i>
		<i>tomeus</i>			<i>phormiicola</i>
		<i>wellsae</i>			
<b>Un-grouped</b>	<b>Un-grouped</b>	<b>Un-grouped</b>	<b>Un-grouped</b>		
<i>aspinus</i>	<i>longicaudatus</i>	<i>australis</i>	<i>nigropilosus</i>		
<i>coloratus</i>	<i>maculicollis</i>	<i>imaginis</i>	<i>simplex</i>		
<i>darwini</i>	<i>novocaledonensis</i>	<i>safrus</i>	<i>tabaci</i>		
<i>florum</i>		<i>setipennis</i>	<i>trehernei</i>		
<i>hawaiiensis</i>			<i>vulgatissimus</i>		
<i>hoddlei</i>					
<i>palmi</i>					
<i>subnudula</i>					
<i>sumatrensis</i>					
<i>unispinus</i>					
<i>vitticornis</i>					

### Host-plant relationships

In considering the flower-thrips fauna of Australia it is essential to distinguish between areas dominated by native and by non-native vegetation. In the latter, two of the most com-

mon thrips species are themselves introduced: *Tenothrips frici* (Uzel) in the yellow flowers of weedy Asteraceae, and *Frankliniella schultzei* (Trybom) in many different flowers (Mound & Gillespie, 1997), and the polyphagous pest species, *Frankliniella occidentalis* (Pergande), is progressively becoming more widespread in eastern New South Wales and southern Queensland. In areas of native vegetation the most common thrips species are endemics: *Thrips setipennis* in the flowers of trees and shrubs of forests in eastern Australia, and *Pseudanaphothrips achaetus* (Bagnall) in a wide diversity of herbs and small shrubs. However, in all parts of the southern half of this continent, the most abundant species in flowers is usually the Plague Thrips, *T. imaginis*, a versatile insect that is common on garden plants, various crops, and a wide range of native plants, and occurs in vast numbers in the Australian Alps. In the northern half of Australia *T. imaginis* is replaced by *T. safrus*, a closely related species that has previously been misidentified as *T. imaginis*. And across the whole continent, another abundant species, *T. australis*, occurs in the white flowers of *Eucalyptus* as well as the white flowers of several other Myrtaceae.

Many members of *Thrips* genus undoubtedly breed primarily, or even exclusively, in flowers. Thus, of the species considered here: *T. australis* breeds in the white flowers of *Eucalyptus* species and to a lesser extent in similar Myrtaceae flowers such as *Melaleuca*; *T. knoxi* breeds in the flowers of several *Lomandra* species; *T. setipennis* breeds in pale-coloured flowers of a range of native shrubs; *T. wellsae* breeds in the flowers of various montane Epacridaceae; *T. trehernei* breeds in the flowers of *Taraxacum*; and *T. aspinus* and *T. unispinus*, although abundant in *Mangifera* flowers, have both been taken in the flowers of *Syzygium gustavioides*. In contrast, although *T. imaginis* occurs in many flowers, and *T. simplex* is abundant in cultivated *Gladiolus* flowers, the larvae of both species can be found on leaves. This is also true of *T. palmi* and *T. tabaci*, whereas colonies of *T. nigropilosus* are more common on leaves than in flowers. In New Zealand, colonies of *T. phormiicola* occur usually only within the leaf funnels of their host plant, but larvae of the New Zealand flower thrips, *T. obscuratus*, are reported from the flowers of more than 50 species of native and introduced plants (Teulon & Penman, 1990).

Some species in this genus, particularly those that are polyphagous, are crop pests due to their feeding damage, including *T. hawaiiensis* and *T. obscuratus*, whilst *T. palmi* and *T. tabaci* can be vectors of damaging tospoviruses (Mound, 1996b), as can one Japanese species in this genus, *T. setosus* Moulton. However, polyphagy and pest status are not necessarily closely correlated, since *T. pini* Uzel in Europe is a pest only on Pinaceae, and *T. alliorum* Priesner in Japan is a pest only on *Allium* (Liliaceae). In considering the biological diversity exhibited by members of this genus, it should be mentioned that *T. setipennis* is the pollinator of the rainforest tree *Wilkiea huegeliana* (Monimiaceae) in eastern Australia (Williams *et al.*, 2001), and this thrips has also been taken abundantly in the flowers of *Macadamia* in northern New South Wales. The significance of thrips as pollinating agents is gradually being recognized, and *Thrips antiaropsidis* has recently been demonstrated to be the specific pollinator of *Antiaropsis decipiens* (Moraceae) in Papua New Guinea

(Zerega *et al.*, 2004). There remain many details concerning the precise biology of these insects that have yet to be established, including why two abundant polyphagous species, *T. imaginis* in Australia and *T. obscuratus* in New Zealand, have never managed to become established successfully outside their country of origin.

### Systematic relationships

Worldwide, 14 genera are considered to comprise the *Thrips* genus-group (Mound, 2002). Membership of this group is characterized by three autapomorphies: ocellar setae I absent (Fig. 1); abdominal tergites V–VIII with paired ctenidia laterally (Fig. 28); tergite VIII with ctenidia posteromesad to the spiracles (Mound, 2002). Within this genus-group, recognition of smaller genera is more difficult (Bhatti & Mound, 1981). Some genera represent groups of species that are associated with Poaceae, and these grass-living species appear to represent more than one Old World clade, each having diverged from within *Thrips* genus (e.g.. *Bolacothrips* and *Stenchaetothrips*). Others of the small genera in *Thrips* genus-group are monotypic in order to accommodate single species with a particular autapomorphy (e.g.. *Microcephalothrips*), and the phylogenetic significance of these smaller genera remains unclear (Mound, 2002).

Three genus-group names are placed into synonymy below. *Ramaswamiahiella* has been distinguished from *Thrips* because the only included species has the sternal posteromarginal setae duplicated, that is there are 12 setae instead of six setae in this row (Fig. 91) (Ananthakrishnan & Jagadish, 1968; Bhatti, 1990). Although an interesting apomorphy, similar duplication occurs in species within other genera of Thripidae, such as *Dendrothrips jeanneli* Bagnall (Mound, 1968). Moreover, two further very different species from Australia are discussed below that exhibit this apomorphy (Fig. 4) but that are divergent in other character states, and the genus *Ramaswamiahiella* is thus placed into synonymy. All three of these *Thrips* species with duplicated sternal posteromarginal setae also have ocellar setae III close together behind the first ocellus. However, whereas *T. unispinus* has no pleurotergal discal setae and the chaetotaxy of tergites VI–VII is typical of *Thrips* genus (Mound, 2002: 380), with tergal setae S3 smaller than S2, both *T. subnudula* and the new species *T. aspinus* have numerous pleurotergal discal setae (Fig. 4), and setae S3 are larger than S2 on tergites VI–VII (Fig. 3).

Two monobasic genera that were erected for species with particularly short pronotal postero-angular setae, *Athrips* and *Kemothrips*, were synonymised with each other by Bhatti (1990: 237), but they are both placed here as synonyms of *Thrips*. The new species described below as *T. aspinus* has these pronotal setae exceptionally short, scarcely distinguished from the pronotal marginal setae (Fig. 1). Reduction in length of the pronotal postero-angular setae occurs within several unrelated Thripidae genera (Mound & Masumoto, 2004), and is a character state that is of limited use in determining phylogenetic relationships. In most *Thrips* species, two pairs of elongate postero-angular setae are developed,



but *T. unispinus* has only one long pair (Fig. 101), and this is true also of *T. antiaropsidis* that was described recently from Papua New Guinea as the pollinating agent of *Antiaris decipiens* (Zerega *et al.*, 2004). Despite sharing this character state, these two species are probably not closely related, because *T. unispinus* has 8 to 12 posteromarginal setae on each sternite whereas only six are present in *T. antiaropsis*.

In contrast to the modern consensus on the classification of genus *Thrips*, reflected in the synonymy given below (Bhatti, 1978, 1980; Nakahara, 1994; Mound, 2002; Moritz *et al.*, 2004), a genus *Ioneurothrips* is recognized in the key to species known from Europe (zur Strassen, 2003) for the single species *australis* Bagnall. The single autapomorphy supporting this decision is the presence of six, instead of five, setae on the vein of the forewing clavus (Fig. 9). Unfortunately, the significance of this is not discussed, but the phylogenetic implication of such a classification, that this one species is sister-group to genus *Thrips*, is not acceptable given the many similarities between *T. australis* and other species within Australia.

Palmer (1992) recognized five groups of species within *Thrips* genus. However, these involved sub-dividing meristic characters with a continuous range of states (e.g. number of sternal discal setae), and the groups clearly fail to reflect phylogenetic relationships (Mound, 2005). Two species-groups can be distinguished that are endemic to the Australasian region. The '*T. obscuratus* species-group' comprises seven species, three in New Caledonia and five in New Zealand (Mound, 2005), all of which have three posteromarginal setae on sternite II (Fig. 12) in contrast to all of the other members of the genus that have only two setae in this position. The southern Australian '*T. seticollis* species-group' recognized here comprises six species that have the ctenidia on tergite VIII terminating anterior to setae S3 close to the spiracle (Fig. 108), rather than at setae S3 as in all other species of the genus (Fig. 28). Finally, the '*T. orientalis* species-group' has recently been designated for 12 species from South East Asia that are apparently associated with white scented flowers (Mound, 2005), and this group includes several species found in northern Australia.

### ***Thrips* Linneaus**

- Thrips* Linneaus, 1758: 457. Type-species *Thrips physapus* Linneaus  
*Euthrips* Targioni-Tozzetti, 1881: 133. Type-species *Thrips physapus* Linneaus.  
*Parathrips* Karny, 1907: 47. Type-species *P. uzeli* Karny.  
*Achaetothrips* Karny, 1908: 111. Type-species *A. loboptera* Karny.  
*Ioneurothrips* Bagnall, 1915: 592. Type-species *I. australis* Bagnall.  
*Parafrankliniella* Priesner, 1920: 73. Type-species *P. verbasci* Priesner.  
*Paulus* Solowiow, 1924: 25. Type-species *P. gracilis* Solowiow.  
*Thrips* (*Epithrips*) Priesner, 1926: 273. Type-species *T. (E.) uzelianus* Priesner.  
*Ramaswamiahiella* Karny, 1926: 208. Type-species *R. subnudula* Karny. **Syn.n.**  
*Priesneria* Maltbaek, 1928: 2. Type-species *P. mancosetosa* Maltbaek.  
*Isochaetothrips* Moulton, 1928: 227. Type-species *Thrips seticollis* Bagnall.

- Anomalthrips* Morgan, 1929: 5. Type-species *A. amygdali* Morgan.  
*Thrips* (*Athrips*) Priesner, 1938: 353. Type-species *T. kikuyuensis brevisetosa* Trybom. **Syn.n.**  
*Peladothrips* Priesner, 1940: 54. Type-species *P. biunculatus* Priesner.  
*Thrips* (*Isothrips*) Priesner, 1940: 54. Type-species *Isoneurothrips orientalis* Bagnall.  
*Kemothrips* Bhatt, 1967: 14. Type-species *K. mirus* Bhatti. **Syn.n.**  
*Taeniothrips* (*Simillothrips*) Schliephake, 1972: 274. Type-species *Thrips atratus* Haliday.  
*Thrips* (*Bidentothrips*) Bournier & Bournier, 1979: 358. Type-species *T. (B.) englerinae* Bournier & Bournier.

**Diagnosis.** Female macropterous or micropterous. Antennae 7- or 8-segmented, segment I without dorsal apical setae, segment II with mid-dorsal setae basal to campaniform sensillum, forked sense cone on segments III and IV usually short. Ocellar setae I absent, II shorter than III; 6 pairs of postocular setae present. Pronotum with 2 pairs (rarely 1 or 0) of prominent postero-angular setae, with 3 or 4 pairs of posteromarginal setae. Mesonotum with median pair of setae far from posterior margin. Metascutum with striate or reticulate sculpture; campaniform sensilla present or absent; median pair of setae at or behind anterior margin. Forewings with setal row on first vein continuous or interrupted; clavus with 5 (rarely 6) veinal setae and 1 discal seta. Prosternum with ferna not divided and no setae on basantra. Mesosternum with sternopleural suture complete, furca with spinula. Metasternum without furcal spinula. Meta-episternum with setal row. Abdominal tergites with setae S2 usually longer than S3, tergites IV or V to VIII each with paired lateral ctenidia, tergite VIII ctenidia posteromesad to spiracles and usually ending at base of setae S3; tergite VIII posteromarginal comb of microtrichia variable; sternite II with 2 (rarely 3) pairs of marginal setae, III to VII with 3 pairs, sternal discal setae present or absent; pleurotergites II to VII with or without discal setae. Male generally similar to female; abdominal sterna III to VII (or VI) each with a circular, oval or transverse glandular area.

#### Key to species (females)

1. Abdominal sterna without discal setae (Fig. 12)..... 2
- Abdominal sterna with at least 1 pair of discal setae (Fig. 14, 29)..... 18
2. Forewing first vein with setal row complete or almost complete, setae evenly spaced 3
- Forewing first vein setal row with long gap medially and 2 or more setae nearer apex, rarely micropterous ..... 12
3. Abdominal sternite II with 6 posteromarginal setae [New Caledonia] (Fig. 12)..... 4
- Abdominal sternite II with 4 posteromarginal setae ..... 6
4. Forewings with alternating dark and light bands, pale at base and apex, median shaded area sometimes with a paler area medially..... *bianchii*
- Forewings various, but never transversely banded ..... 5
5. Abdominal pleurotergites with lines of sculpture bearing weakly dentate markings; metanotum with equiangular reticulation (Fig. 43)..... *insignis*

- Abdominal pleurotergites with many rows of fine ciliate microtrichia (Fig. 23); metanotum with longitudinal reticulation (Fig. 22) ..... *diana* sp.n.
- 6. Tergite VIII ctenidia terminating anterior to setae S3 close to spiracle [southern temperate] (Fig. 108)..... 7
- Tergite VIII ctenidia terminating at setae S3 [tropical] (Fig. 6)..... 11
- 7. Abdominal sternite III with a small glandular area (Fig. 46); antennal segment VI with a ventral sense cone broadly oval at base (Fig. 45); forewing first vein setal row with short gap near apex ..... *knoxii*
- Abdominal sternite III without glandular area; antennal segment VI with ventral sense cone circular at base; forewing with first vein setal row complete ..... 8
- 8. Antennae 7-segmented; tergite VIII posteromarginal comb incomplete medially (Fig. 71); ocellar setae III arising outside ocellar triangle ..... *pallisetis*
- Antennae 8-segmented; tergite VIII posteromarginal comb complete medially (Fig. 108); ocellar setae III arising within ocellar triangle (Fig. 106) ..... 9
- 9. Tergites IV–VI with a few lines of sculpture extending mesad of setae S2 (Fig. 107); tergite IV with vestigial ctenidia present; fore tarsal pre-apical claw minute or absent; mesonotum with lines of sculpture extending close to campaniform sensilla (Fig. 109) ..... *wellsae* sp. n.
- Tergites IV–VI with no lines of sculpture extending mesad of setae S2; tergite IV with no ctenidia; fore tarsus with prominent pre-apical claw (Fig. 83, 99); mesonotum with no lines of sculpture close to campaniform sensilla (Fig. 97)..... 10
- 10. Antennal segment III yellow in contrast to brown segment IV; metanotum closely striate, median setae arise at anterior margin (Fig. 80) ..... *seticollis*
- Antennal segment III mainly brown; metanotal striations widely and irregularly spaced, median setae arise behind anterior margin (Fig. 97) ..... *tomeus* sp.n.
- 11. Forewing uniformly shaded, as dark at base as medially; metanotal reticles equiangular with internal markings, campaniform sensilla absent ((Fig. 68).. *orientalis* [in part]
- Forewings shaded with base paler; metanotal reticles equiangular to elongate, without internal markings, campaniform sensilla usually present (Fig. 52, 53) ..... *malloti*
- 12. Metanotum with paired campaniform sensilla (Fig. 73) ..... 13
- Metanotum without pair of campaniform sensilla (Fig. 95) ..... 14
- 13. Tergite VIII posteromarginal comb complete (Fig. 74); metanotal sculpture longitudinal striate (Fig. 73); body colour uniformly yellow [tropical] ..... *palmi*
- Tergite VIII posteromarginal comb absent medially (Fig. 20); metanotal sculpture elongate reticulate medially (Fig. 19); body bicoloured, almost yellowish brown with abdominal segments VII to X dark [tropical] ..... *darwini* sp.n.
- 14. Abdominal pleurotergites with numerous rows of fine ciliate microtrichia (Fig. 94) ....  
..... *tabaci*
- Abdominal pleurotergites without ciliate microtrichia ..... 15
- 15. Tergite VIII posteromarginal comb absent or very weak medially (Fig. 28)..... 16

- Tergite VIII posteromarginal comb complete ..... 17
- 16. Metanotum with equiangular reticulation posteromedially (Fig. 27); forewing first vein with 3 distal setae; longest pronotal postero-angular seta 0.5 times as long as pronotum median length [tropical]..... *extensicornis* (in part)
- Metanotum with irregular longitudinal reticulations posteromedially (Fig. 25); forewing first vein with 6 to 9 distal setae; longest pronotal postero-angular seta 0.6 times as long as pronotum median length (Fig. 24)..... *excaelatus* sp. n
- 17. Tergite II with 3 lateral setae; metanotum with irregular longitudinal reticulation medially (Fig. 60); abdominal tergites II–III with median setae about 0.5 times as long as median length of tergite (Fig. 61), with 2 lines of sculpture between the bases of these setae; body colour yellow or pale brown, pronotum and abdominal tergites with brown markings [temperate] .....*nigropilosus*
- Tergite II with 4 lateral setae; metanotum almost striate medially (Fig. 37); abdominal tergites II–III with median setae less than 0.3 times as long as median length of tergite, with no lines of sculpture between these median setae; body colour brown ..... *hoddlei* sp.n.
- 18. Abdominal sternite VII without discal setae (Fig. 76). ..... 19
- Abdominal sternite VII with discal setae. .... 22
- 19. Tergite VIII posteromarginal comb complete, regular long and fine; antennae 8-segmented (Fig. 84); forewing first vein setal row complete; metanotum striate medially (Fig. 87); sternites II–VI with discal setae close to posterior margin (Fig. 85) [eastern Australia] .....*setipennis*
- Tergite VIII posteromarginal comb interrupted medially; antennae 7-segmented; forewing first vein setal row complete or incomplete; metanotum reticulate medially; sternites with discal setae arising well anterior to posterior margins [tropical] ..... 20
- 20. Forewing first vein setal row with long gap, 7 basal and 3 distal setae ... *extensicornis*
- Forewing first vein setal row complete ..... 1
- 21. Forewing uniformly brown; abdominal sternites III–VI with 0–6 discal setae; many metanotal reticulations with internal wrinkles present (Fig. 68) .....*orientalis*
- Forewings brown with base pale; abdominal sternites III–VI with 5–14 discal setae; metanotal reticulations rarely with internal wrinkles (Fig. 75).....*parvispinus*
- 22. Sternites III–VI with 10–15 posteromarginal setae (Fig. 4), sternite VII with 8 [tropical]. ..... 23
- Sternites III–VII usually with 6 posteromarginal setae, but sometimes with 2 or more discal setae arising close to posterior margin ..... 24
- 23. Pronotum with postero-angular setae no longer than discal setae (Fig. 1); mesonotum very closely striate (Fig. 2); paired campaniform sensilla not present on metanotum (Fig. 2) or on anterior half of tergite IX ..... *aspinus* sp.n.
- Pronotum with 2 pairs of postero-angular setae about twice as long as discal setae (Fig. 89); mesonotal striae widely separated (Fig. 90); paired campaniform sensilla

- present on metanotum and on anterior area of tergite IX.....*subnudula*
24. Abdominal pleurotergites each with one or more discal setae (Fig. 17, 40)..... 25
- Abdominal pleurotergites without discal setae (Fig. 42) ..... 33
25. Abdominal sternite II with 3 pairs of marginal setae [New Zealand] ..... 26
- Abdominal sternite II with 2 pairs of marginal setae ..... 30
26. Abdominal tergites III–V with no lines of sculpture near median pair of setae (Fig. 17); fore tarsus with pre-apical claw ..... *coprosmae*
- Abdominal tergites III–V with lines of sculpture extending to median pair of setae; fore tarsus without pre-apical claw ..... 27
27. Metanotal sculpture reticulate medially (Fig. 55) ..... 28
- Metanotal sculpture longitudinally striate medially (Fig. 65, 78)..... 29
28. Body colour uniformly yellow; pronotal postero-angular setae less than 40 microns in length ..... *austellus*
- Body colour variably yellow to brown, but abdominal segments IX–X dark brown; pronotal postero-angular setae 65 microns long (Fig. 54) ..... *martini* sp. n.
29. Head not produced in front of eyes, with postocular region shorter than dorsal length of eyes (Fig. 64); tergites II–IV without lines of sculpture medially ..... *obscuratus*
- Head produced in front of eyes, with postocular region longer than dorsal length of eyes (Fig. 77); tergites II–IV with lines of sculpture present medially ..... *phormiicola*
30. Forewing clavus with 6 marginal setae (Fig. 9); forewing first vein setal row complete or with one seta missing sub-basally ..... *australis*
- Forewing clavus with no more than 5 marginal setae; forewing first vein setal row incomplete, usually 7–8 setae basally and 3 distally ..... 31
31. Antennae 7-segmented; abdominal tergite VIII with posteromarginal comb absent medially; pronotum usually with 4–5 pairs of posteromarginal setae; metanotum with longitudinal reticulation medially (Fig. 41); ocellar setae III arise inside ocellar triangle (Fig. 38) ..... *imuginis*
- Antennae 8-segmented; abdominal tergite VIII with posteromarginal comb complete; pronotum usually with 3 pairs of posteromarginal setae; metanotum longitudinally striate medially (Fig. 105); ocellar setae III arise outside ocellar triangle ..... 32
32. Abdominal tergite II with 4 lateral setae (cf Fig. 86); metanotal median setae arise at anterior margin, with at least 10 transverse lines of sculpture immediately posterior to their bases (Fig. 62); tergite VIII posteromarginal comb slightly irregular [New Caledonia] ..... *novocaledonensis*
- Abdominal tergite II with 3 lateral setae; metanotal median setae arise behind anterior margin on an area of transversely curved lines of sculpture (Fig. 105); tergite VIII posteromarginal comb regular, long and fine [southern temperate] ..... *vulgatissimus*
33. Abdominal tergite VIII posteromarginal comb complete. .... 34
- Abdominal tergite VIII posteromarginal comb absent medially [tropical, sub-tropical] ..... 39

34. Metanotum strongly reticulate, equiangular on anterior half but longitudinal on posterior half, with markings within most reticles and median setae arising near mid-point of sclerite (Fig. 88); abdominal pleurotergites with many rows of ciliate microtrichia; ocellar setae III no longer than longitudinal diameter of hind ocellus and arising on tangent between inner margins of fore and hind ocelli ..... *simplex*
- Metanotum usually striate to longitudinally reticulate, without markings within reticles and with median setae closer to anterior margin (Fig. 100); abdominal pleurotergites without rows of microtrichia; ocellar setae III longer and arising more laterally, often outside ocellar triangle ..... 35
35. Forewing first vein with setae arranged irregularly along full length, but with at least 5 setae on distal half of wing; ocellar setae III longer than side of ocellar triangle (Fig. 93), arising close to setae II anterolateral to first ocellus [tropical] ..... *sumatrensis*
- Forewing first vein usually with 3 setae on distal half of wing, distal to a long interval without setae; ocellar setae III less elongate and not arising so far laterally ..... 36
36. Metanotum without campaniform sensilla (Fig. 100); hind tibiae dark brown; antenna 7-segmented [southern temperate] ..... *trehernei*
- Metanotum with pair of campaniform sensilla (Fig. 30, 33); hind tibiae commonly yellowish; antenna 7- or 8-segmented [tropical, sub-tropical] ..... 37
37. Abdomen yellow with tergite X brown, sometimes with brown markings medially on more anterior tergites; head and thorax yellow ..... *coloratus*
- Abdomen brown, head and thorax brown or yellow ..... 38
38. Mesonotum sculptured around paired campaniform sensilla near anterior margin (Fig. 33); forewing scale with terminal seta longer than subterminal seta (Fig. 35); antenna 7- or 8-segmented ..... *hawaiiensis*
- Mesonotum not sculptured around paired campaniform sensilla near anterior margin (Fig. 30); forewing scale with subterminal seta longer than terminal seta (Fig. 32); antenna 7-segmented ..... *florum*
39. Pronotum with only one pair of postero-angular setae more than 2.0 times as long as discal setae (Fig. 101) ..... *unispinus*
- Pronotum with 2 pairs of postero-angular setae more than 2.0 times as long as discal setae (cf Fig. 38) ..... 40
40. Antennae 7-segmented ..... *safrus* sp.n.
- Antennae 8-segmented ..... 41
41. Metanotal sculpture longitudinally striate (Fig. 103) ..... *vitticornis*
- Metanotal sculpture reticulate medially (Fig. 51) ..... 42
42. Abdominal tergite IX longer than tergite VIII, segment X very long and tube-like (Fig. 49); forewing first vein setal row almost complete, with only 2 distal setae ..... *longicaudatus*
- Abdominal tergite IX shorter than tergite VIII, segment X not tube-like (Fig. 50); forewing first vein setal row with long gap, with 3 setae distally ..... *maculicollis*

***Thrips aspinus* sp.n.**

*Diagnosis:* Female with body and legs yellow; antennal segments I & II yellow, III–VI yellow with progressively more extensive light brown shading distally, VII light brown; forewings pale; major setae pale to light brown.

