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**Australian Thripinae of the *Anaphothrips* genus-group  
(Thysanoptera), with three new genera  
and thirty-three new species**

LAURENCE A. MOUND & MASAMI MASUMOTO



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## Australian Thripinae of the *Anaphothrips* genus-group (Thysanoptera), with three new genera and thirty-three new species

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## Abstract

Relationships are considered among taxa of Thripinae lacking long setae on the pronotum, and these taxa are here discussed as the *Anaphothrips* genus-group. Seven genera from Australia are considered members of this group: *Anaphothrips*, *Apterothrips*, *Aptinothrips*, *Caprithrips*, *Dodonaethrips* **gen.n.**, *Ozanaphothrips* **gen. n.** and *Pandorathrips* **gen. n.** Six new species are described in *Ozanaphothrips*, and one each in *Dodonaethrips* and *Pandorathrips*. The worldwide genus *Anaphothrips* now comprises 79 species, of which 43 are here recorded from Australia, including 27 new species. In other parts of the world *Anaphothrips* species breed on grasses, but host-associations of the Australian species are remarkably diverse, involving at least 20 plant families. Illustrated keys are provided for the identification of the *Anaphothrips* genus-group taxa from Australia. Variation is discussed in the form of the pore plates (=glandular areas or areae porosae) that occur on the sternites of males.

**Key words:** *Anaphothrips*, *Anaphothrips* genus group, *Dodonaethrips*, *Ozanaphothrips*, *Pandorathrips*, Thysanoptera, Thripidae, Australia, pore plates, glandular areas

## Introduction

The traditional classification of the Thysanoptera family Thripidae (cf. Jacot-Guillarmod, 1974) involved acceptance, within a major tribe Thripini, of several weakly defined subtribes including the Aptinothripina. Membership of this particular subtribe was based on a single character state, absence of any long setae on the pronotum. Progressively it has been recognised that “absence of long pronotal setae” is a secondary state that has evolved independently in relatively unrelated lineages, not only among the Thripidae (Mound & Palmer, 1981) but also in other families of Thysanoptera (Pereyra & Mound, 2009). Species within the Thripidae genera *Dichromothrips*, *Pseudanaphothrips*, *Thrips* and *Trichromothrips* usually have one or more pairs of long posteroangular setae on the pronotum, but at least one species in each of these genera has no long setae. Recognition of such intra-generic variation has resulted in most authors avoiding subtribal groupings within the Thripidae (zur Strassen, 2003; Mound & Masumoto, 2005). In an alternative classification, Bhatti (2006) proposed recognition of the Thripidae as a super family, Thripioidea, and within this recognised nine families. However, this classification is considered to be essentially phenetic (Mound & Morris, 2007), and currently the Thripidae is divided into four subfamilies (Hoddle *et al.*, 2008) as suggested originally by Bhatti (1989). Within the largest of these subfamilies, the Thripinae, several possibly monophyletic lineages have been distinguished, but these do not have formal names, and each is referred to as a “genus-group” (Mound & Palmer, 1981; Masumoto & Okajima, 2005, 2007). Relationships among the many taxa that lack long setae on the pronotum, as in the genus *Anaphothrips*, continue to prove particularly difficult to assess. It is upon the Australian Thripinae taxa that share this character state “absence of long pronotal setae” that this paper is focussed. To facilitate the discussion, authority names are omitted in this paper for the many taxa whose names are mentioned but which are not treated taxonomically; full details of all such taxa are available at: <http://www.ento.csiro.au/thysanoptera/worldthrips.html>.

Bhatti (1978) discussed and provided an identification key to distinguish *Anaphothrips* from 18 other genera. Ten of these genera (*Agalmothrips*, *Dictyothrips*, *Flavidothrips*, *Odontanaphothrips*, *Palmiothrips*, *Proscirtothrips*, *Tamaricothrips*, *Tameothrips*, *Thermothrips* and *Zurstrassenia*) each includes only a single species, and a further six genera (*Aurantothrips*, *Baileyothrips*, *Belothrips*, *Hemianaphothrips*, *Hyalopterothrips*, and *Nigritothrips*) each includes only two species. Of the remaining genera, *Rubiothrips* includes seven species, and *Retamothrips* is now a synonym of *Oxythrips*. Almost all of these genera are from the Old World, with only *Odontanaphothrips* and *Baileyothrips* from North America, and *Aurantothrips* from the Neotropics; also, one of the two species in *Hemianaphothrips* is from North America. These genera share fundamentally the same body structure, and they may be included conveniently in an “*Anaphothrips* genus-group”. *Anaphothrips* itself has comprised 52 described species, to which are now added 27 new species described in this paper. Apparently also closely related are the 16 species in *Eremiothrips* from the dry areas of Southeastern Europe (see Bhatti, *et al.*, 2003). The species of *Aptinothrips* and *Caprithrips* similarly lack long pronotal setae, and because of this will need to be considered in any future re-evaluation of the *Anaphothrips* group. Moreover, despite the presence of one pair of long pronotal posteroangular setae, *Oxythrips* with 38 extant and mainly Holarctic species, and the closely related north American genus *Chilothrips* with five species, should probably also be included in the *Anaphothrips* genus-group, together with both *Glaucothrips* and *Helenothrips* from South Africa, and three new genera described here from Australia.

### *Anaphothrips* genus-group in Australia

Seven genera are reported here from Australia that are considered members of the *Anaphothrips* genus-group. Of these, *Aptinothrips* is a genus of four grass-living species from Europe, of which two are now widespread around the world in temperate areas (Palmer, 1975) with one of these common in southern Australia. *Apterothrips* is a genus of two species originally from the American Pacific coast, but both of which are now

also widespread (Hoddle *et al.*, 2008), with one in southern Australia where at times it has been considered a pest on garlic and lucerne. *Caprithrips* is a genus of six species, but although one of these is endemic to southern Australia, and two more widespread species also occur on this continent (Bhatti, 1980), the geographic origin of the genus remains unclear. Three new genera are described here. Two of these are monotypic, and both species are monophagous on particular Australian native plants. The third new genus comprises six species, each of which appears to be associated with native grasses in the tropical areas of northern Australia. *Anaphothrips* itself, with 79 species now recorded worldwide, involves 43 species recognised here from Australia of which three are assumed to be introduced from other parts of the world, *A. obscurus*, *A. sudanensis*, and *A. swezeyi*. Of the 40 *Anaphothrips* species endemic to Australia, one described species, *A. keatsi*, cannot be identified satisfactorily, and 27 are here described as new species.

Members of this genus-group are not uniformly distributed across the Australian continent. *Anaphothrips* is a major element of the Thripidae fauna in the southern half of Australia, but it seems to be replaced in the north by a range of unrelated taxa, particularly in association with Poaceae. The six species in the new genus *Ozanaphothrips* have been taken only in northern Australia, whereas most of the endemic *Anaphothrips* species come from the southern half of the continent. Many of these species are associated with plants in the semi-arid areas, and there seems to be a particularly rich fauna in Western Australia. The diversity of this genus in this and similar areas of Australia is certainly greater than indicated here. The only previous comprehensive study on this group (Pitkin, 1978) recognised 16 species in Australia of which six were newly described. Most of the earlier species, based on a few badly damaged specimens (Fig. 1), were named by A. A. Girault in brief notes that were subsequently re-published in facsimile (Ghord *et al.* 1979).



FIGURE 1. Type slides of some Thysanoptera described by A.A.Girault.

### Host-plant associations among the Australian *Anaphothrips* group

Species of *Anaphothrips* are found widely around the world, and these are commonly considered to be grass-living. For example, Nakahara (1995) recorded 17 *Anaphothrips* species from North America, all from either Poaceae or Cyperaceae, and zur Strassen (2003) recorded seven species from Europe of which five are associated with these two plant families. In contrast, of the 43 species of this genus recorded here from Australia scarcely 10 seem likely to be associated with grasses, although all six of the species in the new genus *Ozanaphothrips* have such a host association (Table 1). The other species of *Anaphothrips* considered here are associated with a wide range of different plants. Among Thysanoptera, host associations are often difficult to establish, because adults are dispersive in their behaviour and may be collected from plants on which they cannot breed. This is particularly so when a large population has developed and many adults disperse and can be found on surrounding plant species. Considering this, the information summarised in

Table 1 is conservative; only included are those plant records that, based on the first author's extensive field studies, are considered likely to represent breeding hosts. Despite this caveat, it is clear that the species of the *Anaphothrips* lineage in Australia have adopted plants in a remarkable range of families, including species in the families Orchidaceae, Lamiaceae and Haemodoraceae, although Asteraceae, Chenopodiaceae and Myoporaceae are likely to prove to be the major host plants for members of this group. Moreover, the association is commonly with the leaves of the host plant rather than with the flowers. In Australia the flowers of Fabaceae are generally occupied by species of *Odontothripiella*, but the species of *Anaphothrips* associated with that plant family near Canberra has been taken only on leaves. Similarly species described here from *Bursaria*, *Cassinia*, *Dodoniaea*, *Pandorea* and *Parsonsia* apparently all breed on leaves rather than flowers.

### **Sternal glandular structures in males**

Among the New World Thripidae fauna nine genera are superficially similar to *Anaphothrips*. These are *Ameranathrips*, *Apterothrips*, *Baileyothrips*, *Charassothrips*, *Desartithrips*, *Enneothrips*, *Pseudothrips*, *Psydrothrips* and *Xenothrips* (De Borbon, 2008). The males of the species in these genera share a particular synapomorphy: a central opening near the anterior margin of the third sternite that is associated with an internal gland. In contrast, males of many Thripidae species bear porose structures medially, or near the anterior margin, on one or more of their sternites. These structures have been referred to in most previous publications on Thysanoptera (e.g. zur Strassen, 2003) as "glandular areas" or "area porosae". However, following El-Ghariani & Kirk (2008), these structures are here referred to as "pore plates"; it seems likely that they are the site from which aggregation pheromones are released (Hamilton *et al.*, 2005; Webster *et al.*, 2006).

One Australian species, described below in the new genus *Dodonaethrips*, has a particularly thick-walled pore plate on the third sternite, in which the pores themselves are exceptionally difficult to resolve with a light microscope (Figs 174, 175). Species described here in the new genus *Ozanaphothrips* have a pore plate that, although typical in appearance, is situated close to the anterior margin of one or more sternites (Figs 182, 192, 203). In contrast, only one of the new species of *Anaphothrips* described below has a pore plate that is in this anterior position, whereas 20 of the 43 Australian species in this genus have a C-shaped pore plate on several sternites (Table 2). This C-shape varies in size, from extending around the margin of a sternite (Figs 114, 124) to being little more than a curve medially (Figs 41, 110, 157, 163). A few Australian species in this genus have the pore plates small, or with only sternite III bearing a transverse pore plate (Figs 28, 30, 53) or even a pair of small disc-like pore plates (Fig. 28), and some species have no pore plates at all. Presumably this structural variation is related to mating habits; there is little or no evidence that it reflects any deep phylogenetic relationships.

### **Character states in *Anaphothrips* genus-group**

**Head.** In species associated with Poaceae the head is usually flattened and more or less prolonged forward. This shape may be an adaptation to living between stems or under leaf-sheaths of grasses. The head is broader and less flattened in species living on plants other than Poaceae.

**Setae on head.** No long setae occur on the head. The presence of ocellar setae I is considered plesiotypic (Mound & Palmer, 1981), and in the species considered here ocellar setae pairs I and II are usually arranged transversely; setae III vary in position. Three or four pairs of postocular setae are present, usually arranged transversely but often not in a straight line (Figs 9, 24). The ordered arrangement of postocular setae may represent a derived condition, with scattered postocular setae being the plesiotypic condition as in many Aeolothripidae.

**Pigmented facets of compound eyes.** In Thysanoptera, the compound eyes often have pigmented facets ventrally, and Nakahara (1989, 1996) discussed the various distribution patterns of these pigmented facets. In

Terebrantia, two to seven pigmented facets are often present, with the number often constant within any genus (Nakahara, 1989), but they are absent in the less advanced families. In Thripidae, many genera have five pigmented facets, but in *Anaphothrips* and related genera six such facets are usually (but not always) present (Fig. 11). The value of these character states for phylogenetic analysis among Thysanoptera remains unclear. In a few pairs of species that are otherwise closely similar to each other in structure, pigmented facets may be present in one but absent in the other. Also, in a few species even the two sexes differ in the state of this character (Nakahara, 1989).

**Antennal segmentation.** Most of the species in *Anaphothrips* have 9-segmented antennae (Figs 19, 23), but in some species the antennae are 8-segmented (Figs 16, 133), and in a few species the number is variable with an oblique or even partial suture between two segments (Figs 120, 144, 171). Although for the Order Thysanoptera the 9-segmented condition of antennae is considered to be plesiotypic (Mound *et al.*, 1980), there is no evidence that the 9-segmented condition in *Anaphothrips* is plesiotypic within the family Thripidae. Members of this family usually have 7- or 8-segmented antennae, and the 9-segmented condition in *Anaphothrips* appears to be secondarily derived within the family, resulting from subdivision of the sixth segment. This division is not always complete and is often oblique, and related genera such as *Chilothrips* and *Apterothrips* also have an oblique, partial or complete, suture across this segment.

**Chaetotaxy of pronotum.** The pronotal chaetotaxy is often very useful for discriminating between genera within Thripidae. However, the presence or absence of long setae does not always reflect phylogeny, because reversal from long to short setae has clearly occurred within several Thripidae genera (Mound & Palmer, 1981). *Anaphothrips* species usually have no long posteromarginal setae, but one new species is described below, *A. dalbyi*, with a single pair of more prominent setae on the posterior margin (Fig. 61).

**Metascutum.** In the *Anaphothrips* group, the median pair of setae on the metascutum is situated well behind the anterior margin, and the median area of this sclerite is usually reticulate (Figs 42, 48). Possibly both of these represent plesiotypic conditions, as found in species of *Aeolothrips*. In *Frankliniella* and also many *Thrips* species, the median setae arise at the anterior margin of the metascutum, and in many *Thrips* species the sculpture is longitudinal medially. The metascutum usually bears one pair of campaniform sensilla (MCS).

**Chaetotaxy of fore wing.** Some *Anaphothrips* species are wing polymorphic, or are known only from short-winged adults. In macropterae, the veinal setae are usually small, and the setal rows are irregular. On the first vein, there are usually two groups at the base with a small gap between them, then 2–3 setae medially and 2–3 on the distal half; on the second vein the setae are irregularly spaced. In some Australian species of *Anaphothrips*, 1–3 setae are present on the second vein basal to the fork of the veins (Figs 2, 77, 95). This character state is apparently unique in Thripidae, and is absent in closely related genera such as *Chilothrips* and *Oxythrips*. In Thripidae, the fore wing clavus usually bears a discal seta in addition to several marginal setae. However, in *Anaphothrips*, the clavus bears four to nine marginal setae but no discal seta, although the most basal seta is commonly slightly displaced mesad of the margin (Figs 2, 90, 95). This basal seta is possibly homologous with the discal seta of the more derived Thripinae, and was interpreted as such by Bhatti (1978).

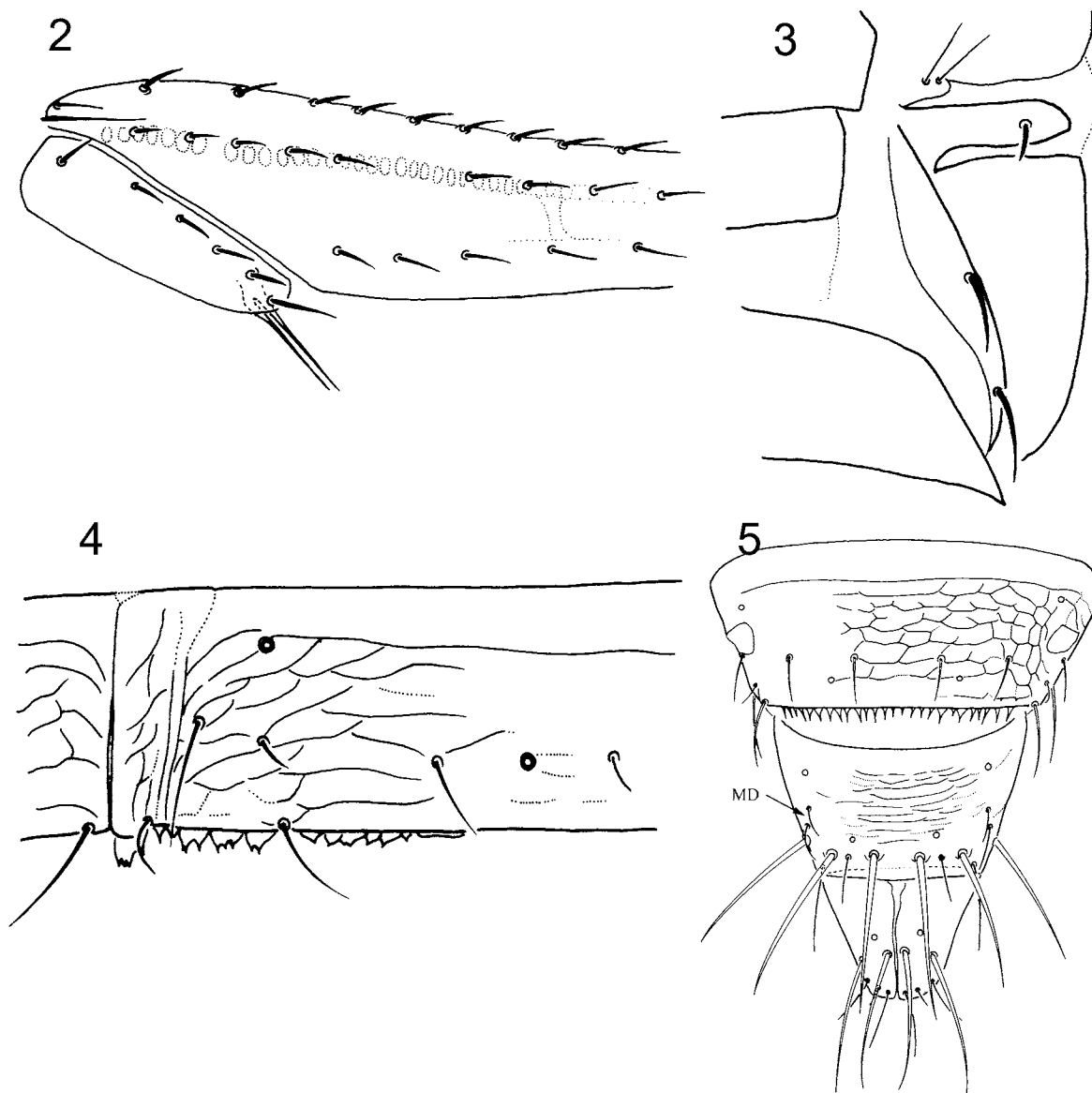
**Metapre-episternum.** In *Aeolothrips*, the metapre-episternum is not divided from the episternum, whereas these sclerites are variably divided in Thripidae, and this can be interpreted as the derived condition. In fully winged Thripidae, the metapre-episternum is usually a fully developed and transverse sclerite, but it is reduced in *Chirothrips* and *Arorathrips*, and this state is presumably a derived condition within the family Thripidae. In *Anaphothrips*, this sclerite is slender and tapers to the apex (Fig. 3), and this is possibly an intermediate condition.

**Prosternum.** The prosternum is membranous with no setae in the species considered in this paper. The ferna is usually more or less fused medially (Fig. 189), but is divided medially in the two largest species of *Anaphothrips* considered here, *A. occidentalis* and *A. whyalla*.

**Meso- and metasterna.** The mesothoracic sternopleural suture is complete and reaches the anterior margin. In *Anaphothrips* species, a spinula is present only on the mesosternal furca, but in a new species of



one new genus described below a metasternal furca is present (Fig. 176). The spinula on the mesosternum and metasternum provide muscle insertion points for the fore wings and hind legs, respectively.



**FIGURES 2–5.** *Anaphothrips* morphology. (2) *A. dubius*, base of right fore wing including clavus. (3) *A. exocarpi*, dorsal aspect of right half of metathorax to abdominal segment I. (4) *A. sudanensis*, left half of tergite VI to sternite. (5) *A. obscurus*, abdominal tergites VIII–X. (MD=mid-dorsal setae).

**Tarsal segmentation.** There are usually two segments on each tarsus, but this is variable within the genus *Aptinothrips*, being reduced to one segment in the widespread species *A. rufus*, and also in the new species described below in the new genus *Dodonaethrips*.

**Chaetotaxy of abdominal tergites.** In most *Anaphothrips* species the median setae on the tergites (pair I) are shorter than the distance between their bases (Fig. 14), whereas in the related European genus *Rubiothrips* these setae are longer than the distance between their bases. The posteroangular tergal setae of species in *Anaphothrips*, also species of the North American *Chilothrips*, are situated on the posterior margin far from the posterior angle (Figs 4, 59), although in *Oxythrips* these setae arise at the posterior angles. The position of these setae far from the posterior angle is presumably a derived condition. In the more highly derived members of the Thripidae, such as *Thrips* and *Frankliniella*, tergite IX usually bears a pair of mid-dorsal

(MD) setae medially the length of which is about half the median length of the tergite. In contrast, species of Aeolothripidae and Merothripidae have no long MD setae. In *Anaphothrips* and some of its relatives discussed here, the MD setae are small and situated laterally (Fig. 5).

**Microtrichia on abdominal tergites.** The presence of closely spaced rows of microtrichia laterally on the tergites was at one time used to define a tribe Sericothripini. However, presence of microtrichia on the body surface is probably not only plesiotypic, these structures being common in Melanthripidae and Aeolothripidae, but is recurrent in taxa that are not closely related. Several species of *Anaphothrips* that live in dry areas of Australia have closely spaced rows of tergal microtrichia that are similar to those found in the species of *Scirtothrips* and also the Sericothripinae (Mound & Tree, 2009); such surface decoration may have a physiological significance in deepening the boundary layer and thus reducing water loss.

**Posteromarginal fringe of abdominal tergites and sternites.** *Anaphothrips* species have no broad craspeda along the posterior margin of abdominal tergites and sternites, although in several apparently related genera broad craspeda are well developed (Figs 181, 190). Tergite VIII commonly has a posteromarginal comb of microtrichia (Figs 10, 151). However, this varies in its development between species (Figs 87, 115), or even within the single species *A. pultenaeae* (Fig. 137), and in some species is not developed at all (Fig. 14).

**Discal setae on sternites and pleurotergites.** The abdominal sternites and pleurotergites bear setae only on the posterior margin in *Anaphothrips* species. This absence of sternal discal setae is considered to be a derived condition (Mound & Palmer, 1981). However, discal setae are usually present in six species described here in a new Australian genus.

**Abdominal tergite IX of male.** *Anaphothrips* species commonly have two pairs of short, stout setae medially on abdominal tergite IX (Figs 17, 70), but these are small or not developed in several species (Figs 34, 60). Presence of these short stout setae is probably plesiotypic, as they also occur in males of some species of Panchaethripinae, as well as the males of *Cycadothrips* (Aeolothripidae). A few Australian species of *Anaphothrips* have unusual drepanae on tergite IX (Figs 47, 70).

**Pore plates of male sternites.** These structures are discussed more extensively above. The pore plates (El-Ghariani & Kirk, 2008) vary from large and C-shaped to small curves or even ovals (Figs 20, 46, 57), but are absent in several species (Table 2).

## Key to genera of *Anaphothrips* group in Australia

1. Abdominal sternites with discal setae as well as posteromarginal setae (Fig. 195); sensorium on antennal segments III–IV simple..... 2
- Abdominal sternites with posteromarginal setae but no discal setae; sensorium on antennal segments III–IV forked (simple in some species with 9-segmented antennae) ..... 4
2. Abdominal tergites III–VIII with no craspedum; head almost 1.5 times as long as median width (Fig. 6) ..... *Aptinothrips*
- Abdominal tergites III–VIII with broad craspedum on posterior margin; head no more than 1.2 times as long as median width (Fig. 7)..... 3
3. Prosternal ferna broad and plate-like (Fig. 8) ..... *Caprithrips*
- Prosternal ferna slender in the midline (Fig. 189) ..... *Ozanaphothrips* **gen. n.**
4. Abdominal sternites with broad craspedum that is strongly lobed between the marginal setae; apterous ..... *Apterothrips*
- Abdominal sternites, either with no craspedum or with unlobed craspedum; usually macropterous ..... 5
5. All tarsi 1-segmented; metathoracic furca with spinula (Fig. 176); male sternite III with irregular pore plate surrounded by thick-wall (Figs 174, 175)..... *Dodonaethrips* **gen. n.**
- All tarsi 2-segmented; metathoracic furca without spinula; males usually with pore plates on several sternites ..... 6
6. Tergites and sternites with unlobed craspedum (Figs 212, 213); tergite VIII in both sexes with comb of long slender teeth that is replaced medially by small craspedal lobe (Fig. 213); fore wing clavus with one discal seta (Fig. 214)..... *Pandorathrips* **gen. n.**

- Tergites and sternites without craspeda; tergite VIII with or without comb on posterior margin (Figs 10, 14, 137); fore wing clavus with basal but no discal seta (Figs 77, 78) ..... *Anaphothrips*

### ***Anaphothrips* Uzel**

*Anaphothrips* Uzel, 1895: 142. Type species *Thrips obscura* Müller, designated by Hood, 1914: 136.

*Neophysopus* Schmutz, 1913: 1016. Type species *N. medioflavus* Schmutz (= *Anaphothrips sudanensis* Trybom), by original designation and monotypy. [Synonymized by Bhatti, 1978: 87.]

*Nakaharathrips* Retana-Salazar, 2007: 329. Type species: *Anaphothrips sudanensis* Trybom. [Synonymized by Goldarazena *et al.*, 2008: 966.]

**Diagnosis.** Apterous, micropterous or macropterous; antennae 8- or 9-segmented, sensorium on III forked (simple in some species), on IV forked; III–VI usually with microtrichia present, often annulate; segment I without dorso-apical setae. Head often slightly projecting in front of eyes; 3 pairs of ocellar setae present; 3 or 4 pairs of postocular setae; eyes large, with or without 6 pigmented facets; maxillary palps 3-segmented, mouth cone relatively long, often slender and pointed at apex. Pronotum with no long setae (one species with posteromarginal S2 longer than remaining setae); ferna usually entire; basantra without setae. Mesonotal CPS usually present but often small and inconspicuous. Metascutum with reticulate sculpture. Metapre-episternum usually weakly developed. Mesothoracic sternopleural sutures complete, furca with spinula; metathoracic furca without spinula. Tarsi 2-segmented. Fore wing with setae short, first vein with setal row irregularly spaced, second vein with many setae irregularly spaced; marginal cilia wavy; clavus with 4–9 marginal but no discal setae. Abdominal tergites and sternites without posteromarginal craspeda; tergites without lateral ctenidia, with median setae rarely close together, campaniform sensilla far from posterior margin; VI–VII usually with setae S3 reduced and much smaller than S4; setae on posterior tergites not elongate; tergite IX with two pairs of campaniform sensilla, MD setae short and arising laterally; tergite X with dorsal split in distal half; sternites without discal setae; sternites III–VII with 3 pairs of marginal setae, median pair on VII ahead of posterior margin. Males (where known) with pore plates on sternite III or III–VII behind antecostal line, often large and C-shaped, but sometimes small, not C-shaped, or absent; tergite IX with or without dorsal paired thorn-like setae.

**Structural variation and phylogenetic relationships.** The structural variation among the various species in this genus is confusing, particularly the occurrence of species with 8-segmented and 9-segmented antennae in the same genus. However, this difference is not clear-cut, because several species exhibit an intermediate condition with a partial suture across the sixth antennal segment that is also variable in its development. On first analysis, the species with this partial division seem to be particularly closely related to the species with 8-segmented antennae, and most of them are associated with Poaceae. However, although the species with nine fully discrete segments also seem to form a discrete group, there are several species in the arid zone of Australia in which the suture between segments VI and VII is oblique and weak (Fig. 171).

Males are not known for eight of the 43 Australian species (Table 2), but in 20 species the males have C-shaped sternal pore plates. These species include three grass-living species with 8-segmented antennae, although most of the other species in which males have C-shaped pore plates have 9-segmented antennae and live on a variety of different Australian plants. The North American fauna of this genus shows a similar pattern, males with large C-shaped pore plates occurring in different species, some with eight but others with nine antennal segments (Nakahara, 1995). It is here considered that the structure of these pore plates is more likely to reflect phylogenetic relationships than the mere subdivision (or partial subdivision) of the sixth antennal segment. In addition to the 20 species, a further three have males with pore plates that are small to weakly curved, a situation that also occurs among North American species. These smaller pore plates are here interpreted as being reduced from the boldly C-shaped form. Four species appear to be divergent, having pore plates only on the third sternite; in one species this is situated medially on the sternite, in two it is slender and transverse and close to the antecostal ridge, whereas in the fourth it comprises an anterolateral pair of small discs. Finally, seven species have males with no sternal pore plates.

Some of the other character states that have previously been used in the classification of the *Anaphothrips* genus-group are equally confusing when applied to the fauna considered here. For example, the variation recorded here in the chaetotaxy of tergite IX in males, including the presence of drepanae, is particularly surprising. Similarly, although none of the Australian species has setae on the prosternal basantra, the prosternal ferna vary in the extent to which they are fused medially, and in two species these sclerites are well separated. The presence of one or more setae on the basal stem of the fore wing second vein is a further unusual feature among some Australian *Anaphothrips* species. Use of such character states to distinguish a series of small or monobasic genera would certainly be possible, but such a classification seems unlikely to help our understanding of the complex radiation within this presumably Australian lineage.