Head broader than long, vertex and ocellar region transversely striate (Fig. 1); ocellar setae III arising close together behind first ocellus; postocular setae I & III scarcely longer than setae II. Antennae 7-segmented. Pronotum transverse (Fig. 1), surface with many transverse lines and at least 50 short stout discal setae; inner and outer postero-angular setae not longer than posteromarginal setae. Mesonotum (Fig. 2) with no campaniform sensilla near anterior margin, median area closely striate. Metanotum (Fig. 2) with arcuate transverse sculpture near anterior, reticulate medially but with no markings within reticles; median pair of setae not close to anterior margin; campaniform sensilla not present. Forewing first vein with about 8 setae on basal half and 3 setae on distal half; second vein with 15 to 18 setae; clavus with 5 marginal setae, terminal seta longest. Abdominal tergite I with irregular sculpture medially, campaniform sensilla close to posterior margin; remaining tergites with lines of sculpture absent mesad of setae S1; tergite II with 3 lateral marginal setae, V–VIII with chaetotaxy and ctenidia similar to other *Thrips*, but VI–VII with setae S3 unusually large (Fig. 3) and ctenidia weakly developed; tergite VIII postero-marginal comb with slender microtrichia near lateral margins but replaced medially by narrow craspedum; tergite IX with anterior pair of campaniform sensilla not developed, X with no median split. Sternites and pleurotergites with numerous discal setae (Fig. 4), sternite II with 12 posteromarginal setae and 3–5 discal setae; sternites III–VI with about 12 posteromarginal setae and 24 discal setae but several of these are close to posterior margin, VII with 6–8 posteromarginal setae and about 30 discal setae.

Measurements of holotype female in microns: Body length 1050. Head, length 65; width 145; ocellar setae III length 15. Pronotum, length 110; width 180; postero-angular setae 15. Forewing length 600. Antennal segments III–VII length 35, 35, 35, 48, 15. Male, smaller and paler than female but similar in structure; antennal segment VI exceptionally long; sternites III–VII with slender transverse glandular area, VII with about 11 marginal setae and 13 discal setae.

Measurements of male paratype in microns: Body length 650. Antennal segments III–VII length 30, 30, 30, 55, 12.

*Type material:* Holotype ♀ Australia, **Queensland**, Mossman, from *Mangifera indica* flowers, 7.viii.2004 (LAM 4453) in ANIC.

Paratypes: 6♀ 1♂ collected with holotype; 20km south of Mossman, 3♀ from *Mangifera indica* flowers, 10.viii.2004 (LAM 4467); Cape Tribulation, 6♀ from *Mangifera indica* flowers, 8.vii.1995 (LAM2734); Cape Tribulation, 4♀ 2♂ from *Syzygium gustavioides* flowers, ix.2001 (S. Boulter).

*Breeding:* Taken at several sites in north-eastern Queensland, most of the available specimens are from the flowers of mango trees. However, several individuals were washed

from the flowers of a native plant, *Syzygium gustaviodes*, but these are rather poorly preserved on microscope slides in Hoyers Mountant. The type series of 7♀ 1♂ from Mossman was beaten from mango flowers together with 39♀ 24♂ *Thrips unispinus*, 12♀ 16♂ *Thrips hawaiiensis*, and 5♀ of an unidentified species of *Haplothrips*.

*Distribution*: Australia, north Queensland.

*Relationships*: This new species is closely related to *Thrips subnudula*, the type species of the synonymic genus *Ramaswamiahiella*. In contrast to most members of the genus *Thrips* these share the following character states: sternal posteromarginal setae duplicated (12 instead of 6), tergites VI–VII with seta S3 larger than S2 (instead of shorter), tergite X with no median split. However, *Thrips unispinus* also shares the first of these character states, and all three species have ocellar setae III close together behind the first ocellus. Two other species of *Thrips* are described with unusually short pronotal postero-angular setae, *T. brevisetosus* Trybom from Kenya, and *T. mirus* Bhatti (= *T. heveae* Ananthakrishnan & Jagadish) from India, but in *T. aspinus* the postero-angular setae are so short that they are not distinguished from the posteromarginal setae. The major setae of *T. aspinus* are unusual in being stout and slightly ridged, and the sexual dimorphism of the male antennae is possibly unique within *Thrips* genus.

### *Thrips austellus* Mound

*Thrips austellus* Mound, 1978: 618

*Diagnosis*: Body yellow, distal antennal segments brown. Antennae 7-segmented; head with ocellar setae III arising outside ocellar triangle. Pronotal postero-angular setae short and stout. Metanotum with median setae arising behind anterior margin, reticulate medially, campaniform sensilla sometimes present. Forewing first vein with complete row of setae. Abdominal tergites lacking sculpture medially, VIII with posteromarginal comb complete but irregular; pleurotergites with 3–6 discal setae, sternite II with 3 pairs of marginal setae, sternites III–VII with 8–10 discal setae.

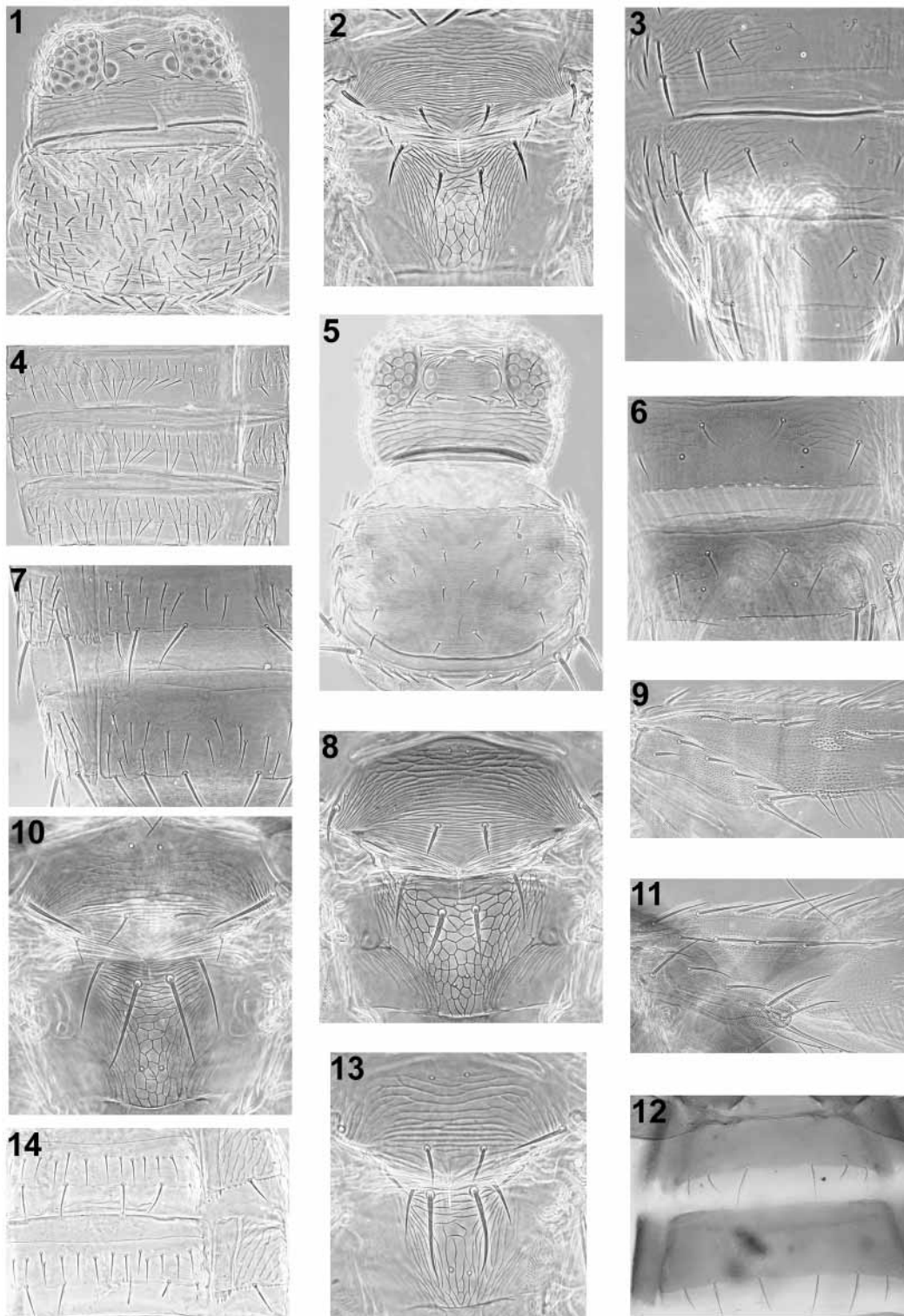
*Breeding*: The only host record is from the flowers of *Clematis quadibracteolata*.

*Distribution*: A New Zealand endemic, this species has been recorded on only two occasions (Mound & Walker, 1982: 71).

*Relationships*: This is a member of the *Thrips obscuratus* group that comprises five species in New Zealand and three in New Caledonia (Mound, 2005). It is particularly similar in structure and sculpture to *T. martini* described below, although that is much darker with longer pronotal setae and more robustly sculptured tergites.

**FIGURES 1–14.** *Thrips* species. *T. aspinus* 1–4: (1) Head & pronotum; (2) Meso-metanota; (3) Tergites VI–VIII; (4) Sternites IV–VI. *T. australis* 5–9: (5) Head & pronotum; (6) Tergites VII–VIII; (7) Sternites VI–VII; (8) Meso-metanota; (9) Forewing clavus. *T. bianchii* 10–12: (10) Meso-metanota; (11) Forewing clavus; (12) Sternites II–III. *T. coloratus* 13–14: (13) Meso-metanota; (14) Sternites III–IV.





***Thrips australis* (Bagnall)**

*Isoneurothrips australis* Bagnall, 1915: 592

*Thrips lacteicarpus* Girault, 1926a: 17

*Thrips mediolineus* Girault, 1926a: 18

*Anomalothrips amygdali* Morgan, 1929: 5

**Diagnosis:** Body yellow to brown, female typically yellow with brown postoccipital ridge on head, brown markings medially on each tergite, and tergites VIII–X brown; forewing pale but shaded along veins, major setae often dark. Antennae 7-segmented, VI large and bullet-shaped; head with ocellar setae III arising inside ocellar triangle. Pronotal postero-marginal apodeme usually stout, postero-angular setae short (Fig. 5). Metanotum reticulate, but reticles without internal markings (Fig. 8), median setae arise behind anterior margin, campaniform sensilla present. Forewing with first vein setal row almost uninterrupted, clavus with 6 marginal setae (Fig. 9). Abdominal tergite II with 4 lateral setae, VIII with marginal comb not developed medially (Fig. 6); sternites with 15–40 discal setae, pleurotergites with 6–10 discal setae (Fig. 7).

**Breeding:** Adults of this common species, the gum tree thrips, fly freely and may be found on many different plants, but females breed primarily in the white flowers of various *Eucalyptus* species, and less commonly in several other white-flowered Myrtaceae, particularly some white-flowered *Melaleuca* species. When populations are high in the flowers of *Eucalyptus* trees and these flowers begin to die, adults of *T. australis* may be found in large numbers on many surrounding plants.

**Distribution:** Found widely across Australia, also in many other parts of the world to which *Eucalyptus* species have been introduced. Kirk (1987) and Sakimura (1967) have both questioned whether *T. australis* is native to Australia, on the basis that this species has been found in so many countries around the world. However, neither of these authors considered the many field observations that so closely associate this thrips with white *Eucalyptus* flowers, both in Australia and in other countries. In countries as different as southern Brazil, Costa Rica, Chile and Kenya, *T. australis* is not commonly collected, but in each of these countries it has been taken in large numbers whenever suitably flowering *Eucalyptus* trees have been examined.

**Relationships:** Two character states are distinctive for this species: the “bullet-shape” of antennal segment VI and the presence of 6 (rather than 5) setae on the margin of the forewing clavus. Apart from these, *T. australis* is a typical member of *Thrips* genus (Mound, 2002), and it shares many character states with *T. imaginis*. Segregating it to a monotypic genus *Isoneurothrips* (see zur Strassen, 2003) fails to represent such relationships satisfactorily.

***Thrips bianchii* (Sakimura)**

*Taeniothrips (Isochaetothrips) bianchii* Sakimura, 1969: 77

**Diagnosis:** Body brown, tibiae, tarsi and antennal segment III paler; forewing banded, pale at base and apex with median brown area variably paler medially. Antennae 8-segmented; ocellar setae III arise outside ocellar triangle. Pronotum with weak sculpture lines, postero-angular setae long. Metanotum reticulate (Fig. 10) but without internal markings, median setae arising behind anterior margin, campaniform sensilla present. Forewing first vein with complete row of setae; clavus with sub-terminal seta longer than terminal seta (Fig. 11). Abdominal tergite II with 4 lateral setae, VIII with marginal comb of few and irregular microtrichia; sternite II with 6 marginal setae (Fig. 12), sternites without discal setae.

**Breeding:** Possibly polyphagous, this species has been found in large numbers in the white flowers of *Psychotria* sp. (Rubiaceae) and *Melaleuca quinquenervia* (Myrtaceae).

**Distribution:** Endemic to New Caledonia.

**Relationships:** The presence of three pairs of marginal setae on the second abdominal sternite is a character state shared only with five New Zealand species and two other species from New Caledonia. These eight species are referred to as the *Thrips obscuratus* group (Mound, 2005).

***Thrips coloratus* Schmutz**

*Thrips coloratus* Schmutz, 1913: 1013

*Thrips aligherini* Girault, 1927b: 1

**Diagnosis:** Body largely yellow, abdominal tergite X brown, also antennal segments IV–VII; abdominal tergites III–VIII usually with brown area medially; forewings uniformly but weakly shaded. Antennae 7-segmented; ocellar setae III arise well outside ocellar triangle, ocellar area with transverse striations; postocular setae I & III subequal, II scarcely half length of I. Pronotum with transverse markings and about 26 discal setae, one pair of midlateral setae slightly stouter. Mesonotum with lines of sculpture close to anterior campaniform sensilla. Metanotum transversely striate on anterior half, with longitudinal but more widely spaced striations on posterior half (Fig. 13), median setae arise close to anterior margin, campaniform sensilla present. Forewing first vein with 3 setae on distal half, clavus with subterminal seta shorter than terminal seta. Abdominal tergite II with 4 lateral setae; tergite VIII comb complete but sometimes irregular; sternite II with 2–4 discal setae, III–VII with 12–25 discal setae (Fig. 14).

**Breeding:** This species is apparently highly polyphagous, adults having been collected in Japan from the flowers of many plants, including Asteraceae (*Chrysanthemum*, *Sol-*

*idago*), Leguminosae (*Lespedeza*, *Pueraria* and *Trifolium*), Malvaceae (*Hibiscus mutabilis*), Moraceae (*Ficus carica*), Rosaceae (*Eriobotrya japonica*), Rutaceae (*Citrus* sp.) and Theaceae (*Thea sinensis*) (Miyazaki & Kudo, 1988).

*Distribution*: A tropical species, *T. coloratus* has been recorded from many countries between Pakistan, Japan and Queensland (Palmer, 1992). Only a few specimens have been taken in Australia, from eastern New South Wales and south-eastern Queensland.

*Relationships*: In structure, this species is very similar to *T. hawaiiensis*, but the forewings are uniformly shaded not paler at the base, and the abdomen is never uniformly brown.

### ***Thrips coprosmae* Mound**

*Thrips coprosmae* Mound, 1978: 618

*Diagnosis*: Colour variable, light to dark brown or bicoloured, forewing pale, antennal segments III–VII darker brown than I–II. Antennae 7-segmented; ocellar setae III relatively long and arising outside ocellar triangle (Fig. 15). Pronotum almost without sculpture; fore tarsus with pre-apical claw. Metanotum with irregular reticulation (Fig. 16), median setae behind anterior margin, campaniform sensilla absent. Forewing first vein with complete row of setae; clavus with 5 marginal setae, termina and subterminal setae sub-equal. Abdominal tergite II with 3 lateral setae; tergite VIII with marginal comb complete, microtrichia irregular and in groups; pleurotergites with 2 or 3 discal setae (Fig. 17), sternite II with 3 pairs of marginal setae, sternites III–VII with 5 to 10 discal setae.

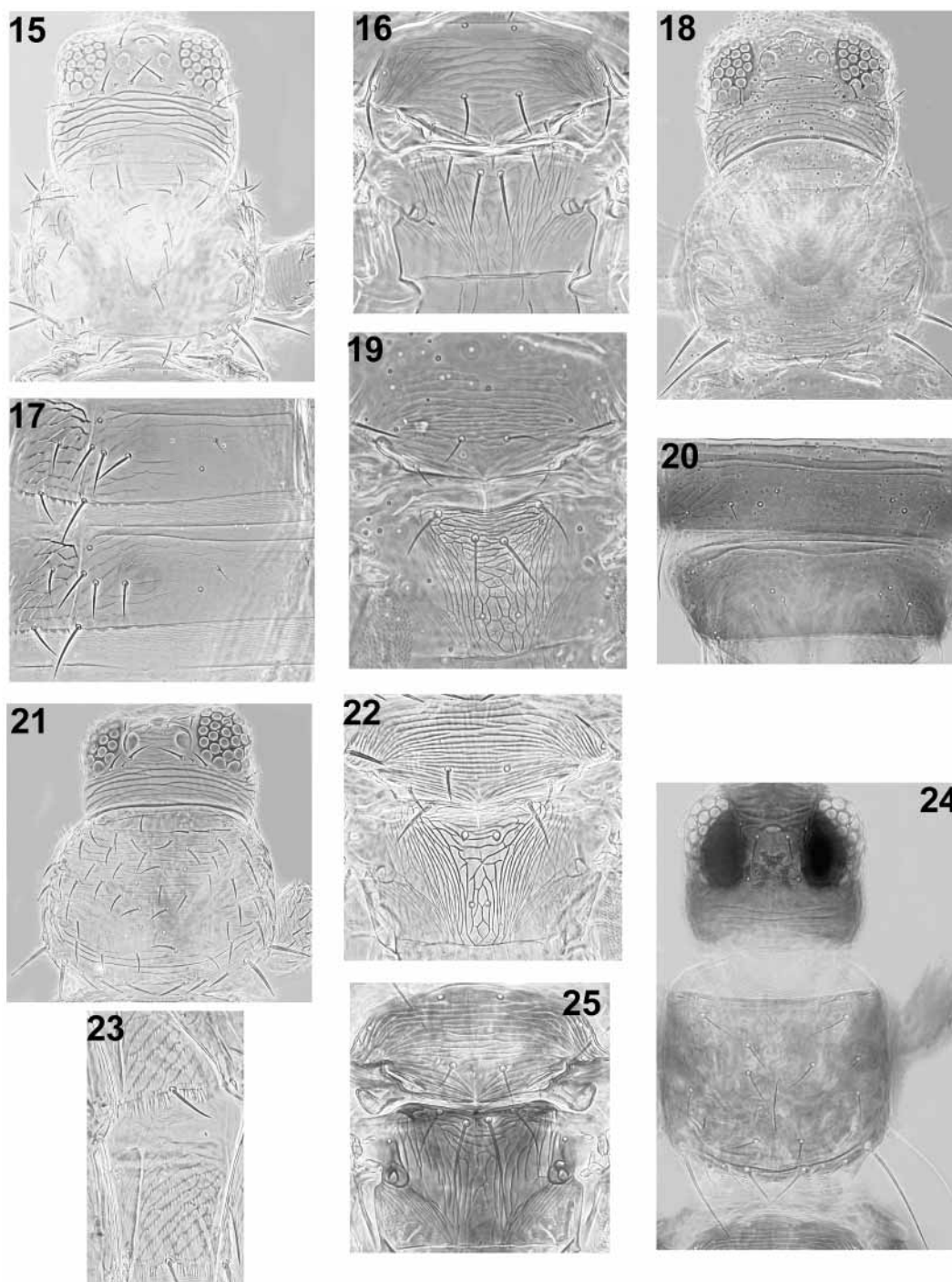
*Breeding*: Adults and larvae have been taken from the young leaf buds of *Coprosma robusta*, *C. rotundifolia* and *C. pseudocuneata* (Martin & Mound, 2005).

*Distribution*: A New Zealand endemic, this species is widespread in both North and South Islands.

*Relationships*: A member of the *Thrips obscuratus* group (Mound, 2005), in which five species from New Zealand and three from New Caledonia share the unusual apomorphy of the second abdominal sternite bearing three pairs of marginal setae.

### ***Thrips darwini* sp.n.**

*Diagnosis*: Female bicoloured, body and legs mainly yellow, abdominal segments VI–VIII progressively darker, IX–X dark brown; antennal segments I & III yellow, II shaded basally on inner margin, IV–V with apical half light brown, VI–VII brown; forewings weakly shaded but with apex and distal part of anterior margin pale; major setae light brown.



**FIGURES 15–25.** *Thrips* species. *T. coprosmae* 15–17: (15) Head & pronotum; (16) Meso-metanota; (17) Tergites & pleurotergites III–IV. *T. darwini* 18–20: (18) Head & pronotum; (19) Meso-metanota; (20) Tergites VII–VIII. *T. diana* 21–23: (21) Head & pronotum; (22) Meso-metanota; (23) Pleurotergites III–IV. *T. excaelestus* 24–25: (24) Head & pronotum; (25) Meso-metanota.

Head broader than long, vertex and ocellar region transversely striate (Fig. 18); ocellar setae III arising on outer margin of ocellar triangle near first ocellus; postocular setae I & III twice as long as setae II and IV, pair V intermediate in length. Antennae 7-segmented. Pronotum transverse, surface with many faint transverse lines but only 2 or 3 setae medially, outer postero-angular setae slightly shorter than inner pair (Fig. 18), posterior margin with 3 pairs of setae. Mesonotum with no campaniform sensilla near anterior margin. Metanotum with transverse sculpture on anterior half, equiangular on posterior, reticles with some internal markings (Fig. 19); median pair of setae not close to anterior margin; campaniform sensilla present. Forewings variable in length, first vein with about 7 setae on basal half and 3 setae on distal half; second vein with 11 to 12 setae; clavus with 5 marginal setae, terminal seta longest. Abdominal tergite I with irregular sculpture medially, remaining tergites with lines of sculpture weak or absent mesad of campaniform sensilla; tergite II with 3 lateral marginal setae, V–VIII with chaetotaxy and ctenidia typical of *Thrips*; tergite VIII with no posteromarginal comb but with a few very small teeth close to lateral margins (Fig. 20); tergite IX with 2 pairs of campaniform sensilla, X with median split long but not complete. Sternites and pleurotergites without discal setae, sternite II with 2 pairs of posteromarginal setae, 3 pairs of small setae at anterior margin; sternite VII median pair of setae close to posterior margin.

Measurements of holotype female in microns: Body length 1300. Head, length 100; width 150; ocellar setae III 20. Pronotum, length 125; width 185; postero-angular setae—outer 50, inner 65. Forewing length 600. Antennal segments III–VII length 47, 45, 37, 55, 20.

*Type material*: Holotype ♀ Australia, **Northern Territory**, Humpty Doo, from bamboo shoots, 16.xi.1994, in ANIC.

*Paratypes*: 1 ♀ taken with holotype; 2 ♀ from same host and locality, 5.xi.1996.

*Breeding*: This species has been taken on two widely separated dates from the young leaves of a bamboo species.

*Distribution*: Australia, Northern Territory.

*Relationships*: This species will track to the Philippines species, *T. alius*, using Palmer's (1992) key to Oriental *Thrips* species, but that is a brown insect with no metanotal campaniform sensilla. Despite the presence of these campaniform sensilla, the sculpture of the metanotum and the absence of a posteromarginal comb on tergite VIII suggest that this species belongs with the *T. orientalis* group. No other member of *Thrips* genus is known with the above character states and a similar bicoloured body (cf. Bhatti, 1999b), although an undescribed member of *Stenchaetothrips*, also collected from bamboo near Darwin, is similar in general appearance to *T. darwini*.

### ***Thrips diana* sp. n.**

*Diagnosis*: Female with body and legs yellow, major setae brown; antennal segments IV–VIII also apex of abdominal X light brown; forewings pale.

Head broader than long, vertex and ocellar region transversely striate; ocellar setae III arising close together behind first ocellus (Fig. 21); postocular setae I, III & V twice as long as setae II and IV. Antennae 8-segmented, VII–VIII short, sensilla on III–IV short and forked. Pronotum transverse, surface with faint transverse lines and about 30 discal setae, inner and outer postero-angular setae subequal and short, posterior margin with 3 pairs of setae. Mesonotum with sculptured lines near to campaniform sensilla. Metanotum with irregular partly elongate reticulation, without internal markings (Fig. 22); median pair of setae not close to anterior margin; campaniform sensilla present. Forewing first vein with complete row of short setae; clavus with 5 marginal setae, terminal seta longest. Abdominal tergite I with irregular transverse reticulate sculpture medially, remaining tergites with lines of sculpture absent mesad of campaniform sensilla; tergite II with 3 lateral marginal setae, V–VIII with chaetotaxy and ctenidia typical of *Thrips*, median pair of setae small; tergite VIII posteromarginal comb complete medially with long slender microtrichia; tergite IX with 2 pairs of campaniform sensilla, median pair of setae shorter than lateral pairs; tergite X with very short median split. Sternites without discal setae, II with 6 posteromarginal setae, VII with median setal pair arising in front of posterior margin; pleurotergites without discal setae, with many oblique rows of ciliate microtrichia and posterior margin with craspedum of fine microtrichia (Fig. 23).

Measurements of holotype female in microns: Body length 1200. Head, length 85; width 140; ocellar setae III 15. Pronotum, length 120; width 175; postero-angular setae 35. Forewing length 660. Antennal segments III–VIII length 40, 45, 27, 38, 5, 8.

*Type material*: Holotype ♀, **New Caledonia**, Nouméa, Park Forestier, 20.viii.2002 (Diana Percy), in Musée National d'Histoire Naturelle, Paris.

*Distribution*: New Caledonia.

*Relationships*: This is the third species from New Caledonia with three pairs of setae on the posterior margin of the second abdominal sternite, and with *T. martini* described below and four other species from New Zealand this brings the *Thrips obscuratus* group to eight species (Mound, 2005). The rows of ciliate microtrichia on the abdominal pleurotergites of *T. diana* are particularly unusual.

### ***Thrips excaelatus* sp.n.**

*Diagnosis*: Female with body brown, tarsi and apices of tibiae yellow, antennae brown with base of segment III yellow, major setae light brown, forewings shaded with base and apex paler.

Head about as broad as long (Fig. 24), vertex with three transverse striae, ocellar region without sculpture; ocellar setae III arising on anterolateral margins of ocellar triangle; postocular setae I almost as long as ocellar setae III. Antennae 7-segmented. Pronotum slightly wider than long, surface lacking sculpture, with about 10 discal setae; inner and outer postero-angular setae subequal and more than two thirds as long as pronotum;

posterior margin with 3 pairs of setae and S1 twice length of S2 and S3. Fore tarsus ventrally with stout recurved apical hamus. Mesonotum with lines of sculpture close to campaniform sensilla. Metanotum with irregular partly elongate reticulation posteromedially (Fig. 25), median pair of setae close to anterior margin; campaniform sensilla absent. Forewing first vein with 7 setae basally and 6 to 9 setae on distal half; clavus with 5 marginal setae, terminal seta longest. Abdominal tergites with no sculpture posterior to antecostal ridge; tergite II with 3 (or 4) lateral marginal setae, V–VII with chaetotaxy and ctenidia typical of *Thrips*; tergite VIII with ctenidia ending anterolateral to setae S3, posteromarginal comb with widely spaced slender microtrichia laterally but medially with very short microtrichia; tergite IX with 2 pairs of campaniform sensilla, median pair of setae much shorter than lateral pairs; tergite X with median split almost complete. Sternites and pleurotergites without discal setae, sternite II with 2 pairs of posteromarginal setae, VII with median pair arising in front of posterior margin.

Measurements of holotype female in microns: Body length 1400. Head, length 125; width 125; ocellar setae III 20. Pronotum, length 120; width 160; postero-angular setae 80. Forewing length 800. Antennal segments III–VII length 50, 50, 40, 55, 20.

*Type material*: Holotype ♀, Australia, **New South Wales**, Googong Dam, Queanbeyan, on *Leucopogon ericoides*, 29.ix.2001 (LAM 4046), in ANIC.

*Distribution*: Australia, New South Wales.

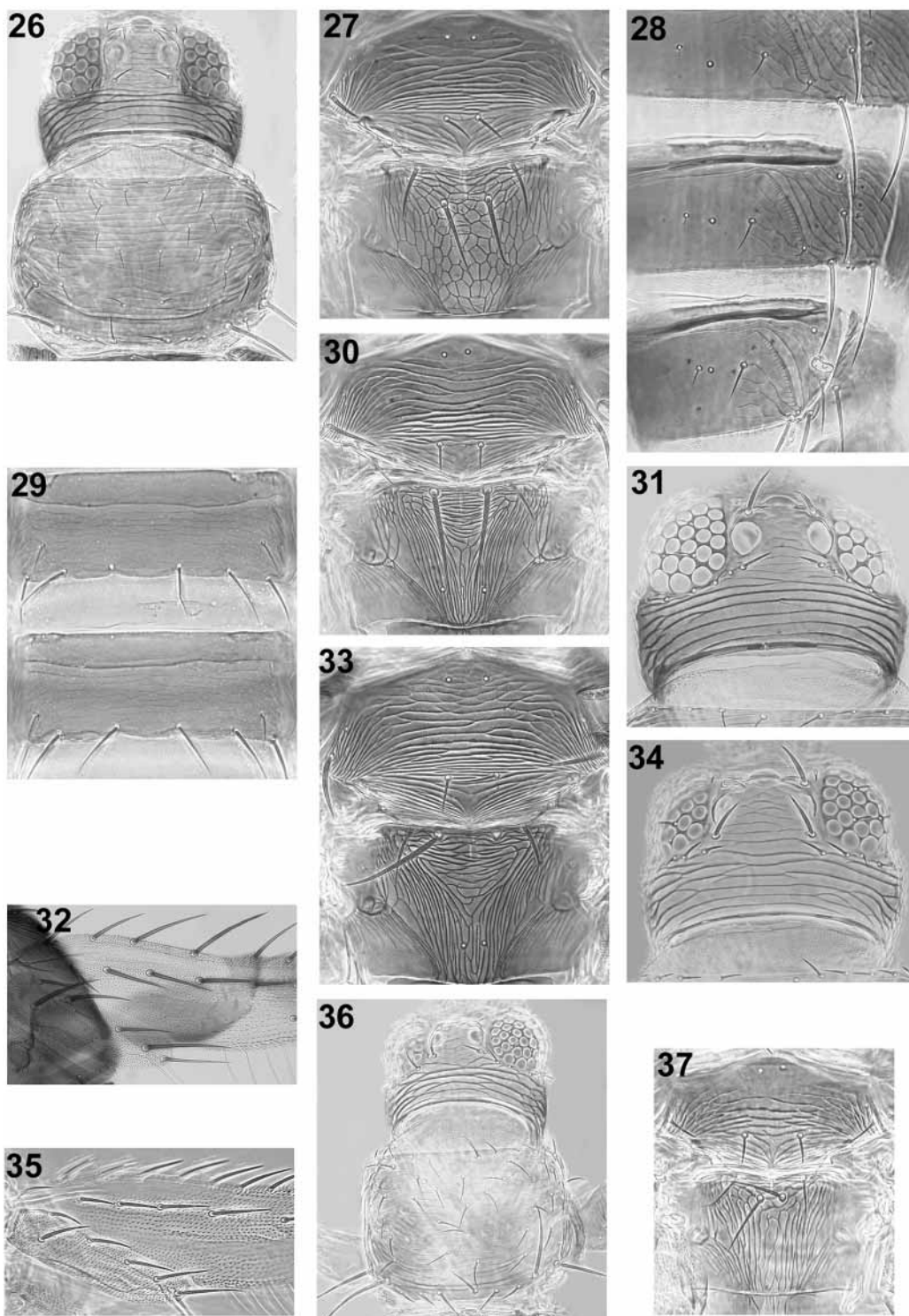
*Relationships*: The condition of the ctenidia on tergite VIII ending anterolateral to setae S3 indicate that this species is a member of the *T. seticollis* group, and the chaetotaxy and sculpture of the metanotum suggest that it is related to *T. pallisetis*, despite the setal row on the first vein of the forewing being widely interrupted. The species is unusual because of the long setae on the pronotum, the presence ventrally of a stout hamus on the fore tarsus, and the lack of sculpture on the tergites.

### ***Thrips extensicornis* Priesner**

*Thrips extensicornis* Priesner, 1934: 276

*Diagnosis*: Body brown, legs yellow with light brown shadings; antennal segment III mainly yellow; forewings brown with base pale. Antennae 7-segmented; ocellar setae III arise behind first ocellus within ocellar triangle, ocellar region with transverse lines; postocular setae II minute (Fig. 26). Pronotum with transverse markings, posterior sub-marginal apodeme sometimes strong (Fig. 26). Metanotum reticulate, some anterior reticles with internal markings (Fig. 27), median setae behind anterior margin, campaniform sensilla absent. Forewing first vein with 3 setae on distal half. Abdominal tergite II with 3 (or 4) lateral margin setae; tergite VIII with no comb; sternites III–VI usually with one pair of discal setae laterally (Fig. 29), but one or both of these setae may be absent on one or all of the sternites, VII with no discal setae.





**FIGURES 26–37.** *Thrips* species. *T. extensicornis* 26–29: (26) Head & pronotum; (27) Meso-metanota; (28) Tergites VI–VIII; (29) Sternites VI–VII. *T. florum* 30–32: (30) Meso-metanota; (31) Head; (32) Forewing clavus. *T. hawaiiensis* 33–35: (33) Meso-metanota; (34) Head; (35) Forewing clavus. *T. hoddlei* 36–37: (36) Head & pronotum; (37) Meso-metanota.

Male yellow, sternites III–VII with transverse glandular area but no discal setae.

*Breeding:* A flower-living species, this thrips appears to be associated with strongly scented white flowers such as those of *Gardenia* and *Pavetta* (Rubiaceae), and also *Glossocarya hemiderma* (Verbenaceae).

*Distribution:* Known from Taiwan and the Philippines to Java and the Riau islands, this species has been taken at Cairns in northern Queensland, and at Darwin and Kakadu in Northern Territory.

*Relationships:* One of the twelve members of the *Thrips orientalis* group (Mound 2005), this species has the metanotum boldly reticulate but with very few markings internal to the reticles, unlike the related species.

### ***Thrips florum* Schmutz**

*Thrips florum* Schmutz, 1913: 1003

*Thrips darci* Girault, 1930: 1

*Diagnosis:* Body brown, tibiae largely yellow femora light brown; antennal segment III yellow; forewings brown with base paler. Antennae 7 (rarely 8)-segmented; ocellar setae III arise outside ocellar triangle; postocular seta II much smaller than I or III (Fig. 31). Pronotum with transverse markings, midlateral setae all equally weak, posterior sub-marginal apodeme weak. Mesonotum with no lines of sculpture close to anterior campaniform sensilla (Fig. 30). Metanotum transversely striate on anterior half, with longitudinal but more widely spaced striations on posterior half, median setae arise at anterior margin, campaniform sensilla present. Forewing first vein with 3 setae on distal half, clavus with subterminal seta longer than terminal seta (Fig. 32). Abdominal tergite II with 4 lateral setae; tergite VIII comb complete but short and irregular; sternites III–VII with 6–14 discal setae.

Male pale brown.

*Breeding:* This species has been recorded from the flowers of many plants, but although this suggest that it is highly polyphagous there appears to have been no attempt to recognise the range of larval hosts. Many records of *T. florum* are likely to involve confusion with *T. hawaiiensis*.

*Distribution:* This tropical species is widespread across Asia and the Pacific, and has also been recorded from Florida and the Caribbean (Nakahara, 1994; Mound, & Marullo, 1996). In Australia, a few specimens have been taken in the coastal regions of Queensland north from Brisbane, and around Darwin in Northern Territory.

*Relationships:* This species is most closely related to *Thrips hawaiiensis*, with which it has often been confused (Bhatti, 1999a).

***Thrips hawaiiensis* (Morgan)**

- Euthrips hawaiiensis* Morgan, 1913: 3  
*Physothrips emersoni* Girault, 1927a: 2  
*Thrips io* Girault, 1927d: 351  
*Thrips partirufus* Girault, 1927c: 1  
*Thrips lacteicolor* Girault, 1928a: 2  
*Physothrips marii* Girault, 1928b: 2  
*Physothrips mjobergi darci* Girault, 1930: 1

**Diagnosis:** Body brown or sometimes bicoloured with abdomen brown and head and thorax orange yellow; antennal segment III yellow; forewings brown with base paler. Antennae 7- or 8-segmented; ocellar setae III arise outside ocellar triangle; postocular setae I & II subequal (Fig. 34). Pronotum with transverse markings, one pair of midlateral setae stout, posterior sub-marginal apodeme weak. Mesonotum with lines of sculpture close to anterior campaniform sensilla (Fig. 33). Metanotum transversely striate on anterior half, with longitudinal but more widely spaced striations on posterior half, median setae arise at anterior margin, campaniform sensilla present, rarely absent. Forewing first vein with 3 setae on distal half, clavus with subterminal seta shorter than terminal seta (Fig. 35). Abdominal tergite II with 4 lateral setae; tergite VIII comb complete but short and irregular; sternites III–VII with 12–25 discal setae.

Male pale brown.

**Breeding:** Apparently highly polyphagous, this species has been recorded from the flowers of many plants, although some earlier records will involve confusion with *T. florum*. No attempt appears to have been made to distinguish the range of plant species on which either of these species is dependent for breeding, although adults occur on various crops.

**Distribution:** This tropical species is widespread across Asia and the Pacific, and has also been recorded from several of the southern States of the USA, also Jamaica (Nakahara, 1994). In Australia, it is most common in the coastal regions of the north, but a considerable population was found on *Gardenia thunbergiana* flowers at the Royal Botanic Gardens, Sydney, and a few specimens have been seen from inland sites around Mundubbera, Queensland.

**Relationships:** A considerable number of species in the genus *Thrips* share a suite of characters with *T. hawaiiensis*, as indicated by Mound (2005). Included amongst these species is the type species of the genus, as discussed below under the introduced European species, *T. trehernei*. However, many of the relatives of *T. hawaiiensis* are from South-East Asia, and all have the metanotum more or less striate medially with the median setae close to the anterior margin. Many of these species have sternal discal setae, but this character is probably not a totally reliable indicator of relationships.

*Thrips hoddlei* sp.n.

*Diagnosis:* Female bicoloured, abdomen brown, head and prothorax yellow with brown markings, pterothorax yellowish-brown, legs mainly yellow; forewing shaded, base and apex paler; antennal segments I–II variable, III mainly yellow, IV–V brown with extreme base yellow, VI–VII brown.

Head slightly broader than long (Fig. 36), vertex with about 6 transverse lines, ocellar region almost without sculpture; ocellar setae III arising on anterior margins of ocellar triangle near first ocellus; postocular setae I nearly twice as long as longitudinal diameter of an ocellus; postocular setae II and IV minute. Antennae 7-segmented. Pronotum with widely spaced transverse lines, with up to 30 discal setae; postero-angular setae well developed; posterior margin with 3 pairs of setae, S1 about 1.5 times as long as S2. Mesonotum with no lines of sculpture near campaniform sensilla. Metanotum with irregular longitudinal reticulate/striate sculpture (Fig. 37); median pair of setae not close to anterior margin; campaniform sensilla not developed. Forewing first vein with about 7 setae on basal half, 3 setae on distal half; second vein with 11 to 12 setae; clavus with 5 marginal setae, terminal seta longest. Abdominal tergite I with irregular sculpture medially, paired campaniform sensilla close to posterior margin; remaining tergites with lines of sculpture weak or absent mesad of campaniform sensilla; tergite II with 4 lateral marginal setae, V–VIII with chaetotaxy and ctenidia typical of *Thrips*, III–IV with vestigial ctenidia; tergite VIII with posteromarginal comb complete, microtrichia long, slender but slightly irregular; tergite IX with anterior pair of campaniform sensilla not developed, X with short median split. Sternites and pleurotergites without discal setae, sternite II with 2 pairs of posteromarginal setae, 3 pairs of small setae at anterior margin; sternite VII median setae arise well in front of posterior margin.

Measurements of holotype female in microns: Body length 1200. Head, length 75; width 125; ocellar setae III 15. Pronotum, length 120; width 165; postero-angular setae 60. Forewing length 580. Antennal segments III–VII length 45, 42, 33, 50, 15.

Male smaller than female, colour yellow, distal antennal segments pale brown, forewings weakly shaded; tergite VIII with posteromarginal comb complete medially; tergite IX S1 and S2 setae arising on a straight transverse line; sternites III–VII each with exceptionally large transverse glandular area.

*Type material:* Holotype female, Australia, **Queensland**, Brisbane Airport, from *Capsella bursapastoris*, 26.xii.2004 (Hoddle & Stosic), in ANIC.

Paratypes: 1♀ 1♂ collected with holotype; 10♀, Queensland, Mt Tamborine, from *Bidens pilosa*, 25.iii.1995 (Steiner & Goodwin). Four of the paratypes were mounted into Hoyers Mountant and thus retain their original colour; the other specimens have been macerated and are paler.

*Breeding:* Both series of specimens were taken from common weeds. This suggests not only that this thrips is likely to be polyphagous but that it is probably not endemic to Australia and is likely to be found in South East Asia.

*Distribution:* Australia, Queensland.