### Key to species of *Anaphothrips* from Australia

1. Antennae clearly 8-segmented (Figs 12, 16, 133), rarely with an indistinct incomplete suture in distal third of segment VI (Fig. 144) ..... 2
- Antennae 9-segmented, segment VI with complete transverse or oblique suture (Figs 23, 55, 88), but sometimes with oblique suture incomplete (Fig. 120) ..... 8
2. Abdominal tergite VIII without posteromarginal comb of microtrichia (Fig. 14); antennal segment III sensorium simple; both sexes micropterous ..... *aptilotus* **sp. n.**
- Abdominal tergite VIII with posteromarginal comb either of long fine microtrichia or of slender dentate lobes (Figs 117, 142); antennal segment III with forked sensorium; usually macropterous ..... 3
3. Body of female strongly bicoloured, at least abdominal segments VIII–X dark brown; male usually bicoloured, sometimes yellow ..... *sudanensis*
- Body dark or light, not strongly bicoloured ..... 4
4. Ocellar setae III arise within ocellar triangle (Fig. 9); male without sternal pore plates; body pale with light brown shadings, antennal segments III–IV brown ..... *ambiguus*
- Ocellar setae III arise anterolateral to ocellar triangle (Fig. 106); male with C-shaped sternal pore plates; body colour uniform yellow or brown, antennal segment III yellow ..... 5
5. Head wider than long (Fig. 118); abdominal tergite II with sculpture lines medially ..... 6
- Head at least as long as wide (Fig. 106); tergite II with no sculpture medially ..... 7
6. Head and pronotum boldly sculptured (Fig. 130); lateral thirds of tergites with stout, dentate microtrichia on sculpture lines (Fig. 129); wing setae weakly spatulate (Fig. 132) ..... *parsonsiae* **sp. n.**
- Head (Fig. 118), also pronotum, with no sculpture medially; lateral thirds of tergites with about five weak transverse lines; wing setae setaceous ..... *nimbus* **sp. n.**
7. Body and legs pale yellow; antennal segments I–II yellow; metascutal campaniform sensilla absent; postocular setae in single row ..... *swezeyi*
- Body and legs brown, including antennal segments I–II; metascutal campaniform sensilla present; postocular setal row with one seta displaced to posterior ..... *incertus*
8. Abdominal tergite VIII posterior margin simple, with neither craspedum nor comb of microtrichia (Fig. 123) ..... 9
- Tergite VIII usually with comb of microtrichia, at least laterally, sometimes weakly craspedate or with small teeth or lobes ..... 12
9. Female macroptera brown, fore wing pale with dark transverse band medially; male wingless, bicoloured, mainly yellow with head and abdominal segments VI–X dark brown ..... *occidentalis*
- Female colour yellow or brown with fore wing uniformly coloured, never banded; if wingless then body not sharply bicoloured ..... 10
10. Female body brown, antennal segment I brown; sternal pore plates of male large C-shaped ..... *carlylei*
- Body yellow, with or without dark markings, antennal segment I almost white; sternal pore plates of male not C-shaped ..... 11
11. Antennal segments I–II pale, III–IX brown; metascutum without campaniform sensilla; tergite VIII spiracular area small; male with pore plates only on sternites III–IV (Fig. 38) ..... *callani* **sp. n.**
- Antennal segment II darker than segment III; metascutum with paired campaniform sensilla; tergite VIII spiracular areas greatly enlarged, occupying at least half of lateral margin of tergite (Fig. 59); male with pore plates on sternites III–VII (Fig. 57) ..... *cucurbiti*

12. Abdominal tergite VIII with narrow craspedum, weakly lobed or toothed (Fig. 115) but scarcely longer than diameter of nearest campaniform sensilla; yellow apterous species; antennal segment III with sensorium simple... 13
  - Tergite VIII posterior margin with distinct microtrichia or teeth (Fig. 51), rarely reduced to a few either medially or laterally (Fig. 161); usually macropterous; sensorium on segment III forked (rarely simple)..... 14
13. Craspedum on tergite VIII of small or minute pointed lobes (Fig. 115); tergites IV–VII posterior margins laterally with row of very small tubercles; antennal segment VI brown; male with large irregular C-shaped pore plate on sternites III–VIII (Fig. 114)..... *moundi*
  - Craspedum on tergite VIII smooth and entire or with small rounded lobes; tergites IV–VII posterior margins smooth laterally; antennal segment VI usually pale at base; male with curved pore plates on sternites III–VII (Fig. 163) ..... *woodi*
14. Tergite VIII posterior margin with pointed microtrichia arising from broad bases on small craspedum (Fig. 51); lateral thirds of tergites IV–VII with prominent dentate microtrichia arising from sculpture lines ..... *chortinus* **sp. n.**
  - Microtrichia on tergite VIII arising not from distinct craspedum, usually separate or only partially fused at base; tergites rarely with prominent microtrichia ..... 15
15. Tergite VIII posterior margin medially without microtrichia, but laterally with several microtrichia in both sexes (Figs 139, 161)..... 16
  - Tergite VIII with microtrichia medially on posterior margin (Figs 84, 98)..... 18
16. Large species with head dark brown; ocellar setae III inside ocellar triangle with bases scarcely further apart than width of fore ocellus (Fig 159); tergite IX setae S1 and S2 capitate (Fig. 161), tergite X with S1 capitate ..... *whyalla* **sp. n.**
  - Small, light brown species; ocellar setae arise outside ocellar triangle ..... 17
17. Antennal segments III–IV largely pale; metascutal campaniform sensilla apparently absent; comb on tergite VIII represented by only a few teeth laterally; male sternal pore plates not visible.....*keatsi*
  - Antennal segments III–IV largely brown; metascutal campaniform sensilla present; comb on tergite VIII represented by only 2 or 3 teeth laterally; male with curved to C-shaped pore plates on sternites III–VII (Fig. 138)..... *pultenaetae* **sp. n.**
18. Abdominal tergites V–VII sculptured at middle (Figs 82, 121) ..... 19
  - Abdominal tergites V–VII without sculpture medially ..... 22
19. Tergite VIII spiracular area occupying at least 0.5 of margin (Figs 113, 148); antennal segment I brown..... 20
  - Tergite VIII with spiracular area small, not occupying more than 0.3 of lateral margin; antennal segment I almost white, much paler than II ..... 21
20. Micropterous species: microtrichia of comb on tergite VIII irregular, broadly based, sometimes fused (Fig. 113); antennal segment III with forked sensorium ..... *monga* **sp. n.**
  - Macropterous species; comb on tergite VIII of long slender microtrichia (Fig. 148); antennal segment III with sensorium simple ..... *varii*
21. Body largely yellow with brown markings; metascutum with pair of campaniform sensilla; tergal sculpture reticulate medially.....*obscurus* [in part]
  - Body largely brown, tergites uniformly brown; metascutum without campaniform sensilla; tergal sculpture lines transverse medially, not reticulate ..... *eremophilae* **sp. n.**
22. Compound eye each with 6 pigmented facets ventrolaterally (Fig. 11)..... 23
  - Compound eyes without any clearly defined pigmented facets ..... 37
23. Tergite VIII posterior margin of female with 6–12 long microtrichia medially, but lateral microtrichia progressively shorter and/or absent (Fig. 156)..... 24
  - Tergite VIII comb with microtrichia equally long across most of posterior margin..... 25
24. Tergal lines of sculpture with irregular strongly dentate microtrichia (Fig. 156); male with small curved pore plate on sternites III–VII (Fig. 157)..... *westringiae* **sp.n**
  - Tergal lines of sculpture with regular weakly dentate microtrichia (Fig. 87); male with large C-shaped pore plate on sternites III–VII..... *geleznowieae* **sp. n.**
25. Major setae broadly spatulate on head, pronotum and fore wings (Figs 101–102, 105); median setae on tergites IV–VI closer together than their length (Fig. 104); sensorium simple on antennal segment III; male with no sternal pore plates ..... *glenysae* **sp. n.**
  - Major setae setaceous or only slightly thickened; length of median setae on tergites IV–VI less than distance between their bases; sensorium forked on antennal segment III ..... 26
26. Body, legs and antennae dark brown, including antennal segments I–III (Fig. 125); antennal segments VII–IX

- clearly longer than VI; tergites with no lines of sculpture extending mesad of setae S2 ..... *orchis* **sp. n.**
- Body, legs and antennae light brown, head often with yellowish markings, antennal segment I almost white; antennal segments VII–IX shorter than VI; tergites usually with sculpture lines extending slightly mesad of setae S2 ..... 27
27. Pronotal posteromarginal setae S2 unusually long, 1.5 times as long as setae S1 (Fig. 61); male without sternal pore plates ..... *dalbyi* **sp. n.**
- Pronotum with all posteromarginal setae equally short; males with or without pore plates medially on one or more sternites ..... 28
28. Head slightly longer than wide, ocellar triangle weakly reticulate; longest fore wing setae about 0.25 as long as wing width ..... *obscurus* [in part]
- Head transverse, clearly wider than long; ocellar triangle with no reticulation; longest fore wing setae often more than 0.3 as long as median wing width ..... 29
29. Ocellar setae III arise inside ocellar triangle, their bases no further apart than diameter of first ocellus (Figs 44, 152) ..... 30
- Ocellar setae III arise further apart, their bases separated by distance at least equal to that between posterior ocelli ..... 31
30. Lateral thirds of tergites IV–VI with closely spaced sculpture lines bearing fine and regular microtrichia (Fig. 45); tergite VI setae S3–S4 equally large, S3 on VII variable but usually smaller than S4; metascutal reticulation usually with internal markings (Fig. 42); male sternites III–VI with small C-shaped pore plates (Fig. 41)..... *cecili*
- Lateral thirds of tergites IV–VI with transverse reticulation bearing weakly dentate microtrichia on sculpture lines (Fig. 151); tergites VI–VII setae S3 much smaller than S4; metascutal reticulation without internal markings; male without sternal pore plates ..... *walchae* **sp. n.**
31. Major setae thickened and weakly spatulate, including median metascutal setae (Fig. 21); abdominal tergites with small dentate microtrichia on sculpture lines; male sternites with small C-shaped pore plates..... *atriplicis* **sp. n.**
- Major setae all finely acute; tergites with or without microtrichia; male sternal pore plates, if present, not C-shaped. .... 32
32. Body and legs mainly brown; abdominal tergite sculpture lines with microtrichia weak or absent (Fig. 54); male sternite III with weakly transverse pore plate medially (Fig. 53) ..... *cobari* **sp. n.**
- Body and legs extensively yellow; abdominal tergite sculpture lines with many microtrichia (Fig. 170); male sternite III with pore plate not as above..... 33
33. Abdominal tergites extensively brown, pleurotergites yellow; tergal sculpture with numerous microtrichia clearly extending mesad of setae S2 (Fig. 170); male sternites with no pore plates ..... *yalgooi* **sp. n.**
- Abdominal tergites largely yellow; tergal sculpture scarcely extending mesad of setae S2 (Fig. 25); at least male sternite III with 1 or 2 small pore plates ..... 34
34. Tergites III–VI with brown antecostal ridge, sometimes with brown area medially; male sternite III with pair of small circular pore plates (Fig. 28) ..... *augustae* **sp. n.**
- Tergal antecostal ridge pale; male sternite III with transverse pore plate ..... 35
35. Male tergite IX with two pairs of short stout setae posteromedially, sternites III–VII with transverse weakly curved pore plates ..... *newmani*
- Male tergite IX without stout setae medially (Fig. 34), sternites IV–VII with no pore plates ..... 36
36. Male sternite III with pore plate slender and close to antecostal ridge ..... *barrowi* **sp. n.**
- Male sternite III with pore plate broader and weakly curved (Fig. 30) ..... *barringtoni* **sp. n.**
37. Body uniformly brown, antennal segments III–IV slightly paler. .... *geijerae* **sp. n.**
- Body colour not uniformly brown, usually yellow or with brown markings ..... 38
38. Abdominal tergites II–VII yellow with brown median area *and* paired lateral dark areas (Fig. 73); male tergite IX posterior margin with pair of exceptionally long but fully recurved “setae” (Fig. 70)..... *dubius*
- Abdominal tergites III–VII with different brown pattern, or yellow and sometimes with pair of more or less distinct dark areas laterally ..... 39
39. Abdominal tergites II–VII yellow medially with pair of brown areas laterally (Fig. 100); antennal segment III sharply yellow in contrast to dark brown IV (Fig. 97) ..... *gillespiei* **sp. n.**
- Abdominal tergites II–VII yellow or light brown but without distinctive brown areas laterally; antennal III not sharply different from IV ..... 40
40. Major setae on head, thorax and fore wings, also antennal segment II, slightly to strongly spatulate (Fig. 78); tergite IX setae S2 stouter and shorter than S1 ..... *exocarpi*
- Major setae on head, thorax and fore wings setaceous (Fig. 83); tergite IX setae S1 and S2 equally setaceous .... 41

41. Abdominal sternite VII posteromarginal setae S2 arise slightly in front of posterior margin (Fig. 85); ocellar setae III just within ocellar triangle ..... *exocarpoides* **sp. n.**
- Abdominal sternite VII posteromarginal setae S2 arise at margin; ocellar setae III arise well outside triangle or close to anterior margins ..... 42
42. Pore plates of males almost confluent around margins of sternites III–VII (Fig. 20); tergite IX of males with two pairs of stout thorn-like setae medially (Fig. 18); females with up to 9 marginal setae on clavus ..... *astrolomi*
- Pore plates broadly C-shaped on sternites III–VII of males, but not close to sternite margins; tergite IX of males with only one pair of stout thorn-like setae medially; females with fewer marginal setae on clavus ..... 43
43. Male tergite IX posterior margin with pair of dark conical “setae”, stouter and thicker than median pair of discal thorn-like setae (Fig. 75)..... *epacrida* **sp. n.**
- Male tergite IX posterior margin with pair of slender spine-like processes, much thinner than median pair of discal thorn-like setae (Fig. 66)..... *desleyae* **sp. n.**

### ***Anaphothrips ambiguus* (Girault)**

(Figs 9–12)

*Neophysopus ambiguus* Girault, 1927b: 2.

This widespread species is closely associated with the leaves of certain species of *Cassinia* (Asteraceae). Many specimens of both sexes and larvae have been collected between Cann River (**Victoria**), Canberra (**Australian Capital Territory**) and Orange (**New South Wales**), particularly from *Cassinia quinquefaria* but also related species including *C. longifolia* and *C. arcuata*. The lectotype, designated by Pitkin (1978), is from **Queensland**, Stanthorpe, forest, 2.iv.1924 (QM). The body colour of females is sometimes more extensively brown than indicated below, probably dependent on the temperature during development. The species is unusual amongst the members of the genus that have 8-segmented antennae, in that the males lack pore plates.

*Female macroptera.* Body and legs mainly yellow with light brown markings laterally on head, medially on meso- and metascutum, and broad T-shaped area on tergites II–VII; antennal segment I white, II–VIII brown, II darkest, III pale at base; fore wings pale or weakly shaded; major body setae brownish. Head transverse, with sculpture lines behind eyes (Fig. 9); eyes with 6 pigmented facets (Fig. 11); ocellar setae III just within triangle. Antennae 8-segmented, III–IV with sensorium forked, II with weak microtrichia; VI with weak pedicel (Fig. 12). Metascutum irregularly reticulate; median setae well behind anterior margin; MCS absent. Fore wing first vein setal row irregular, 6–9 setae in basal group, 2–3 medially and 2 distally; second vein with about 12 setae, including one seta sometimes basal to vein fork; clavus with 5 veinal setae and one seta near base. Abdominal tergites median setae scarcely further apart than their length (Fig. 10); indistinct dentate microtrichia on sculpture lines laterally; IV–VII with no sculpture medially, but lines extend slightly mesad of setae S2; posteromarginal comb on VIII complete long and fine.

*Male macroptera.* Similar to female, with long comb on tergite VIII; two pairs of short stout setae on tergite IX; sternites without pore plates.

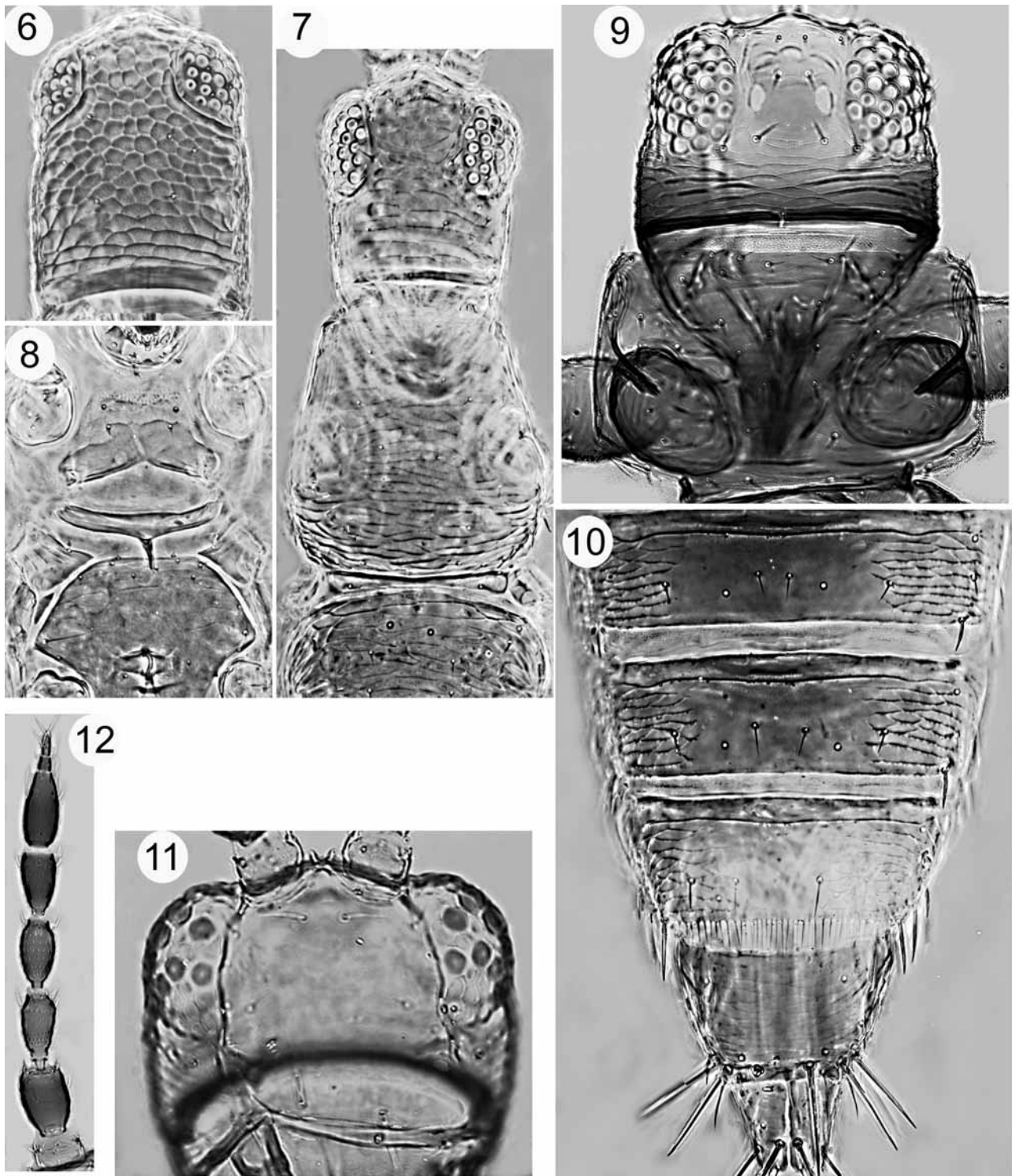
*Larva II.* Major setae with apices expanded, trumpet-shaped, particularly on abdomen; tergite IX with narrow transverse dark band between setal bases, without marginal teeth.

### ***Anaphothrips aptilotus* sp. n.**

(Figs 13–16)

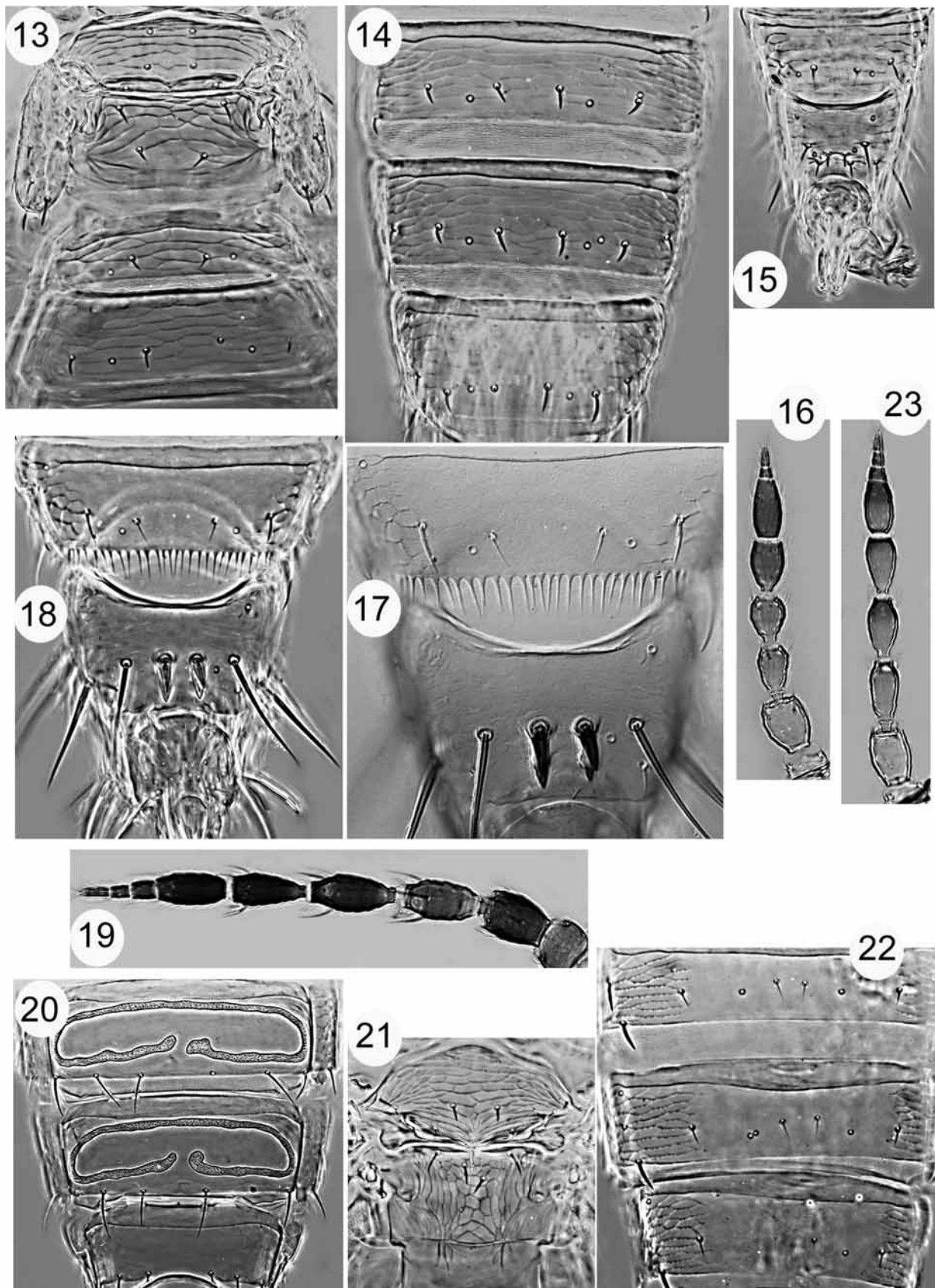
*Female microptera.* Body and legs yellow, prominent setae shaded; antennal segment I yellow, II–V yellow with distal half pale brown, VI–VIII brown. Head as long as wide, slightly overhanging antennal segment I; basal third with strong transverse reticulations; eyes with 6 pigmented facets; ocelli present or absent, ocellar setae III on anterior margins of triangle. Antennae 8-segmented, III with sensorium simple, IV with sensorium

forked; I without microtrichia; VI without pedicel (Fig. 16). Pronotum with widely spaced anastomosing striae, irregular at middle. Mesonotum transverse, campaniform sensilla present. Metascutum with median setae posteromedially, MCS absent. Fore wing lobe about as long as metascutum (Fig. 13). Abdominal tergites with strong transverse reticulation (Fig. 14), VI–VIII median paired setae stout, extending to tergal posterior margin; VI–VII setae S3 as large as S4; VIII with no comb on posterior margin, spiracular area large but not occupying half of tergite lateral margin.



**FIGURES 6–12.** *Anaphothrips* genus-group. (6) *Aptinothrips rufus*, head. *Caprithrips moundi*, 7–8: (7) head & pronotum. (8) thoracic sternites. *Anaphothrips ambiguus* 9–12: (9) head & pronotum; (10) tergites VI–X; (11) head ventral surface with pigmented facets; (12) antenna.





**FIGURES 13–23.** *Anaphothrips* of Australia. *A. aptilotus* 13–16: (13) pterothorax and tergites I–II; (14) tergites VI–VIII; (15) male tergite IX; (16) antenna. *A. astrolomi* 17–20; (17) male tergite VIII–IX (Nomarski); (18) male tergite VIII–IX (phase-contrast); (19) antenna; (20) male sternites. *A. atriplicis* 21–23: (21) meso & metanotum; (22) tergites VI–VIII; (23) antenna.

**Measurements** (holotype, in microns). Body length 920. Head, length 75; width across eyes 115. Pronotum, length 105; maximum width 135. Tergite IV S1 setae 12. Tergite IX, MD setae 12; PM S1 setae 40. Tergite X PM S1 setae 35. Antennal segments III–VIII, 32, 30, 30, 35, 5, 10.

*Male microptera*. Similar to female; sternites without pore plates; tergite IX median setae slightly stout (Fig. 15).

**Specimens examined**. Holotype female microptera, **Lord Howe Island**, Intermediate Hill, from *Cassinia tenuifolia* leaves (Asteraceae), 22.xii.2001 (LAM 4072).

Paratypes: 9 females 1 male taken with holotype; **Lord Howe Island**, Blinkey's Beach, 2 females from *Cassinia*, 28.xii.2001; Clear Space, 4 females 1 male from *Cassinia*, 21.xii.2007. **Australian Capital Territory**, Tidbinbilla: 11 females from *Cassinia arcuata*, 14.ix.2007; 12 females from *Cassinia* flowers, 10 & 13.xi.2002; 5 females from *Cassinia*, 30.ix.2001; 11 females from *Pultenaea* flowers, 13.xi.2002; Canberra, Mt Majura, 1 female from *Cassinia*, 2.ix.1995.

**Comments**. Specimens taken near Canberra are considerably more robustly sculptured than specimens from Lord Howe Island. This species is very similar to several wingless *Anaphothrips* species that have 9-segmented antennae, particularly *A. cucurbiti* that also lacks a comb on abdominal tergite VIII but has the major setae more slender. Amongst the species with 8-segmented antennae, this one is unique in lacking a comb.

### *Anaphothrips astrolomi* Pitkin

(Figs 17–20)

*Anaphothrips astrolomi* Pitkin, 1978: 353

This species was described from 40 females taken at one site on the coast south of Adelaide, Aldinga Reserve, **South Australia**. More recently one male (14.i.2002) and one female (15.i.2008) were collected at this same site, in association with the same Epacridaceae species from which the original series was taken. This thrips is possibly univoltine and host specific in the flowers of *Astroloma styphelioides*. As is evident from the key, it is not easily recognised in the female sex, although the only known male is readily distinguished from *A. epacrida* described below by the form of the setae on tergite IX and the greatly enlarged sternal pore plates (Figs 17, 20). A single male that appears to be *A. astrolomi* has also been seen from **Western Australia**, Jerramungup, 12.xii.1999.

*Female macroptera*. Body and legs yellow, tergite X light brown distally; antennal segment I white, II brown, III brownish yellow, IV–IX brown; fore wing weakly shaded; tergite IX major setae brown. Head with weak transverse anastomosing striae behind eyes not extending to ocellar region; ocellar setae III well outside margins of ocellar triangle; eyes without pigmented facets. Antennae 9-segmented; segment II with no microtrichia, III–IV with short, relatively stout, forked sensorium; VI narrowed to base but not pedicellate; suture transverse between VI–VII (Fig. 19). Pronotum with weak sculpture lines, all setae small. Metascutum reticulate; median setae near anterior margin; MCS present. Fore wing first vein with 9–13 setae basally, 2–3 setae medially, 2 setae distally; second vein with 15–22 setae, including 1–3 setae basal to vein fork; clavus with 7–9 veinal setae. Abdominal tergites III–VII with no sculpture medially; laterally with about 8 anastomosing striae bearing short, weak microtrichia, lines not extending mesad of setae S2; tergite VIII with long regular comb (Fig. 17).

*Male macroptera*. Similar to female; tergite IX medially with two pairs of dark brown, thorn-like setae (Figs 17–18); sternites III–VII with large C-shaped pore plate that is almost confluent with the margins of each sternite (Fig. 20).

***Anaphothrips atriplicis* sp. n.**

(Figs 21–23)

*Female macroptera.* Body and legs yellow, sometimes with light brown markings laterally on metascutum, also laterally and even medially on abdominal tergites III–VII; antennal segments I–II yellow, III–VI yellow with apex increasingly brown or VI entirely brown, VII–IX brown; fore wing pale; tergites VIII–X major setae light brown. Head wider than long; transverse reticulation behind eyes, ocellar region with little or no sculpture; eyes with 6 pigmented facets; ocellar and postocular setae weakly spatulate; ocellar setae III on anterior margins of ocellar triangle. Antennae 9-segmented, III–IV with apex weakly constricted, sensorium forked; II with no microtrichia; VI narrowed to base but not pedicellate (Fig. 23). Pronotum with transverse lines of sculpture, all setae weakly spatulate. Metascutum reticulate; median setae spatulate (Fig. 21), well back from anterior margin, lateral setae setaceous, MCS present. Fore wing first vein with about 9 setae on basal half and 5 setae distributed along distal half; second vein with about 12 setae; clavus with 6 veinal setae. Abdominal tergites II–VII with no sculpture medially, lateral lines not extending mesad of S2 and bearing small dentate microtrichia (Fig. 22); VIII with long fine comb of microtrichia.

**Measurements** (holotype, in microns). Body length 1000. Head, length 70; width across eyes 135. Pronotum, length 85; maximum width 160. Fore wing, length 520; median width 40; first vein longest seta in basal row 10. Tergite IV S1 setae 10. Tergite IX, MD setae 8; PM S1 setae 30. Tergite X PM S1 setae 28. Antennal segments III–IX, 37, 32, 32, 30, 8, 8, 10.

*Male macroptera.* Similar to female; thoracic setae less thickened than female; tergite IX with two pairs of short stout setae medially; sternites III–VII with C-shaped pore plate.

*Larvae II.* Tergal setae trumpet-shaped; tergites with dense rows of plaques, tergite IX smooth, X mainly light brown.

**Specimens examined.** Holotype female macroptera, **South Australia**, North Adelaide Plains, Virginia, from *Atriplex paludosa* (Chenopodiaceae), 12.i.2006 (G. Wood).

Paratypes: 9 females and larvae taken with holotype; same locality and date, 3 females 1 male from *Rhagodia parabolica* (Chenopodiaceae); **New South Wales**, Balranald, 8 females 5 males and larvae from leaves of *Rhagodia* sp., 20.xii.2008.

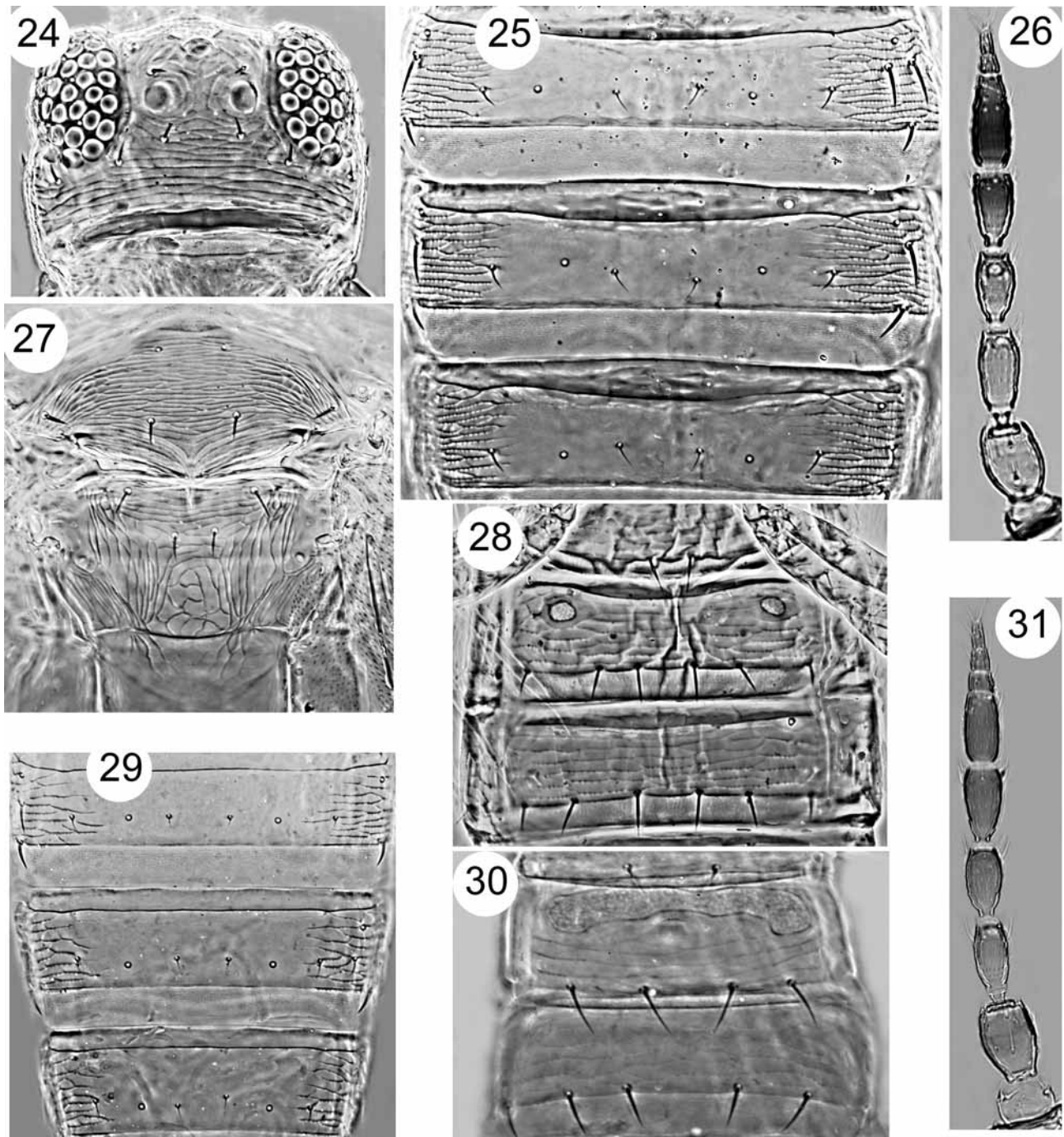
**Comments.** In a few of the available specimens the sensorium on the third antennal segment is simple and relatively stout. The specimens from *Rhagodia* have the major setae on the pronotum more slender, and the tergites more frequently shaded, than the specimens from *Atriplex*. This species, or a group of similar species, is apparently widespread across the arid areas of Australia in association with the Chenopodiaceae plants commonly known as bluebush and saltbush. A few specimens that are similar to *A. atriplicis* but with more slender major setae have been seen from Kangaroo Island on *Arthrocnemon*, also from northern South Australia, and from Barrow Island in **Western Australia**.