*Relationships:* In the key to Oriental *Thrips* species (Palmer, 1992) this species tracks to *T. formosanus* Priesner, but that has dark legs and the metanotal campaniform sensilla are present. Judging from descriptive notes given by Bhatti (1980), *T. hoddlei* is similar to *T. tanicus* Bhatti from Tamil Nadu, India, which also has ocellar setae III shorter than postocular setae I. *T. tanicus* was described originally as *T. montanus* Ananthakrishnan & Jagadish (1968) and that description indicates that the legs are dark apart from the fore tibiae and tarsi, in contrast to the yellow legs of *T. hoddlei*. Unfortunately, the original Indian material is not available for study. *T. hoddlei* is similar to *T. palmi*, but differs in the closer position of ocellar setae III, the lack of sculptured lines close to the mesonotal campaniform sensilla, the more irregular metanotal sculpture, and the lack of campaniform sensilla on tergite IX.

### ***Thrips imaginis* Bagnall**

*Thrips imaginis* Bagnall, 1926: 111

*Thrips imaginis* apicalis Bagnall, 1926: 111

*Thrips fortis* Bagnall, 1926: 109

*Thrips shakespearei* Girault, 1927a: 1 **syn.n.**

*Neophysopus io* Girault, 1927a: 1

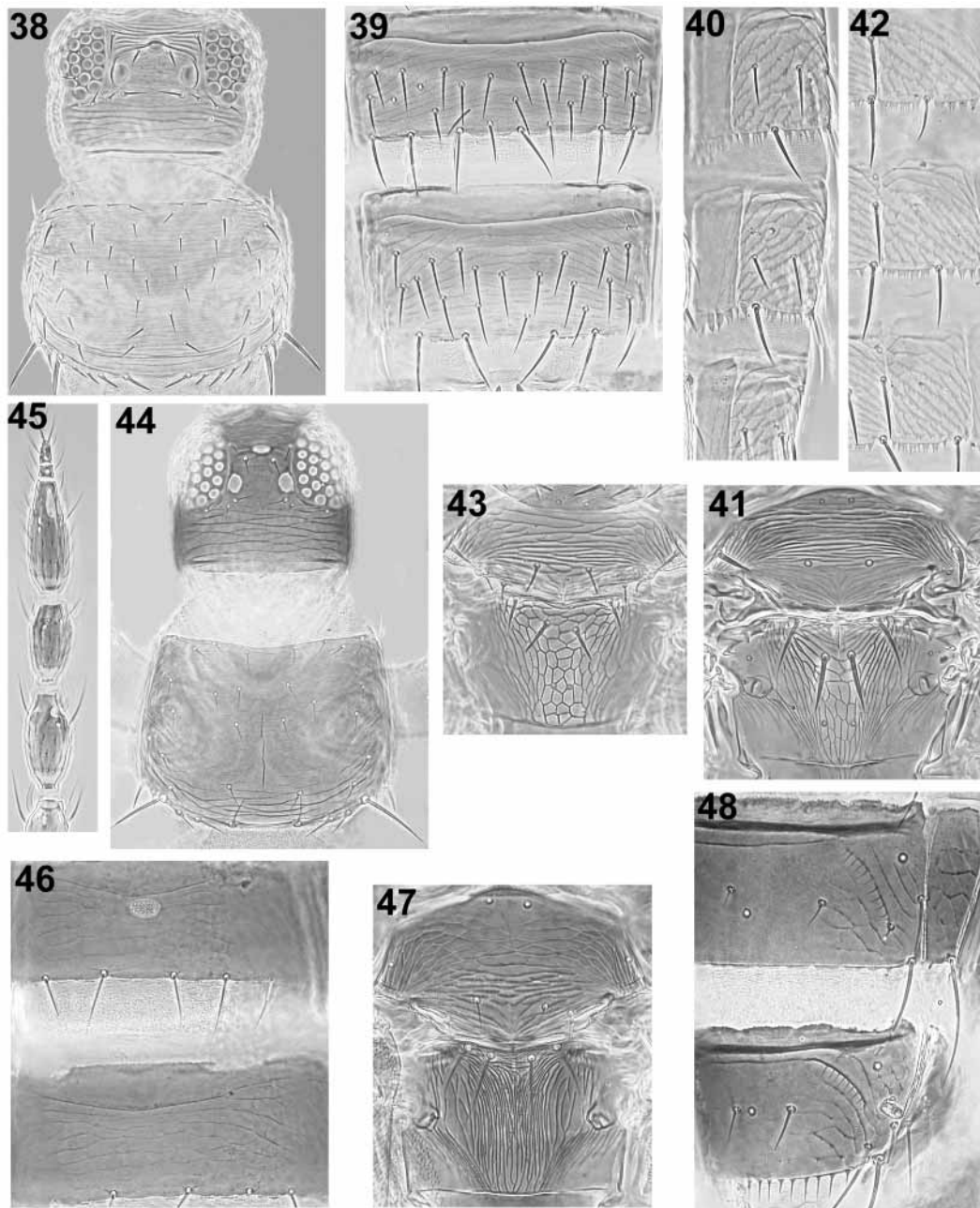
*Neophysopus aureolus* Girault, 1928c: 3

*Aptinothrips apertus* Kelly & Mayne, 1934: 33

*Diagnosis:* Body colour variable, sometimes yellow but frequently bicoloured with abdomen brown and head and thorax paler; antennal segments I, III and base of IV yellow; legs yellow; forewings pale. Antennae 7-segmented; ocellar setae III arise within ocellar triangle close to first ocellus (Fig. 38). Pronotum with 4–5 posteromarginal setae, external postero-angular seta shorter than inner seta (Fig. 38). Metanotum irregularly reticulate medially (Fig. 41), median setae well behind anterior margin, campaniform sensilla present. Forewing first vein with 3 or 4 setae on distal half. Abdominal tergite II with 3 lateral setae; tergite VIII comb represented by a few teeth laterally; sternites III–VII with 15–25 discal setae, pleurotergites with 1–3 discal setae (Fig. 40).

Male yellow, pleurotergites without discal setae.

*Comments:* *T. shakespearei* was inadvertently placed as a synonym of *T. tabaci* by Mound & Houston (1987). This error is clear from the discussion by these authors in referring to the presence of sternal discal setae – a character state never found in *T. tabaci*. The holotype of *T. shakespearei* is severely damaged; not only are the head and pronotum detached, but the shrunken abdomen is at the margin of the coverslip and has been partially cut away, presumably when someone decided to clean off excess balsam from the slide with a knife. This species is further discussed below under the newly described species, *T. safrus*.



**FIGURES 38–47.** *Thrips* species. *T. imaginis* 38–41: (38) Head & pronotum; (39) Sternites VI–VII; (40) Pleurotergites IV–VI; (41) Meso-metanota. *T. safrus* (42) Pleurotergites IV–VI. *T. insignis* (43) Meso-metanota. *T. knoxi* 44–48: (44) Head & pronotum; (45) antennal segments IV–VIII; (46) Sternites III–IV; (47) Meso-metanota; (48) tergites VII–VIII.

*Breeding:* The Plague Thrips, *T. imaginis*, is one of the most abundant and widespread insects across the southern half of Australia. It is highly polyphagous, occurring in large numbers in the flowers of native as well as introduced plants such as *Echium*. Populations

increase early in Spring and are particularly large in summer in the flowers of alpine plants of the south eastern mountains. The Plague Thrips sometimes causes damage through feeding in the flowers of apple trees, grape vines and strawberries. However, despite much early literature (Evans, 1932; Andrewartha & Birch, 1952) there are no modern studies on the biology or economic importance of this species. The large populations can at times constitute a public annoyance or even health hazard, when large numbers of individuals crawl through the filters of air conditioners and enter buildings. Adults vary greatly in colour, some females being brown or bicoloured whereas others are yellowish white. The palest forms occur during hot weather in summer, and these have been found around Perth in Western Australia as well as Adelaide in South Australia. Around Canberra, the palest forms have been found in the white flowers of *Sophora* in mid-summer, and the darkest forms in the blue flowers of *Echium* in spring, but the cause of the variation in body colour remains unknown.

*Distribution:* An Australian endemic, this species is widespread in southern Australia including Tasmania, but records from further north than Latitude 27° on this continent are likely to refer to the new species described below as *T. safrus*, the Northern Plague Thrips. A few specimens of *T. imarginis* have been seen from New Zealand (Mound & Walker, 1982), and this species is also recorded from New Caledonia (Bournier & Mound, 2000), but the only specimen available from that territory during the present studies represents *T. safrus*. As indicated above in the Introduction, the failure of this polyphagous insect to establish in other countries remains an enigma.

*Relationships:* *T. imarginis* is sister-species to *T. safrus* described below, and these two appear to be closely related to *T. unispinus* and possibly also to *T. australis*, although molecular data are needed in order to confirm the available morphological evidence.

### ***Thrips insignis* (Bianchi)**

*Isochaetothrips insignis* Bianchi, 1945: 274

*Diagnosis:* Body and legs yellow; antennal segments I, III and base of IV pale; forewings pale. Antennae 8-segmented; ocellar setae III arise on anterior margins of ocellar triangle close to first ocellus. Pronotum with postero-angular setae short. Metanotum reticulate with no marking inside the reticles (Fig. 43), median setae well behind anterior margin, campaniform sensilla present. Forewing first vein with complete row of setae. Abdominal tergite II with 3 lateral setae; tergite VIII comb complete with long fine microtrichia; sternite II with 6 posteromarginal setae; sternites with no discal setae. Male similar to female, sternites III–VII with small oval glandular area medially.

*Breeding:* The host is not known, although a few specimens of both sexes have been collected from the flowers of the orchid *Eriaxis rigida* (Bournier & Mound, 2000).

*Distribution:* Endemic to New Caledonia.

*Relationships:* This is a member of the *Thrips obscuratus* group (Mound, 2005) found in New Caledonia and New Zealand. The eight species involved have three, instead of two, pairs of posteromarginal setae on the second abdominal sternite.

***Thrips knoxi* (Girault)**

*Idolimoithrips knoxi* Girault, 1927c: 2

*Diagnosis:* Female with body brown to light brown, legs yellow with light brown shadings; antennal segments I–III brownish yellow, IV–VIII brown; forewings pale at base then brown but paler medially then again a little darker at apex. Antennae 8 (or 7) -segmented; VI usually with base of major sensorium exceptionally broad (Fig. 45). Head slightly longer than wide; ocellar setae III arise just within or just outside ocellar triangle (Fig. 44). Pronotum with transverse markings sometimes scarcely visible, discal setae varying in number from 10–24, external postero-angular setae scarcely 0.4 as long as inner pair (Fig. 44). Metanotum longitudinally striate medially (Fig. 47), median setae at anterior margin, campaniform sensilla absent. Forewing first vein with setal row complete with about 18 setae. Abdominal tergite II with 4 lateral margin setae; tergites with no sculpture medially; chaetotaxy of tergites VI–VII typical of *Thrips*, but VIII with ctenidia terminating anterior to setae S3 (Fig. 48), posteromarginal comb almost complete but irregular medially. Sternites and pleurotergites with no discal setae; sternite III usually with circular or transverse glandular area (Fig. 46).

Male yellow, sternites III–VII with small circular glandular area.

*Comments:* There is considerable structural variation, both within and between samples in several characters. Most specimens have 8-segmented antennae, but several individuals have been studied with one or both antennae having only seven segments. The ocellar setae vary in position, from just inside the triangle to clearly outside. The metanotal striation seems to be related to body size, with the smallest individuals having the striae wider apart and irregular, and the largest individuals having the striae closely spaced. The glandular area on the third sternite of females varies from almost circular to more than five times as wide as long. None of this variation has been found to correlate with the different species of *Lomandra* from which samples have been taken, and the variants are thus treated here as conspecific. One series from *Lomandra fibrata* at Adelaide has the external pair of pronotal postero-angular setae more than 0.5 as long as the inner pair.

*Breeding:* This species occurs in large numbers in the inflorescences of several species of *Lomandra* in early summer, and it appears to be univoltine.

*Distribution:* An Australian endemic, this species has been taken at various sites in coastal forests between Adelaide and Brisbane.

*Relationships:* The ctenidia on abdominal tergite VIII terminate anterior to setae S3, close to the spiracle, and this species is therefore considered to be a member of the *T. seti-*



*collis* group of endemic Australian species. *T. knoxi*, however, is particularly unusual in two other character states: the sixth antennal segment usually (but not always) bears an enlarged “*Odontothrips*-like” sensorium, and the third abdominal sternite of females bears a glandular area of variable size.

### ***Thrips longicaudatus* (Bianchi)**

*Taeniothrips longicaudatus* Bianchi, 1953: 94

**Diagnosis:** Female brown, tarsi and apex of fore tibiae yellow; antennal segment III yellow; forewings pale in basal quarter, then brown but shading gradually to pale apex. Antennae 8-segmented; ocellar setae III arise on external margins of ocellar triangle; postocular setae II less than half length of seta I. Pronotum broad with no markings, discal setae relatively small. Mesonotum transversely striate on posterior half, no lines close to anterior campaniform sensilla. Metanotum reticulate medially, median setae arise at anterior margin, campaniform sensilla present. Forewing first vein with complete row of setae on distal half, clavus with subterminal seta longer than terminal seta. Abdominal tergite II with 4 lateral setae; tergites with no lines of sculpture mesad of discal setae S2; tergite VIII comb absent; tergite X about twice as long as VIII (Fig. 49); sternite II with 2 discal setae, III–VII with 8–12 discal setae; pleurotergites without discal setae.

**Breeding:** This species remains known only from females, and too few specimens have been collected for there to be any knowledge of its biology.

**Distribution:** Described from Samoa, and recorded from the Philippines (Reyes, 1994), two females have been studied from near Atherton in north-eastern Queensland.

**Relationships:** Despite the remarkable elongate terminal abdominal segments, this is one of a group of species closely similar to *T. hawaiiensis* in structure, and is also related to *T. maculicollis*.

### ***Thrips maculicollis* (Hood)**

*Physothrips maculicollis* Hood, 1918: 122

**Diagnosis:** Female brown, tarsi and tibiae yellow with brown shadings; antennal segment III yellow; forewings pale in basal quarter, then brown but slightly paler to apex. Antennae 8-segmented; ocellar setae III arise outside ocellar triangle; postocular setae II about half length of seta I. Pronotum broad with weak transverse markings, discal setae relatively small. Mesonotum transversely striate on posterior half, no lines close to anterior campaniform sensilla. Metanotum reticulate medially (Fig. 51), median setae arise at anterior margin, campaniform sensilla present. Forewing first vein with 7 setae basally and 3 widely

spaced setae on distal half, clavus with subterminal seta longer than terminal seta. Abdominal tergite II with 4 lateral setae; tergite I covered with lines of sculpture, II–VIII with no lines of sculpture extending mesad to campaniform sensilla; tergite VIII comb with a few teeth laterally; tergite X as long as VIII (Fig. 50); sternite II with 4 discal setae, III–VII with 12–16 discal setae; pleurotergites without discal setae.

Male yellow, antennal segments IV–VIII brown, wings slightly shaded, sternites III–VII with large transverse glandula area.

*Breeding:* On New Caledonia, a substantial population with larvae was found in the flowers of *Fagraea schlechteri* (Loganiaceae). A few females were also taken from the orange flowers of an unidentified member of the Apocynaceae, as well the white flowers of a member of Cunoniaceae. No host records are available for the few specimens known from Australia.

*Distribution:* Although described from Australia, only a few specimens are known and these were taken near Cairns in northern Queensland. In contrast, many specimens of both sexes have been taken in New Caledonia (Bournier & Mound, 2000).

*Relationships:* This species used to be placed in the genus *Lefroythrips* but was recognized as a *Thrips* species by Mound (1996a). In the form of the head, pronotum, mesonotum, metanotum and forewing clavus it is similar to *T. longicaudatus*, but the terminal abdominal segments are short, and there are few setae on the first vein of the forewing.

### ***Thrips malloti* Priesner**

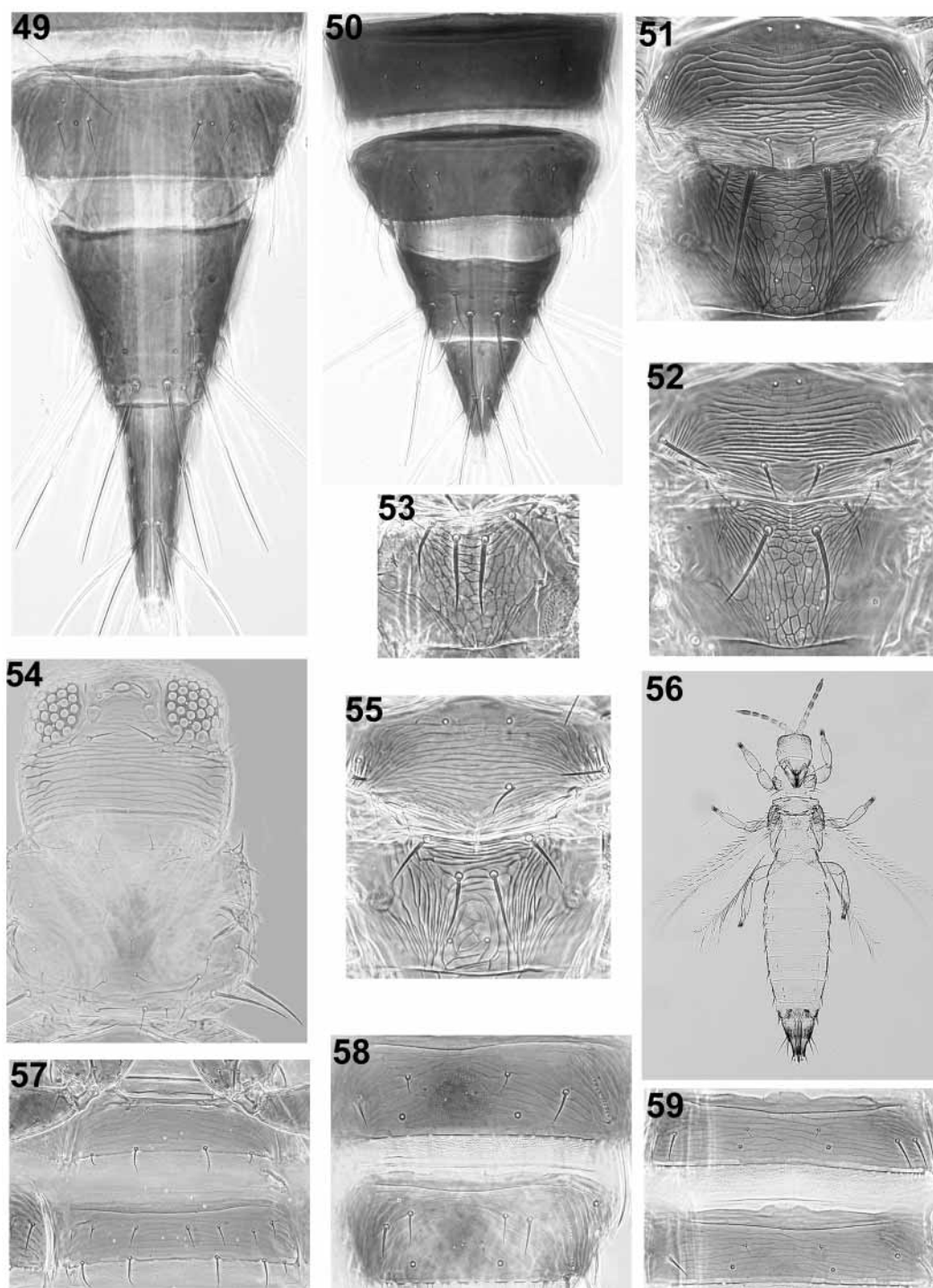
*Thrips (Isoneurothrips) malloti* Priesner 1934: 269

*Thrips (Isoneurothrips) addendus* Priesner 1934: 270

*Diagnosis:* Body brown to dark brown, legs paler; antennal segment III mainly yellow; forewings brown with base paler. Antennae 7-segmented; ocellar setae III arise on (or just outside) margins of ocellar triangle, ocellar region sometimes with faint transverse markings; postocular setae II minute. Pronotum with strong transverse markings, about 20 discal setae. Metanotum reticulate (Figs 52, 53), reticles without internal markings, median setae behind anterior margin, campaniform sensilla usually present. Forewing first vein with complete setal row; clavus with subterminal seta shorter than terminal seta. Abdominal tergite II with 3 (or 4) lateral margin setae; tergite VIII with comb absent; sternites III–VI with no discal setae.

*Breeding:* Collected from various flowers.

*Distribution:* Apparently widespread in South East Asia, but extending to India and to Okinawa (Palmer, 1992), a single female has been studied from Australia. Collected in September 1959 at Millaroo on the Burdekin River, 100km west of Bowen, Queensland, this specimen is in poor condition. Moreover, in contrast to Javanese specimens identified as this species it lacks campaniform sensilla on the metanotum.



**FIGURES 49–59.** *Thrips* species. *T. longicaudatus* (49) Tergites VIII–X. *T. maculicollis* 50–51: (50) Tergites VII–X; (51) Meso-metanota. *T. malloti* (52) Meso-metanota, female from Java; (53) Metanotum, female from Queensland. *T. martini* 54–59: (54) Head & pronotum; (55) Meso-metanota; (56) Teneral female; (57) Sternites II–III; (58) Tergites VII–VIII; (59) Tergites III–IV.

*Relationships:* This species is considered to be a member of the South East Asian *Thrips orientalis* group (Mound, 2005).

***Thrips martini* sp.n.**

*Diagnosis:* Female with body and legs light brown, head paler medially, abdominal segments IX–X dark brown (Fig. 56), tarsi yellow; antennal segments light brown to brown; forewings uniformly shaded; major setae brown. Head broader than long with a small tubercle or ridge anterior to first ocellus, vertex transversely striate, ocellar region weakly striate; ocellar setae III arising outside ocellar triangle, shorter than distance between hind ocelli; postocular setae I longer than ocellar setae III (Fig. 54). Antennae 7-segmented. Pronotum transverse, with transverse lines medially but scarcely 16 discal setae; postero-angular setae well developed. Mesonotum with lines of sculpture near campaniform sensilla. Metanotal sculpture longitudinal laterally, but irregularly reticulate medially the sculpture lines bearing indistinct flanges (Fig. 55); median pair of setae not close to anterior margin; campaniform sensilla present. Forewing relatively short, first vein with continuous row of 17–20 setae, second vein with 9–11 setae; clavus with 5 marginal setae, terminal seta longest. Abdominal tergites I–IV with irregular sculpture medially (Fig. 59), V–VIII without sculpture medially posterior to setae S1; tergite II with 3 lateral marginal setae, tergites V–VIII with chaetotaxy and ctenidia typical of *Thrips*, IV sometimes with vestigial ctenidia; tergite VIII posteromarginal comb with small slender microtrichia arising irregularly in groups (Fig. 58); tergite X with almost complete median split. Sternite II with 6 marginal setae (Fig. 57), III–VII with about 4 to 8 discal setae; pleurotergites III–VI usually with 2 discal setae.

Measurements of holotype female in microns: Body length 1450. Head, length 125; width 160; ocellar setae 20. Pronotum, length 125; width 200; postero-angular setae 55. Forewing length 670. Antennal segments III–VII length 47, 43, 37, 47, 15.

*Type material:* Holotype ♀, **New Zealand**, South Island, Porters Pass [about 80km west of Christchurch], from *Hebe brachysiphon*, 26.x.2004 (in NZAC).

Paratypes, 14 ♀ collected with holotype.

*Breeding:* Dr Nicholas Martin reared the adult females of this species from larvae feeding on young leaves of *Hebe brachysiphon*, and noted that these larvae were leaving faecal droplets on the leaves. Also reared were two males of *Desmidothrips walkerae* Mound (Aeolothripidae) whose larvae were presumably predatory on the *T. martini* larvae.

*Distribution:* New Zealand, South Island.

*Relationships:* This species is very similar to *T. austellus*, and is the fifth member of the *Thrips obscuratus* group from New Zealand. Teneral individuals have the body yellow as in *T. austellus*, but with the terminal abdominal segments brown; mature individuals are extensively light brown. In contrast to *T. austellus*, the pronotal postero-angular setae of *T. martini* are considerably longer than antennal segment III, the abdominal tergites are more

extensively sculptured medially, and the sternites and pleurotergites bear fewer discal setae. The forewings are relatively short in the available specimens and, in association with the strong tergal sculpture, this may suggest that this species sometimes produces micropterous adults.

### ***Thrips nigropilosus* Uzel**

*Thrips nigropilosus* Uzel, 1895: 198

**Diagnosis:** Macropterous or micropterous. Body and legs largely yellow, light brown shadings on thorax and medially on tergites I–VI; major setae brown; antennal segment I yellow, II light brown, III - VII brown; forewings pale with very faint shading on clavus and at veinal fork. Antennae 7-segmented; ocellar setae pair III stout, arising lateral to first ocellus; postocular setae I slightly longer than III, setae II minute. Pronotum with transverse lines of sculpture weak, 16–20 discal setae all relatively long, also anteromarginal, antero-angular, midlateral and posteromarginal setae S1 unusually long and dark. Mesonotum with campaniform sensilla present or absent. Metanotum with irregular reticulation (Fig. 60); median setae arising behind anterior margin, campaniform sensilla present or absent. Forewing first vein (when present) with 3 setae on distal half, wings variably reduced in length, sometimes no longer than width of pterothorax. Tergite II with 3 lateral marginal setae; tergites II–VII with lines of sculpture between median setal pair, these setae variable in length but usually more than half as long as their tergite (Fig. 61); posterior margin of tergite VIII with complete comb of slender microtrichia; pleurotergites and sternites without discal setae. Male smaller than female, sternites III–VII with transverse glandular area.

**Breeding:** A leaf feeding polyphage, this species has been considered a pest of cultivated *Pyrethrum* in the highlands of Kenya, also of *Chrysanthemum* and lettuce under glass in Europe, and of *Chrysanthemum* in Japan. A substantial population was found on a garden *Achillea* species at Gosford, New South Wales. This is an unusual *Thrips* species, in that the wing condition varies from fully macropterous to micropterous. Males are always short winged, but females are more commonly long winged under long day lengths and short winged under short day lengths (Nakao, 1993).

**Distribution:** Widespread in temperate countries around the world, including New Zealand, this species is also found in the cooler parts of tropical countries such as Kenya and Tanzania. In Australia, populations have been seen from near Adelaide and also from Gosford, north of Sydney.

**Relationships:** The abdominal chaetotaxy and ctenidia of this species are typical of *Thrips*, with S3 small on tergites VI–VIII despite S1 and S2 being unusually large, as might be expected in a species that exhibits microptery. However, even fully winged females have the pronotal anteromarginal and midlateral setae exceptionally long. The

only described member of the genus with which *T. nigropilosus* might usefully be compared is a little known Indian species, *T. garuda* Bhatti, in which the metanotal structure as well as the general body colour and chaetotaxy are similar.

### ***Thrips novocaledonensis* (Bianchi)**

*Taeniothrips novocaledonensis* Bianchi, 1945: 270

**Diagnosis:** Body brown, tarsi and apices of fore tibiae yellow; antennal segment III yellow; forewings brown with base paler. Antennae 8-segmented; ocellar setae III arise outside ocellar triangle; postocular setae I as long as ocellar setae III, postocular setae II about half as long as I. Pronotum with transverse markings, one pair of sublateral setae stouter than remaining discal setae. Mesonotum with lines of sculpture close to anterior campaniform sensilla. Metanotum (Fig. 62) transversely striate on anterior half, with longitudinal but more widely spaced striations on posterior half, median setae arise at anterior margin, campaniform sensilla present. Forewing first vein with setal row variable, basal series with 9–12 then 2 or 3 near wing apex; clavus with subterminal seta shorter than terminal seta. Abdominal tergite II with 4 lateral setae; tergite VIII comb complete but short and irregular; sternites III–VII with 14–18 discal setae; pleurotergites with 0–3 discal setae (Fig. 63). Male brown, pleurotergites usually with no discal setae, sternites III–VII with broad glandular area.

**Breeding:** Apparently breeding in the flowers of a range of herbs and shrubs in New Caledonia (Bournier & Mound, 2000), this species was taken in considerable numbers from the flowers of *Lantana* on Norfolk Island, and has been intercepted in quarantine at Sydney in rose flowers from that territory.

**Distribution:** Described from New Caledonia, this species is known from Vanuatu and also from Norfolk Island where it appears to have become the dominant flower thrips.

**Relationships:** Despite the presence of pleurotergal discal setae, this species is considered to be closely related to *Thrips hawaiiensis* on the basis of most of its structural characters, particularly the metanotum.

### ***Thrips obscuratus* (Crawford)**

*Isoneurothrips obscuratus* Crawford, 1941: 63

**Diagnosis:** Macropterous, rarely micropterous. Body, legs and antennae brown; forewing shaded with base usually paler; major setae dark. Antennae 7- or 8-segmented; ocellar setae III arising outside ocellar triangle, postocular setae II minute (Fig. 64). Pronotum with little sculpture, 4–8 discal setae of which one midlateral pair particularly long. Met-

anotum (Fig. 65) closely striate, transversely on anterior half but longitudinally on posterior half, median setae arise near anterior margin, campaniform sensilla present. Forewing (when present) with first vein bearing complete row of setae. Abdominal tergite II with 3 lateral setae; tergite VIII with marginal comb complete but sometimes irregular (Fig. 67); pleurotergites with 1–4 discal setae (Fig. 66); sternite II with 3 pairs of marginal setae, sternites III–VII with 6 to 14 discal setae. Male yellow brown, sternites III–VII with transverse glandular area.

*Breeding:* Teulon and Penman (1990) recorded larvae of this thrips from 51 different species of plant in New Zealand, including 36 introduced plant species some of which are crops. These larvae were found almost entirely in flowers, although adults were found in other situations and on a much wider range of plants.

*Distribution:* A New Zealand endemic, this is the most abundant thrips in that country. Despite being highly polyphagous and associated with major exports such as apples and kiwi fruit, this thrips has never become established in any other country, including Australia.

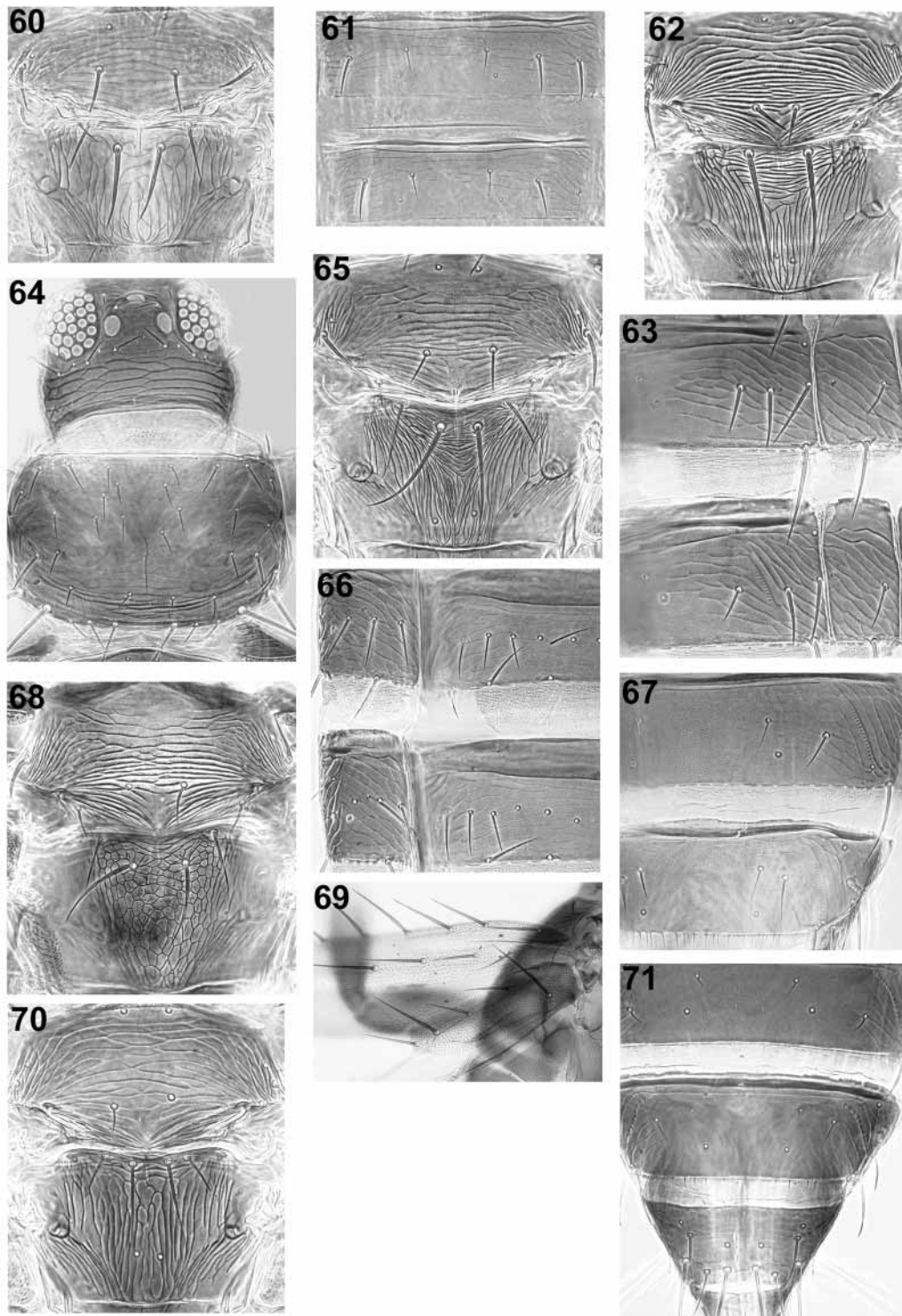
*Relationships:* This species shares with four other species from New Zealand and three from New Caledonia the unusual apomorphy of having three, instead of two, pairs of marginal setae on the second abdominal sternite. These eight species are referred to as the *Thrips obscuratus* group (Mound, 2005).

### ***Thrips orientalis* (Bagnall)**

*Isoneurothrips orientalis* Bagnall, 1915: 593

*Diagnosis:* Body and legs brown to dark brown, tarsi and apices of fore tibiae yellow; antennal segment III mainly yellow, IV light brown with yellow base; forewings brown with base scarcely paler. Antennae 7-segmented; ocellar setae III arise on (or just outside) margins of ocellar triangle, ocellar region sometimes with faint reticulate markings; postocular region strongly sculptured, postocular setae II minute. Pronotum with strong transverse markings, 20–30 discal setae with one midlateral pair stout. Mesonotal campaniform sensilla present or absent. Metanotum reticulate (Fig. 68), reticles with internal markings, median setae behind anterior margin, campaniform sensilla absent. Forewing first vein with setal row variable, 7–10 irregularly placed setae on distal half; clavus with subterminal seta longer than terminal seta (Fig. 69). Abdominal tergite II with 3 (or 4) lateral margin setae; tergite VIII with comb absent medially and short laterally; sternites III–VI sometimes with no discal setae but usually with 1–6 setae laterally. Male brown, sternites III–VII with transverse glandular area but no discal setae.

*Breeding:* Apparently polyphagous, and probably associated with various strongly scented flowers such as those of *Gardenia*, this species has been collected on one occasion in northern Australia from the flowers of *Glossocarya hemiderma* (Verbenaceae).



**FIGURES 60–71.** *Thrips* species. *T. nigropilosus* 60–61: (60) Meso-metanota; (61) Tergites III–IV. *T. novocaledonensis* 62–63: (62) Meso-metanota; (63) Tergites & pleurotergites IV–V. *T. obscuratus* 64–67: (64) Head & pronotum; (65) Meso-metanota; (66) Tergites & pleurotergites III–IV; (67) Tergites VII–VIII. *T. orientalis* 68–69: (68) Meso-metanota; (69) Forewing clavus. *T. pallisetis* 70–71: (70) Meso-metanota; (71) Tergites VII–X.



*Distribution:* This tropical species is widespread between India, Indonesia, southern Japan, New Caledonia and Hawaii, and is also recorded from Trinidad and Florida (Nakahara, 1994). A few specimens of both sexes have been studied from near Cape York in northern Australia, also one male from near Brisbane.

*Relationships:* Twelve related species from South East Asia have been referred to as the *Thrips orientalis* group (Mound 2005). These have the metanotum reticulate, usually with markings internal to the reticles, the median pair of metanotal setae arising far from the anterior margin, the metanotal campaniform sensilla absent, and sternite VII without discal setae despite the more anterior sternites usually having discal setae.

### ***Thrips pallisetis* Sakimura**

*Thrips (Isothrips) pallisetis* Sakimura, 1969: 71

*Diagnosis:* Body brown, tibiae yellow with light brown shadings; antennal segment III yellow; forewings weakly shaded. Antennae 7-segmented; ocellar setae III arise outside ocellar triangle. Pronotum with weak transverse markings, posterior sub-marginal apodeme present, postero-angular setae long. Metanotum with irregular elongate reticulation (Fig. 70), median setae at anterior margin, campaniform sensilla present. Forewing first vein with setal row complete. Abdominal tergite II with 4 lateral margin setae; chaetotaxy and ctenidia of tergites V–VII typical of *Thrips*, VIII with ctenidia terminating anterior to setae S3 (Fig. 71), posteromarginal comb present laterally; sternites and pleurotergites with no discal setae.

*Breeding:* Known only from four females, nothing is known of the biology of this species.

*Distribution:* An Australian endemic, this species presumably lives in the arid inner area of Australia, three females having been taken near Bourke, in New South Wales, and one female just south of the border between Northern Territory and South Australia, at Marla on the Stuart Highway.

*Relationships:* The position of the ctenidia on tergite VIII indicates that this species is a member of the Australian endemic *T. seticollis* group, although it is the most northerly member of the group. The metanotum is similar in structure to *T. excaelatus*, but the forewing first vein has a complete row of setae.

### ***Thrips palmi* Karny**

*Thrips palmi* Karny, 1925: 10

*Diagnosis:* Body and legs yellow, major setae light brown; antennal segments IV & V

brown distally, VI & VII brown; forewings pale. Head wider than long, ocellar setae pair III small and arising just outside ocellar triangle; postocular setae pair I slightly longer than ocellar setae III (Fig. 72). Antennae 7-segmented, III & IV slightly constricted at apex, VII short. Pronotum with 2 pairs of long postero-angular setae, posterior margin with 3 pairs of setae. Metanotum with irregular longitudinal lines converging to posterior margin, with curving transverse lines at anterior (Fig. 73); median setae arising behind anterior margin, campaniform sensilla present. Forewing first vein with 3 (or 2) setae on distal half, second vein with row of about 15 setae. Tergite II with 4 lateral marginal setae; posterior margin of tergite VIII with complete comb of long slender microtrichia (Fig. 74); pleurotergites without discal setae. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs, median pair on VII arising in front of margin; sternites without discal setae.

Male smaller than female; tergite VIII with marginal comb complete medially; sternites III–VII with narrow transverse glandular area.

*Breeding:* This serious crop pest and Tospovirus vector is highly polyphagous in the flowers and on the leaves of many plants, including cucurbitaceous and solanaceous crops (Murai, 2002).

*Distribution:* Originally from South East Asia, this species became widespread in tropical countries during the final 30 years of the 20<sup>th</sup> century, presumably transported by the horticultural trade. In Australia it was first recorded near Darwin, but is also a pest of potatoes in south-eastern Queensland. The distribution in Australia appears to be limited by the prevailing aridity in much of the northern part of the continent.

*Relationships:* Although very similar to *T. flavus* Schrank, a common Holarctic species, *T. palmi* has ocellar setae pair III close together behind the first ocellus and within the ocellar triangle.

### ***Thrips parvispinus* (Karny)**

*Isoneurothrips parvispinus* Karny, 1922: 106

*Isoneurothrips jensensi* Karny, 1925: 7

*Isoneurothrips pallipes* Moulton, 1928: 296

*Thrips (Isoneurothrips) taiwanus* Takahashi, 1936: 440

*Diagnosis:* Body brown, head and thorax paler than abdomen, head commonly with cheeks darker than median area; legs mainly yellow; antennal segment III yellow, also basal half of IV & V; forewings brown with base sharply pale. Head wider than long, ocellar setae pair III small and arising on anterior margins of ocellar triangle; postocular setae pairs I & III slightly longer than ocellar setae III, pair II minute. Antennae 7-segmented, III & IV constricted at apex with forked sense cone, VII small. Pronotum with 2 pairs of long postero-angular setae; posterior margin with 3 pairs of setae. Metanotum reticulate medially (Fig. 75), reticles varying in shape and sometimes with faint internal markings;

median setae long and arising behind anterior margin; campaniform sensilla absent. Forewing first and second veins with complete rows of setae; clavus with 5 marginal setae. Tergite II with 3 lateral marginal setae; posterior margin of tergite VIII with comb almost absent, a few microtrichia present laterally; pleurotergites without discal setae. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs, VII with median pair arising in front of margin; II & VII without discal setae, III–VI with about 6 to 12 discal setae in an irregular row (Fig. 76).

Male largely yellow; tergite VIII with no posteromarginal comb; tergite IX S1 setae arising slightly anterior to line joining bases of S2 setae; sternites III–VII each with small transverse glandular area, discal setae arising laterally.

*Breeding:* Polyphagous in the flowers of a range of plants, this species seems particularly associated with strongly scented flowers, such as those of *Gardenia* species, in common with the related species *T. orientalis* and *T. extensicornis*.

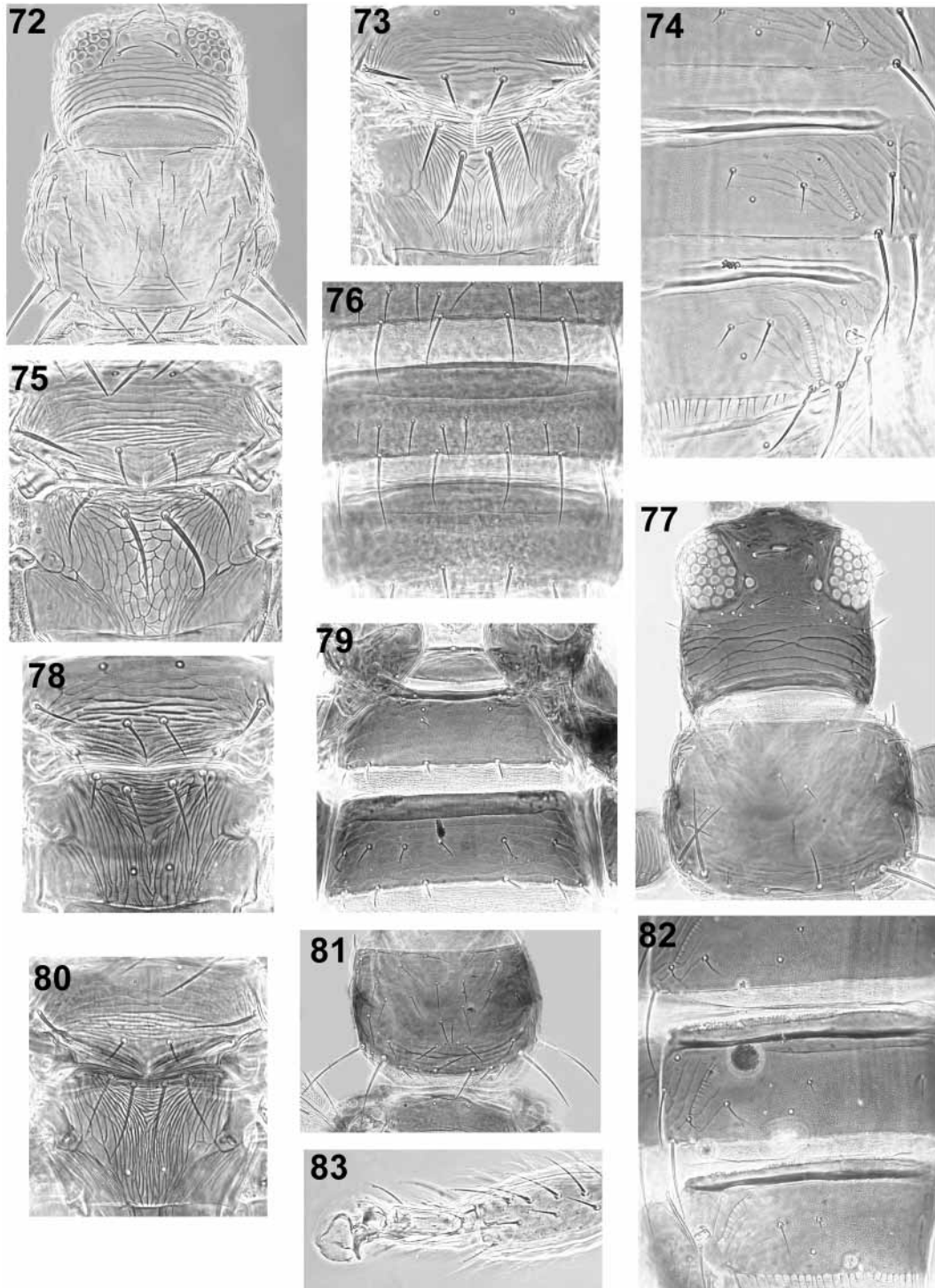
*Distribution:* Widespread in South East Asia, from Java and Taiwan to East Timur, but also recorded from Greece (Mound & Collins, 2000), this species has been found widely in northern Australian coastal regions between northern New South Wales and Western Australia, north from Broome. In Australia it has usually been taken in low numbers, but a large population involving both sexes and larvae was taken from mango flowers at Kununurra on the Ord River.