***Anaphothrips augustae* sp. n.**

(Figs 24–28)

*Female macroptera.* Body, legs and antennal segments I–III yellow, IV weakly shaded at apex, V yellow in basal half, VI–IX light brown; wings pale; tergite IX setae light brown. Head wider than long, with closely spaced sculpture lines behind eyes (Fig. 24); eyes with 6 pigmented facets; ocellar setae III outside ocellar triangle. Antennae 9-segmented; III–IV with sensorium forked, II without microtrichia; VI not pedicellate, suture between VI–VII oblique (Fig. 26). Pronotum with closely spaced, faint, transverse lines of sculpture; discal setae small. Metascutal sculpture transverse on anterior half, irregularly reticulate medially (Fig. 27); median setae fine and well back from anterior margin; MCS absent. Prosternal ferna almost complete medially. Fore wing first vein with about 9 setae basally, 2 setae medially and 2 setae near apex; second vein with 12–15 setae; clavus with 5–6 veinal setae. Abdominal tergites II–VII with no sculpture medially, lateral

to setae S2 with about 10 closely spaced lines bearing microtrichia similar to some *Scirtothrips* species (Fig. 25); VIII with long regular marginal comb. Sternite VII median setae close to posterior margin.



**FIGURES 24–31.** *Anaphothrips* of Australia. *A. augustae* 24–28: (24) head; (25) tergites V–VII; (26) antenna; (27) meso & metanotum; (28) male sternites II–IV. *A. barringtoni* 29–31: (29) tergites V–VII; (30) male sternites III–IV; (31) antenna.

**Measurements** (holotype, in microns). Body length 1280. Head, length 70; width across eyes 135. Pronotum, length 85; maximum width 160. Fore wing, length 700; median width 65; first vein longest seta in basal row 15. Tergite IV S1 setae 12. Tergite IX, MD setae 10; PM S1 setae 70. Tergite X PM S1 setae 55. Antennal segments III–IX, 45, 30, 32, 32, 10, 8, 10.

*Male macroptera.* Similar to female; tergite IX with all setae slender; sternite III with pair of circular pore plates at anterolateral angles (Fig. 28).

*Larvae.* White with tergites IX–X deeply shaded. Most dorsal setae finely acute; tergite IX with 2 pairs of stout capitate setae, X with one pair.

**Specimens examined.** Holotype female macroptera, **South Australia**, 35km southwest of Port Augusta, from *Myoporum* leaves (Myoporaceae), 30.xii.1997 (LAM 3378).

Paratypes: 18 females 5 males taken with holotype.

Non-paratypic specimens: **Queensland**, Dalby 55km west, 2 females from *Myoporum* leaves, 28.iii.1998.

**Comments.** The pair of small circular pore plates anterolaterally on the third sternite of males is a character state not known in any other species. The tergal sculpture with rows of small microtrichia in both sexes is similar to that of some *Scirtothrips* species. Females are similar to those of *A. barrowi* and *A. barringtoni*, but in these the microtrichia are less well developed. In *A. cobari* the microtrichia are effectively absent, and the male differs in having a median, weakly transverse, pore plate on the third sternite.

### *Anaphothrips barringtoni* sp. n.

(Figs 29–31)

*Female macroptera.* Body and legs yellow, antennal segment I white, II faintly shaded, III yellow, IV shaded at apex, V–IX palest brown; fore wings pale; tergite IX major setae pale. Head wider than long, with closely spaced sculpture lines behind eyes; eyes with 6 weakly pigmented facets; ocellar setae III outside ocellar triangle. Antennae 9-segmented; III–IV with sensorium forked, II without microtrichia; VI not pedicellate, suture between VI–VII slightly oblique (Fig. 31). Pronotum with faint well-spaced, transverse lines; discal setae small. Metascutal sculpture reticulate; median setae fine and well back from anterior margin; MCS absent. Fore wing first vein with about 8 setae basally, 2 setae medially and 2 setae near apex; second vein with 9–11 setae; clavus with 5–6 veinal setae plus one seta at base. Abdominal tergites II–VII with no sculpture medially, lateral to setae S2 with about 7 lines bearing indistinct microtrichia (Fig. 29); VIII with long regular marginal comb.

**Measurements** (holotype, in microns). Body length 1100. Head, length 85; width across eyes 135. Pronotum, length 85; maximum width 150. Fore wing, length 600; median width 50; first vein longest seta in basal row 15. Tergite IV S1 setae 7. Tergite IX, MD setae 10; PM S1 setae 65. Tergite X PM S1 setae 50. Antennal segments III–IX, 35, 30, 32, 32, 7, 7, 10.

*Male macroptera.* Similar to female; tergite IX medially with two pairs of setae scarcely thickened; sternite III with broad, weakly curved and transverse pore plate close to anterior margin (Fig. 30).

**Specimens examined.** Holotype female macroptera, **New South Wales**, Telegerry, 25km south of Barrington, from *Urtica* leaves, 23.xii.2000 (LAM 3974).

Paratypes: 6 females 2 males taken with holotype.

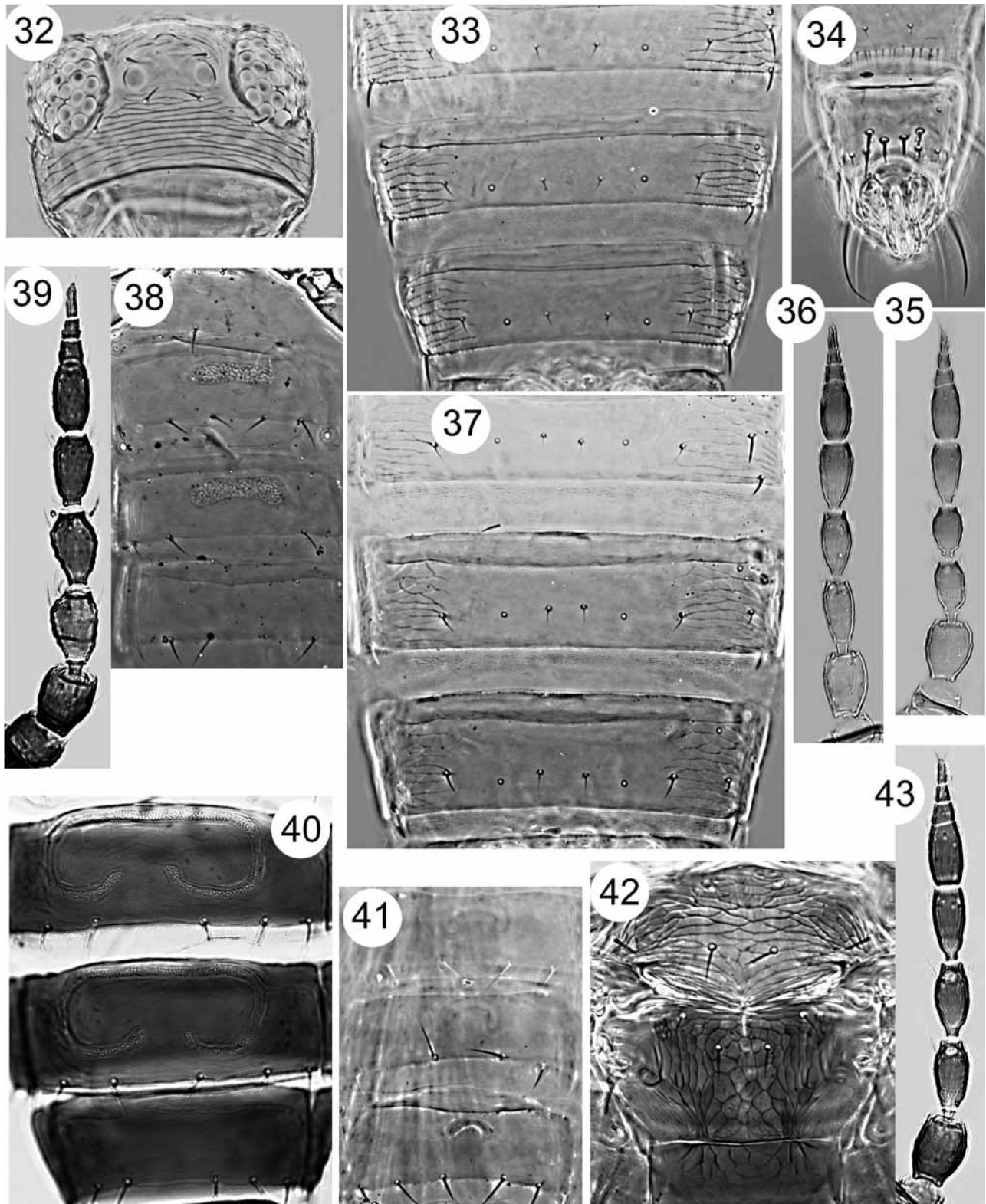
**Comments.** Females are very similar to those of *A. barrowi* from Western Australia, but the sternal pore plate of the male is much broader and less close to the antecostal ridge. The species was found within an area of moist forest, but the host association remains unknown, there being no native *Urtica* species in Australia.

### *Anaphothrips barrowi* sp. n.

(Figs 32–35)

*Female macroptera.* Body, legs and antennal segments I–III yellow, IV–VI faintly shaded at apex, VII–IX palest brown; fore wings pale; tergite IX major setae pale. Head wider than long, with closely spaced sculpture lines behind eyes (Fig. 32); eyes with 6 pigmented facets; ocellar setae III outside ocellar triangle. Antennae 9-segmented; III–IV with sensorium forked, II without microtrichia; VI not pedicellate, suture between VI–VII oblique (Fig. 35). Pronotum almost without sculpture, or with faint well-spaced, transverse lines; discal setae small. Metascutal sculpture irregularly reticulate with some elongate reticles; median setae

fine and well back from anterior margin; MCS absent. Fore wing first vein with about 9 setae basally, 2 setae medially and 2 setae near apex; second vein with 9–11 setae; clavus with 5 veinal setae plus one seta at base. Abdominal tergites II–VII with no sculpture medially, lateral to setae S2 with about 7 lines bearing short microtrichia (Fig. 33); VIII with long regular marginal comb.



**FIGURES 32–43.** *Anaphothrips* of Australia. *A. barrowi* 32–35: (32) head; (33) tergites V–VII; (34) male tergite IX; (35) antenna. *A. callani* 36–38: (36) antenna; (37) tergites V–VII; (38) male sternites II–V. *A. carlylei* 39–40: (39) antenna; (40) male sternites. *A. cecili* 41–43: (41) male sternites; (42) meso & metanotum; (43) antenna.



**Measurements** (holotype, in microns). Body length 1020. Head, length 75; width across eyes 135. Pronotum, length 85; maximum width 160. Fore wing, length 570; median width 45; first vein longest seta in basal row 15. Tergite IV S1 setae 7. Tergite IX, MD setae 7; PM S1 setae 65. Tergite X PM S1 setae 50. Antennal segments III–IX, 30, 25, 30, 30, 7, 7, 10.

*Male macroptera*. Similar to female; tergite IX with two pairs of setae scarcely thickened (Fig. 34); sternite III with very slender, transverse pore plate close to anterior margin.

**Specimens examined**. Holotype female macroptera, **Western Australia**, Barrow Island, beaten, v.2005 (S. Callan).

Paratypes: 10 females 3 males taken with holotype; 3 females same locality, iv–v.2005. Non-paratypic specimens: **Western Australia**, Cue, 6 females from *Eremophila* leaves (Myoporaceae), 20.iv.1997.

**Comments**. The females of this species are particularly similar to those of *A. barringtoni*, but the males have a transverse pore plate on sternite III that is exceptionally slender.

### *Anaphothrips callani* sp. n.

(Figs 36–38)

*Female macroptera*. Body, legs and antennal segments I–II yellow, III shaded brown, IV–IX light brown; wings pale. Head dorsally wider than long; mouth cone long, extending to mesosternum; eyes with 6 pigmented facets; ocellar setae III on anterior margins of triangle. Antennae 9-segmented, III–IV with sensorium forked, II without microtrichia, IX longer than VIII; VI narrowed to base but not pedicellate (Fig. 36). Pronotum transverse, with faint lines of sculpture. Mesonotal anteromedian campaniform sensilla absent or weak. Metascutum weakly reticulate, median setae well back from anterior margin, MCS absent. Prosternal ferna incomplete medially; mesothoracic furca long and slender. Fore wing first vein with about 7 setae basally, and 3 widely spaced setae to apex; second vein with about 9 setae; clavus with 5 veinal setae plus one seta at base. Abdominal tergites with faint sculpture lines laterally but none medially (Fig. 37); VIII with no marginal comb; IX–X relatively long. Ovipositor unusually long.

**Measurements** (holotype, in microns). Body length 1150. Head, length 65; width across eyes 125. Pronotum, length 110; maximum width 150. Fore wing, length 620; median width 40; first vein longest seta in basal row 15. Tergite IV S1 setae 7. Tergite IX, MD setae 7; PM S1 setae 60. Tergite X PM S1 setae 50. Antennal segments III–IX, 40, 35, 35, 35, 7, 7, 10.

*Male macroptera*. Similar to female; tergite IX with all setae slender; sternites III–IV with broad, curved pore plate (Fig. 38).

**Specimens examined**. Holotype female macroptera, **Western Australia**, Barrow Island, beaten, iv–v.2005 (J. Majer & S. Callan).

Paratypes: **Western Australia**, 3 females 2 males with same data as holotype; 1 female with similar data, ix.2006, 1 female ditto, v.2007; Perth airport, 2 females from *Grevillea* ‘Robyn Gordon’, 18.ii.2005; West Binu, 80km north of Geraldton, 1 female from *Geleznovia* flowers, 4.viii.1998.

**Comments**. Adults of this species are particularly pale and weakly sculptured, and thus difficult to study. The female differs from most of the other species with 9-segmented antennae in the absence of a comb on tergite VIII, and the male lacks stout setae on the ninth tergite, and has curved (not C-shaped) pore plates on two sternites only. The host association of this thrips remains unknown, but is likely to involve a species of Myoporaceae or Chenopodiaceae among the arid zone flora.

### *Anaphothrips carlylei* Girault

(Figs 39–40)

*Anaphothrips carlylei* Girault, 1928: 1.

The male described below was found in isolation, and its identity is therefore not certain. The species has proved to be remarkably elusive, but is possibly associated with the Australian plant genus *Dianella*.

*Female macroptera*. Body and legs brown, tarsi and apices of tibiae paler; antennal segments I–II and IV–IX brown, III yellow; fore wings shaded. Head as long as wide; eyes with 6 pigmented facets; ocellar setae III at margin of triangle, anterior to hind ocelli. Antennae 9-segmented, III–IV weakly constricted at apex, IV with sensorium forked, III with sensorium apparently simple, inner branch short and parallel to segment apex; II without microtrichia, VI not pedicellate, IX longer than VIII (Fig. 39). Pronotum with anastomosing striae. Metascutum reticulate, median setae far behind anterior margin; MCS present. Fore wing first vein with about 7 setae basally, 2 setae medially, 2 or 3 setae distally; second vein with 11 to 14 setae, including one seta basal to vein fork; clavus with 4–5 veinal setae plus one seta at base. Abdominal tergites median setae small, wide apart; small dentate microtrichia on sculpture lines lateral to S2 setae; VIII with no marginal comb.

*Male microptera*. Colour similar to female; fore wing lobe as long as pronotum; abdominal tergites with sculpture weak; tergite IX with 2 pairs of stout setae medially; sternites III–VII with very large C-shaped glandular area (Fig. 40).

**Specimens examined.** Syntypes 2 females, **Queensland**, Norman Park, from *Dianella coerulea* (Liliaceae), 6.x.1927 (QM).

**Queensland**, Brisbane, Mt Glorious, 1 female from *Dianella coerulea*, 29.x.1992. **Australian Capital Territory**, Canberra, Black Mtn, 4 females from grasses and *Dianella*, 4.xii.1960. **South Australia**, Adelaide Hills, Scotts Creek, 1 male from *Dianella*, 1.x.2007.

### ***Anaphothrips cecili* Girault**

(Figs 44–45)

*Anaphothrips cecili* Girault, 1928: 1

*Hemianaphothrips (Anaphothrips) concinnus* Morison, 1931: 245

The only mention of the name *A. cecili* in any publication by Girault was as follows:

“**6. An. cecili. A. striatus**, in Froggatt, Agric. Gaz. N.S.W., 1920, p.505, pl.; near keatsi.”

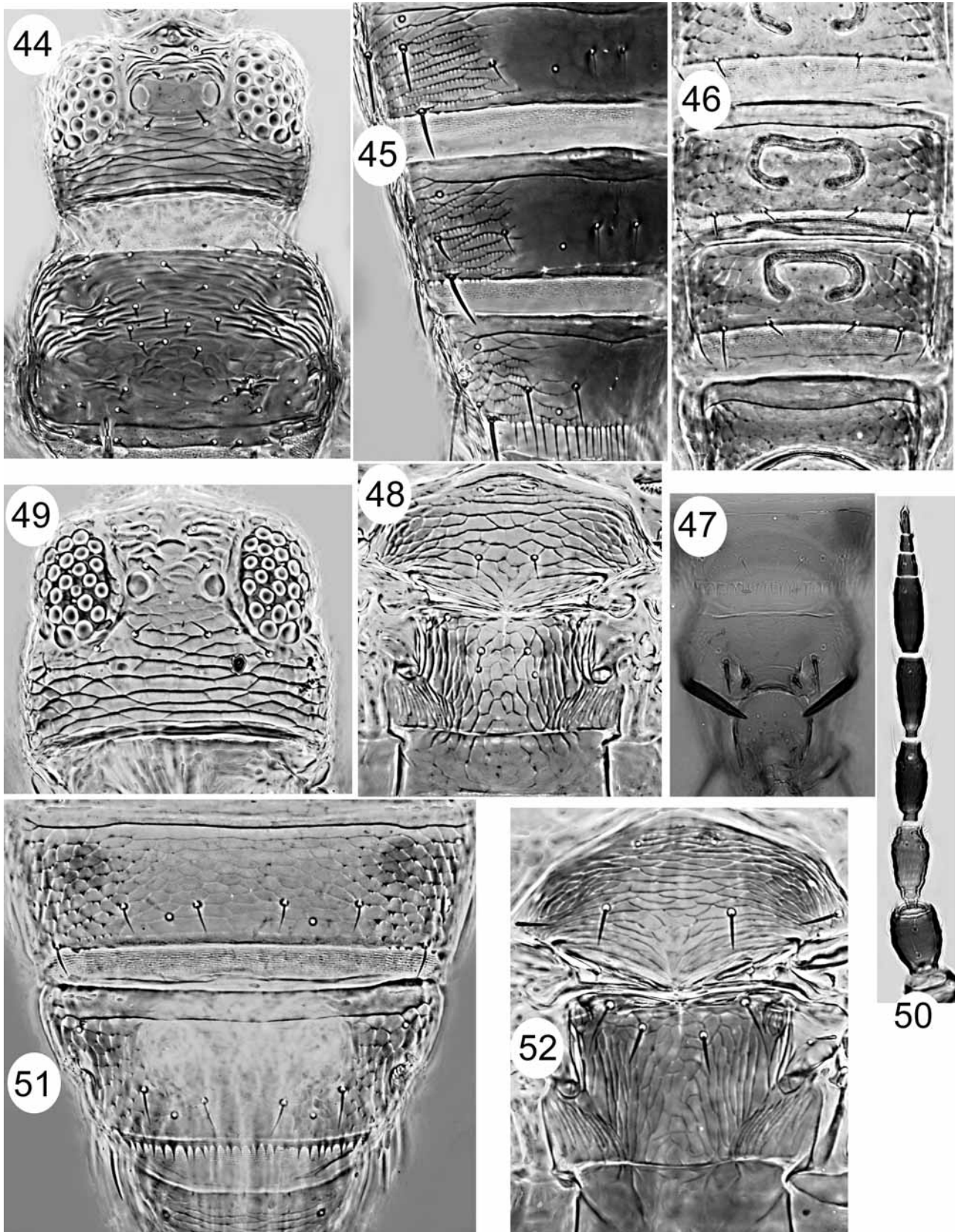
By these two lines Girault (1928) provided a new name for a species misidentified by Froggatt in 1920 as *A. striatus* (now regarded as a synonym of *A. obscurus*). However, Froggatt stated that the specimens he discussed as *A. striatus* were collected from tobacco leaves at Gunnedah and Tamworth (**New South Wales**). In contrast, the specimens labelled by Girault as Types of *A. cecili* (see Pitkin, 1978) bear the locality “Bowen Q” (**Queensland**) and the date “10.9.31”. That is, they appear to have been collected three years after publication of the name at a site more than 1000 km further north, and thus cannot be considered type material. No specimens bearing Froggatt’s original data have been found amongst the collections of his material at Canberra or at Orange. A neotype is therefore designated, as follows:

**Neotype** here designated: **Victoria**, Burnley, paratype female of *Hemianaphothrips concinnus* Morison, taken on *Lycium horridum*, 11.xii.1929, in ANIC, Canberra.

This thrips seems to be associated with several unrelated plants. It has been taken at widely separated sites on tobacco, including northern New South Wales, Canberra (in greenhouse), and South Australia. More commonly it is associated with the leaves of *Lycium ferossissimum* (Solanaceae) and has been taken on this plant in Hobart, Canberra, and near Adelaide. Moreover, in southeastern Queensland it has been taken in large numbers on both *Zygophyllum apiculatum* (Zygophyllaceae) and *Duboisia* (Solanaceae). This species is unusual amongst the Australian *Anaphothrips* in having setae S3 on tergite VI (and VII) as long as setae S4. A few female specimens have been studied from Wittenoom in the north of **Western Australia** that have the S3 setae long on tergite VI but reduced on tergite VII.

*Female macroptera*. Colour variable, from largely yellow with brown tergite markings and yellow legs, to mainly brown with legs extensively brown; antennal segment I commonly white but sometimes light brown,





**FIGURES 44–52.** *Anaphothrips* of Australia. *A.cecili* 44–45: (44) head & pronotum; (45) tergites VI–VIII. *A.chortinus* 46–51: (46) male sternites; (47) male tergite IX; (48) meso & metanotum; (49) head; (50) antenna; (51) tergites VII–VIII. (52) *A.cobari* meso & metanotum.

II dark brown, III–IX light brown; fore wings weakly shaded along veins; major setae at abdomen apex dark. Head wider than long; transverse reticulation behind eyes, weakly sculptured in ocellar triangle; ocellar setae III inside triangle, usually no further apart than diameter of first ocellus (Fig. 44); eyes with 6 pigmented facets. Antennae 9-segmented; III–IV weakly constricted at apex with prominent forked sensorium; II with a few microtrichia. Pronotum with irregular sculpture lines, discal setae sometimes weakly thickened rather than finely setaceous. Prosternal ferna almost entire. Metascutum reticulate, reticles usually with internal markings (Fig. 42), median setae well posterior to anterior margin, MCS absent. Fore wing first vein with about 8 setae basally, 2 setae medially and 2 setae distally; second vein with 10–16 setae including one setae sometimes present basal to vein fork; clavus with 5–7 veinal setae plus one seta at base. Abdominal tergites II–VII with no sculpture medially, lateral sculpture of closely spaced lines with *Scirtothrips*-like microtrichia not extending mesad of setae S2 (Fig. 45); median pair of setae on IV–VII closer together than their length; VI (and often VII) with setae S3 as large as S4; VIII with long regular posteromarginal comb.

*Male macroptera*. Similar to female; tergite VIII with two pairs of small stout setae medially; sternites III–VI with small C-shaped pore plate (Fig. 41).

### ***Anaphothrips chortinus* sp. n.**

(Figs 44–45)

*Female macroptera*. Body and legs yellow; tergites II–VII with paired brown areas laterally, pterothorax weakly shaded laterally; antennal segment I white, II and IV–IX brown, III mainly yellow; fore wings weakly shaded, clavus darkest. Head wider than long; reticulate behind eyes, weakly sculptured in ocellar triangle (Fig. 49); ocellar setae III on margins of triangle just anterior to hind ocelli; eyes with no pigmented facets. Antennae 9-segmented; forked sensorium on III short and curved; II with short microtrichia on transverse lines; VI with short pedicel (Fig. 50). Pronotum with sculpture markings. Metascutum reticulate (Fig. 48), median setae well posterior to anterior margin, MCS present. Fore wing first vein with about 10 setae basally, 2 medially and 2 distally; second vein with about 10 setae; clavus with 6 veinal setae plus one seta at base. Abdominal tergites with weak reticulate sculpture medially, laterally with prominent dentate microtrichia (Fig. 51); VIII with spiracle large, posterior margin with comb of microtrichia of which the bases are fused to form a continuous craspedum. Sternites with dentate microtrichia laterally on sculpture lines.

**Measurements** (holotype, in microns). Body length 1550. Head, length 130; width across eyes 150. Pronotum, length 130; maximum width 180. Fore wing, length 650; median width 50; first vein longest seta in basal row 15. Tergite IV S1 setae 12. Tergite IX, MD setae 12; PM S1 setae 85. Tergite X PM S1 setae 90. Antennal segments III–IX, 45, 45, 45, 40, 10, 7, 12.

*Female microptera*. Similar to macroptera; fore wing lobe shorter than width of mesonotum.

*Male microptera*. Similar to female; tergite IX with one pair of short stout setae medially and paired large dark drepanae posterolaterally that curve dorso-medially (Fig. 47); sternites III–VII with broad C-shaped pore plate (Fig. 46).

**Specimens examined**. Holotype female macroptera. **Australian Capital Territory**, Black Mtn, CSIRO Entomology, from native *Poa*, 23.xi.2001 (LAM).

Paratypes: 2 female micropterae taken with holotype. **New South Wales**, Cabbage Tree Creek, near Nelligen, 2 male micropterae from grasses, 13.i.1999; Lake Chichester Dam, 1 female macroptera from grass, 23.xii.2000. **Victoria**, Genoa, 1 female microptera from native *Poa*, 30.xii.2004. **Queensland**, Brisbane, from native *Poa*, Mt Cootha, 1 female microptera, 20.v.2004; 1 male microptera, 16.i.2006.

**Comments**. This grass-living species is apparently widespread in eastern Australia. It has a distinctive posterior margin on tergite VIII, with the bases of the slender microtrichia fused to form a small continuous craspedum (Fig. 51), and the sculpture laterally on the abdomen is strongly dentate. The males are remarkable for the pair of strong, incurved, drepanae on the ninth tergite (Fig. 47). The two male paratypes from near Nelligen have the anterior tergites far more robustly sculptured than in females, but the paratype male from Brisbane has weaker tergal sculpture.

### *Anaphothrips cobari* sp. n.

(Figs 52–55)

*Female macroptera.* Body, legs and antennae pale brown, hind tibiae paler, antennal segment I white; fore wing weakly shaded in basal half; tergite IX major setae brown. Head wider than long; transverse sculpture lines behind eyes, ocellar triangle without sculpture; eyes with 6 pigmented facets; ocellar setae III outside triangle. Antennae 9-segmented, III–IV with forked sensorium; II with a few short microtrichia near apex; VI not pedicellate, suture oblique between VI–VII (Fig. 55). Pronotum with faint transverse lines, posteromarginal setae S1 slightly larger than remaining setae; prosternal ferna weakly divided. Metascutum irregularly reticulate, reticles sometimes elongate (Fig. 52); median setae not close to anterior margin, MCS absent. Fore wing first vein with about 9 setae near base, 2 setae medially, 2 setae distally; second vein with about 12 setae; clavus with 6–7 venal setae plus one seta at base. Abdominal tergites II–VII with no sculpture medially; laterally with about 8 transverse lines with few or no microtrichia, not extending mesad of setae S2 (Fig. 54); VIII with long regular posteromarginal comb.

**Measurements** (holotype, in microns). Body length 1450. Head, length 85; width across eyes 150. Pronotum, length 100; maximum width 185. Fore wing, length 800; median width 70; first vein longest seta in basal row 25. Tergite IV S1 setae 12. Tergite IX, MD setae 12; PM S1 setae 80. Tergite X PM S1 setae 70. Antennal segments III–IX, 42, 35, 45, 38, 7, 7, 12.

*Male macroptera.* Similar to female; tergite IX with median setae not short and stout; sternite III with one weakly transverse pore plate medially (Fig. 53).

**Specimens examined.** Holotype female macroptera. **New South Wales**, 5 km east of Cobar, from *Myoporum* bush, 31.v.2003 (LAM 4314).

*Paratypes:* 8 females 1 male taken with holotype; 1 female same locality and date, from *Dodonaea*. **South Australia**, 20km east of Meningie, 1 female 1 male from *Lycium ferossissimum*, 9.ii.2003.

Non-paratypic specimens: **New South Wales**, Broken Hill, 15 females from *Eremophila serrulata* leaves 3.vi.2003; **Western Australia**, 180km south of Carnarvon, 15 females 1 male from *Eremophila* leaves, 25.iv.1997; 25km south of Newman, 3 females from *Eremophila* leaves, 21.iv.1997; **South Australia**, Kangaroo Island, 10 females from *Suaeda australis* leaves (Chenopodiaceae), 3.x.2007.

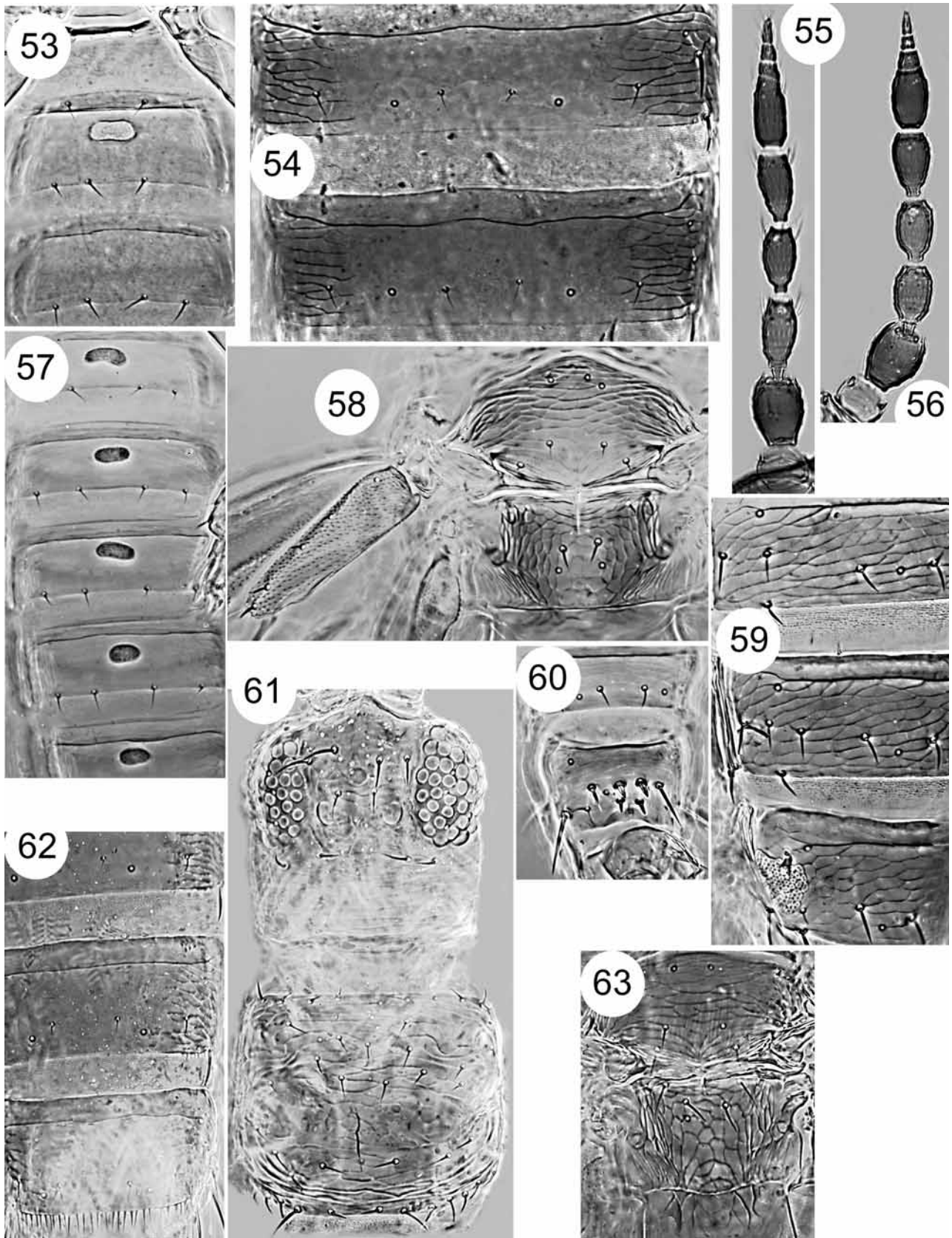
**Comments.** This is probably a widespread species across the arid areas of Australia in association with the leaves of the common shrubs *Eremophila* and *Myoporum*. The species is unusual within this group in the absence or weakness of microtrichia on the tergal sculpture lines. The metascutal sculpture is variable within the type series, and is sometimes more linear than is usual in this genus (Fig. 52). The distal segmentation of the antennae is irregular (Fig. 55), and the presence of just one small weakly transverse pore plate medially on the third sternite in males (Fig. 53) is currently unique in this genus. The specimens from Western Australia are smaller with the fore wing setae shorter than the specimens from New South Wales. The other non-paratypic specimens listed cannot be identified with certainty in the absence of males.

### *Anaphothrips cucurbiti* Pitkin

(Figs 56–60)

*Anaphothrips cucurbiti* Pitkin, 1978: 356

It seems likely that the “curcurbit creeper”, from which the original specimens of this species were collected at Wisemans Ferry, N.S.W. was actually growing over a shrub that the collector failed to notice. Subsequent collecting between northern Victoria and eastern New South Wales has indicated that both sexes and larvae of this thrips occur on the leaves of the common and widespread shrub, *Bursaria spinosa* (Pittosporaceae).



**FIGURES 53–63.** *A. cobari* 53–55: (53) male sternites II–IV; (54) tergites VI–VII; (55) antenna. *A. cucurbiti* 56–60: (56) antenna; (57) male sternites; (58) clavus with meso & metanotum; (59) tergites VI–VIII left margins; (60) male tergite IX. *A. dalbyi* 61–63: (61) head & pronotum; (62) tergites VI–VIII; (63) meso & metanotum.

*Female macroptera.* Body and legs yellow with light brown markings on pterothorax, and laterally on abdominal segments II–VI; antennal segment I white, II and V–IX dark brown, III–IV light brown; fore wing weakly shaded medially. Head wider than long, slightly produced at anterior over antennal segment I; area behind eyes with transverse reticulation, ocellar triangle with weak reticulation; eyes with 6 weakly pigmented facets; ocellar setae III close together within triangle. Antennae 9-segmented, III–IV sensorium forked; II with some short microtrichia near apex; VI not pedicellate (Fig. 56). Pronotum almost without sculpture. Metascutum weakly and irregularly reticulate (Fig. 58), median setae arise almost medially, MCS present; metascutellum reticulate. Fore wing veinal setae short; first vein with about 6 setae near base, 2 setae distally; second vein with about 8 setae; clavus with 6–7 veinal setae plus one seta at base. Abdominal tergites with weak transverse reticulation medially; VI–VII setae S3 similar in size to S4; VIII with no posteromarginal comb, spiracular area occupying more than half of tergal lateral margin (Fig. 59); tergite X short.

*Female aptera.* Similar to macroptera; antennal segment II without microtrichia; ocelli absent or weakly developed; ocellar setae III sometimes more widely apart; mesonotum and metascutum transverse.

*Male aptera.* Similar to female; tergite IX with 2 pairs of short stout setae medially (Fig. 60); sternites III–VII with small median oval pore plate (Fig. 57).

*Larva II.* Major setae with broadly expanded, fringed apices; tergite IX without either posteromarginal coloured band or teeth, tergite X with dark posteromarginal band.

### ***Anaphothrips dalbyi* sp. n.**

(Figs 61–64)

*Female macroptera.* Body, legs and antennal segments I–IV yellow, but II and apex of IV weakly shaded, V–VI brown with basal third yellow; fore wings weakly shaded along veins; tergite IX major setae pale. Head about as long as wide, projecting slightly in front of eyes, with faint anastomosing sculpture lines behind eyes and around ocelli; eyes with 6 pigmented facets; ocellar setae I wide apart, II relatively long, III just within triangle. Antennae 9-segmented; segments III–IV with small forked sensorium; II with a few weak, short microtrichia; suture oblique between VI–VII; VI weakly pedicellate (Fig. 64). Pronotum with weak transverse sculpture lines; posteromarginal setae S2 at least 1.5 times as long as S1 (Fig. 61). Metascutum irregularly reticulate (Fig. 63), median setae not close to anterior margin, MCS present. Fore wing first vein with about 8 setae basally, 2 medially and 2 distally; second vein with 10 setae; clavus with 4–5 veinal setae. Abdominal tergites II–VII with no sculpture medially, lines extend just mesad of setae S2, median setal pair minute to small; posterolateral margins of tergites with broadly dentate microtrichia; VIII with long regular comb of microtrichia (Fig. 62); IX elongate.

**Measurements** (holotype, in microns). Body length 1380. Head, length 120; width across eyes 130. Pronotum, length 115; maximum width 150. Fore wing, length 620; median width 40; first vein longest seta in basal row 25. Tergite IV S1 setae 5. Tergite IX, MD setae 20; PM S1 setae 90. Tergite X PM S1 setae 90. Antennal segments III–IX, 45, 35, 30, 35, 10, 7, 12.

*Male macroptera.* Similar to female; tergite IX with 2 pairs of short stout setae medially; sternites with no pore plates.

**Specimens examined.** Holotype female, **Queensland**, 30km west of Dalby, from grass along Condamyne River, 19.vii.1995 (LAM 2782).

Paratypes: 7 females 1 male taken with holotype.

**Comments.** Apart from the slightly elongate pair of setae on the pronotum, this species shares most character states with the other Australian *Anaphothrips* species, and in body form it is a typical grass-living species.

***Anaphothrips desleyae* sp. n.**

(Figs 65–68)

*Female macroptera.* Body and legs yellow; antennal segment I white, II pale brown, III–V pale brown with base variably yellow, VI–IX brown; fore wing lightly shaded; tergite IX major setae dark. Head with transverse anastomosing lines behind eyes, extending weakly into ocellar triangle; ocellar setae III on anterior margins of ocellar triangle; eyes without pigmented facets. Antennae 9-segmented; segment II with few microtrichia; III–IV with sensorium forked, VI pedicellate, suture between VI–VII transverse. Pronotum with about 20 transverse sculpture lines. Metascutum reticulate (Fig. 65), median setae distant from anterior margin, MCS present. Fore wing first vein with about 9 setae basally, then about 6 setae irregularly placed to wing apex; second vein with about 12–16 setae including 1–2 setae basal to vein fork; clavus with 6–8 marginal setae. Abdominal tergites III–VII smooth medially; laterally with about 8 transverse lines with small triangular microtrichia, lines extend just mesad of S2 setae (Fig. 67); VIII with long, fine posteromarginal comb.

**Measurements** (holotype, in microns). Body length 1350. Head, length 75; width across eyes 135. Pronotum, length 115; maximum width 180. Fore wing, length 700; median width 50; first vein longest seta in basal row 15. Tergite IV S1 setae 10. Tergite IX, MD setae 12; PM S1 setae 65. Tergite X PM S1 setae 70. Antennal segments III–IX, 45, 40, 40, 32, 7, 7, 12.

*Male macroptera.* Similar to female; tergite IX with one pair of short, stout setae medially, posterolateral margin with one pair of slender setae, posterior margin submedially with pair of slender spine-like processes (Fig. 66); sternites III–VII with C-shaped pore plate (Fig. 68).

**Specimens examined.** Holotype male macroptera, **Queensland**, Indooroopilly, from leaves of unidentified garden vine, 7.iii.2006 (LAM 4849).

Paratypes: 4 males 5 females taken with holotype.

**Comments.** The females of this species are similar to those of *A. epacrida*, and share with that species and *A. astrolomi* the character state of setae present on the basal stem of the fore wing second vein. However, the fore wing veinal setae are considerably shorter (15 instead of 30), and the pronotal transverse lines of sculpture stronger. The chaetotaxy of tergite IX of males is different (Fig. 66), but the slender spine-like processes on the posterior margin may be homologous with structures in a similar position in the males of *A. dubius* and *A. epacrida*.

***Anaphothrips dubius* (Girault)**

(Figs 69–73)

*Heterothrips dubius* Girault, 1926: 2

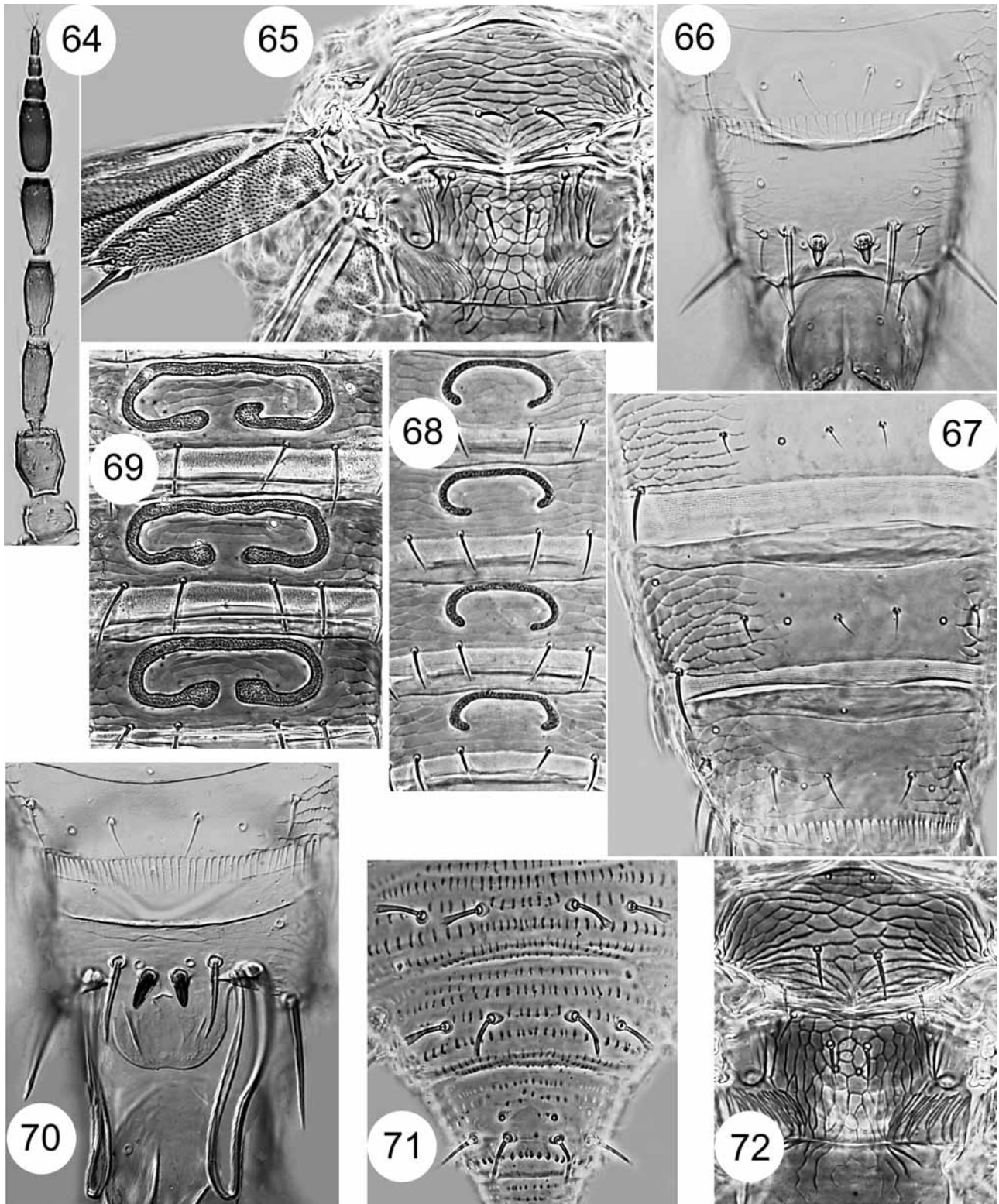
*Anaphothrips 5-guttatus* Girault, 1927a: 2.

*Anaphothrips regalis* Girault, 1928: 2.

*Hemianaphothrips (Anaphothrips) tersus* Morison, 1930: 9.

Type specimens of these four described species have been examined (Fig. 1), to confirm the synonymies indicated by Pitkin (1978). *A. dubius* has been collected at various sites between Brisbane, Sydney and Canberra in eastern Australia, but the precise host-plant relationships remain unclear. Many females have been collected at two widely separated sites from the leaves of *Urtica*, and at another site large numbers of both sexes, together with larvae, were taken from young leaves of *Pandorea*. At Canberra, a large population of this thrips, including both sexes and larvae, was observed severely damaging plants of *Xerochrysum bracteatum* (Asteraceae) over several weeks between October and December, 2005. A few females have also been studied from Central Australia, west of Alice Springs, from *Dodonaea viscosa* leaves. Presumably the species is truly polyphagous. The strongly recurved “setae” on the posterior margin of tergite IX in males do not appear to have typical setal bases, and may be homologous with smaller structures in a similar position on *A. desleyae* and *A. epacrida*.





**FIGURES 64–72.** *Anaphothrips* of Australia. (64) *A. dalbyi* antenna. *A. desleyae* 65–68: (65) clavus with meso & metanotum; (66) male tergite IX; (67) tergites VI–VIII; (68) male sternites. *A. dubius* 69–72: (69) male sternites; (70) male tergite IX; (71) larva II tergites VII–IX; (72) meso & metanotum.

**Type Specimens examined.** (Fig. 1). Syntypes of *dubius*, 3♀, **Queensland**, Gympie, 19.x.1924 (QM). Lectotype ♀ of *5-guttatus* (designated Pitkin, 1978), slide without data, but original description indicates locality as **Queensland**, Gympie, jungle, 14.vii.1924 (QM). Syntypes of *regalis*, 2♀ **Queensland**, Norman

Park, 14.viii.1927 (QM). Holotype ♀ of *tersus*. **South Australia**, Glen Osmond, WARI, from *Malva parviflora*, 30.vii.1928 (BMNH).

*Female macroptera*. Body and legs mainly yellow; abdominal tergite II light across anterior half, III–VI with median and anterolateral dark areas (varying in size and intensity); antennal segment I white, II variable from pale to brown, III yellow to light brown, IV–V brown but sometimes with bases paler; fore wings weakly shaded except at apex; tergite IX setae light brown. Head wider than long with transverse sculpture lines behind eyes, extending weakly into ocellar triangle; eyes without pigmented facets; ocellar setae III varying in position from anterior margins of triangle to close together behind first ocellus. Antennae 9-segmented, III–IV with forked sensorium; II with very few microtrichia; VI pedicellate, suture transverse between VI–VII. Pronotum with transverse lines, discal setae relatively robust. Metascutum reticulate; median setae close to anterior margin (Fig. 72); MCS present. Fore wing first vein with about 9–11 setae on basal half, 2–4 setae medially, 2 setae distally; second vein with 12–16 setae including 1–2 setae basal to vein fork; clavus with 6–7 veinal setae. Abdominal tergites II–IV with a few sculpture lines medially, V–VII usually without such lines (Fig. 73); laterally with about 8 anastomosing lines with broadly based, short microtrichia, sculpture extending just mesad of setae S2; VIII with long regular posteromarginal comb. Sternite VII setae S1 far anterior to posterior margin, S2 sometimes slightly submarginal.

*Male macroptera*. Similar to female; tergite IX with one pair of stout median thorn-like setae, posterior margin with pair of greatly elongate, recurved “setae” (Fig. 70); sternites III–VII with large C-shaped pore plate (Fig. 69).

*Larva II*. Body and legs mainly yellow, antennal segments shaded; tergite IX shaded posterior to major setae, X shaded in distal half; all dorsal setae slightly to broadly expanded at apex (Fig. 71); tergites with transverse rows of prominent plaques; IX posterior margin with small but prominent pointed tubercles.

### ***Anaphothrips epacrida* sp. n.**

(Figs 74–77)

*Female macroptera*. Body and legs yellow; antennal segment I white, II pale brown, III–V pale brown with base variably yellow, VI–IX brown; fore wing lightly shaded; tergite IX major setae dark. Head with a few transverse anastomosing lines, smooth within ocellar triangle; ocellar setae III just outside ocellar triangle, in front of hind ocelli; eyes without pigmented facets. Antennae 9-segmented; segments III–IV with sensorium forked, VI weakly pedicellate, suture between VI–VII transverse (Fig. 76). Pronotum almost without sculpture lines. Metascutum reticulate, median setae near anterior margin, MCS present usually on anterior half. Fore wing first vein with about 9 setae basally, 2 setae medially, 2 setae distally; second vein with about 15 setae including 1–3 setae basal to vein fork (Fig. 77); clavus with 6–7 marginal setae including one seta near base. Abdominal tergites II–VII smooth medially; laterally with about 8 anastomosing lines with weak microtrichia, lines extend just mesad of S2 setae; VIII with long, fine posteromarginal comb.

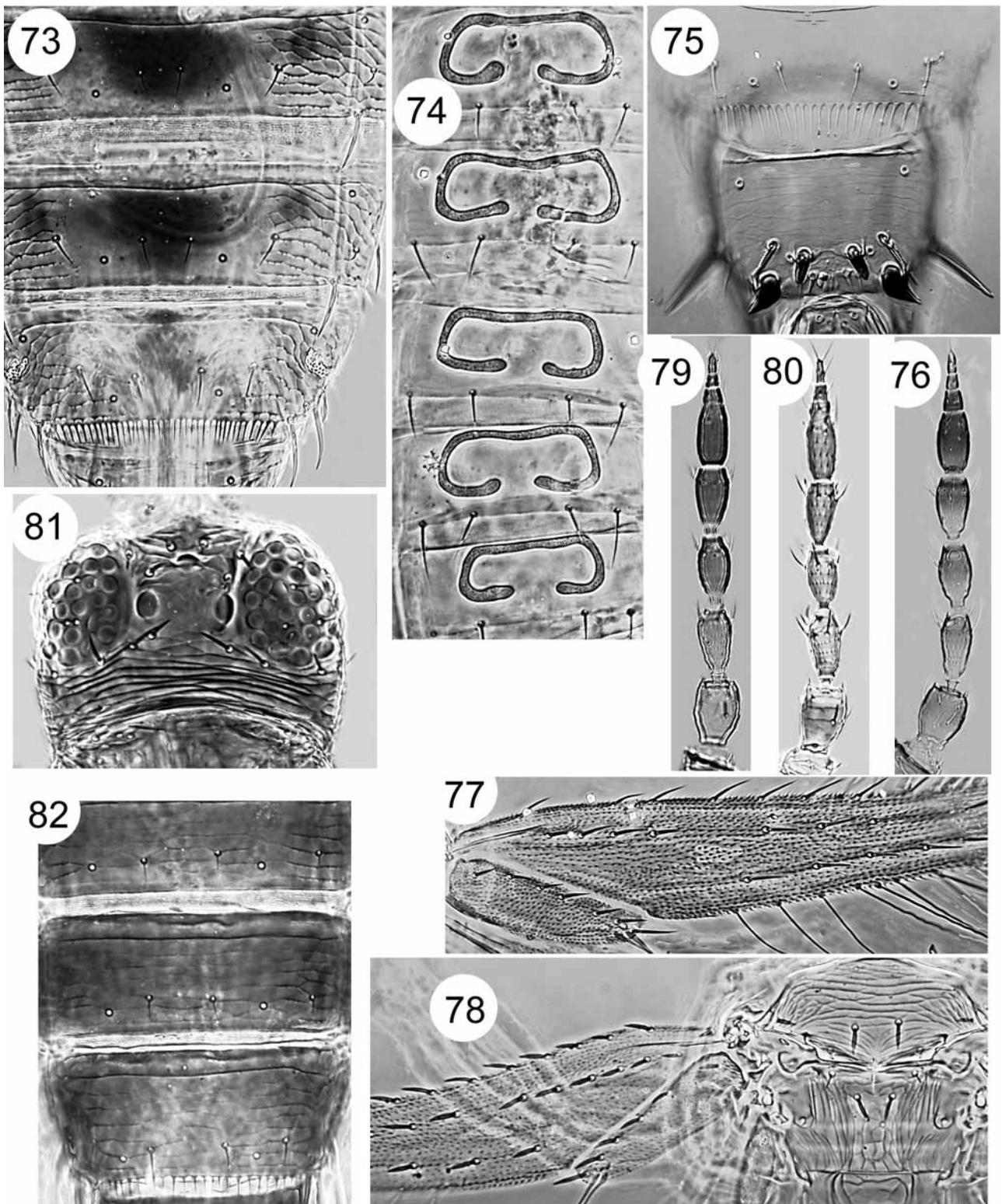
**Measurements** (paratype, in microns). Body length 1300. Head, length 100; width across eyes 135. Pronotum, length 110; maximum width 160. Fore wing, length 720; median width 50; first vein longest seta in basal row 25. Tergite IV S1 setae 12. Tergite IX, MD setae 10; PM S1 setae 70. Tergite X PM S1 setae 90. Antennal segments III–IX, 45, 45, 40, 40, 12, 7, 12.

*Male macroptera*. Similar to female; tergite IX with one pair of short, stout, dark setae medially, and two pairs of small pale, fine setae posterior to these; tergite IX posterolateral margin with one pair of short, broadly conical, dark brown “setae” (Fig. 75); sternites III–VII with large C-shaped pore plate (Fig. 74).

**Measurements** (holotype, in microns). Body length 1050. Head, length 85; width across eyes 125. Pronotum, length 85; maximum width 135. Fore wing, length 580; median width 45; first vein longest seta in basal row 25. Tergite IV S1 setae 7. Tergite IX median setae 15.

**Specimens examined**. Holotype male macroptera, **New South Wales**, Bermagui Beach, from *Monotoca elliptica* (Epacridaceae), 16.ii.2002 (LAM 4117).





**FIGURES 73–82.** *Anaphothrips* of Australia. (73) *A. dubius* tergites VI–VIII. *A. epacrida* 74–77: (74) male sternites; (75) male tergite IX; (76) antenna; (77) forewing base. *A. exocarpi* 78–79: (78) forewing base with meso & metanotum; (79) antenna. *A. eremophilae* 80–82: (80) antenna; (81) head; (82) tergites VI–VIII.

Paratypes: 4 males 9 females taken with holotype; **New South Wales**, Murrah, 15km south of Bermagui, 7 males 16 females, from *Monotoca elliptica*, 16.ii.2002; Sydney, Castle Hill, NSW Forestry, 4 males 5 females from Epacridaceae, 12.iv.2002; Chichester State Forest, 5 males 6 females from Epacridaceae,

26.xii.2000; Talaganda Forest, 2 males 7 females, from *Leucopogon* leaves (Epacridaceae), 9.iv.2003. **Victoria**, 20km west of Mallacoota, 4 males 8 females from *Leucopogon* leaves, 29.xii.2004.

**Comments.** A male is chosen as the holotype of this species because of the distinctive chaetotaxy of the ninth tergite, and the difficulty in distinguishing females from some other members of the genus. In particular, both sexes share many character states with *A. astrolomi* and *A. desleyae*. This species is widespread in eastern Australia in association with the leaves of several species of Epacridaceae. The broadly conical “setae” posterolaterally on tergite IX of males do not appear to have typical setal bases (Fig. 75), and they may be homologous with the pair of spine-like structures arising in a similar position on *A. desleyae* males, also the recurved structures on *A. dubius*.

### ***Anaphothrips eremophilae* sp. n.**

(Figs 80–82)

*Female macroptera.* Body largely medium brown; antennal segment I pale, II dark brown, III–IX evenly light brown; wings slightly shaded; tergite IX setae dark brown. Head wider than long, with transverse sculpture lines behind eyes (Fig. 81); eyes with 6 pigmented facets; ocellar setae III just outside ocellar triangle, anterolateral to hind ocelli. Antennae 9-segmented; II with few microtrichia; III–IV with small forked sensorium; VI constricted at base but not pedicellate, suture between VI–VII oblique, weak, and sometimes incomplete (Fig. 80). Pronotum with weak lines of sculpture, fewer than 10 pairs of setae; posteromarginal setae S1 slightly larger than remaining marginal setae. Metascutum irregularly reticulate; median setae fine and well back from anterior margin; MCS absent. Prosternal ferna undivided medially. Fore wing first vein with about 10 setae irregularly spaced on basal half, 2 setae on distal half; second vein with 7–10 setae; clavus with 4–7 veinal setae and one basal seta. Abdominal tergites I–VIII with transverse sculpture medially, with no ciliate microtrichia on lateral sculpture lines (Fig. 82); tergites IV–VIII with S1 and S2 setae relatively close to posterior margin; VIII with long regular marginal comb, spiracular area slightly enlarged; IX with many transverse sculpture lines. Sternite VII median setae anterior to margin.

**Measurements** (holotype, in microns). Body length 1050. Head, length 80; width across eyes 125. Pronotum, length 100; maximum width 140. Fore wing, length 580; median width 50; first vein longest seta in basal row 15. Tergite IV S1 setae 10. Tergite IX PM S1 setae 75. Tergite X PM S1 setae 65. Antennal segments III–IX, 38, 30, 33, 33, 7, 7, 12.

*Female hemimacroptera.* Wing longer than width of pterothorax; one specimen has a single MCS.

*Female microptera.* Wing shorter than width of pterothorax.

*Male microptera.* Pronotal sculpture weaker than in female; abdominal tergite VIII with posteromarginal comb; tergite IX with median two pairs of setae not stout; sternite III with a oblong glandular area close to antecostal line.

**Specimens examined.** Holotype female macroptera, **Western Australia**, 11km SW of Morawa, from *Eremophila* leaves, 26.iv.1997 (LAM3241).

Paratypes: 9 females 1 male taken with holotype.

**Comments.** Despite the darker body colour and transverse sculpture across the abdominal tergites, this species is probably closely related to several other members of this genus that are found in the arid zone. It is similar in the form of the antennae to species such as *A. barrowi* and *A. barringtoni* described above. Unlike such species, the lateral tergal sculpture lines do not bear any microtrichia, and the metascutal sculpture lines bear weak flanges.

### ***Anaphothrips exocarpi* Pitkin**

(Figs 78–79)

*Anaphothrips exocarpi* Pitkin, 1978: 358

This species lives on the leaves of *Exocarpos* (Santalaceae) trees. It was described from specimens collected on *E. cupressiformis* at Canberra, and is common on this tree in southern New South Wales. It has also been found in South Australia, from *E. aphylla* at Blanchetown, and in large numbers on *Exocarpos* near Whyalla. Specimens that are very similar but have the pronotal discal setae rather less spatulate, and the comb on tergite VIII shorter and more irregular, have been taken in large numbers on *E. sparteus* in Central Australia near Alice Springs and Uluru.

*Female macroptera.* Body and legs usually yellow, abdominal tergites sometimes with paired pale brown shadings laterally; antennal segment I white, II–III brownish yellow, IV similar but with apex shaded, V–IX pale brown; fore wing very weakly shaded; tergite IX major setae pale and conspicuously thickened or spatulate. Head with weak transverse anastomosing striae behind eyes, sometimes extending into ocellar triangle; all setae spatulate, ocellar setae III within or on anterior margins of ocellar triangle; eyes without pigmented facets. Antennae 9-segmented; segment II with 2 dorsal setae spatulate, III–IV with small forked sensorium; VI not pedicellate, suture transverse between VI–VII (Fig. 79). Pronotum with irregular transverse lines, all setae small, strongly spatulate. Mesonotal setae strongly spatulate. Metascutum irregularly reticulate; median setae strongly spatulate (Fig. 78), lateral setae setaceous; MCS present. Fore wings including clavus with setae strongly spatulate; first vein with 9–10 setae basally, 2 setae medially, 2 setae distally; second vein with about 16 setae including 1–3 basal to vein fork; clavus with 5–6 marginal setae and one basal seta. Abdominal tergites III–VII with no sculpture medially; laterally with anastomosing striae with small microtrichia; tergite VIII with long regular comb, microtrichia with wide bases; tergite IX setae S2 stout. Sternite VII median setae well in front of margin, S2 almost on posterior margin.

*Male macroptera.* Similar to female, but major setae less thickened, sometimes almost setaceous; abdominal tergite IX medially with one pair of short, stout setae; sternites III–VII with C-shaped pore plate, often large but sometimes small or on sternite III almost transverse and even subdivided.

#### ***Anaphothrips exocarpoides* sp. n.**

(Figs 83–85)

*Female macroptera.* Body and legs yellow, abdominal tergites with paired pale brown shadings anterolaterally; antennal segment I white, II brown, III brownish yellow, IV–IX pale brown; fore wing very weakly shaded; tergite IX major setae pale and setaceous. Head with weak transverse anastomosing striae behind eyes not extending to ocellar region; ocellar setae III just within anterior margins of ocellar triangle; eyes without pigmented facets. Antennae 9-segmented; segment II with few or no microtrichia, III–IV with sensorium forked; VI weakly pedicellate; suture transverse between VI–VII. Pronotum with weak transverse lines, all setae small. Metascutum reticulate (Fig. 83); median setae near anterior margin; MCS present. Fore wings first vein with 9–10 setae basally, 2 setae medially, 2 setae distally; second vein with about 13 setae including 1–2 setae basal to vein fork; clavus with 5–6 marginal setae and one basal seta. Abdominal tergites III–VII with no sculpture medially; laterally with anastomosing striae but microtrichia scarcely developed; tergite VIII with long regular comb (Fig. 84). Sternite VII median setae S1 far apart and distant from margin, S2 arising slightly anterior to margin (Fig. 85)(rarely at margin).