*Relationships:* The synonymy indicated above was given by Mound and Collins (2000) after studying variation in specimens from many localities. *T. parvispinus* is closely related to *T. orientalis*, but that has the forewing uniformly shaded not pale at the base, and the metanotal sculptured reticles with more pronounced internal markings.

### ***Thrips phormiicola* Mound**

*Thrips phormiicola* Mound, 1978: 620

*Diagnosis:* Usually micropterous. Body brown, head and thorax sometimes paler than abdomen, tarsi yellow, tibiae paler than femora; forewing shaded with base pale; antennal segment III and base of IV yellow; major setae dark. Antennae 7-segmented; ocellar setae III arising outside ocellar triangle (Fig. 77), postocular setal row often irregular. Pronotum almost without sculpture, 4–8 discal setae, only 2 pairs of posteromarginal setae. Metanotum (Fig. 78) irregularly striate medially with faint shadow lines, median setae arise near anterior margin, campaniform sensilla present. Forewing (when present) with first vein bearing complete row of widely spaced setae. Abdominal tergite II with 3 lateral setae; tergite VIII with marginal comb complete but irregular, particularly short in micropterae; pleurotergites with 1–3 discal setae; sternite II with 3 pairs of marginal setae and 1 or 2 discal setae (Fig. 79), sternites III–VII with 5 to 7 discal setae. Male brown, micropterous, sternites III–VII with transverse glandular area, II with a very small circular area.



**FIGURES 72–83.** *Thrips* species. *T. palmi* 72–74: (72) Head & pronotum; (73) Meso-metanota; (74) Tergites VI–VIII. *T. parvispinus* 75–76: (75) Meso-metanota; (76) Sternites V–VII. *T. phormicola* 77–79: (77) Head & pronotum; (78) Meso-metanota; (79) sternites II–III. *T. seticollis* 80–83: (80) Meso-metanota; (81) Pronotum; (82) Tergites VI–VIII; (83) fore tarsus.

*Breeding*: Substantial colonies of this thrips, usually comprising only micropterae, can be found within the funnels at the base of the leaves of *Phormium* species.

*Distribution*: This species is endemic to New Zealand, where it is widespread at various altitudes on both North and South Islands (Mound & Walker, 1982: 71).

*Relationships*: Despite the prolongation of the head in front of the eyes, this species is considered one of the eight members of the *Thrips obscuratus* group (Mound, 2005), because of the presence of three pairs of marginal setae on the second abdominal sternite. The metanotal sculpture lines have faint shadow lines as in *T. obscuratus* and *T. martini*.

### *Thrips safrus* sp.n.

*Diagnosis*: Body and legs yellow to white, distal antennal segments light brown, IV-VI yellow at base; forewings pale. Antennae 7-segmented; ocellar setae III arise just within anterolateral margins of ocellar triangle close to first ocellus, ocellar region with weak transverse striae; postocular setae in straight row, subequal in size. Pronotum with transverse striae, 20–30 discal setae and 4–5 posteromarginal setae, external postero-angular seta shorter than inner seta. Metanotum irregularly reticulate medially, median setae well behind anterior margin, campaniform sensilla present. Forewing first vein usually with 3 setae on distal half; clavus with terminal seta longer than subterminal seta. Abdominal tergite II with 3 lateral setae; tergite VIII comb represented by a few teeth laterally; sternite II with 1 or 2 discal setae, III–VII with 15–25 discal setae in an irregular transverse row; pleurotergites with no discal setae (Fig. 42). Male yellow, sternites III–VII with 9–15 discal setae in an irregular transverse row posterior to small transverse glandular area.

Measurements of holotype female in microns: Body length 1400. Head, length 75; width 150. Pronotum, length 145; width 200; inner pa setae 60; outer pa setae 45. Forewing length 800. Antennal segments III–VII length 55, 50, 35, 50, 14.

*Type material*: Holotype ♀, Australia, **Queensland**, Townsville, from *Cochlospermum fraseri* flowers, 16.vii.1995 (LAM 2770), in ANIC.

Paratypes: 4♀ collected with holotype.

*Non-paratypic material*: Specimens of this species have been examined from many plant species across a wide range of localities in northern Australia: **Queensland** — Brisbane, Dalby, Bundaberg, Mundubera, Charters Towers, Thursday Island, Mareeba, Mossman, Cape Tribulation; **Northern Territory** — Alice Springs, Katherine, Darwin, Jabiru; **Western Australia** — Kununurra, Wittenoom, Millstream; **New South Wales** — Jervis Bay, Sydney, Orange; **South Australia** — Maree. **New Caledonia** — Poe Beach.

*Breeding*: Adults have been recorded from the flowers of a wide range of plants, but no evidence is available concerning the plants on which breeding occurs.

*Distribution*: Presumably endemic to Australia, this new species is largely restricted to the northern parts of this continent where it replaces the closely related species *T. imaginis*. Although a few specimens have been taken near Sydney, and one female from further

south at Jervis Bay, *T. safrus* is generally found north of latitude 27°. One female of this species has been studied from New Caledonia on *Acacia spirorbis* flowers; this was previously identified as *T. imaginis*, but the remaining specimens in that series (Bournier & Mound, 2000) require further checking.

*Relationships:* Using the key to *Thrips* species by Palmer (1992), this new species will track to an un-named species subsequently described as *T. palmerae* Reyes (1994) from the Philippines. However that is a brown insect in which the metanotum has no campaniform sensilla and the sculptured reticles possess internal markings. *T. safrus* is closely related to, and has previously been identified as, *Thrips imaginis*, the Plague Thrips of southern Australia. Females of *T. imaginis* vary in colour from brown to yellowish white, but always have one to three discal setae on the pleurotergites of abdominal segments III to VI. In contrast, females of the Northern Plague Thrips are always yellow in colour, and bear no discal setae on any of the abdominal pleurotergites. The males of these two species cannot at present be distinguished.

The single damaged specimen on which *T. shakespearei* Girault was based may possibly represent this species. Only abdominal segments VI–X are preserved on the Girault holotype, and even these are heavily distorted, so that it is not possible to be sure that pleurotergal discal setae are absent rather than not visible. Rather than use this severely damaged and equivocal specimen as the basis for recognizing one of the most common and widespread insects of northern Australia, *T. shakespearei* is here placed as a synonym of *T. imaginis*, and the Northern Plague Thrips is described as this new species.

### ***Thrips seticollis* (Bagnall)**

*Taeniothrips seticollis* Bagnall, 1915: 591

*Diagnosis:* Female brown, legs brown with tibiae paler at apex, tarsi yellow, antennal segment III yellow, IV yellow at base and II at apex, remaining segments brown; forewings shaded, base sharply pale. Antennae 8-segmented; ocellar setae III short, arising just inside ocellar triangle; postocular setae I longer than side of ocellar triangle, setae III and V at least twice as long as II and IV. Pronotum with weak transverse markings, 16–20 discal setae present each about as long as postocular setae I; postero-angular setae elongate (Fig. 81), also median posteromarginal setae. Fore tarsus with large pretarsal claw (Fig. 83). Mesonotum with no sculpture near campaniform sensilla. Metanotum (Fig. 80) closely striate medially, anterior area with transverse striae, median setae at anterior margin, campaniform sensilla present. Forewing first vein with setal row complete; clavus with terminal and subterminal setae subequal. Tergite II with 4 lateral margin setae; median tergites with no lines of sculpture extending mesad of setae S2; ctenidia present on tergites V–VIII but weak on V and absent on IV, on VIII terminating anterior to setae S3 (Fig. 82); tergite VIII with posteromarginal comb complete but irregular medially; sternites and pleurotergites with no discal setae.

Male light brown, tergite VIII with no comb, sternites III–VII with small transverse glandular area.

*Breeding:* No specific host plant for this species has yet been recognized.

*Distribution:* This Australian endemic is known only from five specimens: the female holotype taken near Perth in 1914, and three females and one male taken in 1967 from 100km south of Perth.

*Relationships:* This species is unusual in having a large pretarsal claw, but is otherwise very similar to *T. wellsae*, described below from the mountains of south-eastern Australia and Tasmania. Also closely related is *T. tomeus*, described below from two females taken at Canberra that have a similar large pretarsal claw.

### ***Thrips setipennis* (Bagnall)**

*Physothrips setipennis* Bagnall, 1916: 399

*Physothrips chaetoneurus* Karny, 1920: 37

*Physothrips ignobilis* Bagnall, 1926: 101

*Physothrips myrsiniicola* Bagnall, 1926: 103

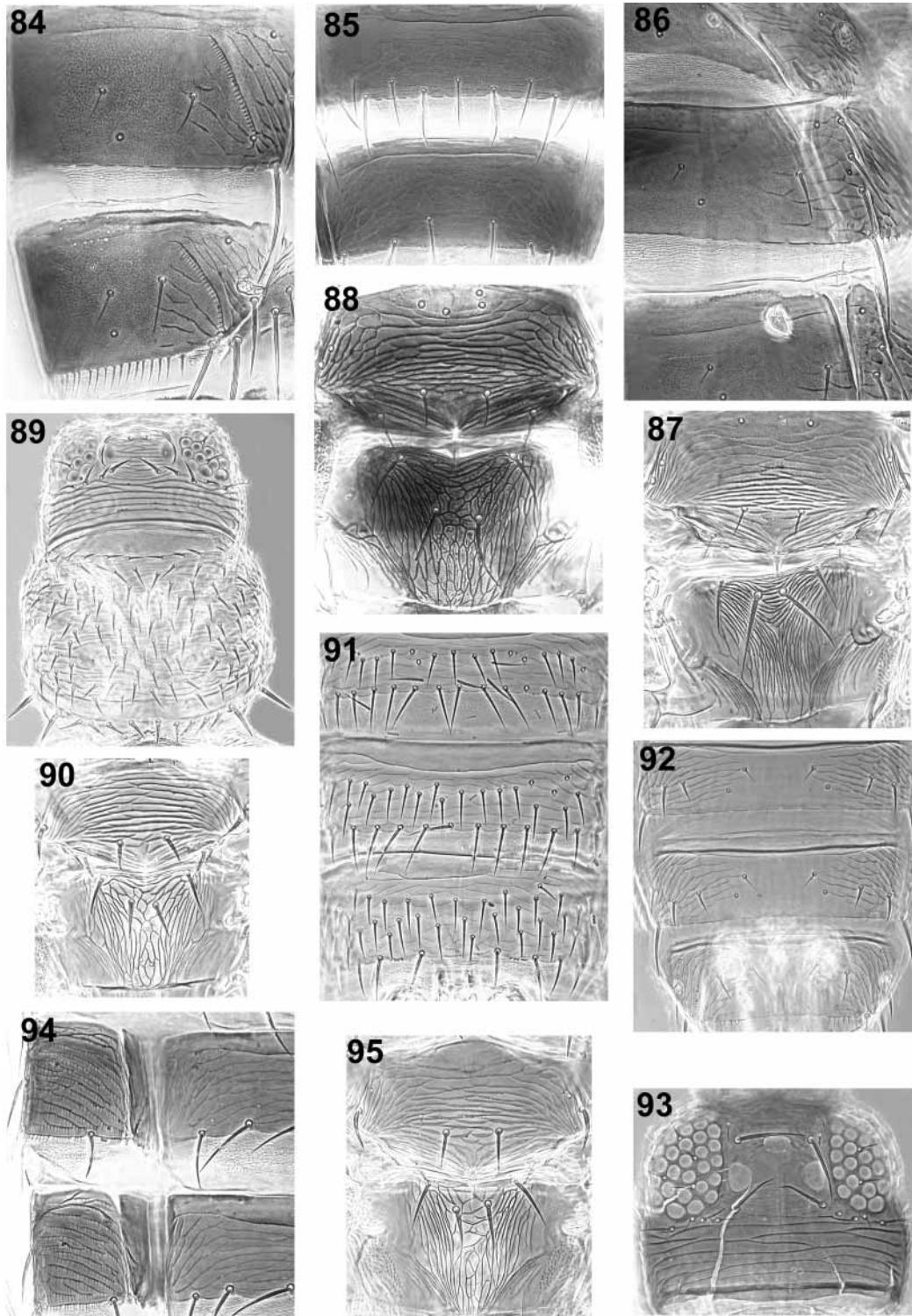
*Physothrips quadrisetae* Girault, 1927c: 1

*Physothrips citrilacteus* Girault, 1928a: 1

*Physothrips keatsi* Girault, 1928c: 3

*Diagnosis:* Female with body and femora brown, tibiae and tarsi largely yellow; antennal segment III and extreme base of IV yellow, remaining segments brown; forewings brown with base sharply paler. Head wider than long, ocellar setae pair III small and arising on anterior margins of ocellar triangle; postocular setae pairs I & III as long as ocellar setae III, pair II minute. Antennae 8-segmented, III & IV with constricted slender apex and forked sense cone; VII & VIII short. Pronotum with 2 pairs of long postero-angular setae; posterior margin with 3 pairs of setae of which the median pair is relatively long. Metanotum (Fig. 87) with tightly spaced, converging, longitudinal striae; median setae arising behind anterior margin; campaniform sensilla absent. Forewing first and second veins with complete rows of setae; clavus with 5 marginal setae. Tergite II with 4 lateral marginal setae (Fig. 86), the anterior 2 setae equal in length; tergal sculpture lines not extending mesad of setae S2; tergites V–VIII with chaetotaxy and ctenidia typical of *Thrips* (Fig. 84), VIII with complete posteromarginal comb of slender microtrichia; pleurotergites without discal setae. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs, VII with median pair arising well in front of margin; all sternites with a few discal setae, but these arise close to or even at posterior margin (Fig. 85).

Male yellow with distal antennal segments brown; tergite VIII posterior margin without comb; tergite IX setae S1 arising anterior to line joining bases of S2 setae; sternites III–VII each with slender transverse glandular area, sternal marginal and discal setae difficult to distinguish from each other.



**FIGURES 84–95.** *Thrips* species. *T. setipennis* 84–87: (84) Tergites VII–VIII; (85) Sternites VI–VII; (86) Tergite II; (87) Meso-metanota. *T. simplex* (88) Meso-metanota. *T. subnudula* 89–92: (89) Head & pronotum; (90) Meso-metanota; (91) Sternites V–VII; (92) Tergites VI–VIII. *T. sumatrensis* (93) Head. *T. tabaci* 94–95: (94) pleurotergites V–VI; (95) Meso-metanota.



**Breeding:** This common eastern Australian thrips has been recorded as the specific pollinator of a rainforest tree, *Wilkiea huegeliana* (Monimiaceae), in coastal New South Wales (Williams *et al.*, 2001). It has been found breeding in the flowers of several native Australian plants from unrelated genera, including *Hibbertia* (Dilleniaceae), *Lomandra* (Xanthorrhoeaceae), *Macadamia* (Proteaceae), *Prostanthera* (Labiatae), *Ripogonum* (Smilacaceae), and *Synoum* (Meliaceae), as well as in the flowers of *Gardenia* (Rubiaceae).

**Distribution:** This is an Australian endemic that is widespread in the coastal forests of the south east, from Adelaide to Brisbane, and including Tasmania.

**Relationships:** The striate sculpture of the metanotum suggest that this species might be related to certain members of the genus from the Pacific Region, such as *T. rhabdotus*. However, the arrangement of the sternal discal setae, close to or even at the posterior margin, is unique.

### ***Thrips simplex* (Morison)**

*Physothrips simplex* Morison, 1930: 12

*Physothrips spiranthidis plurisetae* Girault, 1933: 2

**Diagnosis:** Female with body and legs dark brown, tarsi and antennal segment III yellowish brown; forewings brown with base paler. Head wider than long, ocellar setae pair III small and arising just inside anterior margins of ocellar triangle; postocular setae pairs I & III slightly longer than ocellar setae III, pair II minute. Antennae 8-segmented, III & IV slightly constricted at apex with forked sense cone. Pronotum with 2 pairs of posteroangular setae of which the external pair is slightly shorter than the inner pair; posterior margin with 3 or 4 pairs of setae. Metanotum (Fig. 88) reticulate medially, reticles elongate on posterior half, with faint sculptured markings inside most reticles; median setae short and arising behind anterior margin; campaniform sensilla absent. Forewing first vein with about 7 setae on distal half, second vein with about 14 setae; clavus with 5 marginal setae. Tergite II with 3 lateral marginal setae; posterior margin of tergite VIII with complete but slightly irregular comb of microtrichia; pleurotergites without discal setae, sculptured with rows of coarsely ciliate microtrichia. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs, VII with median pair arising in front of margin; II with 1 or 2 discal setae, III–VII with about 12 discal setae in single row.

Male smaller than female but similar in colour; tergite VIII with no posteromarginal comb; tergite IX S1 setae arising anterior to line joining bases of S2 setae; sternites III–VII each with large transverse glandular area, discal setae arising laterally.

**Breeding:** The gladiolus thrips breeds particularly on *Gladiolus* flowers and leaves, sometimes causing streaking, but it can also be common on other Iridaceae such as *Crocodymia* and *Neomarica*.

**Distribution:** Presumably originating from South Africa, this species is now found wherever *Gladiolus* plants are cultivated, in both temperate and tropical regions.

*Relationships:* No species are known that might be considered a close relative, but the fauna of *Thrips* genus in Africa, where *T. simplex* originated, is poorly known.

***Thrips subnudula* (Karny)**

*Ramaswamiahiella subnudula* Karny, 1926: 208

*Diagnosis:* Body and legs yellow, distal antennal segments light brown; forewings pale. Head wider than long (Fig. 89), ocellar setae pair III small and arising within ocellar triangle behind fore ocellus; postocular setae I about as long as ocellar setae III. Antennae 7-segmented, III & IV with short forked sense cone. Pronotum with numerous small discal setae and 2 pairs of short postero-angular setae (Fig. 89); posterior margin with 4 or 5 pairs of setae. Metanotum (Fig. 90) with irregular longitudinal reticulation medially but longitudinally striate laterally; median setae small, arising well behind anterior margin, campaniform sensilla present and close together. Forewing first vein with 3 setae on distal half, second vein with row of about 18 setae; clavus with 5 setae on marginal vein. Tergite II with 3 lateral marginal setae; median tergites with lines of sculpture extending to campaniform sensilla (Fig. 92); tergite VIII posterior margin with comb broadly interrupted medially but with a few small microtrichia laterally; pleurotergites with 4 to 8 discal setae, also rows of ciliate microtrichia. Sternite II with 8 marginal setae, III–VI with about 12 marginal setae (Fig. 91), VII with 3 pairs of marginal setae the median pair arising at the margin; sternite II with about 6 discal setae, III–VI with up to 18 discal setae, VII with about 20 discal setae in a double row.

Male smaller than female; tergite VIII without marginal comb of microtrichia; tergite IX S1 & S2 setae arising on a transverse straight line; sternites III–V with narrow transverse glandular area.

*Breeding:* No host has been recorded for this species in Australia, but in India it has been found breeding on the leaves of *Parthenium hysterophorus*.

*Distribution:* Widespread in India and Pakistan, and recorded from Nigeria (Bhatti, 1990), a single female of this species has been seen from near Brisbane, Queensland.

*Relationships:* The duplication of the sternal posteromarginal setae has led some authors to place this species in a separate genus, *Ramaswamiahiella*. However, similar duplication occurs in both *T. aspinus* and *T. unispinus*, although the latter lacks discal setae on the pleurotergites.

***Thrips sumatrensis* Priesner**

*Thrips (Isoneurothrips) sumatrensis* Priesner, 1934: 254

*Diagnosis:* Body and femora brown to dark brown, tibiae yellow with brown shadings; antennal segment III yellow, IV–V yellow at base; forewings brown with base pale. Antennae 7-segmented; ocellar setae III long, arising anterolateral to ocellar triangle (Fig. 93); postocular setae I about twice length of setae II & III. Pronotum with transverse markings and about 20 small discal setae. Mesonotum with no lines of sculpture close to anterior campaniform sensilla. Metanotum transversely striate on anterior half, with longitudinal striations on posterior half, median setae arise at anterior margin, campaniform sensilla present. Forewing first vein with setal row irregular, commonly with up to 12 setae on basal half then about 5 setae variably spaced on distal half, clavus with terminal and subterminal setae subequal in length. Abdominal tergite II with 3 (or 4) lateral setae; tergite VIII comb complete but short and irregular; sternites III–VII with 9–16 discal setae. Male yellow, sternites III–VII with about 9 discal setae in row posterior to transverse glandular area.

*Breeding:* Recorded from the flowers of a wide range of plant species in Asian countries, the only record in Australia is from the flowers of a *Solanum* species near Brisbane in October 1985.

*Distribution:* Widespread from South East Asia to the Pacific, including Thailand, Guam and Tahiti, this species is recorded from Australia on a single series of females taken in Queensland near Brisbane, and has also been seen from New Caledonia (in SMF).

*Relationships:* Closely related to *T. hawaiiensis*, this species has a more extensive, but irregular, row of setae on the first vein of the forewing, and ocellar setae III are unusually elongate.

### ***Thrips tabaci* Lindeman**

*Thrips tabaci* Lindeman, 1889: 61

*Thrips seminiveus* Girault, 1926b: 1

*Thrips indigenus* Girault, 1929: 29

*Diagnosis:* Body colour varying from yellow to brown, depending largely on temperatures during development; ocellar pigment never red, usually grey; antennal segments III & IV brown with basal half pale; forewings pale. Head wider than long, ocellar setae pair III small and arising on anterior margins or just within ocellar triangle; postocular setae pairs I–III about equal to ocellar setae III in length. Antennae 7-segmented, III & IV slightly constricted at apex with short forked sense cone; VII short. Pronotum with 2 pairs of postero-angular setae; posterior margin with 3 (or 4) pairs of setae. Mesonotum without anterior pair of campaniform sensilla. Metanotum (Fig. 95) irregularly reticulate medially with lines converging to midpoint near posterior margin; median setae short and arising behind anterior margin; campaniform sensilla absent. Forewing first vein usually with 4 (2–6) setae on distal half, second vein with row of about 15 setae. Tergite II with 3 lateral mar-

ginal setae; posterior margin of tergite VIII with complete comb of long slender microtrichia; tergite IX lacking pair of campaniform sensilla on anterior half; pleurotergites without discal setae but with sculpture bearing rows of fine microtrichia (Fig. 94). Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs, the median pair on VII arising in front of margin; sternites without discal setae.