**Measurements** (holotype, in microns). Body length 1250. Head, length 100; width across eyes 135. Pronotum, length 115; maximum width 160. Fore wing, length 730; median width 50; first vein longest seta in basal row 25. Tergite IV S1 setae 10. Tergite IX, MD setae 12; PM S1 setae 70. Tergite X PM S1 setae 80. Antennal segments III–IX, 45, 40, 38, 40, 10, 7, 12.

*Male unknown.*

**Specimens examined.** Holotype female macroptera, **Australian Capital Territory**, Black Mountain, from *Exocarpos cupressiformis* leaves, 30.x.2002 (LAM 4204).

Paratypes, all from *E. cupressiformis* leaves except where indicated: 7 females taken with holotype; same locality, 11 females, 28.xi.2002 (M. Masumoto); **A.C.T.**, 20km east of Araluen, 6 females, 20.iv.2000, 5

females 2.iii.2002. **New South Wales**, Orange, Mt Canobolas, 7 females, 12.ii.2002. **Victoria**, Healesville, 2 females 23.iii.1996; 20km west of Mallacoota, 1 female, 29.xii.2004. **South Australia**, Adelaide, Crafers, 5 females, 20.xii.2002; Whyalla, Middleback, 1 female 4.v.1999; Blanchtown 5km west, 2 females from flowers? of *E. aphylla*, 26.iv.1995. **Queensland**, Brisbane, Mt Glorious, 4 females from *Exocarpos* leaves, 1.xi.2007.

**Comments.** The significance of this species is difficult to assess. Most specimens have come from *Exocarpos cupressiformis* (Santalaceae), on which it has been taken commonly at the type locality, during several years, but also at other sites in the vicinity, and in various other places in southeastern Australia between Brisbane and Melbourne. However, no males have ever been found, despite much collecting activity targeted at this tree species. The thrips is usually found in association with *A. exocarpi*, of which it may be merely a parthenogenetic form with setaceous rather than spatulate setae. The females are particularly similar in structure to those of *A. epacrida*, despite the very different host-plant associations.

### ***Anaphothrips geijerae* sp. n.**

(Figs 88–91)

*Female macroptera.* Body and legs brown, tarsi yellow; antennal segments I and IV–IX brown, II darker, III paler; fore wings uniformly weakly shaded; tergite IX major setae brown. Head wider than long, with transverse anastomosing striae behind eyes (Fig. 91); eyes without pigmented facets; ocellar setae III just within triangle. Antennae 9-segmented, III–IV with sensorium forked; II with microtrichia on sculpture lines; suture between VI–VII transverse; VI constricted at base but not pedicellate (Fig. 88). Pronotum with prominent transverse ridges on anterior half (Fig. 91); discal setae relatively stout. Metascutum irregularly reticulate, sculpture lines apparently with flanges (Fig. 90); median setae near anterior margin; MCS present or absent. Prosternal ferna interrupted medially. Fore wing first vein with about 9 setae basally, 2 medially and 2 distally; second vein with 10 setae; clavus with 5 veinal setae and one seta at base. Abdominal tergites II–VII with no sculpture medially; laterally with closely spaced sculpture lines bearing weak broadly based microtrichia, not extending mesad of S2; posterior margin of VIII with complete long comb, lateral microtrichia arising from larger bases. Sternites with transverse reticulation medially.

**Measurements** (holotype, in microns). Body length 1220. Head, length 75; width across eyes 135. Pronotum, length 110; maximum width 175. Fore wing, length 650; median width 50; first vein longest seta in basal row 20. Tergite IV S1 setae 5. Tergite IX, MD setae 12; PM S1 setae 80. Tergite X PM S1 setae 75. Antennal segments III–IX, 37, 35, 35, 30, 10, 7, 12.

*Male unknown.*

**Specimens examined.** Holotype female macroptera, **New South Wales**, Peak Hill, from *Geijera parviflora* leaves (Rutaceae), 8.xii.2001 (LAM 4064).

Paratypes: 3 females taken with holotype.

**Comments.** The sculpture of this brown species, with small flanges on many of the sculpture lines, is unusual within the genus. Although here named after the widespread shrub on which the type series was found, there is no certainty that this is the definitive host plant.

### ***Anaphothrips geleznowiae* sp. n.**

(Figs 86–87, 92)

*Female macroptera.* Body, antennae and legs light brown, antennal segments I and III paler; fore wings weakly shaded; major setae on abdomen pale brown. Head slightly wider than long, with transverse anastomosing striae behind eyes (Fig. 92); eyes with 6 pigmented facets; ocellar setae III variable in position within triangle. Antennae 9-segmented, III–IV with slender forked sensorium; II without microtrichia; VI

short, constricted at base but not pedicellate, suture oblique between VI–VII; IX longer than VIII (Fig. 86). Pronotum transverse, almost without sculpture medially. Metascutum reticulate, median setae not close to anterior margin, MCS present. Fore wing first vein setae irregular, about 8 setae basally, 2 medially and 2 distally; second vein with 12–14 setae including 1–2 basal to vein fork; clavus with 5–7 veinal setae and one at base. Abdominal tergites II–VIII with no sculpture medially; lateral sculpture lines with small microtrichia, not extending mesad of S2; posterior margin of VIII with about 10 microtrichia on median third but none laterally (Fig. 87). Sternites laterally with similar lines of sculpture to tergites.

**Measurements** (holotype, in microns). Body length 1420. Head, length 115; width across eyes 160. Pronotum, length 115; maximum width 185. Fore wing, length 700; median width 60; first vein longest seta in basal row 15. Tergite IV S1 setae 10. Tergite IX, MD setae 10; PM S1 setae 95. Tergite X PM S1 setae 85. Antennal segments III–IX, 43, 32, 35, 35, 10, 7, 12.

*Male macroptera*. Smaller and paler than female; tergite VIII comb apparently absent; IX with two pairs of short stout setae; sternites III–VII each with faint C-shaped pore plate.

**Specimens examined**. Holotype female, **Western Australia**, West Binu, 80km north-east of Geraldton, from *Geleznovia verrucosa* flowers (Rutaceae), 4.viii.1998 (A. Szitas).

Paratypes: 5 females 3 males taken with holotype. Intercepted at Narita Airport, Japan, 2 females, 2 males from cut-flowers of *Geleznovia* imported from Australia, 23.vii.2001 (H. Kitamura, plant quarantine, Japan).

**Comments**. The holotype and associated specimens have been remounted into Canada balsam from Hoyers Mountant, and are thus not entirely satisfactory. However, the form of the comb on tergite VIII in females is not found in any other species, although the presence in males of large C-shaped pore plates and two pairs of stout setae medially on tergite IX occurs in some other Australian species considered here.

### *Anaphothrips gillespiei* sp. n.

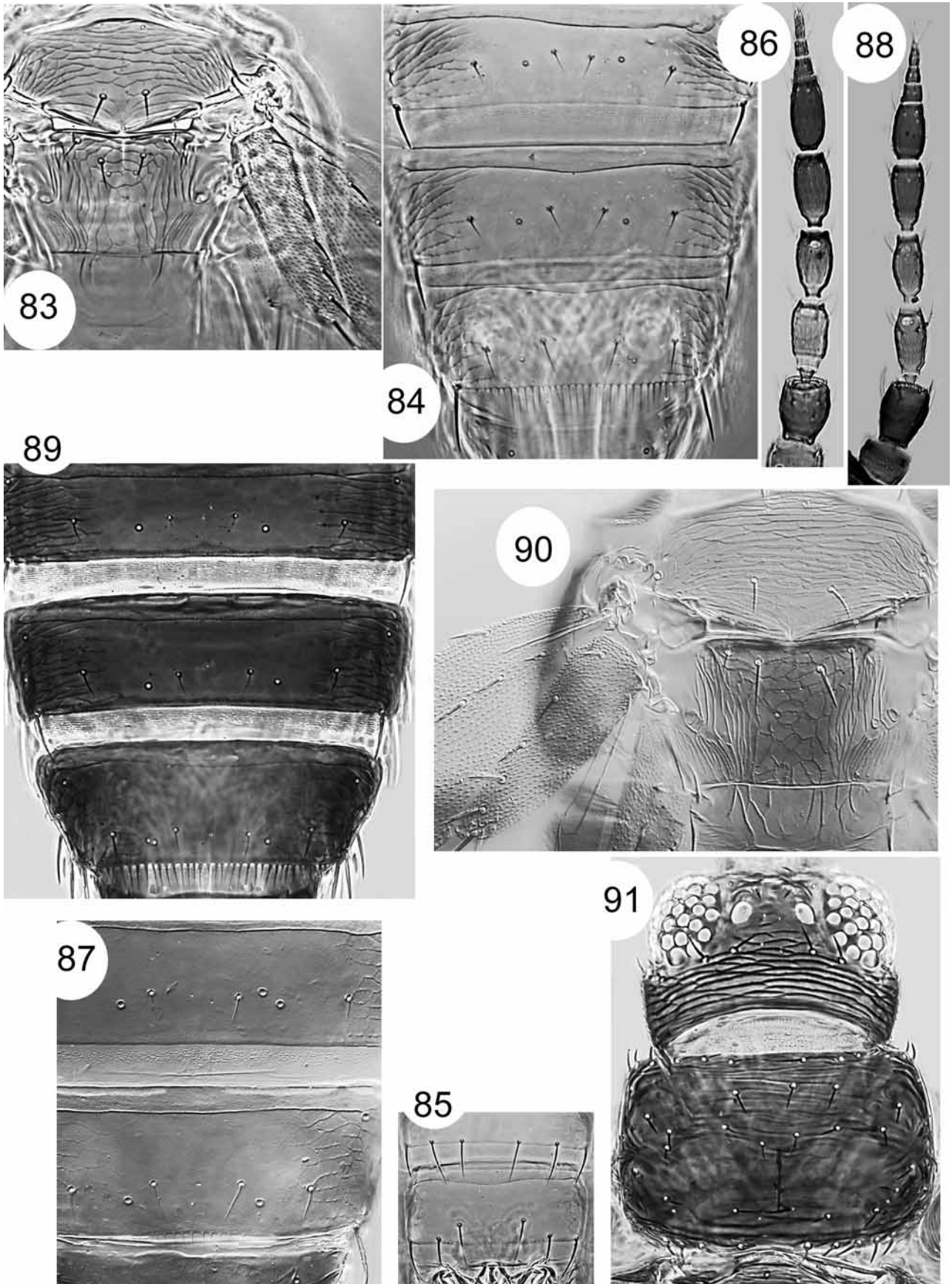
(Figs 93–100)

*Female macroptera*. Body and legs yellow, abdominal tergites II–VII with pair of brown areas anterolaterally (Fig. 100); antennal segment I white, II brown, III yellow, IV dark brown, V brown with basal third yellow, VI–IX brown; fore wings weakly shaded around vein fork and clavus apex; major setae on abdomen brown. Head wider than long, with transverse sculpture behind eyes extending weakly to ocellar region (Fig. 96); eyes without pigmented facets; ocellar setae III vary in position, usually within triangle but sometimes on anterior margins. Antennae 9-segmented; II with few microtrichia, III–IV with sensorium forked; VI weakly pedicellate (Fig. 97). Pronotum with transverse sculpture lines, numerous discal setae. Metascutum reticulate; median setae near anterior margin; MCS present (Fig. 94). Fore wing first vein with setal row irregular, about 12 setae on basal half, 4–6 on distal half, this row sometimes almost continuous; second vein with 18–22 setae including 2–4 basal to vein fork (Fig. 95); clavus with 7–8 veinal setae and one at base. Abdominal tergites III–VII with no sculpture medially; irregular anastomosing lines laterally extending just mesad of setae S2, with few weak microtrichia (Fig. 100); tergite VIII comb with long, slender teeth (Fig. 98). Sternite VII setae S1 far anterior to posterior margin.

**Measurements** (holotype, in microns). Body length 1550. Head, length 95; width across eyes 150. Pronotum, length 130; maximum width 210. Fore wing, length 850; median width 55; first vein longest seta in basal row 25. Tergite IV S1 setae 15. Tergite IX, MD setae 12; PM S1 setae 85. Tergite X PM S1 setae 85. Antennal segments III–IX, 50, 50, 40, 37, 12, 7, 12.

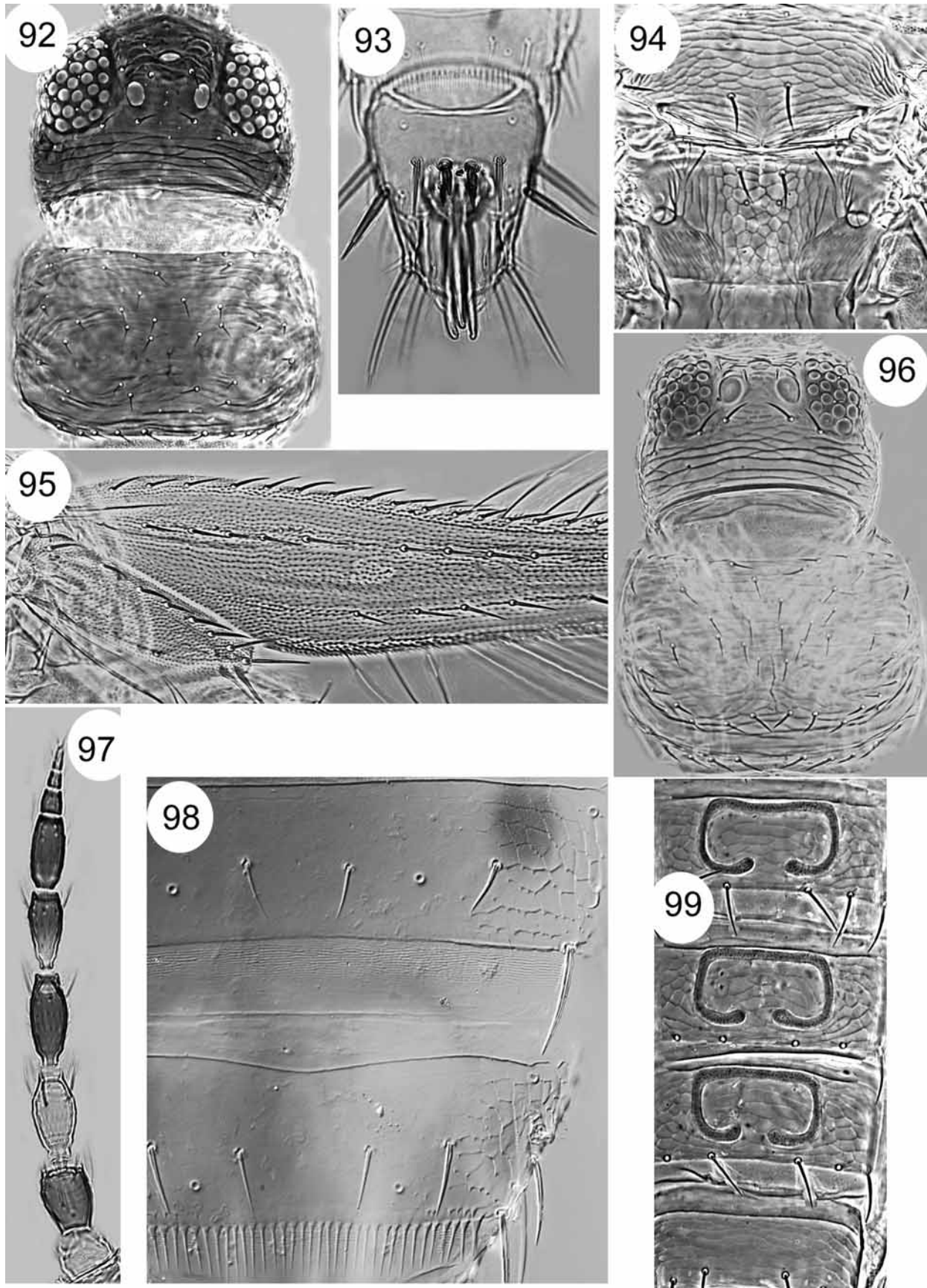
*Male macroptera*. Similar to female but usually without dark tergal markings; tergite VIII with long comb; IX with two pairs of long, thorn-like setae medially (Fig. 93); sternites III–VII with C-shaped pore plates (Fig. 99).

**Specimens examined**. Holotype female, **Queensland**, Brisbane, Mt Glorious, from *Hibbertia scandens* flowers (Dilleniaceae), 4.x.1997 (P. Gillespie).

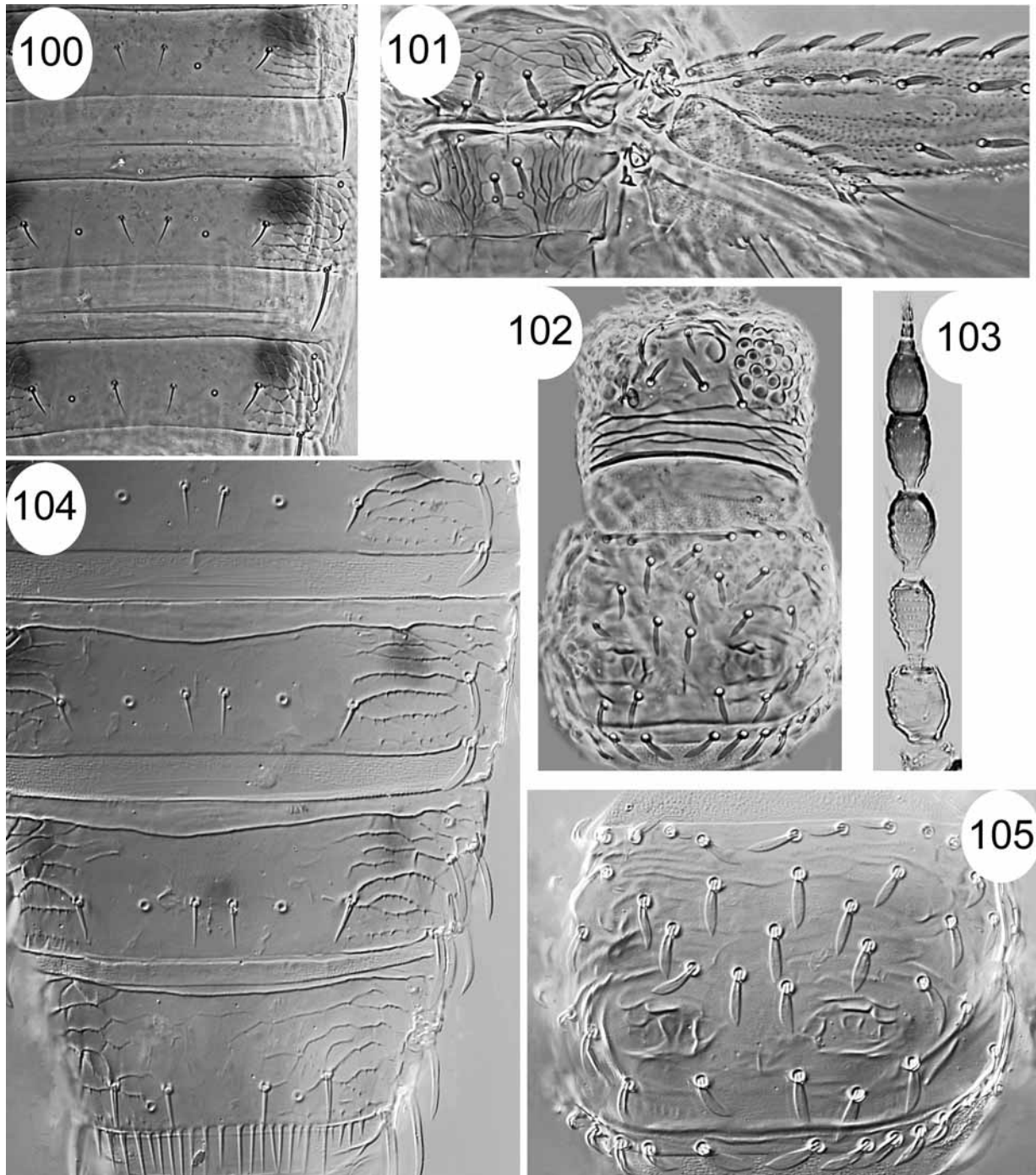


**FIGURES 83–91.** *Anaphothrips* of Australia. *A. exocarpoides* 83–85: (83) meso & metanotum; (84) tergites VI–VIII; (85) sternites VI–VII. *A. geleznowiae* 86–87: (86) antenna; (87) tergites VII–VIII. *A. geijerae* 88–91: (88) antenna; (89) tergites VI–VIII; (90) clavus with meso & metanotum; (91) head & pronotum.





**FIGURES 92–99.** *Anaphothrips* of Australia. (92) *A. geleznowiae* head & pronotum. *A. gillespiei* 93–99: (93) male tergite IX; (94) meso & metanotum; (95) forewing base; (96) head & pronotum; (97) antenna; (98) tergites VII–VIII; (99) male sternites.



**FIGURES 100–105.** *Anaphothrips* of Australia. **(100)** *A. gillespiei* tergites V–VII. *A. glenysae* 101–105: **(101)** meso & metanotum with forewing base; **(102)** head & pronotum; **(103)** antenna; **(104)** tergites V–VIII; **(105)** pronotum.

Paratypes: 5 females 2 males taken with holotype; **Queensland**, Lamington, O'Reilly's, 4 females 3 males from *Pimelia latifolia* flowers (Thymeleaceae), 12/13.iii.2007; same locality, 2 females 1 male from *Solanum mauritianum* flowers (Solanaceae), 9.x.2006; same locality, 3 females from *Helicia glabrifolia* (Proteaceae), 13.iii.2007; 20km north of Townsville, 1 female from grass, 23.viii.2004. **New South Wales**, Murwillumbah, 1 female from *Lantana* flowers, 23.xii.2006; Taree, Lansdowne, 7 females from *Breynia oblongifolia* (Euphorbiaceae), 23.ii.2002; 20km north of Batemans Bay, 1 female from *Synoum glandulosum* (Meliaceae), 16.iii.2006; 30km west of Kiama, 3 females 2 males from flowers, 24.xi.2000; Mt Dromedary, 1 female from *Synoum glandulosum*, 20.iii.1999.



**Comments.** This large species, with its strikingly bicoloured antennae and tergites, is presumably polyphagous, but the association with flowers or leaves remains uncertain. It has been collected widely in the eastern coastal areas of Australia. The specimens from *Breyenia* at Taree are smaller with less strikingly bicoloured antennal segments.

***Anaphothrips glenysae* sp. n.**

(Figs 101–105)

*Female macroptera.* Body and legs yellow, abdominal tergites III–VII with pair of small brown areas laterally (Fig. 104), III–IV with brown shading medially; antennal segments I–II white, III yellow, IV–V with apex shaded brown, VI–IX brown; fore wings pale. All dorsal setae on head, thorax and fore wings distinctly spatulate; head wider than long, with transverse sculpture behind eyes but ocellar region without sculpture; eyes with 6 pigmented facets; ocellar setae III within triangle (Fig. 102). Antennae 9-segmented; II with few microtrichia, 2 dorsal setae weakly spatulate; sensorium simple or weakly forked on III, forked on IV; VI short, constricted at base but not pedicellate; suture oblique between VI–VII (Fig. 103). Pronotum with irregular sculpture markings, discal setae spatulate (Fig. 105). Metascutum irregularly reticulate; median setae spatulate, on anterior third of sclerite, lateral setae finely setaceous (Fig. 101); MCS present. Fore wing first vein with setal row irregular, 8–11 setae on basal half, 4–6 on distal half, row sometimes almost continuous; second vein with 12–14 setae including one seta basal to vein fork (Fig. 101); clavus with 4–6 veinal setae and one seta at base. Abdominal tergites III–VII with no sculpture medially, median setae closer together than their length; irregular sculpture lines laterally not extending mesad of setae S2; VI–VII with setae S3 as large and spatulate as S4; tergite VIII median setae wide apart, comb with long, slender teeth, lateral setae spatulate; major setae on IX–X pointed.

**Measurements** (holotype, in microns). Body length 1000. Head, length 75; width across eyes 110. Pronotum, length 100; maximum width 140. Fore wing, length 560; median width 35; first vein longest seta in basal row 20. Tergite IV S1 setae 10. Tergite IX, MD setae 12; PM S1 setae 55. Tergite X PM S1 setae 45. Antennal segments III–IX, 35, 30, 30, 25, 7, 7, 10.

*Male macroptera.* Similar to female; tergite VIII with long comb; IX with one pair of short setae medially; sternites without pore plates.

**Specimens examined.** Holotype female, **South Australia**, Virginia, from *Rhagodia parabolica* (Chenopodiaceae), 17.x.2003 (G. Wood).

Paratypes: 16 females 6 males, taken with holotype.

**Comments.** The simple sensorium on the third antennal segment sometimes has a very small inner lobe that presumably represents the undeveloped inner branch of the normal forked sensorium found in most other species. Similar variation is mentioned below under *A. orchis*. The major setae in both sexes of *A. glenysae* are more broadly spatulate (Fig. 105) than on any other member of the genus, including *A. exocarpis*. In contrast to that species, the eyes have pigmented facets, also the males of *A. glenysae* have no sternal pore plates and the median setae on tergite IX are short but not stout. The host plant is a common shrub across dry areas of eastern and central Australia.

***Anaphothrips incertus* (Girault)**

(Figs 106–108)

*Limothrips incertus* Girault, 1929: 3

*Anaphothrips incertus* (Girault) Pitkin, 1978: 359

In structure, this is a typical grass-living species of *Anaphothrips*. It has been beaten from many different species of native grasses, but not from introduced pasture grasses. It is known from a wide area across eastern

Australia, between Brown Mountain in south eastern **New South Wales** to Broken Hill in western N.S.W., and northward through various sites in **Queensland** to Charleville. Pitkin (1978: 359) selected a female from forest grasses at Mt Cootha, Brisbane, 1.i.1929 as Lectotype.

*Female macroptera.* Body dark brown, legs with tarsi and apices of tibiae yellowish; antennal segments II and V–VIII dark brown, I light brown, III–IV yellow; fore wings mainly pale; major body setae dark. Head about as long as wide, projecting weakly in front of eyes (Fig. 106); eyes with 6 pigmented facets; ocellar setae III just anterior to hind ocelli; postocular setae III displaced behind setal row. Antennae 8-segmented (Fig. 107), III–IV with small forked sensorium, II without microtrichia; VI not pedicellate. Pronotum with transverse anastomosing striae; posteromarginal setae slightly longer than discal setae. Metascutum irregularly reticulate, without internal wrinkles; median setae on anterior third of sclerite; MCS present. Fore wing first vein with about 6 setae on basal half, 1 seta medially and 2 distally; second vein with about 12 setae including 1–2 basal to vein fork; clavus with about 5 veinal setae and one seta at base. Abdominal tergites laterally with small dentate microtrichia on sculpture and dentate microtrichia on posterior margin; II–VII with sculpture extending just mesad of setae S2, smooth at middle; VIII with long slender posteromarginal comb. Sternites with small dentate microtrichia along posterior margin.

*Male macroptera.* Similar to female; tergite VIII with long comb; IX with two pairs of short stout setae medially; sternites III–VII each with C-shaped pore plate (Fig. 108).

### ***Anaphothrips keatsi* (Girault)**

*Heterothrips Keatsi* Girault, 1926: 2

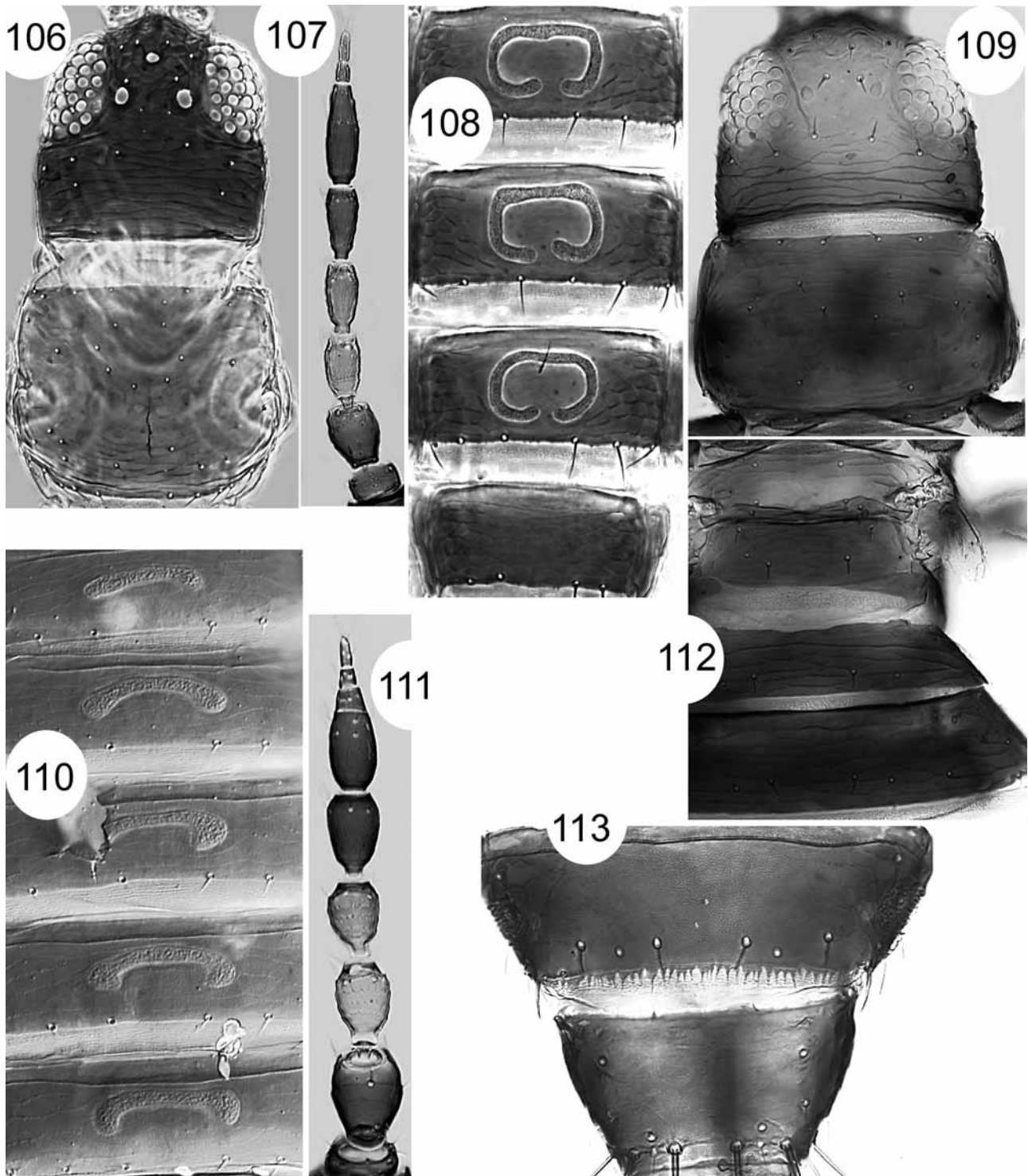
The only known specimens of this species are the five syntypes, mounted under one coverslip (Fig. 1), with the following data: **Queensland**, Morningside, from *Hibbertia stricta* blossoms, 1.xi.1925 (QM).

As indicated by Pitkin (1978) few details are visible on these specimens. On one female the posteromarginal comb on tergite VIII can be seen to be represented by a few slender teeth laterally with none medially. Although this character state is shared with the new species, *pultenaea*, the antennae of the *keatsi* syntypes are paler. Unfortunately, in the males it is not possible to determine the shape of any sternal pore plates, nor the number of sternites on which they might exist. The identity of this species will remain obscure until fresh specimens can be found in the vicinity of the original locality.

### ***Anaphothrips monga* sp. n.**

(Figs 109–113)

*Female microptera.* Body and legs brown to dark brown, all tarsi, apices of tibiae and median area of head paler; antennal segments I–II and V–IX brown, III–IV brownish-yellow. Head wider than long, with transverse sculpture behind eyes but none near ocelli (Fig. 109); ocelli reduced, ocellar setae III within or near anterior margins of triangle; eyes without pigmented facets. Antennae 9-segmented; III–IV with small forked sensorium; II without microtrichia; VI with base narrowed and weakly pedicellate (Fig. 111). Pronotum with transverse striae, but few small setae. Meso and metascutum transverse, campaniform sensilla present (Fig. 112). Fore wing lobe scarcely longer than metascutal length. Abdominal tergites I–VII with transverse sculpture lines medially, VIII almost without sculpture; VIII with posteromarginal comb of irregular, short and partially fused microtrichia, spiracles occupying half of lateral margin of tergite (Fig. 113); tergal setae S3 and S4 no longer than S1 and S2; setae on IX shorter than dorsal length of tergite X. Sternites with a few short microtrichia on sculpture lines laterally; setae S1 on VII close to posterior margin.



**FIGURES 106–113.** *Anaphothrips* of Australia. *A. incertus* 106–108: (106) head & pronotum; (107) antenna; (108) male sternites. *A. monga* 109–113: (109) head & pronotum; (110) male sternites; (111) antenna; (112) pterothorax and tergites I–II; (113) tergite VIII–IX.

**Measurements** (holotype, in microns). Body length 980. Head, length 100; width across eyes 125. Pronotum, length 85; maximum width 165. Tergite IV S1 setae 7. Tergite IX, MD setae 10; PM S1 setae 40. Tergite X PM S1 setae 40. Antennal segments III–IX, 33, 25, 27, 27, 7, 7, 10.

*Male microptera.* Similar to female but smaller and paler; tergite IX with two pairs of short stout setae; sternites III–VII each with small, curved, weakly C-shaped pore plate (Fig. 110).

**Specimens examined.** Holotype female microptera, **New South Wales**, Monga, from *Bursaria* leaves (Pittosporaceae), 13.i.1999 (LAM 3660).

Paratypes: 2 females 1 male taken with holotype and larvae; **New South Wales**, Newcastle, Thornton, 4 females 4 males with no host data, 25.i.1995.

**Comments.** The micropterous adults of this species have unusually large spiracles on tergite VIII (Fig. 113). This character state occurs in several Australian *Anaphothrips* species, and is particularly obvious in the grass-living species *A. moundi*, *A. varii* and *A. woodi*.

### *Anaphothrips moundi* Pitkin

(Figs 114–116)

*Anaphothrips moundi* Pitkin, 1978: 362

The significance of this grass-living species remains in doubt, and it is possibly merely the apterous form of *A. varii*. The shape of antennal segment VI, sharply constricted to a pedicel, the shape of the pedicel of antennal segment III, the lack of microtrichia on antennal segments II–III, the greatly enlarged spiracles on both tergite VIII and the mesothorax, all suggest this. Moreover, these apterous females are very similar to those of *A. woodi* (q.v.).

*Female aptera.* Body, legs and antennal segments I–III yellow, IV–IX brown to dark brown. Head reticulate; eyes without pigmented facets or these only weakly indicated; ocellar setae III variable in position. Antennae 9-segmented; sensorium simple on III, forked on IV; II without microtrichia (frequently also III); IV–VI pedicellate (Fig. 116). Pronotum sculptured. Mesonotum and metascutum transverse, MCS present, number and positions of setae variable. Abdominal tergites transversely reticulate medially, posterolateral margins with row of minute tubercles; tergal setal pair S4 arising at margin; VIII with irregular, narrow craspedum of small lobes or teeth, spiracles occupying more than half of lateral margins (Fig. 115); tergal setae S3 and S4 no longer than S1 and S2; sternite VII setae S1 close to posterior margin.

*Male aptera.* Similar to female; tergite IX with 2 pairs of short stout setae medially; sternites III–VIII with very large C-shaped pore plate that is fragmented (Fig. 114).

**Specimens examined.** Holotype female aptera, **New South Wales**, Mt Kosciuszko, on sedges, 8.ii.1968 (LAM480). Paratype female aptera, **A.C.T.**, grasses by Lake Burley Griffin, 3.ii.1968.

**Australian Capital Territory**, Canberra, Black Mtn, CSIRO Entomology, 27 females 11 males with larvae from lawn grasses, 16.xi–5.xii. 2001. **Lord Howe Island**, 1 female from *Trophis* leaves, 21.xii.2001.

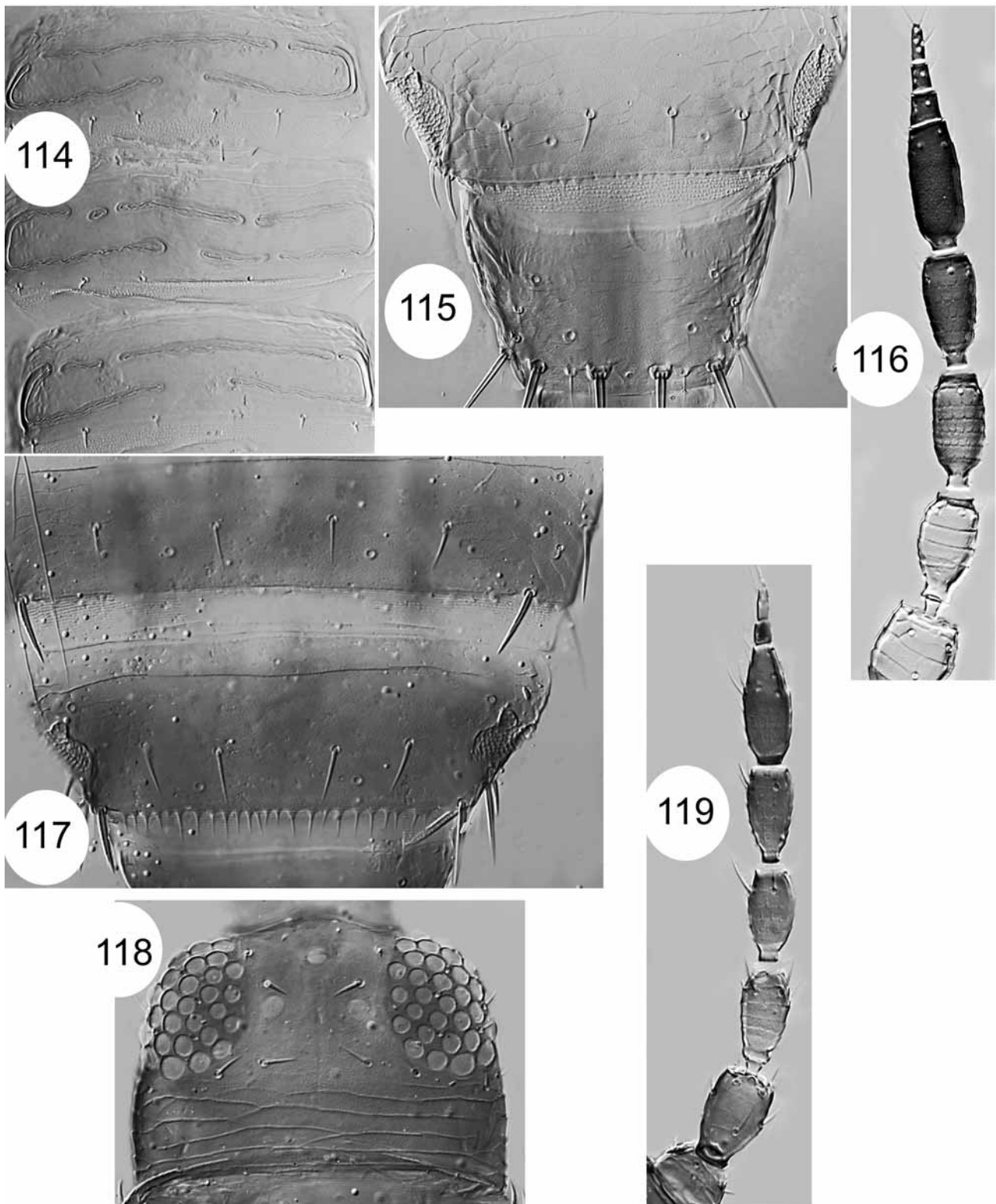
### *Anaphothrips newmani* Moulton

*Anaphothrips newmani* Moulton, in Moulton & Newman, 1935: 99

This species is known only from the original specimens, and the holotype is mounted under one cover slip with four other females, one male and two larvae (contrary to the statement in Pitkin, 1978). None of the specimens is in a suitable condition for critical study. The antennal segments are shrunken, but the suture between VI–VII is apparently oblique. On the head, ocellar setae pair III are just anterolateral to the triangle. The metascutum is reticulate medially but campaniform sensilla are not visible on any of the specimens. The fore wing has at least one seta on the second vein basal to the vein fork. Laterally on the tergites there are 9–10 lines of sculpture bearing many fine microtrichia, but these lines do not extend mesad of the S2 setae. The tergites of one of the females have pale brown shading medially, although the other females appear to be entirely yellow. The male has two pairs of stout setae medially on tergite IX, and the pore plates appear to be very weakly curved rather than transverse. The most closely related species are probably *A. atriplicis* and *A.*

*cobari*, but neither of these have such closely spaced microtrichiate sculpture lines on the tergites, and the males of both have different pore plates.

**Specimens examined.** Holotype female macroptera, 4 paratype females, one paratype male with 2 larvae, **Western Australia**, Claremont, on *Acacia*, 15.iii.1932 (in California Academy of Sciences).



**FIGURES 114–119.** *Anaphothrips* of Australia. *A. moundi* 114–116: (114) male sternites; (115) tergites VIII–IX; (116) antenna. *A. nimbus* 117–119: (117) tergites VII–VIII; (118) head; (119) antenna.

***Anaphothrips nimbus* sp. n.**

(Figs 117–119)

*Female macroptera.* Body and legs light brown, tarsi and tibiae mainly yellow; antennal segments I–II and IV–VIII brown, III paler but with apex shaded; fore wing pale with median brown band. Head wider than long, with transverse lines on posterior third, ocellar region without sculpture (Fig. 118); ocellar setae III anterior to posterior ocelli, just outside triangle; eyes with 6 weakly pigmented facets. Antennae 8-segmented, III–IV with sensorium forked; II–III without microtrichia; VI weakly pedicellate; VIII longer than VII (Fig. 119). Pronotum almost without sculpture. Mesonotum with few transverse lines. Metascutum irregularly reticulate, median setae behind anterior margin; MCS present medially. Fore wing first vein with about 7 setae on basal half, 2 setae medially, 2 setae distally; second vein with 8–9 setae including 1–2 basal to vein fork; clavus with 6 veinal setae including one seta at base. Tergites I–II fully sculptured medially, III–VI with faint lines between median setae; VIII with comb long but irregular, spiracles large (Fig. 117).

**Measurements** (holotype, in microns). Body length 1150. Head, length 90; width across eyes 125. Pronotum, length 115; maximum width 165. Fore wing, length 560; median width 35; first vein longest seta in basal row 20. Tergite IV S1 setae 12. Tergite IX, MD setae 10; PM S1 setae 80. Tergite X PM S1 setae 65. Antennal segments III–VIII, 40, 30, 30, 42, 10, 15.

*Male unknown.*

**Specimens examined.** Holotype female macroptera, **Queensland**, Lamington, Werrikimbe, fogging *Nothofagus moorei*, 10.xii.1990 (R.Kitching).

Paratypes: 7 females taken with holotype.

**Comments.** Judging from the shape of the head, but despite the enlarged spiracles on tergites I and VIII, this species with 8-segmented antennae is not related to the grass-living members of *Anaphothrips*. It possibly lives on the leaves of the trees from which it was obtained by insecticide fogging. The pale fore wing with transverse shaded band is particularly unusual.

***Anaphothrips obscurus* (Müller)**

(Figs 120–121)

*Thrips obscura* Müller, 1776: 96

*Anaphothrips 6-guttus* Girault, 1928: 1

This worldwide grass thrips has been studied from many localities across southern Australia. The abdominal tergites usually bear distinct reticulate markings medially, but on some pale specimens these can be difficult to see. The country of origin of the species remains unknown, and in contrast to most of the Australian species discussed here the second vein of the fore wing does not bear any setae basal to the vein fork. In many parts of the world females can be abundant, but the male has never been found, and the only published reference to males (zur Strassen, 2003) is now thought likely to refer to some other species (zur Strassen in litt. 2008). The species causes feeding damage on the leaves of cereal crops in the form of linear rust-like markings.

*Female macroptera.* Body and legs brownish yellow, brown markings on pronotum, laterally on mesonotum and metascutum, medially on tergites; antennal segment I yellow, II–IV yellowish brown, V–IX darker brown; fore wings pale, veins weakly shaded; tergites IX–X with dark setae. Head longer than wide, produced in front of eyes; eyes with 6 pigmented facets; ocellar setae III outside ocellar triangle, anterior to hind ocelli; head with sculpture behind eyes, but not near ocelli. Antennae 9-segmented, II without microtrichia, III–IV with sensorium forked, VI–VII broadly joined by oblique suture; VI with pedicel (Fig. 120). Pronotum weakly sculptured medially. Metascutum reticulate, median setae well behind anterior margin; MCS present. Fore wing first vein with about 7 setae near base, 3–4 widely spaced setae on distal half; second vein with about 9 setae, with no setae basal to vein fork; clavus with 5–6 veinal setae and one seta

at base. Abdominal tergites with small dentate microtrichia on sculpture lines laterally; II–VII with sculpture medially (rarely very weak), small dentate microtrichia on posterior margin laterally; VIII with posteromarginal comb complete; spiracles occupying no more than 0.3 of lateral margin of tergite VIII (Fig. 121).

*Female microptera.* Similar to macroptera, wing lobe shorter than thorax width.

*Larva II.* Tergal dorsal setae capitate, but not broadly expanded; tergite IX faintly shaded at posterior margin with row of small pointed tubercles; X weakly shaded around bases of setae.

*Male unknown.*

### ***Anaphothrips occidentalis* Pitkin**

(Figs 122–124)

*Anaphothrips occidentalis* Pitkin, 1978: 364

This Western Australian species has been studied from the flowers of various Haemodoraceae around Perth, including species of *Conostylus* and *Anigozanthos* (Kangaroo Paws). It has also been studied from Kangaroo Paw flowers cultivated by commercial wildflower nurseries near Sydney and Gosford (**New South Wales**). It is a particularly large and dark species, with strikingly bicoloured fore wings, and very large pore plates in males (Fig. 124). It is unusual within this genus for the wide separation medially of the prosternal ferna. The holotype was collected in Western Australia near Busselton, Tuart Forest, from grasses, 28.ix.1967.

*Female macroptera.* Body and legs dark brown, tarsi yellow also apices of mid and hind tibiae and much of fore tibiae; antennal segments I–II and IV–IX dark brown, III yellow; fore wings pale with a dark submedian band, and a more diffuse dark area subapically on posterior margin; prominent body setae dark. Head as long as wide, smaller than pronotum; cheeks almost straight; mouth-cone long; eyes with 6 pigmented facets; ocellar setae III outside ocellar triangle, just anterior to hind ocelli; only 3 pairs of postocular setae. Antennae 9-segmented; segments III–IV with apex slightly constricted, sensorium forked; II without microtrichia, also III ventrally; VI with narrow pedicel; IX longer than VIII (Fig. 122). Pronotum weakly trapezoidal, medial sculpture weak. Metascutum reticulate, median setae behind anterior margin, MCS present. Prosternal ferna divided medially. Fore wing first vein with about 8 setae basally, then up to 10 setae placed irregularly; second vein with 11 to 16 setae including 1–2 setae basal to vein fork; clavus with 5–6 veinal setae and one basal seta. Abdominal tergites weakly sculptured laterally, without microtrichia; VIII posterior margin deeply concave, without comb (Fig. 123); X longer than IX.

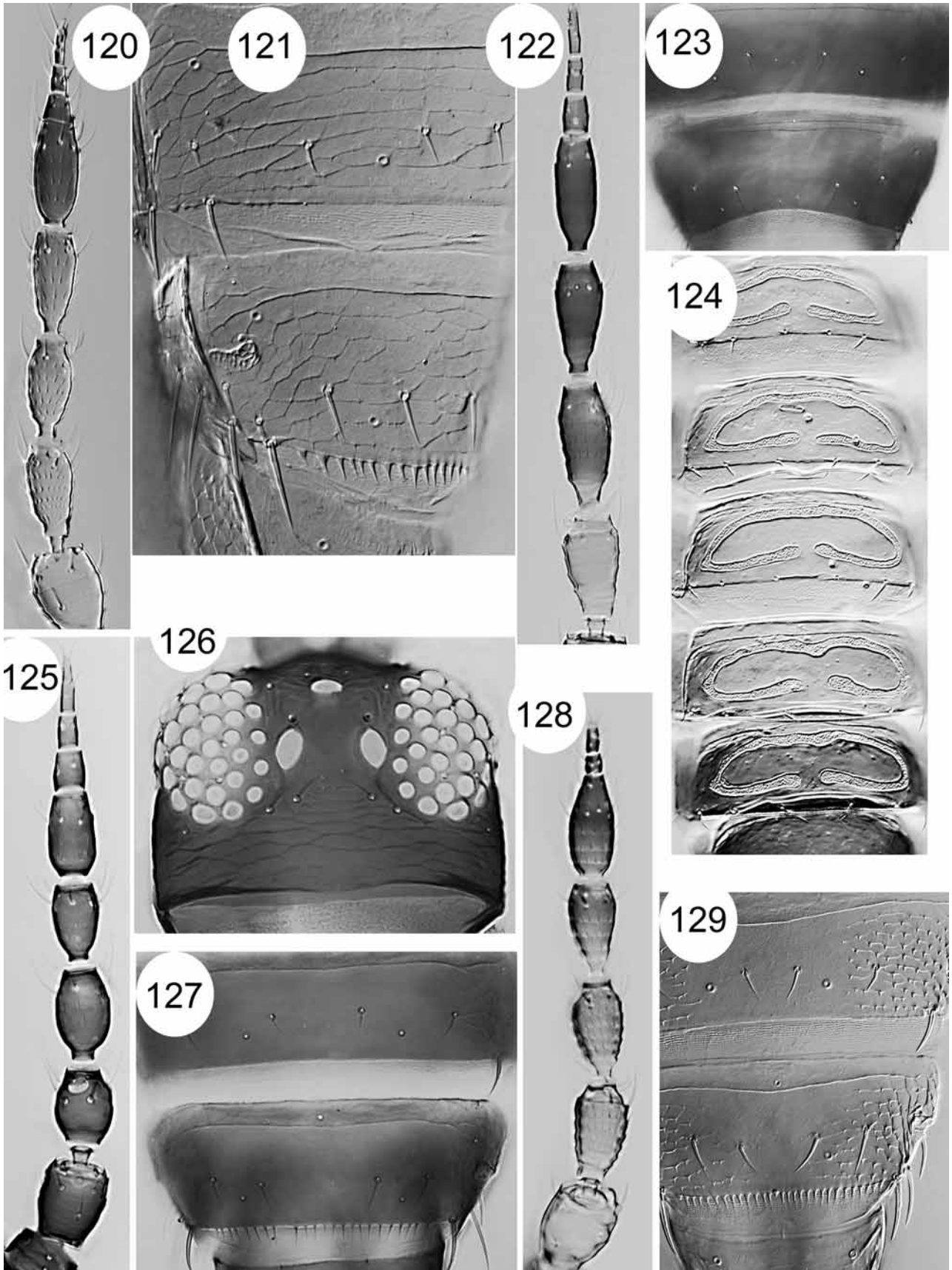
*Male aptera.* Bicoloured, head and abdominal segments VI–X dark brown, remainder and legs variably yellowish brown; tergite IX medially with two pairs of short stout setae; sternites III–VII with very large C-shaped pore plate (Fig. 124).

*Larva II.* Body and legs yellow, tergite IX with faintly shaded posterior margin but no teeth; major setae slender trumpet shaped with apex asymmetric.

### ***Anaphothrips orchis* sp. n.**

(Figs 125–127)

*Female macroptera.* Body, antennae and legs brown, tarsi slightly paler; fore wings shaded but paler near base. Head wider than long, sculptured behind eyes but not near ocelli; eyes with 6 pigmented facets; ocellar setae III on anterior margins of triangle (Fig. 126). Antennae 9-segmented; III–IV with forked sensorium; III unusually short, VII–IX elongate; II–V with few or with no microtrichia; VI narrowed to base but not pedicellate; IX longer than VIII (Fig. 125). Pronotum weakly sculptured, with few discal setae. Metascutum reticulate; median setae small, on anterior third of sclerite; MCS present. Fore wing setae well developed, first



**FIGURES 120–129.** *Anaphothrips* of Australia. *A. obscurus* 120–121: (120) antenna; (121) tergites VII–VIII left margins. *A. occidentalis* 122–124: (122) antenna; (123) tergites VII–VIII; (124) male sternites. *A. orchis* 125–127: (125) antenna; (126) head; (127) tergites VII–VIII. *A. parsonsiae* 128–129: (128) antenna; (129) tergites VII–VIII.



vein with 8–9 basally, 3 medially and 2 distally; second vein with 11 setae including one seta basal to vein fork; clavus with 6 veinal setae and one basal seta. Abdominal tergites IV–VII with no sculpture medially, lines scarcely extend mesad of setae S2; VIII with posteromarginal comb of slender but rather widely spaced microtrichia (Fig. 127); setae on IX–X long.

**Measurements** (holotype, in microns). Body length 1450. Head, length 110; width across eyes 150. Pronotum, length 115; maximum width 190. Fore wing, length 700; median width 50; first vein longest seta in basal row 20. Tergite IV S1 setae 7. Tergite IX, MD setae 10; PM S1 setae 105. Tergite X PM S1 setae 115. Antennal segments III–IX, 37, 35, 30, 32, 15, 12, 23.

*Male unknown.*

**Specimens examined.** Holotype female macroptera, **New South Wales**, Kinghorn Point, from *Prasophyllum affine* (Orchidaceae), ix.2001 (D.L.Jones).

Paratypes: 4 females taken with holotype; **South Australia**, Adelaide Hills, 5 females from orchids, 1998; Adelaide Hills, Scott Creek, 1 female from native grasses, 16.x.2004.

**Comments.** The uniformly brown colour of the body of this orchid-living species, also the short brown third antennal segment, is distinctive within the genus *Anaphothrips*. The inner lobe of the forked sensorium on the third antennal segment is not always fully developed, and the ninth segment is unusually long.

### *Anaphothrips parsonsia* sp. n.

(Figs 128–132)

*Female macroptera.* Body and legs yellow, antennal segments I–II yellow, III–V increasingly brown at apex, VI–VIII brown; fore wings and major setae pale. Head transverse, transversely reticulate on posterior third, weakly reticulate between ocelli (Fig. 130); ocellar setae III just outside anterior margins of triangle; eyes without pigmented facets. Antennae 8-segmented; III–IV with forked sensorium; II without microtrichia; VI weakly pedicellate (Fig. 128). Pronotum with irregular reticulation, posteromarginal setae thickened. Mesonotum boldly reticulate. Metascutum boldly reticulate, sometimes with weak internal markings; median setae on anterior third of sclerite, MCS present (Fig. 131). Fore wing first vein with about 8 setae on basal half and 4 setae on distal half, arranged irregularly; second vein with up to 12 setae including 1–3 setae basal to vein fork; clavus with 7–8 veinal setae and one basal seta; wing setae all more or less spatulate (Fig. 132). Tergites III–VII without sculpture medially, lateral thirds with up to 12 rows of stout, dentate microtrichia, sculpture extending just mesad of setae S2 (Fig. 129); VIII with comb of moderately long fine microtrichia; tergite IX major setae with apices chisel-shaped.

**Measurements** (holotype, in microns). Body length 1370. Head, length 90; width across eyes 150. Pronotum, length 135; maximum width 200. Fore wing, length 700; median width 45; first vein longest seta in basal row 15. Tergite IV S1 setae 12. Tergite IX, MD setae 12; PM S1 setae 65. Tergite X PM S1 setae 65. Antennal segments III–VIII, 42, 40, 33, 40, 7, 10.

*Male macroptera.* Similar to female; tergite IX with 3 pairs of short stout setae dorsally, and one pair of longer stout setae posterolaterally; sternites III–VII with slender C-shaped pore plate.

**Specimens examined.** Holotype female macroptera, **Australian Capital Territory**, Australian National Botanic Gardens, from *Parsonsia straminea* (Apocynaceae), 13.ii.2003 (LAM).

Paratypes: 1 female 3 males taken with holotype; same site and plant, 6 females, 17.xii.2007. **Queensland**, Cooloolo National Park, from *Parsonsia straminea*, 3 females 1 male 19.iii.2006, 2 females 1 male 11.ii.2006; Brisbane, Deception Bay, 2 females from *Parsonsia* vine, 15.v.2006; Noosa, 2 females 2 males from *Parsonsia* vine, 14.iv.2007.

**Comments.** This species appears to be host specific to an apocynaceous vine that is common in the forests of eastern Australia, and it has been taken from the flowers as well as the leaves. Similarly modified, spatulate, setae that occur on the fore wings of this species are also found on the thorax and head of a few

other Australian species of *Anaphothrips*. One of the male paratypes has an oblique, partial suture in the apical third of segment VI on both antennae.

***Anaphothrips pultenaeae* sp. n.**

(Figs 134–139)

*Female macroptera*. Body and legs brownish yellow, antennal segment I white, II–IX brown with III slightly paler; fore wing weakly shaded. Head slightly wider than long; transversely reticulate behind eyes, with no sculpture near ocelli; ocellar setae III outside triangle (Fig. 135); eyes with 6 pigmented facets. Antennae 9-segmented (rarely 8); III–IV with forked sensorium; II with no microtrichia; VI with short pedicel (Fig. 134). Pronotum almost without sculpture (Fig. 135). Metascutum with few elongate reticles, median setae near anterior margin, MCS present (Fig. 136). Prosternal ferna not entire, with small gap medially. Fore wing slender, first vein with about 7 setae on basal half, 3 setae on distal half; second vein with about 8 setae including one seta basal to vein fork; clavus with 5–6 veinal setae and one basal seta. Abdominal tergites I–VII with no sculpture medially, median setae S1 small and weak, VIII posterior margin with 3–4 widely spaced slender microtrichia laterally, none medially (Fig. 137).

**Measurements** (holotype, in microns). Body length 1230. Head, length 90; width across eyes 120. Pronotum, length 100; maximum width 175. Fore wing, length 600; median width 35; first vein longest seta in basal row 18. Tergite IV S1 setae 5. Tergite IX, MD setae 5; PM S1 setae 70. Tergite X PM S1 setae 70. Antennal segments III–IX, 37, 35, 32, 35, 7, 7, 12.

*Male macroptera*. Similar to female; tergite IX with 2 pairs of short stout setae medially (Fig. 139); sternites III–VII with pore plate medially, C-shaped on anterior segments but only curved on VII (Fig. 138).

**Specimens examined**. Holotype female macroptera, **New South Wales**, Bungendore, Brookhill, from *Pultenaea subspicata* leaves (Fabaceae), 21.xi.2004 (LAM 4507).

Paratypes: 6 females 1 male taken with holotype; **New South Wales**, Googong Dam, Queanbeyan, 3 females from dwarf legume with yellow flowers, 29.ix.2004. **Australian Capital Territory**, Black Mtn, 2 females from *Pultenaea procumbens*, 30.x.2002; Molonglo Gorge, Canberra, 7 females from *Pultenaea procumbens* leaves, 21 & 28.x.2000.

Non-paratypic specimens: 3 females 1 male, from *Pultenaea?* yellow flowers, **South Australia**, Kangaroo Island, Cap Lyonais, 4.x.2007.

**Comments**. This species is apparently quite common on low-growing Fabaceae of the genus *Pultenaea* around Canberra. The specimens listed from Kangaroo Island are very similar, but one female has no comb on tergite VIII, one has a single microtrichium on one side only, whereas the third has three or four on each side as in the holotype. The possibility remains that this is the same species as *A. keatsi* from Brisbane, but establishing that will require further field studies. It provides a further example of variation in the number of antennal segments, even the holotype having one antenna 9-segmented but the other 8-segmented.