Male small and yellow; tergite VIII with marginal comb represented by a few irregular microtrichia; tergite IX S1 & S2 setae arising on a transverse straight line; sternites III–V with narrow transverse glandular area.

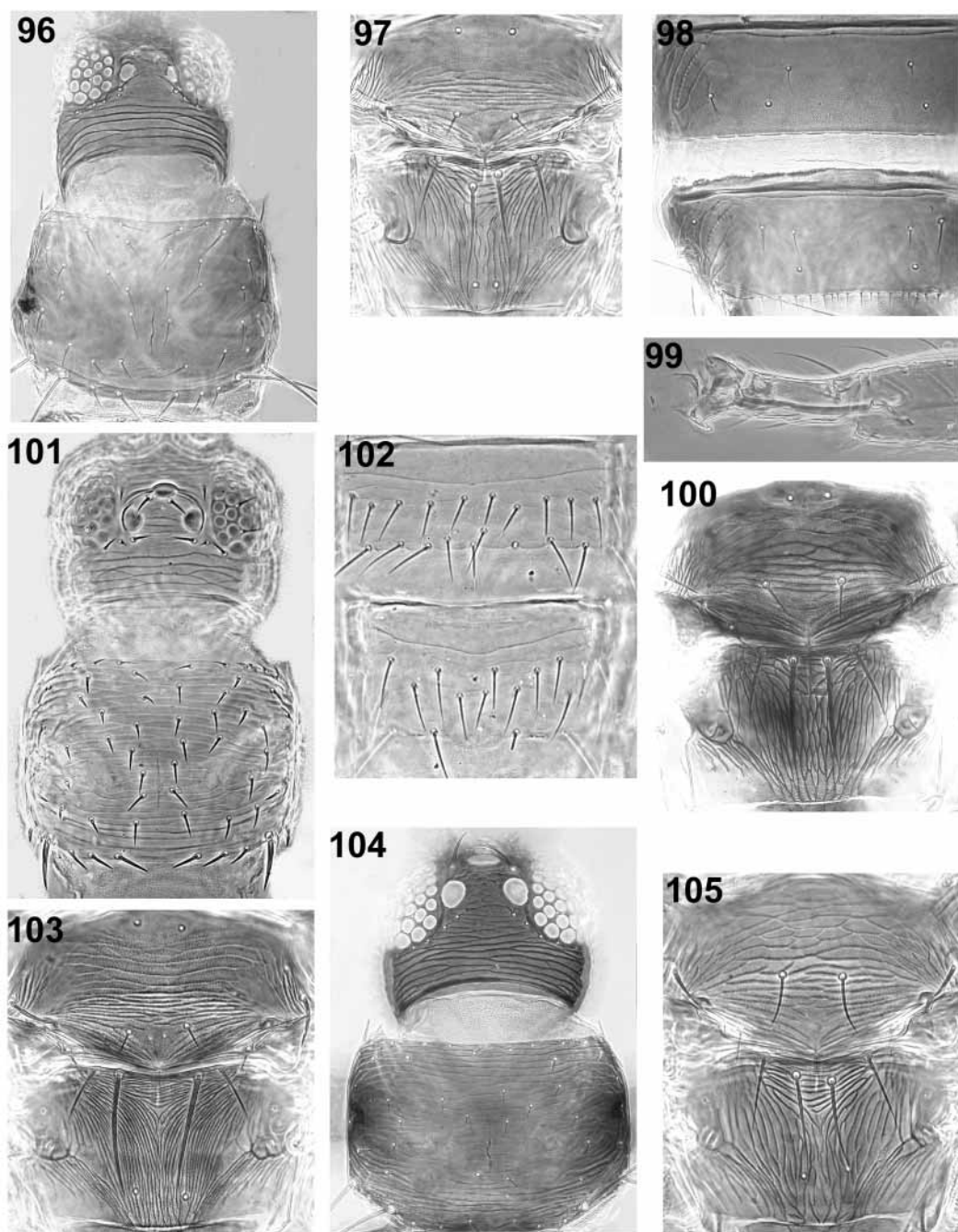
*Breeding:* This thrips breeds both in flowers and on leaves of many plants. It is particularly abundant on *Allium* (onions, leeks and garlic), but also on cereals, potatoes, vines and glasshouse crops. It is sometimes an important vector of tospoviruses, particularly on potatoes in Tasmania, but can also be predatory on mites.

*Distribution:* Found throughout the temperate regions of the world, this species is rare, or even absent in the humid tropics. In Australia, it is usual for only small numbers of individuals to be found on native vegetation, although large populations develop on some crop plants. Males of *T. tabaci* have been seen on onions from New Zealand, but no males have been seen from Australia, although they are recorded from Japan (Murai, 1990) and have been seen commonly from countries in the eastern Mediterranean.

*Relationships:* The dense covering of microtrichia on the pleurotergites, and the lack of paired campaniform sensilla on the anterior half of the ninth abdominal tergite, are unusual character states within the genus *Thrips*. The lack of red pigment beneath the three ocelli on the head usually facilitates recognition of this species.

### ***Thrips tomeus* sp.n.**

*Diagnosis:* Female with body, legs and antennae brown, tarsi yellow also apices of tibiae and base of antennal segment III; forewings weakly shaded, base pale. Head relatively elongate (Fig. 96); ocellar setae III short, arising just within ocellar triangle; postocular setae I almost as long as side of ocellar triangle, III and V twice as long as II and IV. Antennae 8-segmented. Pronotum without sculpture lines, 12–16 discal setae present each about as long as postocular setae I; postero-angular setae more than 0.5 as long as median length of pronotum. Fore tarsus with prominent pretarsal claw (Fig. 99). Mesonotum with no sculpture lines near anterior campaniform sensilla. Metanotum (Fig. 97) with irregular longitudinal reticulations or striae; median setae just behind anterior margin, campaniform sensilla present. Forewing first vein with 20 setae in complete row, second vein with 16 setae; clavus with terminal and subterminal setae subequal. Tergite II with 4 lateral margin setae; tergites IV–VI each with no lines of sculpture extending mesad of setae S2; ctenidia present on tergites V–VIII, ctenidium on VIII terminating close to spiracle anterior to setae S3 (Fig. 98); tergite VIII with posteromarginal comb complete; sternites and pleurotergites with no discal setae.



**FIGURES 96–105.** *Thrips* species. *T. tomeus* 96–99: (96) Head & pronotum; (97) Meso-metanota; (98) Tergites VII–VIII; (99) Fore tarsus. *T. trehernei* (100) Meso-metanota. *T. unispinus* 101–102: (101) Head & pronotum; (102) Sternites VI–VII. *T. vitticornis* 103–104: (103) Meso-metanota; (104) Head & pronotum. *T. vulgatissimus* (105) Meso-metanota.

Measurements of holotype female in microns: Body length 1550. Head, length 115; width 125; ocellar setae III 12. Pronotum, length 125; width 175; postero-angular setae 75. Forewing length 850. Antennal segments III–VIII length 65, 52, 37, 50, 12, 15.

*Type material:* Holotype female, Australia, **Australian Capital Territory**, Molonglo Gorge, from Epacridaceae, 28.x.2000 (LAM 3953), in ANIC.

*Paratypes:* 1 ♀, same locality, from *Pultenaea* leaves, 21.x.2000 (LAM 3940).

*Breeding:* The host-plant of this species is not known, but it is likely to be one of the species of Epacridaceae that are common at the type locality.

*Distribution:* Known only from the Australian Capital Territory.

*Relationships:* Closely related to the Western Australian *T. seticollis*, which has a similar large pretarsal claw on the fore tarsus, *T. tomeus* has the head more slender, antennae darker, and the metanotum less tightly striate (Fig. 97).

### ***Thrips trehernei* Priesner**

*Thrips trehernei* Priesner, 1927: 356

*Diagnosis:* Body and legs brown, tarsi and apices of fore tibiae yellow; antennal segments III–V mainly yellow, VI yellow in basal half; forewings uniformly shaded. Antennae 7-segmented; ocellar setae III arise outside ocellar triangle; postocular setae I twice as long as II & III. Pronotum with transverse markings on anterior half and about 20–24 discal setae. Mesonotum (Fig. 100) with widely spaced lines of sculpture, but no lines close to anterior campaniform sensilla. Metanotum with irregular longitudinal reticulate-striate sculpture, median setae arise close to anterior margin, campaniform sensilla absent. Forewing first vein with 3 (or 4) setae on distal half, clavus with subterminal seta shorter than terminal seta. Abdominal tergite II with 3 lateral setae; tergite VIII comb complete but short and irregular; sternites III–VII with 8–12 discal setae. Male brown, sternites III–VII with broadly oval glandular area and about 4 discal setae posterolaterally.

*Breeding:* In Australia, this species has been found breeding only in dandelion flowers, that is, the flowers of *Taraxacum vulgare*. It apparently does not breed in the flowers of the more widespread species of *Hypochaeris*, all of which are also introduced to Australia and are commonly referred to as “dandelions” in this country.

*Distribution:* Widespread in North America and Europe (Nakahara, 1994), this species has been found in Australia only at a few south-eastern localities (Mound, 1998).

*Relationships:* This species is closely related to *Thrips physapus* L., the type species of the genus. They are very similar in structure and sculpture, but *T. trehernei* has abdominal tergite X more than 80 microns long, and the major setae on the body are longer than in *T. physapus*. The two species are most readily distinguished by the males, these being brown in *T. trehernei* but yellow in *T. physapus*. The record of *T. physapus* in New Zealand (Mound & Walker, 1982) was a misidentification of *T. trehernei*.

***Thrips unispinus* Moulton**

*Thrips (Epithrips) unispinus* Moulton, 1940: 252

**Diagnosis:** Body and legs yellow; antennal segments I–III yellow, IV–VI light brown with base yellow; forewing pale. Head wider than long, ocellar setae pair III small and arising just within ocellar triangle posterolateral to fore ocellus (Fig. 101); postocular setae pair I about as long as ocellar setae pair III; postocular seta pair II much smaller than III. Antennae 7-segmented, III & IV slightly constricted at apex with short forked sense cone; segment VII short. Pronotum with 1 pair of postero-angular setae (Fig. 101), posterior margin with 3 pairs of setae. Metanotum reticulate medially, median setae arising behind anterior margin, campaniform sensilla present. Forewing first vein with 3 setae on distal half, second vein with about 16 setae; clavus with 5 marginal setae. Tergite II with 4 lateral marginal setae; posterior margin of tergite VIII with comb absent medially but represented laterally by a few irregular microtrichia. Sternite II with 2 pairs of marginal setae, III–VI commonly with 4 to 5 pairs (of which one or more setae may arise sub-marginally), VII with 3 pairs (Fig. 102); sternite II with 1 to 4 discal setae, III–VII with discal setae varying in number from 10 to 24 in more than one irregular transverse row; pleurotergites without discal setae.

Male similar to female in colour and structure but smaller; tergite VIII without posteromarginal comb of microtrichia; IX with median setae S1 arising anterior to a line joining bases of S2 setae; sternites III–VII with small transverse glandular area.

**Breeding:** A polyphagous flower thrips, this species has been taken from many different plants in northern Australia, but particularly from the flowers of *Mangifera indica* (see *T. aspinus* above).

**Distribution:** Described from Papua New Guinea, and recorded from the Solomon Islands and Brunei (Palmer, 1992), this species has been taken widely in tropical northern Australia between Cairns (Queensland) and Kununurra (Western Australia), although only as far south as Katherine (Northern Territory).

**Relationships:** This species shares with *T. aspinus* and *T. subnudula* the duplication, or partial duplication, of the setae on the posterior margin of the sternites. However, in contrast to those two species, and also to *T. imaginis*, it has no pleurotergal discal setae. Only one other member of the genus has been described with a single pair of elongate pronotal postero-angular setae, *T. antiaropsis* from Papua New Guinea (Zerega *et al.*, 2004), but that lacks discal setae on the sternites as well as the pleurotergites.

***Thrips vitticornis* (Karny)**

*Physothrips vitticornis* Karny, 1922: 103

*Diagnosis:* Body brown, tarsi and antennal segment III and base of IV yellow; forewing uniformly brown. Head wider than long, ocellar setae pair III longer than side of ocellar triangle (Fig. 104) and arising outside lateral margins of ocellar triangle; postocular setae very small. Antennae 8-segmented, III & IV slightly constricted at apex with short forked sense cone; segments VII & VIII short. Pronotum with 2 pairs of long postero-angular setae, posterior margin with 3 pairs of small setae. Metanotum (Fig. 103) with very closely spaced longitudinal lines medially and with finer lines between these major lines; median setae long, arising at anterior margin; campaniform sensilla present. Forewing first vein with 3–8 setae on distal half, second vein with about 14 setae; clavus with 5 marginal setae. Tergite II with 4 lateral marginal setae; posterior margin of tergite VIII with comb absent medially but represented by a few irregular microtrichia laterally. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs; median marginal setae on VII arising at margin; sternite II with 1 to 2 discal setae, III–VII with discal setae varying from 10 to 14 in one transverse row; pleurotergites without discal setae.

Male brown, smaller than female; tergite VIII without posteromarginal comb; sternites III–VII with broad glandular area.

*Breeding:* Apparently associated with the flowers of Papilionaceae, this species was found in considerable numbers in the flowers of the cover crop *Calopogonium*, near Darwin.

*Distribution:* Widespread from India to the Pacific Islands, this species is recorded from Australia only around Darwin in the Northern Territory.

*Relationships:* The closely striate metanotal sculpture suggests that *T. vitticornis* is related to various species from the Pacific Region, such as *T. rhabdotus* (see Palmer, 1992). However, those species have the row of setae on the forewing first vein usually almost complete, whereas in *T. vitticornis* the number of setae on the distal half of this vein varies from a maximum of eight to the typical condition of three setae that occurs in many species of the genus *Thrips*.

### ***Thrips vulgatissimus* Haliday**

*Thrips vulgatissimus* Haliday, 1836: 447

*Diagnosis:* Female with body and legs brown, tarsi and antennal segment III yellow; forewings pale. Head as wide as long, cheeks convex, ocellar setae pair III arising on anterior margins of ocellar triangle and slightly longer than side of triangle; postocular setae pairs I & III shorter than ocellar setae pair III, pair II minute. Antennae 8-segmented, III & IV constricted to distinct apical neck with forked sense cone. Pronotum with 2 pairs of long postero-angular setae, posterior margin with 3 (or 4) pairs of setae. Metanotum (Fig. 105) with parallel lines of sculpture medially converging at posterior, median setae arising near anterior margin; campaniform sensilla present. Forewing first vein with 3 setae on



distal half, second vein with complete row of about 14 setae. Tergite II with 3 lateral marginal setae; posterior margin of VIII with complete comb of long microtrichia; pleurotergites with 3 or 4 discal setae. Sternite II with 2 pairs of marginal setae, III–VII with 3 pairs; median marginal setae on VII arising well in front of margin; sternite II with few discal setae, III–VII with 15 to 20 discal setae in an irregular double row.

Male brown, smaller than female; tergite VIII without posteromarginal comb; tergite IX S1 setae widely separated from S2 setae; sternites III–VII with broadly transverse glandular area in front of discal setae.

*Breeding:* In Europe this species apparently breeds in the flowers of a range of plants, but it is most commonly found in small white flowers such as certain Caryophyllaceae.

*Distribution:* Widespread in Europe and North America (Nakahara, 1994), this species has been taken infrequently in Tasmania and southern Victoria, and also in New Zealand.

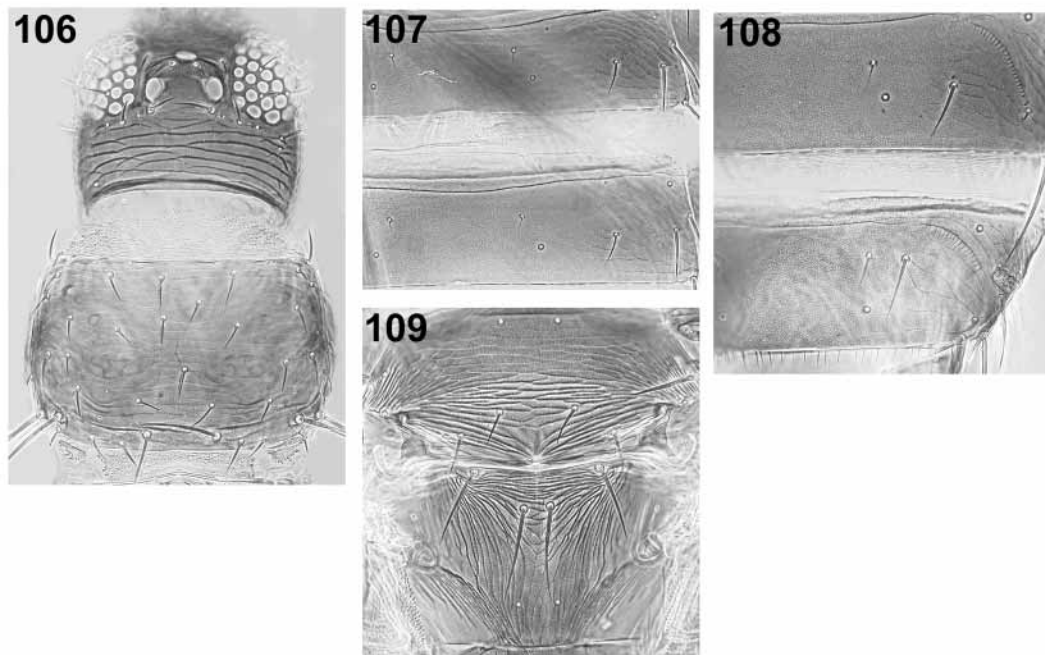
*Relationships:* Although similar in general appearance to *T. obscuratus* from New Zealand, *T. vulgatissimus* differs from that and other New Zealand members of *Thrips* genus in the number of setae on the posterior margin of the second abdominal sternite (Palmer, 1992). It is a European species, and is most closely related to *T. meridionalis* from the Mediterranean Region.

### *Thrips wellsae* sp.n.

*Diagnosis:* Female with body, legs and antennae brown, tarsi yellow, antennal segment III scarcely paler brown than IV; forewings deeply shaded, base pale. Head broader than long; ocellar setae III short, arising behind first ocellus (Fig. 106); postocular setae I about as long as side of ocellar triangle, III and V twice as long as II and IV. Antennae 8-segmented. Pronotum with weak transverse markings, 20–26 discal setae present each about as long as postocular setae I; postero-angular setae more than 0.6 as long as median length of pronotum; posterior margin with 3 pairs of setae, S1 almost 0.5 as long as postero-angular setae. Fore tarsus with pretarsal claw minute, commonly not visible. Mesonotum with sculpture lines near anterior campaniform sensilla. Metanotum (Fig. 109) transversely striate at anterior but medially with irregular longitudinal reticulations or striae; median setae behind anterior margin, campaniform sensilla present. Forewing first vein with continuous row of 20 to 24 setae, second vein with 12–18 setae; clavus with terminal and subterminal setae subequal. Tergite II with 4 lateral margin setae; tergites IV–VI each with 3 lines of sculpture extending mesad of setae S2 (Fig. 107); ctenidia present on tergites V–VIII, vestigial ctenidium sometimes present on IV, ctenidium on VIII terminating close to spiracle anterior to setae S3 (Fig. 108); tergite VIII with posteromarginal comb complete but often irregular medially; tergite IX with anterior campaniform sensilla present, X with median split almost complete; sternite II with 2 pairs of marginal setae, sternites and pleurotergites with no discal setae.

Measurements of holotype female in microns, with smallest paratype female from same series in parentheses: Body length 1800 (1250). Head, length 100; width 160. Pronotum, length 135 (110); width 225; postero-angular setae 125 (65); median posteromarginal setae 55 (30). Forewing length 1000 (700). Antennal segments III–VIII length 70, 63, 42, 60, 15, 15 (43, 43, 30, 45, 8, 8).

Male brown, tergite VIII with comb sometimes absent, sternites III–VII with transverse glandular area.



**FIGURES 106–109.** *Thrips* species. *T. wellsae* 106–109: (106) Head & pronotum; (107) Tergites IV–V; (108) Tergites VII–VIII; (109) Meso-metanota.

*Type material:* Holotype female, Australia, **New South Wales**, Charlotte's Pass, Mt Kosciuszko, in flower of *Richea continentis*, 25.xii.2004 (LAM 4515), in ANIC.

*Paratypes:* 17♀ 1♂ from same flower as holotype; same locality and date, 6♀ 1♂ from flowers of *R. continentis* (LAM 4513), 2♀ 2♂ from flowers of *Leucopogon montanus* (LAM 4514); same locality but 4.xii.2004, 8♀ 10♂ from flowers of *Epacris glacialis* (LAM 4511), 8♀ 10♂ from flowers of *Epacris paludosa* (LAM 4512).

*Breeding:* This thrips was found in large numbers in early summer in the flowers of montane heathland plants near Mt Kosciuszko, New South Wales, in association with vast numbers of *Thrips imaginis*. This latter species occurred in the flowers of plants from many different families. In contrast, *T. wellsae* was found only in the flowers of four species of Epacridaceae, although larvae were not retrieved from any of them. The variation

in body size between individuals from the same plant was very considerable, as indicated by the measurements of the female holotype and the smallest female paratype given above.

*Distribution:* Probably widespread in the montane areas of south-eastern Australia, specimens of both sexes that apparently represent this species have been studied that were swept from button grass moorland near Lake Peder, Tasmania.

*Relationships:* The position of the ctenidia on tergite VIII indicates that this is a member of the endemic Australian *T. seticollis* species-group. It is closely related to *T. seticollis* and to *T. tomeus* but has a dark third antennal segment and lacks a prominent pretarsal claw on the fore tarsus. Moreover, the metanotal sculpture and position of the median setae differ in these three species (Figs 80, 109).