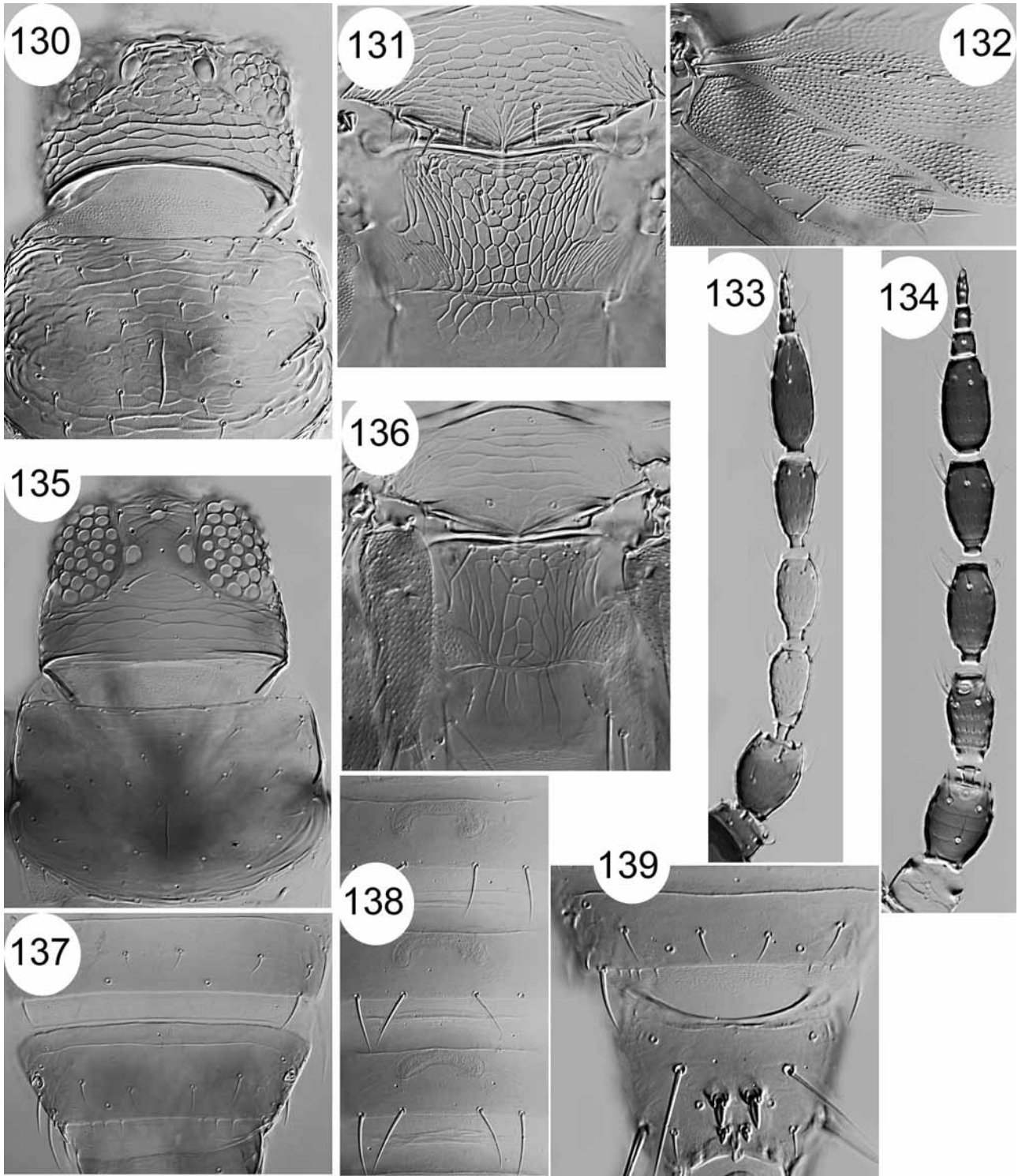
***Anaphothrips sudanensis* Trybom**

(Figs 133, 140–142)

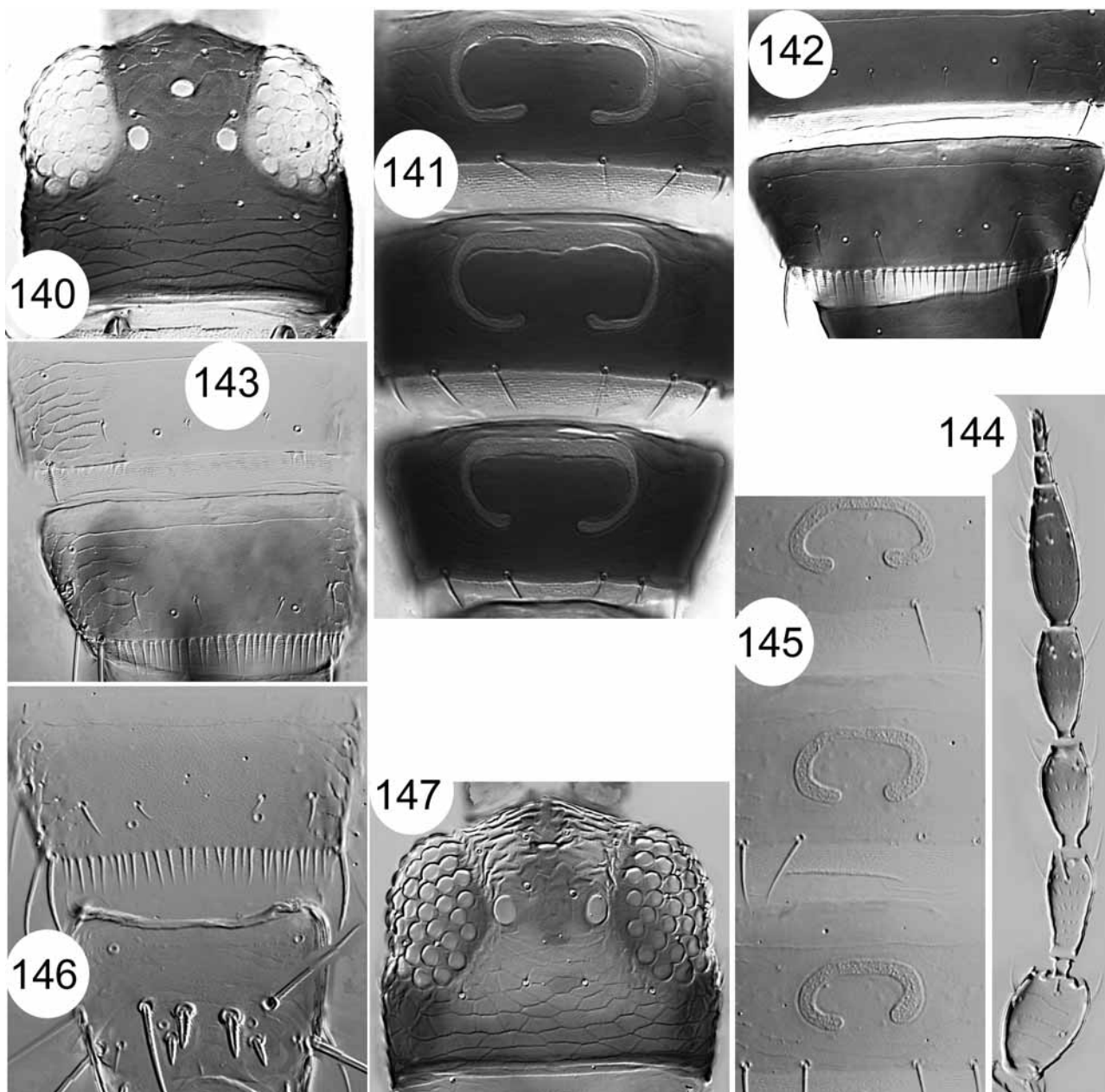
*Anaphothrips sudanensis* Trybom, 1911: 1

This species has been described under at least 10 different names, and has been studied from many tropical and subtropical areas around the world. In Australia it is widespread on various grasses from Sydney northwards to Darwin and Kununurra. The body colour varies between geographical areas. Only bicoloured males have been seen from Australia, but yellow males have been studied from India, Abu Dhabi and northern Africa. Abdominal segment VI of females is often yellow in these latter populations, and antennal segments I–II are also yellow, in contrast to Australian populations. In Japan, seven colour varieties (five in female, two

in male) are recorded (Kudo, 1989; Nakao *et al.*, 2001), and contrary to Pitkin (1978) there is no evidence that this variation represents more than one species. Apterous forms of this widespread and variable species are described here for the first time. These apterae came from grasses at a single locality at Canberra on dates spanning May 2003 and December 2005. Although at first considered to be a distinct species, the few structural and colour differences seem best interpreted as morph-related variation, despite neither macropterae nor micropterae being taken at this locality.



**FIGURES 130–139.** *Anaphothrips* of Australia. *A. parsonsiae* 130–132: (130) head & pronotum; (131) meso & metanotum; (132) clavus. (133) *A. sudanensis* antenna. *A. pultenaeae* 134–139: (134) antenna; (135) head & pronotum; (136) meso & metanotum; (137) tergites VII–VIII; (138) male sternites; (139) male tergites VIII–IX.



**FIGURES 140–147.** *Anaphothrips* of Australia. *A. sudanensis* 140–142: (140) head; (141) male sternites; (142) tergites VII–VIII. *A. swezeyi* 143–146: (143) tergites VII–VIII; (144) antenna; (145) male sternites; (146) male tergites VIII–IX. (147) *A. varii* head.

*Female macroptera.* Body bicoloured, generally dark brown with abdominal segments III–V (or VI) yellow, colour pattern variable; legs yellow; antennal segments I–II brown (sometimes yellow), III–IV yellow, V–VIII brown; fore wings pale with dark sub-basal band. Head slightly longer than wide, projecting very slightly in front of eyes (Fig. 140); eyes with 6 pigmented facets; ocellar setae III outside triangle, just anterior to hind ocelli. Antennae 8-segmented, III–IV with short forked sensorium, II without microtrichia, IV–VI pedicellate (Fig. 133). Pronotum weakly sculptured. Metascutum irregularly reticulate, median setae far back from anterior margin; MCS present or absent. Fore wing first vein with about 6 setae on basal half, 1 seta medially and 2 distally; second vein with about 8 setae, sometimes with one seta just basal to vein fork; clavus with about 4–5 venal setae and one seta at base. Abdominal tergites often with small dentate microtrichia on sculpture lines laterally, sculpture not extending mesad of setae S2, dentate microtrichia laterally on posterior margin; VIII with posteromarginal comb complete, microtrichia broad at base (Fig. 142).

*Female microptera.* Similar to macroptera but ocelli small or absent; fore wing lobe almost as long as head width.

*Male microptera.* Similar to female, but pterothorax yellow (in Australia); ocelli absent; tergites VI–VII sometimes with irregular dentate microtrichia on posterior margin medially, VIII with comb sometimes reduced to broadly based teeth, IX with 2 pairs of stout setae medially; sternites III–VIII with large C-shaped pore plate (Fig. 141).

*Apterae.* Closely similar to micropterae except: females yellow with abdominal segments VIII–X dark brown; mesonotum and metascutum transverse; abdominal tergites weakly reticulate medially; tergites VI–VII setae S3 and S4 shorter than S1 and S2; tergite VIII posterior margin with large triangular teeth laterally and small teeth medially; spiracular area large. Males yellow, structurally identical to micropterae except for transverse meso- and metathorax.

### ***Anaphothrips swezeyi* Moulton** (Figs 143–146)

*Anaphothrips swezeyi* Moulton, 1928: 107

Described from Hawaii on sugar cane, and recorded from New Caledonia, this slender-bodied species with slightly shaded wings appears to be widespread in the coastal regions of Queensland (Mound & Tree, 2007). It is a typical grass-living member of the genus, similar in structure to *A. sudanensis*, but antennal segment VI sometimes has a partial suture (Fig. 144).

*Female macroptera.* Body and legs yellow; antennal segments I–III mainly yellow, IV brown with basal third yellow, V–VIII brown; fore wings pale, basal third and posterior margin shaded, scale shaded; body setae pale. Head slender, as long as wide, slightly produced in front of eyes; eyes with 6 pigmented facets; ocellar setae III anterolateral to hind ocelli. Antennae 8-segmented (rarely with weak incomplete suture in apical third), III–IV with small forked sensorium, II without microtrichia, IV–VI pedicellate, sometimes VI ventrally with partial transverse suture (Fig. 144). Pronotum with faint anastomosing striae. Metascutum with large irregular reticulation, without internal wrinkles; median setae near anterior margin; MCS absent. Fore wing first vein with about 6 setae on basal half, 1 seta at middle, 2 setae distally; second vein with 7–10 setae, sometimes with one seta just basal to vein fork; clavus with 4 veinal setae and one basal seta. Abdominal tergites without microtrichia on sculpture lines, but with small dentate microtrichia on posterior margins laterally; tergites II–VIII with sculpture not extending mesad of S2 setae; tergal setae S1 small, wide apart; VIII posteromarginal comb long and fine (Fig. 143).

*Male macroptera.* Similar to female; tergite VIII with long comb; IX with 2 pairs of short stout setae medially (Fig. 146); sternites III–VII with large C-shaped pore plate (Fig. 145).

### ***Anaphothrips varii* Moulton** (Figs 148–149)

*Anaphothrips varii* Moulton, in Moulton & Newman, 1935: 98

The holotype of this species was collected at Guilford, **Western Australia**, and is deposited in the California Academy of Sciences. It is a grass-living species, and although never collected in large numbers, female macropterae have been taken widely across southern Australia, including Tasmania, South Australia, southern New South Wales, and the Australian Capital Territory. The holotype aptera of *A. moundsi* was collected together with macropterae of *A. varii*, and it seems likely that these represent the same species. They share the following characteristics; antennal segments annulated, segment III with pedicel widened near the base, body

surface reticulated, abdominal tergite VIII with large spiracles. Moreover, the macropterae have the median two pairs of tergal setae unusually long.

*Female macroptera.* Body brown to dark brown, abdomen yellow laterally, head yellowish around ocellar triangle, pronotum partly yellow, tibiae and tarsi yellow; antennal segments brown; fore wings uniformly shaded; prominent body setae brown. Head as long as wide, produced in front of eyes, reticulate behind eyes but very weakly near ocelli (Fig. 147); eyes with 6 weakly pigmented facets; ocellar setae III within ocellar triangle. Antennae 9-segmented, III with sensorium simple, base slightly wider just above pedicel; IV with sensorium forked; II–VI annulate, but II–III without microtrichia, VI sharply pedicellate (Fig. 149). Pronotum weakly reticulate medially. Metascutum reticulate, median setae well behind anterior margin; MCS present. Fore wing veinal setae minute; second vein with no setae basal to vein fork; clavus with 4–5 veinal setae. Abdominal tergites reticulate medially, small microtrichia on sculpture lines laterally; II–VII with small tuberculate microtrichia on posterior margin laterally and sometimes medially, setae S3 and S4 shorter than S1 and S2; VIII with posteromarginal comb complete, microtrichia with wide bases; spiracles greatly enlarged, occupying at least half of tergal lateral margin (Fig. 148). Sternite VII setae S1 close to posterior margin.

*Male unknown.*

### ***Anaphothrips walchae* sp. n.**

(Figs 150–152)

*Female macroptera.* Body colour brownish yellow with brown markings on tergites I–IV, thorax and posterior margin of head; legs yellow with brown shadings; antennal segment I white, II dark brown, III–IX brown; fore wings weakly shaded along veins; major setae at abdomen apex brown. Head wider than long; transverse reticulation behind eyes, weakly sculptured in ocellar triangle; ocellar setae III inside triangle, no further apart than diameter of first ocellus (Fig. 152); eyes with 6 pigmented facets. Antennae 9-segmented; III–IV weakly constricted at apex with forked sensorium; II without microtrichia; VI with short pedicel; suture oblique between VI–VII (Fig. 150). Pronotum with irregular sculpture lines, discal setae setaceous. Metascutum reticulate, median setae well posterior to anterior margin, MCS absent. Fore wing setae short and stout, first vein with about 6–8 setae basally, 2 medially and 2 distally; second vein with about 10 widely spaced setae; clavus with 4–5 veinal setae but no discal setae. Abdominal tergites II–VII with no sculpture medially, lateral sculpture extending just mesad of setae S2; widely spaced sculpture lines bear a few short microtrichia; tergites IV–VI with distance between median setae scarcely greater than the setal lengths; VIII with long regular posteromarginal comb; spiracular area large (Fig. 151).

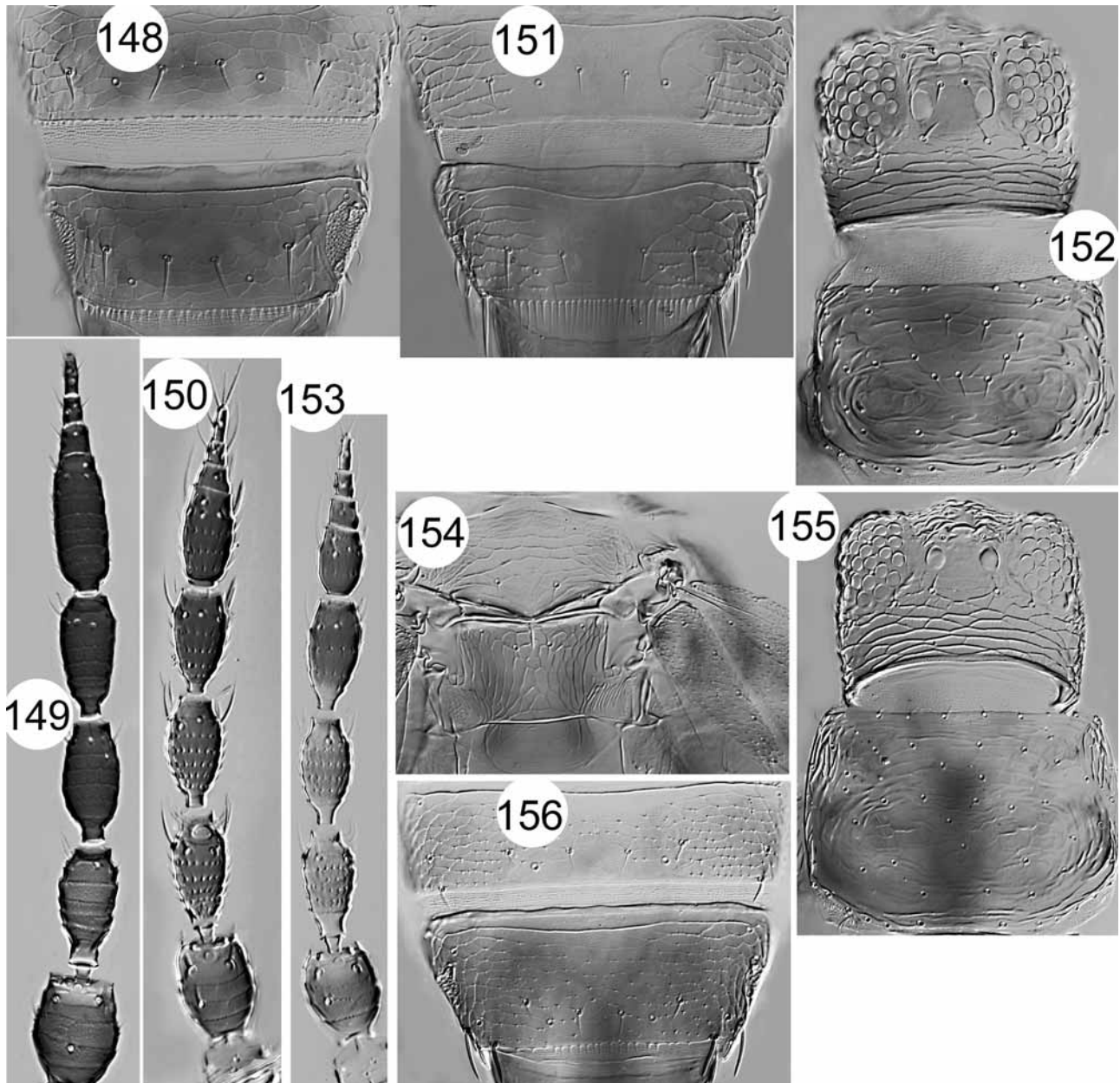
**Measurements** (holotype, in microns). Body length 1150. Head, length 75; width across eyes 130. Pronotum, length 100; maximum width 160. Fore wing, length 670; median width 50; first vein longest seta in basal row 12. Tergite IV S1 setae 7. Tergite IX, MD setae 12; PM S1 setae 45. Tergite X PM S1 setae 50. Antennal segments III–IX, 40, 35, 32, 32, 7, 7, 12.

*Male macroptera.* Similar to female; tergite VIII with two pairs of small thickened setae medially; sternites without pore plates.

**Specimens examined.** Holotype female macroptera, **New South Wales**, Walcha, from *Ozothamnus diosmifolius* leaves (Asteraceae), 28.xii.2000 (LAM 3997).

Paratypes: 14 females 3 males and larvae taken with holotype; **New South Wales**, Chichester, 1 female on *Cissus antarctica* leaves, 25.xii.2000; Sydney, Castle Hill, NSW Forestry, 5 females from *Cassinia* sp., 12.iv.2002. **Queensland**, Mt Glorious, 1 female from dead wood, 1.xi.2007; Lamington, O'Reilly's, 3 females from *Ozothamnus diosmifolius* flowers, 11.x.2006.

**Comments.** Although similar to *A. cecili* in general appearance and many details, the males lack sternal pore plates. The major setae on the base of the fore wing first vein, and also the median metascutal setae, are shorter and stouter (very weakly spatulate) than in related species.



**FIGURES 148–156.** *Anaphothrips* of Australia. *A. varii* 148–149: (148) tergites VII–VIII; (149) antenna. *A. walchae* 150–152: (150) antenna; (151) tergites VII–VIII; (152) head & pronotum. *A. westringiae* 153–156: (153) antenna; (154) meso & metanotum; (155) head & pronotum; (156) tergites VII–VIII.

***Anaphothrips westringiae* sp. n.**  
(Figs 153–157)

*Female macroptera.* Body and legs yellow, tergites II–VI with pair of brown areas anterolaterally; antennal segment I white, II–IX brown but III–IV slightly paler; major setae on abdominal tergites IX–X dark; fore wings weakly shaded. Head wider than long, reticulate behind eyes but no sculpture in ocellar triangle; eyes with 6 pigmented facets; ocellar setae III on anterior margins of triangle (Fig. 155). Antennae 9-segmented, III–IV with small forked sensorium; segment VI short; II without microtrichia; VI narrowed to base but not pedicellate (Fig. 153). Pronotum with irregular sculpture lines (Fig. 155). Metascutum irregularly reticulate, median setae not at anterior margin; MCS absent (Fig. 154). Fore wing setae small, first vein with about 9



setae basally, 2 medially and 2 distally; second vein with 8–9 setae; clavus with 6 veinal but no discal setae. Abdominal tergites III–VI with no sculpture medially; lateral sculpture lines not extending mesad of setae S2; lateral lines with dentate microtrichia, extending mesad on VII–VIII (Fig. 156); posteromarginal comb on VIII with about 10 short fine microtrichia medially but usually none laterally; spiracles slightly enlarged; X with complete dorsal split; major setae on IX–X stout with chisel-shaped apices. Sternites with dentate microtrichia laterally on sculpture lines.

**Measurements** (holotype, in microns). Body length 1100. Head, length 90; width across eyes 135. Pronotum, length 110; maximum width 160. Fore wing, length 500; median width 40; first vein longest seta in basal row 7. Tergite IV S1 setae 7. Tergite IX, MD setae 5; PM S1 setae 55. Tergite X PM S1 setae 55. Antennal segments III–IX, 40, 35, 35, 22, 10, 7, 12.

*Male macroptera*. Similar to but smaller than female; tergite IX with 2 pairs of short stout setae medially; sternites III–VII with small C-shaped pore plate, reduced to a curve on VII (Fig. 157).

**Specimens examined**. Holotype female macroptera, **Australian Capital Territory**, Canberra, Black Mtn, from leaves of cultivated *Westringia fruticosa* (Lamiaceae), 5.ii.2007 (LAM).

Paratypes: 9 females 5 males taken with holotype and larvae.

**Comments**. The plant species from which this thrips was collected has a natural distribution along the eastern coast of Australia, but is also widely cultivated as a garden plant. This thrips species has the posteromarginal comb on tergite VIII similar to that of *A. geleznowiae*, but that Western Australian species has the metascutal campaniform sensilla present, long setaceous setae on tergite IX of females, and males with large C-shaped pore plates. Moreover, antennal segment VI is unusually short in *A. westringiae*.

### ***Anaphothrips whyalla* sp. n.**

(Figs 158–162)

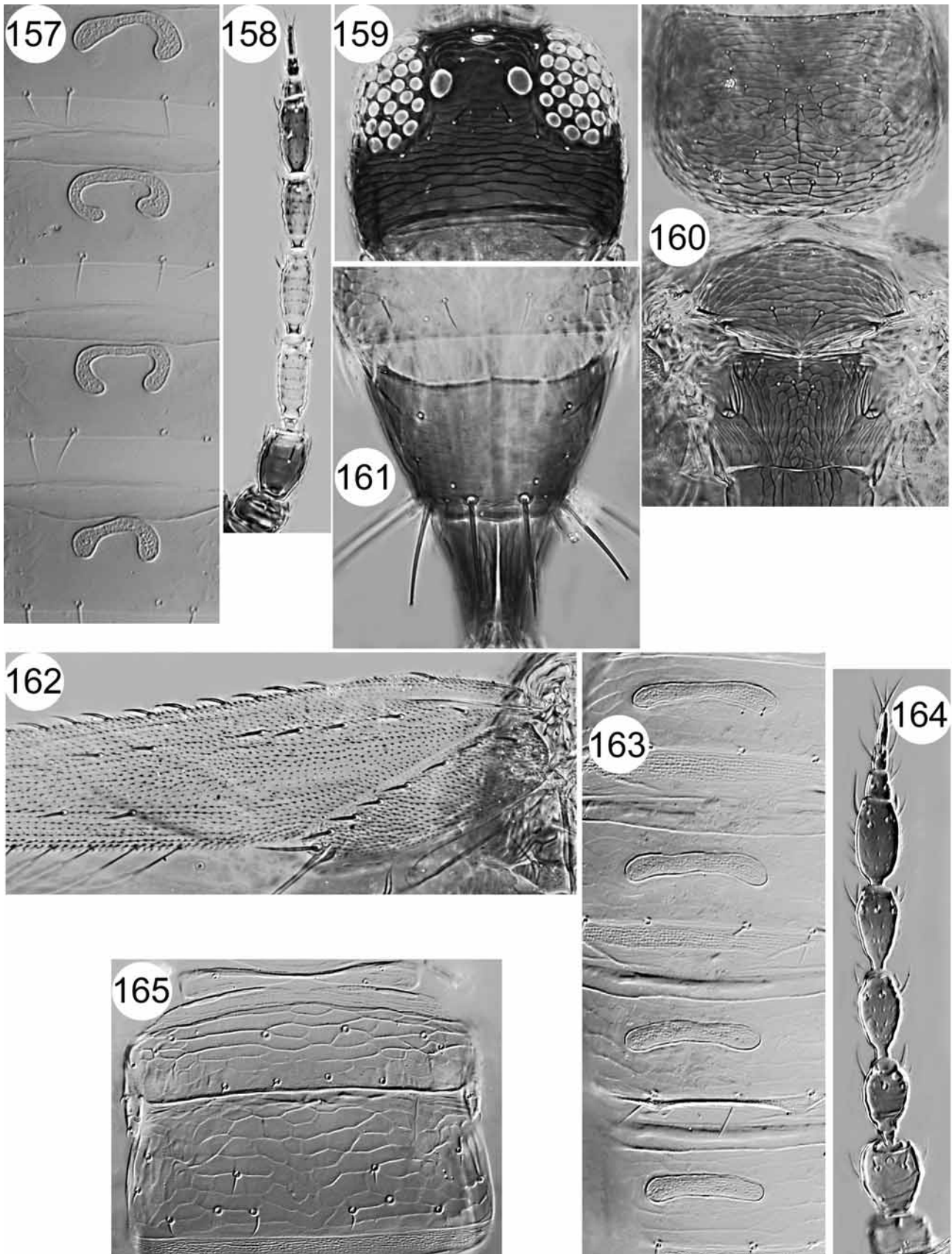
*Female macroptera*. Body light brown, head dark brown, antennal segments I–II dark brown, III–IV largely yellow, V–IX brown, but V slightly paler; wings pale; tergite IX setae shaded. Head wider than long, cheeks almost straight, transversely reticulate behind eyes, ocellar triangle with little or no sculpture; eyes with 6 pigmented facets; ocellar setae III within ocellar triangle, slightly anterior to level of anterior margins of hind ocelli (Fig. 159); postocular setae not transverse, setae I–III along inner and posterior margins of eye. Antennae 9-segmented; II without microtrichia; III–IV slender with weakly rounded margins and small forked sensorium; VI weakly pedicellate, suture between VI–VII transverse (Fig. 158). Pronotum reticulate; posteromarginal setae subequal in size. Metascutal reticulations small medially (Fig. 160); median setae fine and well back from anterior margin; MCS present. Prosternal ferna divided medially. Fore wing first vein with about 10 setae on basal half and 2 or 3 setae on distal half; second vein with 15–17 setae irregularly spaced, 2 setae basal to veinal fork; clavus with 6–7 veinal setae and one basal seta (Fig. 162). Abdominal tergites I–VII with faint transverse sculpture medially, lateral reticulation bearing small microtrichia; VIII posterior margin with no comb medially but a few small microtrichia laterally (Fig. 161), spiracular area small; IX with S1–S2 capitate (Fig. 161); X with longitudinal sculpture lines, S1 capitate. Sternite VII median setae far in front of posterior margin.

**Measurements** (holotype, in microns). Body length 1600. Head, length 110; width across eyes 150. Pronotum, length 135; maximum width 200. Fore wing, length 780; median width 57; first vein longest seta in basal row 15. Tergite IV S1 setae 7. Tergite IX, MD setae 12; PM S1 setae 75. Tergite X, length 80; PM S1 setae 65. Antennal segments III–IX, 50, 45, 38, 38, 12, 10, 15.

**Specimens examined**. Holotype female macroptera, **South Australia**, 14km north of Port Augusta, from *Acacia oswaldii*, 13.iii.1996 (LAM 2969).

**Comments**. This species is based on a single specimen, but the capitate major setae on tergites IX and X are unique within this genus (Fig. 161). In most species these major setae are acute, although in both *A. parsonsiae* and *A. westringiae* their apices are chisel-shaped.





**FIGURES 157–165.** *Anaphothrips* of Australia. (157) *A. westringiae* male sternites. *A. whyalla* 158–162: (158) antenna; (159) head; (160) pro, meso & metanotum; (161) tergites VIII–X; (162) forewing base. *A. woodi* 163–165: (163) male sternites; (164) antenna; (165) meso & metanotum.

***Anaphothrips woodi* Pitkin**  
(Figs 163–167)

*Anaphothrips woodi* Pitkin, 1978: 367

Females of this species are not easily distinguished from those of *A. moundi*. The significance of the differences between them is difficult to assess, and the possibility remains that they represent a single variable species. Both species have been taken from grasses in damp places in south-eastern Australia, and both have been found on Mt. Kosciuszko although not in the same collection. However, the males associated with the two names are readily distinguished from each other by the form of the sternal pore plates. Moreover, the sixth antennal segment is longer with almost parallel margins in *A. moundi*, whereas it has strongly convex margins in *A. woodi*. A series of both sexes taken on grasses and sedges in a damp area of Namadji, near Canberra, have the antennae slightly longer and paler than the type specimens from Mt. Kosciuszko, and the head more clearly sculptured.

*Female aptera*. Body, legs and antennal segments I–II yellow, III–V yellow with pale brown shadings, VI variably yellow at base, VII–IX brown. Head reticulate, weakly so in ocellar region (Fig. 166); eyes with no facets pigmented or only weakly indicated; ocellar setae III variable in position. Antennae 9-segmented; sensorium simple on III, forked on IV; II without microtrichia (also III in type series); IV–VI pedicellate (Fig. 164). Pronotum almost without sculpture. Mesonotum and metascutum transverse, MCS present (Fig. 165). Abdominal tergites transversely reticulate medially, posterolateral margins smooth; II–VII with all four pairs of setae equally small, setal pair S4 arising in front of margin; VIII with narrow, irregularly lobed, craspedum; spiracles occupying almost half of lateral margins of VIII (Fig. 167).

*Male aptera*. Similar to female; tergite IX with 2 pairs of short stout setae medially; sternites III–VII with weakly C-shaped or curved pore plate (Fig. 163).

***Anaphothrips yalgooi* sp. n.**  
(Figs 168–171)

*Female macroptera*. Body and legs yellow with brown markings; tergites II–VIII brown medially and across anterior half; mesonotum and metascutum brown laterally; pronotum with brown markings; antennal segment I white, II dark brown, III and basal half of IV brownish yellow, V–IX light brown; wings faintly shaded; tergite IX setae light brown. Head wider than long, with closely spaced sculpture lines behind eyes; eyes with 6 weakly pigmented facets; ocellar setae III just outside ocellar triangle (Fig. 168). Antennae 9-segmented; III–IV with sensorium forked, II with three rows of microtrichia; VI not pedicellate, suture between VI–VII oblique (Fig. 171). Pronotum with irregular transverse lines of sculpture; posteromarginal setae S1 larger than remaining setae (Fig. 169). Metascutal sculpture reticulate, lines with slight craspedal flanges; median setae fine and well back from anterior margin; MCS absent. Prosternal ferna almost complete medially. Fore wing relatively broad, first vein with about 15 setae basally, 2 setae medially and 2 setae near apex; second vein with about 16 setae; clavus with 6 veinal setae and one basal seta. Abdominal tergites V–VII with no sculpture medially, II–IV with some lines medially; tergites laterally with up to 10 striae bearing numerous pale ciliate microtrichia with triangular bases, sculpture extending mesad of setae S2 almost to campaniform sensilla (Fig. 170); VIII with long regular marginal comb; IX with many transverse sculpture lines. Sternite VII median setae close to posterior margin.