### Acknowledgements

The authors are grateful to the many entomologists throughout Australia who, in recent years, have collected thrips and sent them to Canberra for identification — faunistic works such as this would not be possible without such collaboration. Dr Alice Wells helped with field studies and the identification of host plants, and critically reviewed an early draft of the manuscript. Dr Jon Martin, the Natural History Museum, London, and Dr Richard zur Strassen, Senckenberg Museum, Frankfurt organized loans of museum specimens, and research facilities at Canberra were made available by CSIRO Entomology. A study visit to Canberra by M. Masumoto was kindly facilitated by staff of Plant Protection Division of MAFF, Mr. Kenji Morita, Head of Yokohama Plant Protection Station, and Mr. Tetsuo Imamura, Chief of Identification Section, Yokohama Plant Protection Station.

### References

- Ananthakrishnan, T.N. & Jagadish, A. (1968) Studies on the species of the genus *Thrips* from India—II. *Deutsche Entomologische Zeitschrift*, 15, 359–365.
- Andrewartha, H.G. & Birch, L.C. (1954) *The Distribution and Abundance of Animals*. Chicago: University of Chicago Press.
- Austin, A.D., Yeates, D.K., Cassis, G., Fletcher, M.J., LaSalle, J., Lawrence, J.F., McQuillan, P.B., Mound, L.A., Bickel, D.J., Gullan, P.J., Hales, D.F., Taylor, G.S. (2004) Insects “Down Under”—Diversity, endemism and evolution of the Australian insect fauna: examples from select orders. *Australian Journal of Entomology*, 43, 216–234.
- Bagnall, R.S. (1915) Brief descriptions of new Thysanoptera. VI. *Annals and Magazine of Natural History*, (8) 15, 588–597.
- Bagnall, R.S. (1916) Brief descriptions of new Thysanoptera VIII. *Annals and Magazine of Natural History*, 17, 397–412
- Bagnall, R.S. (1926) Brief descriptions of new Thysanoptera. XV. *Annals and Magazine of Natural History*, (9) 18, 98–114.
- Bhatti, J.S. (1967) *Thysanoptera nova Indica*. Published by the author, Delhi, 24 pp.
- Bhatti, J.S. (1978) Preliminary revision of *Taeniothrips*. *Oriental Insects*, 12, 157–199.

- Bhatti, J.S. (1980) Species of the genus *Thrips* from India. *Systematic Entomology*, 5, 109–166.
- Bhatti, J.S. (1990) Catalogue of insects of the Order Terebrantia from the Indian Subregion. *Zoology (Journal of Pure and Applied Zoology)*, 2, 205–352.
- Bhatti, J.S. (1999a) New characters for identification of the pest species *Thrips hawaiiensis* and *florum* (Terebrantia: Thripidae). *Thrips*, 1, 31–53.
- Bhatti, J.S. (1999b) Yellow dorsally spotted species of *Thrips* (Terebrantia: Thripidae) in India with description of a new species in flowers of *Tabernaemontana* (Apocynaceae) and *Lantana* (Verbenaceae). *Thrips*, 1, 58–65.
- Bhatti, J.S. & Mound, L.A. (1981) The genera of grass and cereal-feeding Thysanoptera related to the genus *Thrips* (Thysanoptera: Thripidae). *Bulletin of Entomology*, 21, 1–22.
- Bianchi, F.A. (1945) Introduction to the Thysanoptera of New Caledonia. *Proceedings of the Hawaiian entomological Society*, 12, 249–278.
- Bianchi, F.A. (1953) Thysanoptera of Samoa. *Proceedings of the Hawaiian entomological Society*, 15, 93–108.
- Bournier, A. & Bournier, J.-P. (1979) Thysanoptères d'Afrique noire, II. *Bulletin de l'Institut Fondamental d'Afrique Noire*, 41, 355–365.
- Bournier, J.-P. & Mound, L.A. (2000) Inventaire commenté des Thysanoptères de Nouvelle-Calédonie. *Bulletin de la Société Entomologique de France*, 105, 231–240.
- Crawford, J.C. (1941) A new *Isoneurothrips* from New Zealand (Thysanoptera: Thripidae). *Proceedings of the Entomological Society of Washington*, 43, 63–64.
- Crespi, B.J., Morris, D.C. & Mound, L.A. (2004) *Evolution of Ecological and Behavioural Diversity: Australian Acacia Thrips as Model Organisms*. Australian Biological Resources Study, Canberra & Australian National Insect Collection, Canberra, 328 pp.
- Evans, J.W. (1932) The bionomics and economic importance of *Thrips imaginis* Bagnall. CSIR Melbourne, Australia. *Pamphlet*, 30, 1–52.
- Girault, A.A. (1926a) Three new Thysanoptera from Australia. *Insector inscitiae menstruus*, 14, 17–18.
- Girault, A.A. (1926b) *New pests from Australia IV*. Published Privately, Brisbane, 1 pp.
- Girault, A.A. (1927a) *Some new wild animals from Queensland*. Published Privately, Brisbane, 3 pp.
- Girault, A.A. (1927b) *New Australian animals so far overlooked by outsiders*. Published Privately, Brisbane, 2 pp.
- Girault, A.A. (1927c) *A discourse on wild animals*. Published Privately, Brisbane, 2 pp.
- Girault, A.A. (1927d) Records of Australian Thysanoptera (thrips), part II. *Queensland Agricultural Journal*, 28, 348–352.
- Girault, A.A. (1928a) *A prodigious discourse on wild animals*. Published Privately, Brisbane, 3 pp.
- Girault, A.A. (1928b) *Notice of a curious professor and of native wasps and wood lice*. Published Privately, Brisbane, 4 pp.
- Girault, A.A. (1928c) *Some new Insecta and a new all highness (notes compiled in fear and sorrow)*. Published Privately, Brisbane, 4 pp.
- Girault, A.A. (1929) *North American Hymenoptera Mymaridae*. Published Privately, Brisbane, 29 pp.
- Girault, A.A. (1930) *New pests from Australia VIII*. Published Privately, Brisbane, 5 pp.
- Girault, A.A. (1933) *Some beauties inhabitant not of the boudoirs of commerce but of nature's bosom—new insects*. Published Privately, Brisbane, 2 pp.
- Holiday, A.H. (1836) Epitome of British genera, in the order Thysanoptera, with indications of a few of the species. *Entomological Magazine*, 3, 438–451.
- Hood, J.D. (1918) New genera and species of Australian Thysanoptera. *Memoirs of the Queensland Museum*, 6, 121–150.
- Karny, H. (1907) Die Orthopterenfauna des Küstengebietes von Österreich-Ungarn. *Berliner Ento-*

- mologischer Zeitschrift*, 52, 17–52.
- Karny, H. (1908) Die zoologische Reise des naturwissenschaftlichen Vereins nach Dalmatien im April 1906. *Mitteilungen des Naturwissenschaftlichen Vereins an der Universität Wien*, 6, 101–113.
- Karny, H. (1920) Nova Australska Thysanoptera, jez nashbiral Mjöberg. *Casopis Ceskoslovenské společnosti entomologické*, 17, 35–44.
- Karny, H. (1922) Thysanoptera from Siam and Indo-China. *Journal of the Siam Society*, 16, 91–153.
- Karny, H. (1925) Die an Tabak auf Java und Sumatra angetroffenen Blasenfüßer. *Bulletin van het deli Proefstation te Medan*, 23, 1–55.
- Karny, H. (1926) Studies on Indian Thysanoptera. *Memoirs of the Department of Agriculture in India. Entomology Series*, 9, 187–239.
- Kelly, R. & Mayne, R.J.B. (1934) *The Australian Thrips*. Australasian Medical Publishing Co., Glebe, NSW. 81 pp.
- Kirk, W.D.J. (1987) A key to the larvae of some common Australian flower thrips (Insecta: Thysanoptera), with a host-plant survey. *Australian Journal of Zoology*, 35, 173–185.
- Lindeman, K. (1889) Die schädlichsten Insekten des Tabak. *Byull' Moskovskogo Obshchestva Ispytatelei Prirody*, 1888, 10–77.
- Linnaeus, C. (1758) *Systema Naturae* (10<sup>th</sup> edn). Holmiae, 823 pp.
- Maltbaek, J. (1928) Thysanoptera Danica. *Danske Frynsevinger. Entomologiske Meddelelser*, 16, 159–184.
- Martin, N.A. & Mound, L.A. (2005) Host plants for some New Zealand thrips (Thysanoptera: Terebrantia). *New Zealand Entomologist*, 27, 119–123.
- Miyazaki, M. & Kudo, I. (1988) Bibliography and host plant catalogue of Thysanoptera of Japan. *Miscellaneous Publication of the National Institute of Agro-Environmental Sciences*, 3, 1–246.
- Morgan, A.C. (1913) New genera and species of Thysanoptera, with notes on distribution and food plants. *Proceedings of the United States national Museum*, 46, 1–55.
- Morgan, A.C. (1929) A new genus and five new species of Thysanoptera foreign to the United States. *Proceedings of the Entomological Society of Washington*, 31, 1–9.
- Morison, G.D. (1930) On a collection of Thysanoptera from South Australia. *Bulletin of Entomological Research*, 21, 9–14
- Moritz, G., Mound, L.A., Morris, D.C. & Goldarazena, A. (2004). *Pest thrips of the world—visual and molecular identification of pest thrips*. Cd-rom published by CBIT Brisbane.
- Moulton, D. (1928) Thysanoptera from Abyssinia. *Annals and Magazine of natural History*, (10) 2, 227–248.
- Moulton, D. (1940) Thysanoptera from New Guinea and New Britain. *Occasional Papers of the Bishop Museum*, 15, 243–270.
- Mound, L.A. (1968). A review of R.S. Bagnall's Thysanoptera collections. *Bulletin of the British Museum (Natural History). Entomology Supplement* 11, 1–181.
- Mound, L.A. (1978) Five new species of Thripidae (Thysanoptera) endemic to New Zealand. *New Zealand Journal of Zoology*, 5, 615–622.
- Mound, L.A. (1996a) Thysanoptera. In: Wells A [ed.], *Zoological Catalogue of Australia. Volume 26. Psocoptera, Phthiraptera, Thysanoptera*. Melbourne. CSIRO Australia, pp. 249–336, 397–414 (Index).
- Mound, L.A. (1996b) The Thysanoptera vector species of tospoviruses. *Acta horticultrae*, 431, 298–309.
- Mound, L.A. (1998) Another immigrant thrips species in Australia. *Victorian Entomologist*, 28, 72–73.
- Mound, L.A. (2002) The *Thrips* and *Frankliniella* genus groups: the phylogenetic significance of ctenidia. pp. 379–386 in Marullo, R. & Mound, L.A. [eds] *Thrips and Tospoviruses: Proceed-*

- ings of the 7<sup>th</sup> International Symposium on Thysanoptera. Australian National Insect Collection, Canberra.
- Mound, L.A. (2004) Australian Thysanoptera—biological diversity and a diversity of studies. *Australian Journal of Entomology*, 43, 248–257.
- Mound, L.A. (2005) The *Thrips orientalis* group from South East Asia and Australia: some species identities and relationships (Thysanoptera, Thripidae). *Australian Journal of Entomology*, 45, [in press]
- Mound, L.A. & Collins, D.W. (2000) A south east Asian pest species newly recorded from Europe: *Thrips parvispinus* (Thysanoptera: Thripidae), its confused identity and potential quarantine significance. *Journal of European Entomology*, 97, 197–200.
- Mound, L.A. & Gillespie, P.S. (1997) *Identification Guide to Thrips Associated with Crops in Australia*. NSW Agriculture, Orange & CSIRO Entomology, Canberra, 56 pp.
- Mound, L.A. & Houston, K.J. (1987) An annotated check-list of Thysanoptera from Australia. *Occasional Papers on Systematic Entomology*, 4, 1–28.
- Mound, L.A. & Marullo, R. (1996) The Thrips of Central and South America: An Introduction. *Memoirs on Entomology, International*, 6, 1–488.
- Mound, L.A. & Masumoto, M. (2004) *Trichomothrips veversae* sp.n. (Insecta, Thysanoptera), and the botanical significance of insects host-specific to Austral bracken fern (*Pteridium esculentum*). *Proceedings of the Linnean Society of NSW*, 125, 67–71.
- Mound, L.A., Morison, G.D., Pitkin, B.R. & Palmer, J.M. (1976) Thysanoptera. *Handbooks for the Identification of British Insects*, 1 (2), 1–79.
- Mound, L.A. & Walker, A.K. (1982) Terebrantia (Insecta: Thysanoptera). *Fauna of New Zealand*, 1, 1–113.
- Murai, T. (1990) Parthenogenetic reproduction in *Thrips tabaci* and *Frankliniella intonsa* (Insecta: Thysanoptera). In: Hoshi, M. & Yamashita, O. (Eds.), *Advances in Invertebrate Reproduction*, Elsevier Science, pp. 350–353.
- Murai, T. (2002) The pest and vector from the East: *Thrips palmi*. In: Marullo, R. & Mound, L.A. (eds) *Thrips and Tospoviruses: Proceedings of the 7<sup>th</sup> International Symposium on Thysanoptera*. Australian National Insect Collection, Canberra, pp. 19–32.
- Nakahara, S. (1994) The genus *Thrips* Linnaeus (Thysanoptera: Thripidae) of the New World. *United States Department of Agriculture. Technical Bulletin*, 1822, 1–183.
- Nakao, S. (1993) Effects of temperature and photoperiod on wing form determination and reproduction of *Thrips nigropilosus* Uzel (Thysanoptera: Thripidae). *Applied Entomology and Zoology*, 28, 463–472.
- Palmer, J.M. (1992) *Thrips* from Pakistan to the Pacific: a review. *Bulletin of the British Museum Natural History (Entomology)*, 61, 1–76.
- Priesner, H. (1920) Kurze Beschreibung neuer Thysanopteren aus Österreich. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften*, 129, 71–88.
- Priesner, H. (1926–1928). *Die Thysanopteren Europas*. Wagner verlag. Wien. 755 pp.
- Priesner, H. (1934) Indomalayische Thysanopteren VII. [as VI]. *Naturkundig Tijdschrift voor Nederlandsch-Indië, Batavia*, 94, 254–290.
- Priesner, H. (1938) Thysanopteren aus dem Belgischen Kongo (4. Beitrag). *Revue Zoologie et Botanique africaine*, 30, 343–355.
- Priesner, H. (1940) On some Thysanoptera (Thripidae) from Palestine and Cyprus. *Bulletin de la Société Royal Entomologique d'Egypte*, 24, 46–56.
- Reyes, C.P. (1994) Thysanoptera (Hexapoda) of the Philippine Islands. *The Raffles Bulletin of Zoology*, 42, 107–507.
- Sakimura, K. (1967) A preliminary review of the genus *Isoneurothrips* and the subgenus *Thrips* (*Isothrips*). *Pacific Insects*, 9, 429–436
- Sakimura, K. (1969) New species of subgenera *Isothrips* and *Isochaetothrips* from Oceania and

- Australia, with note on changes in nomenclature. *Pacific Insects*, 11, 71–80
- Schliephake, G. (1972) Systematische und morphologisch-vergleichende Beziehungen der europäischen genera der Subtribus Thripina (Thys.). *Folia Entomologica*, 25, 271–277.
- Schmutz, K. (1913) Zur Kenntniss der Thysanopterenfauna von Ceylon. *Sitzungsberichte der Akademie der Wissenschaften in Wien*, 122, 921–1102.
- Solowiow, P. (1924) Neue Arten Blasenfüße. *Entomologische Zeitschrift (Frankfurt)*, 38 (12/13), 25.
- Takahashi, R. (1936) Thysanoptera of Formosa. *Philippine Journal of Science*, 60, 427–459.
- Targioni-Tozzetti, A. (1881) Relazione intorno ai lavori della R. Stazione di entomologia agraria di Firenze per gli anni 1877–1878. Art. V Fisapodi (Thrips). *Annali di Agricoltura*, 34, 120–134.
- Teulon, D.A.J. & Penman, D.R. (1990) Host records for the New Zealand flower thrips (*Thrips obscuratus* (Crawford) Thysanoptera: Thripidae). *New Zealand Entomologist*, 13, 46–51
- Uzel, H. (1895) *Monographie der Ordnung Thysanoptera*. Königratz, 472 pp.
- Williams, G., Adams, P. & Mound, L.A. (2001) Thrips (Thysanoptera) pollination in Australian subtropical rainforests, with particular reference to pollination of *Wilkiea huegeliana*. (Monimiacae). *Journal of Natural History*, 35, 1–21
- Zerega, N.J.C., Mound, L.A. & Weiblin, G.D. (2004) Pollination in the New Guinea endemic *Antiaropsis decipiens* (Moraceae) is mediated by a new species of thrips, *Thrips antiaropsidis* sp. nov. (Thysanoptera: Thripidae). *International Journal of Plant Sciences*, 165, 1017–1026.
- zur Strassen, R. (2003) Die terebranten Thysanopteren Europas und des Mittelmeer-Gebietes. *Die Tierwelt Deutschlands*, 74, 1–277.

## About the authors

**Masami Masumoto** is a quarantine entomologist with the Plant Protection Station, Yokohama, Japan, and **Laurence Mound** is an Honorary Research Fellow with CSIRO Entomology, Canberra, Australia. They collaborate in various taxonomic studies on Australian Thripidae. This list indicates the diversity of recent studies on Australian thrips.

- Chapman, T.W., Kranz, B.D., Bejah, K., Morris, D., Schwarz, M.P. & Crespi, B.J. (2002) The evolution of reproductive skew in social thrips. *Behavioural Ecology*, 13, 519–525.
- Crespi, B.J., Morris, D.C. & Mound, L.A. (2004) *Evolution of ecological and behavioural diversity: Australian Acacia thrips as model organisms*. Australian Biological Resources Study & Australian National Insect Collection, CSIRO, Canberra, Australia, 328 pp.
- Gillespie, P.S., Mound, L.A. & Wang, C.L. (2002) Austro-oriental genus *Parabaliathrips* Priesner (Thysanoptera, Thripidae) with a new Australian species forming male aggregations. *Australian Journal of Entomology*, 41, 111–117.
- Hoddle, M. & Mound, L.A. (2003) The genus *Scirtothrips* in Australia (Insecta, Thysanoptera, Thripidae). *Zootaxa*, 268, 1–40. <http://www.mapress.com/zootaxa/2003f/zt00268.pdf>
- Kranz, B.D. (2005) Egg size and reproductive allocation in eusocial thrips. *Behavioural Ecology*, 16, 779–787.
- Kranz, B.D., Schwarz, M.P., Morris, D.C., Crespi, B.J. (2002) Life history of *Kladothrips ellobus* and *Oncothrips rodwayi*: insight into the origin and loss of soldiers in gall-inducing thrips. *Ecological Entomology*, 27, 49–57.
- Malipatil, M.B., Mound, L.A., Finlay, K.J. & Semeraro, L. (2002) First record of lily thrips, *Liothrips vaneckei* Priesner, in Australia (Thysanoptera: Phlaeothripidae). *Australian Journal of Entomology*, 41, 159–160.
- Moritz, G., Mound, L.A., Morris, D.C. & Goldarazena, A. (2004) *Pest thrips of the world visual and molecular identification of pest thrips*. Cd-rom published by CBIT, Brisbane. <http://www.cbit.uq.edu.au/software/pestthrips/default.htm>
- Morris, D.C. & Mound, L.A. (2004) Molecular relationships between populations of South African citrus thrips (*Scirtothrips aurantii* Faure) in South Africa and Queensland, Australia. *Australian Journal of Entomology*, 43, 353–358.
- Morris, D.C., Schwarz, M.P., Cooper, S.J.B. & Mound, L.A. (2002) Phylogenetics of Australian *Acacia* thrips: the evolution of behaviour and ecology. *Molecular Phylogenetics and Evolution*, 25, 278–292.
- Mound, L.A. (2002) *Zemiathrips*; a new genus of fungus-feeding phlaeothripine Thysanoptera in Australian leaf-litter. *Australian Journal of Entomology*, 41, 209–215.
- Mound, L.A. (2002) Thrips and their host plants: new Australian records (Thysanoptera: Terebrantia). *Australian Entomologist*, 29, 49–60.
- Mound, L.A. (2004) Australian long-tailed gall thrips (Thysanoptera, Phlaeothripinae, Leeuweniini), with comments on related Old World taxa. *Australian Journal of Entomology*, 43, 36–45.
- Mound, L.A. (2004) Australian Thysanoptera biological diversity and a diversity of studies. *Australian Journal of Entomology*, 43, 248–257.
- Mound, L.A. & Masumoto, M. (2004) *Trichomothrips veversae* sp.n. (Insecta, Thysanoptera), and the botanical significance of insects host-specific to Austral bracken fern (*Pteridium esculentum*). *Proceedings of the Linnean Society of NSW*, 125, 67–71.
- Mound, L.A. & Morris, D.C. (2005) Gall-inducing thrips: an evolutionary perspective. In: Raman, A. Schaefer, C.W. & Withers, T.M. (Eds.) *Biology, Ecology, and Evolution of Gall-inducing Arthropods*. Science Publishers, Inc., Enfield (NH), USA, pp. 59–72.
- Mound, L.A. & Postle, A. (2004) *Panchaetothrips timonii* sp.n. (Thysanoptera, Thripidae); first Australian record of this Old World tropical genus. *Australian Journal of Entomology*, 43, 133–137.
- Mound, L.A. & Reynaud, P. (2005) *Frankliniothrips*; a pantropical Thysanoptera genus of ant-mimicking predators (Aeolothripidae). *Zootaxa*, 864, 1–16. <http://www.mapress.com/zootaxa/2005f/zt00864.pdf>
- Mound, L.A., Ritchie, S. & King, J. (2002) Thrips (Thysanoptera) as a public nuisance: a Queensland case study and overview, with comments on host plant specificity. *Australian Entomologist*, 29, 25–28.
- Mound, L.A. & Williams, G. (2003) Host-plant Disjunction in a New Species of *Neohoodiella* (Insecta, Thysanoptera, Phlaeothripinae), with Notes on Leaf-Frequenting Thrips in New South Wales Subtropical Rainforests. *Proceedings of the Linnean Society of NSW*, 124, 17–28.
- Terry, I., Walter, G., Donaldson, J., Forster, P., Snow, E. & Machin, P. (2005) Pollination of Australian *Macrozamia* cycads (Zamiaceae): effectiveness and behavior of specialist vectors in a dependent mutualism. *American Journal of Botany*, 92, 931–940.
- Wills, T.E., Chapman, T.W., Mound, L.A., Kranz, B.D. & Schwarz, M.P. (2004) Natural history and description of *Oncothrips kinchegea*, a new species of gall-inducing thrips with soldiers (Thysanoptera: Phlaeothripidae). *Australian Journal of Entomology*, 43, 169–176.