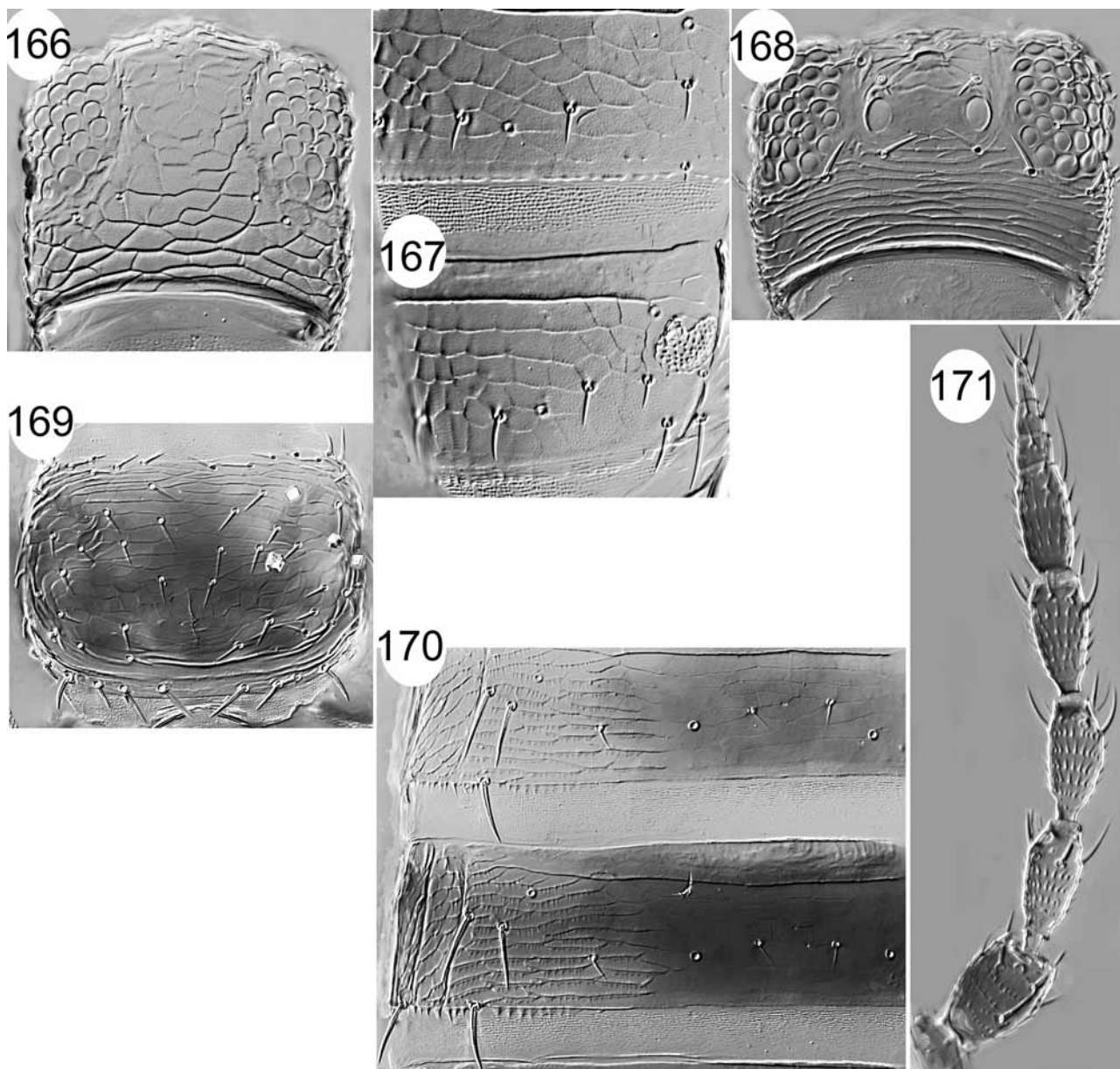
**Measurements** (holotype, in microns). Body length 1380. Head, length 90; width across eyes 155. Pronotum, length 120; maximum width 185. Fore wing, length 730; median width 60; first vein longest seta in basal row 30. Tergite IV S1 setae 15. Tergite IX, MD setae 12; PM S1 setae 85. Tergite X PM S1 setae 75. Antennal segments III–IX, 42, 37, 37, 32, 10, 10, 12.

*Male macroptera*. Similar to female; tergite lateral sculpture lines with distinct craspeda but not microtrichia; IX with median setae not stout; sternites with no pore plates.

**Specimens examined.** Holotype female macroptera, **Western Australia**, 63km south-west of Yalgoo, from leaves of *Eremophila* species (Myoporaceae), 26.iv.1997 (LAM 3238).

Paratypes: 2 females 1 male taken with holotype.

**Comments.** Although the metascutal sculpture is similar to that of *A. geijerae*, that species has a neat transverse suture between antennal segments VI–VII, and also lacks pigmented eye facets.



**FIGURES 166–171.** *Anaphothrips* of Australia. *A. woodi* 166–167: (166) head; (167) tergites VII–VIII right margins. *A. yalgooi* 168–171: (168) head; (169) pronotum; (170) tergites V–VI; (171) antenna.

### *Dodonaethrips* gen. n.

**Diagnosis.** Macropterous; antennae 8-segmented (Fig. 178), sensorium on segments III–IV forked, II–VI with microtrichial rows, I without dorso-apical setae. Head transverse, eyes large with 6 pigmented facets; 3 pairs of ocellar setae, pair III within ocellar triangle (Fig. 172); 2 pairs of postocular setae; maxillary palps 2-

segmented. Pronotum transverse, with no long setae. Mesonotum and metascutum without campaniform sensilla, median setae arise medially (Fig. 173). Prosternal ferna entire; basantra without setae. Mesothoracic and metathoracic furcae each with prominent spinula (Fig. 176); mesothoracic sternopleural sutures complete. Metapre-episternum weakly developed. Tarsi 1-segmented. Fore wing first vein setal row incomplete, 2 setae distally; clavus with 4 veinal setae and 1 basal submarginal (?discal) seta (Fig. 173). Tergites and sternites without craspeda (Figs 177, 179); tergites with little sculpture, median setae wider apart than their length; VI–VII with S3 and S4 equally stout and larger than S1 and S2; tergite VIII with no comb; tergite IX without campaniform sensilla, or with one pair posteromedially, MD setae short and arising laterally. Sternites III–VII with 3 pairs of marginal setae, S1 and S2 on VII arising sub-marginally, without discal setae. Males with thick-walled pore plate on sternite III (Figs 174, 175); tergite IX without thorn-like setae.

Type species *Dodonaethrips eremiae* **sp. n.**

**Comments.** This genus is erected for a single species with several unusual characteristics. No other member of the *Anaphothrips* group is known to have single segmented tarsi, a furca is present on the metathorax as well as the mesothorax, the maxillary palps are 2-segmented, and the condition of the campaniform sensilla on the ninth tergite in females (usually absent or with one pair present posteromedially) is unusual amongst Thripinae. The metathoracic furca is rather thick, with poorly defined margins, in contrast to the clearly delimited mesothoracic furca. Demonstration of the porous nature of the thick-walled pore plate on the third sternite of males requires particularly careful adjustment of a microscope's illumination (Figs 174, 175). Currently, it is not possible to suggest any generic relationships for this taxon.

#### ***Dodonaethrips eremiae* sp. n.**

(Figs 172–179)

*Female macroptera.* Body brownish yellow to light brown, tergite IX darkest, head with dark post-occipital ridge; legs yellowish brown, tarsi yellow; antennal segment I white, II–VIII light brown; fore wings uniformly but weakly shaded. Head usually without sculpture except on posterior third; ocellar setae short and blunt, pair I close to fore ocellus. Pronotum almost without sculpture, all setae short and blunt. Metascutum reticulate. Fore wing relatively broad; first vein with about 7 setae on basal half, 2 setae distally; second vein with 7–10 setae. Tergites with lateral setae blunt (Fig. 179); tergite X with dorsal split short. Sternite II with 2 pairs of marginal setae but apparently no setae near anterior margin; posterior sternites with short weak microtrichia on transverse lines of sculpture.

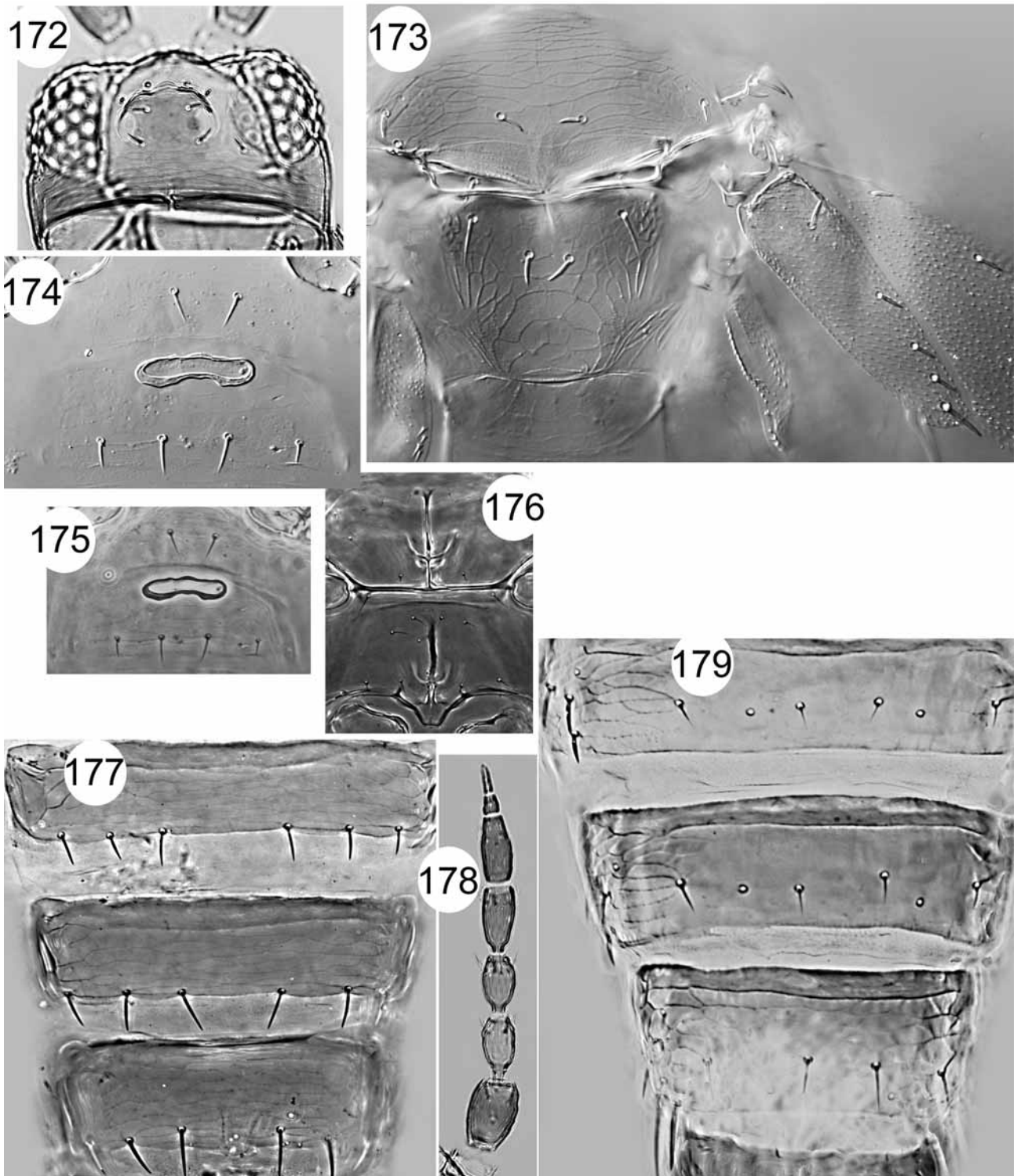
**Measurements** (holotype, in microns). Body length 1100. Head, length 70; width across eyes 135. Pronotum, length 85; maximum width 160. Fore wing, length 640; median width 60; first vein longest seta in basal row 10. Tergite IV S1 setae 7. Tergite IX, MD setae 15; PM S1 setae 55. Tergite X PM S1 setae 45. Antennal segments III–VIII, 32, 30, 35, 37, 10, 15.

*Male macroptera.* Similar to female; sternite III pore plate thick-walled, internal markings scarcely visible (Figs 174, 175); tergite IX without campaniform sensilla, dorsal setae slender.

**Specimens examined.** Holotype female macroptera. **New South Wales**, 80km east of Wilcannia, from *Dodonaea ?viscosa* leaves, 1.vi.2003 (LAM 4317).

Paratypes: 5 females 1 male taken with a larva and the holotype; **New South Wales**, 5km east of Cobar, 10 females from *Dodonaea ?viscosa* leaves, 31.v.2003; Mutawintji, 8 females from *Dodonaea ?viscosa* leaves, 2.vi.2003; Mutawintji, 1 female from *Acacia aneura*, 27.xi.1998. **Queensland**, Windorah, 1 female from *Dodonaea ?viscosa* leaves, 13.iv.2005. **South Australia**, 82km north of Maree, 3 females 1 male from *Acacia stenophylla*, 8.iv.1998; Renmark, 6 females swept, 14.ii.2000.

**Comments.** Although found on *Dodonaea* (Sapindaceae) widely across the semi-desert areas of eastern Australia, in more moist areas this thrips is replaced on this host plant by *Scirtothrips albomaculatus* Bianchi (Hoddle & Mound, 2003).



**FIGURES 172–179.** *Dodonaethrips eremiae*. (172) head; (173) meso & metanotum with clavus (DIC illumination); (174) male sternite III (DIC illumination); (175) male sternite III (phase contrast illumination); (176) thoracic furcae; (177) sternites V–VII; (178) antenna; (179) tergites VI–VIII.

***Ozanaphothrips* gen n.**

**Diagnosis.** Apterous or macropterous; antennae 8-segmented (Figs 183, 187), sensorium on segment III simple, antennal microtrichia weak, absent on segment III; segment I without dorso-apical setae. Head

projecting in front of eyes, vertex often swollen over bases of antennal segment I (Figs 188, 199); 3 pairs of ocellar setae but pairs I and II sometimes absent; no more than 3 pairs of postocular setae; eyes large, with 6 pigmented facets; maxillary palps 2-segmented, mouth cone robust and projecting ventrally. Pronotum with no long setae, or with one lateral pair (S8?) prominent; femora usually entire; basitrochantera without setae. Metapreepisternum transverse. Tarsi 2-segmented. Mesothoracic furca usually with spinula, metathoracic furca without spinula. Mesonotum with paired campaniform sensilla anteromedially. Mesothoracic sternopleural sutures usually complete. Fore wing with reduced chaetotaxy, first vein with 2 setae on distal half, second vein with no more than 6 setae; clavus with neither discal seta nor basal seta; marginal cilia wavy. Abdominal tergites II–VIII with distinct craspedum; median setae on tergites not close together, campaniform sensilla usually close to posterior margin; IV–VI with lateral marginal setae no longer than S1 and S2; tergite IX with 2 pairs of campaniform sensilla, MD setae often long and situated medially; tergite X dorsal split and major setae usually short. Sternites III–VII with 3 pairs of marginal setae, sometimes arising sub-marginally, rarely without several discal setae. Males (where known) with a pore plate close behind antecostal ridge on sternite III or III–VII (Fig. 192); tergite IX without dorsal paired thorn-like setae.

Type species *Ozanaphothrips fenarius* **sp. n.**

**Comments.** This genus shares many character states with *Bregmatothrips* Hood, but these similarities are possibly due to convergence given that all of the species in both of these genera live on Poaceae (possibly also Cyperaceae). In *Bregmatothrips* species the first antennal segment bears a pair of dorso-apical setae, there are two pairs of long pronotal posteroangular setae, and the males lack sternal pore plates. In general appearance, species of *Anaphothrips* are particularly similar, but these lack sternal discal setae, and in males the sternal pore plates are usually on the discal area and only rarely closely parallel to the antecostal ridge. In some species of this new genus the chaetotaxy is not stable, including the number and position of ocellar setae, the number of pronotal posteromarginal setae, and the number and disposition of sternal discal setae. The genus also shares many character states with *Monothrips flavus* Moulton, a species described from New Guinea, but of which several specimens have been seen from northern and northwestern Australia. Currently *Monothrips* is distinguished because of the presence of two pairs of long pronotal posteroangular setae, but the new species described below, *O. torridus*, is particularly similar to *M. flavus*.

### Key to species of *Ozanaphothrips*

1. Abdominal sternites with craspeda on posterior margin (Fig. 181)..... 2
- Abdominal sternites without craspeda ..... 3
2. Body brown to dark brown; macroptera with ocellar setae pair III within ocellar triangle (Fig. 188)... *fenarius* **sp. n.**
- Body bicoloured, mainly yellow with head and abdominal segments VIII–X brown; macroptera with pterothorax brown; macroptera with ocellar setae pair III anterolateral to ocellar triangle ..... *condaminei* **sp. n.**
3. Antennal segment IV with sensorium forked ..... 4
- Antennal segment IV with sensorium simple ..... 5
4. Sternal marginal setae arising in front of margin (Fig. 202); macroptera with metascutal reticulation equiangular [aptera metascutum almost smooth]; tergal craspeda strongly lobed (Figs 201, 203); pronotal posteromarginal setae all equally short [male bicoloured] ..... *perotis* **sp. n.**
- Sternal marginal setae arising at margin (Fig. 206); macroptera with metascutal sculpture irregularly longitudinal (Fig. 207); tergal craspeda not strongly lobed; pronotal posteromarginal setae pair 8 at least twice as long as posteromarginal setae pair 1 [male unknown] ..... *thulius* **sp. n.**
5. Abdominal tergite I with no craspedum (Fig. 196), II–VIII with narrow craspedum; pronotum transverse (Fig. 193); tergites III–VI with no sculpture medially; sternites II–III usually without discal setae..... *kununurrai* **sp. n.**
- Abdominal tergites I–VIII each with broad craspedum on posterior margin (Fig. 208); pronotum trapezoidal (Fig. 209); tergites III–VI with reticulate sculpture medially; sternites II–III with discal setae ..... *torridus* **sp. n.**

***Ozanaphothrips condaminei* sp. n.**

(Figs 180–184)

*Female aptera.* Legs and most of body yellow, head and abdominal segments VIII–X brown with pale setae, segment VII lightly shaded; antennal segments I–II and V–VIII light brown, III–IV mainly yellow. Head (Fig. 180) smaller than pronotum, projecting in front of eyes but scarcely overhanging antennal segment I; vertex without sculpture or ocelli; ocellar setae I when present slightly posteromesad of setae II; ocellar setae III wide apart close to compound eyes. Antennal segment IV with simple sensorium, III–V with no microtrichia on transverse lines (Fig. 183). Pronotum trapezoidal (Fig. 184), faintly reticulate, setae all small. Prosternal ferna weakly continuous medially. Mesothoracic furca with short spinula. Mesonotum reticulate, with 2 pairs of campaniform sensilla anteromedially, 2 or 3 pairs of setae near posterior margin. Metascutum reticulate, transverse with 1 pair of setae medially; MCS present, 2 pairs of setae near posterior margin. Abdominal tergites I–IX reticulate, with unlobed posteromarginal craspedum on I–VIII; paired campaniform sensilla close to posterior margin; posteromarginal setae arise in line with campaniform sensilla; tergite IX MD setae small and slender, major setae short. Sternites II–VII reticulate, with broad unlobed posteromarginal craspedum, on VII not developed mesad of setae S2 (Fig. 181); sternites III–VII posteromarginal setae arise in front of margin, with discal setae indistinguishable from marginals.

**Measurements** (holotype, in microns). Body length 1200. Head, length 90; width across eyes 100. Pronotum, length 135; maximum width 165. Tergite IV S1 setae 15. Tergite IX, MD setae 15; PM S1 setae 65. Tergite X PM S1 setae 40. Antennal segments III–VIII, 25, 25, 25, 45, 10, 10.

*Female macroptera.* Colour and structure similar to aptera, fore wing shaded; pterothorax brown; prosternal ferna discontinuous medially; mesothoracic furca short and weak; metascutum and metascutellum reticulate; metascutal median setae arise medially, MCS near posterior. Fore wing clavus with 4 marginal setae; first vein with 4 setae basally, 2 setae distally; second vein with 6 setae.

*Male aptera.* Similar to female aptera but considerably paler; tergite IX medially with pair of small setae between pair of campaniform sensilla; sternites III–VII each with slender transverse pore plate close to antecostal ridge (Fig. 182).

**Specimens examined.** Holotype female aptera. **Queensland**, 30km west of Milmerran, on grasses, 25.ii.2003 (LAM4299).

Paratypes: 8 female 5 male apterae, 1 female macroptera, taken with holotype; **Queensland**, Glenmorgan, on *Bryophyllum*, 1 female aptera, 8.vii.2002; **New South Wales**, 40km south of Coonabarabran, 1 female macroptera, from native grasses, 13.iii.2006.

**Comments.** The head of this species is smaller than that of *O. fenarius*, with a distinctive trapezoidal pronotum, but these two share many other character states.

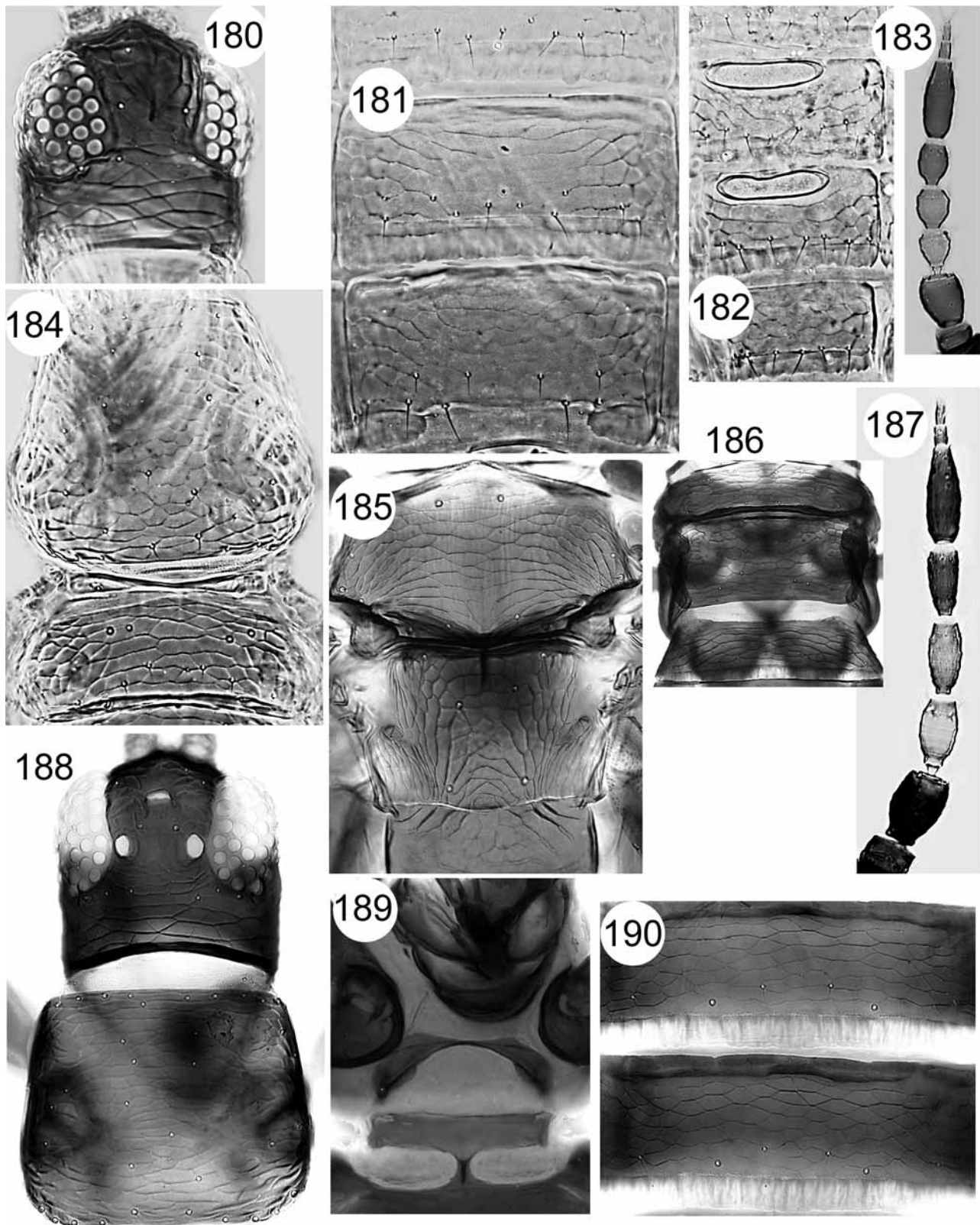
***Ozanaphothrips fenarius* sp. n.**

(Figs 185–192)

*Female macroptera.* Body, legs and antennae dark brown, antennal segment II darkest; major setae on abdominal apex dark. Fore wing uniformly brown. Head reticulate on posterior third, projecting slightly in front of eyes, cheeks straight; eyes large. Antennal segment IV with forked sensorium, II–V annulate, IV–VI with few microtrichial rows dorsally and ventrally (Fig. 187). Pronotum trapezoidal (Fig. 188), reticulate, setae small, posteromarginal seta pair S8 slightly more prominent. Mesonotum reticulate, median pair of setae not close to posterior margin. Metascutum reticulate, median setae arise medially, MCS near posterior (Fig. 185). Mesothoracic sternopleural sutures incomplete at anterior margin; furca with prominent spinula. Fore wing first vein with 5–6 basal and 1–2 distal setae, second vein with 2 setae; clavus with veinal setae varying 3–6. Abdominal tergites I–VIII reticulate, with broad unlobed but slightly dentate posteromarginal craspedum, paired campaniform sensilla close to posterior margin; posteromarginal setae arise slightly in front of margin; tergite IX MD setae long and wide apart, major setae short. Sternites II–VII reticulate, with



broad unlobed posteromarginal craspedum, on VII not developed mesad of setae S2; sternites II–VII posteromarginal setae arise in front of margin, III–VII with discal setae indistinguishable from marginals (Fig. 191).



**FIGURES 180–190.** *Ozanaphothrips* species. *O. condaminei* 180–184: (180) head; (181) sternites VI–VII; (182) male sternites; (183) antenna; (184) pro & mesonotum. *O. fenarius* 185–190: (185) meso & metanotum of macroptera; (186) meso & metanotum of aptera; (187) antenna; (188) head & pronotum; (189) prosternum; (190) tergites V–VI.

**Measurements** (holotype, in microns). Body length 1550. Head, length 130; width across eyes 125. Pronotum, length 160; width 180. Fore wing, length 850; first vein longest seta in basal row 20. Tergite IV S1 setae 15. Tergite IX, MD setae 40; PM S1 setae 90. Tergite X PM S1 setae 65. Antennal segments III–VIII, 45, 40, 37, 45, 10, 10.

*Female aptera*. Colour and structure similar to macroptera. Mesonotum reticulate, with 2 pairs of campaniform sensilla anteromedially, 2 pairs of setae near posterior margin. Metascutum reticulate, transverse with 2 pairs of setae medially; MCS near posterior (Fig. 186). Mesothoracic sternopleural suture weak or absent; furca with small spinula. Tergite IX MD setae shorter than in macropterae.

*Male aptera*. Colour and structure similar to female. Abdominal tergite IX with all setae small; sternites III–VII each with transverse pore plate close to antecostal ridge (Fig. 192).

*Second instar larva* with red internal pigment; head thickened and dark on dorsal surface except Y-shaped pale membranous area; antennal segment I dark with outer side of distal half pale, segment II dark with distal half pale, segment III dark with base and apex pale, segments IV to VII dark; pronotum thickened and dark at each side; each notum of thorax with a pair of small thickened dark spots; all femora dark with distal half pale, all tibiae dark on outer margin and basal half of inner margin; abdominal segment IX dark distal two-thirds, segment X dark. Antennal segments annulated and without microtrichia; body surface granulated, with setae short and stout but not expanded at apex.

**Specimens examined**. Holotype female macroptera, **Western Australia**, Geraldton, from *Phalaris paradoxa*, 23.x.1994 (Steiner & Goodwin).

Paratypes: 29 female macroptera taken with holotype; **Western Australia**, Meekathera, 2 female aptera, from grasses, 20.iv.200; Perth, from grasses, 2 female 2 male apterae with larvae, 28.ix.1995, 8 female apterae, 29.ix.1995; Meckering, 14 female apterae, from *Pinus pinaster*, 4.xi.1998; Regan Ford, 2 female macropterae, from *Triticum*, 19.x.1994; Narrogin, 3 female apterae, 2 female macropterae, fogging *Eucalyptus*, x.2006; Mt Barker, 1 female macroptera, from *Conostylus*, 3.x.1995; intercepted from Australia at Narita Airport, Japan, 1 female macroptera from *Asparagus officinalis* [Liliaceae], 22.xi.2001 (N. Matsumoto, plant quarantine, Japan).

Non-paratypic specimens: **Western Australia**, Rawlinna, 30 female apterae, 9.viii.1968. **South Australia**, Cox Scrub near Adelaide, 1 female aptera, 14.i.2002. **ACT**, Canberra, Mulligans Flat, 1 female aptera, 6.xii.2003.

**Comments**. This species is widespread in Western Australia, from Geraldton and Meekathera south to Mt Barker. The specimens listed from Rawlinna on the Nullarbor Plain are undoubtedly the same species, but are all severely crushed. The other two non-paratypic specimens appear to be the same species. However, they both come from areas that have been collected at frequently without further specimens being found, therefore these distribution records should be treated with caution. Many of the larvae from grasses at Perth were full of the black spores of *Neozygites* (Entomophthorales) (identified courtesy of Roger Shivas, QDPI).

### ***Ozanaphothrips kununurrai* sp. n.**

(Figs 193–197)

*Female macroptera*. Body and legs brown, but tarsi and apices of tibiae and femora yellow; antennal segments brown (Fig. 194), II dark brown; fore wings pale. Head projecting in front of eyes (Fig. 193), vertex swollen over base of antennal segment I, fore ocellus reduced; ocellar setae pair I situated far forward of pair II, sometimes absent, pair III between posterior ocelli; eyes large, cheeks straight. Antennal segment IV with simple sensorium, IV–V with microtrichia on transverse ridges; pedicel of III slightly swollen. Pronotum transverse (Fig. 193), with sculptured lines, no discal setae; 4–6 posteromarginal setae, of which pair S6 (?) almost three times as long as minor setae. Mesonotum reticulate, median pair of setae distant from posterior margin; without campaniform sensilla anteromedially. Metascutum weakly reticulate medially (Fig. 197), median setae arise close to anterior margin, no MCS. Mesothoracic furca without spinula. Fore wing first vein

with 4 basal and 2 distal setae, second vein with 2 setae; clavus with 4 veinal setae. Abdominal tergite I with weak sculpture at anterior, no craspedum medially (Fig. 196); tergites II–VIII without sculpture medially, with narrow posteromarginal craspedum; campaniform sensilla not close to posterior margin; tergite IX MD setae long. Sternites without craspeda, marginal setae arise at margin (Fig. 195), including S1 on VII; 0 to 6 discal setae in irregular transverse row medially on IV–VII.

**Measurements** (holotype, in microns). Body length 1300. Head, length 130; width across eyes 145. Pronotum, length 100; maximum width 185. Fore wing, length 680; first vein longest seta in basal row 20. Tergite IV S1 setae 5. Tergite IX, MD setae 30; PM S1 setae 85. Tergite X PM S1 setae 60. Antennal segments III–VIII, 35, 35, 35, 50, 10, 12.

*Male macroptera.* Colour and structure similar to female, but abdomen slender; tergite IX posterior margin with pair of short, dark-tipped, upwardly curved, drepanae; sternite III with transverse pore plate close to antecostal ridge.

**Comments.** The number of sternal discal setae varies amongst the paratypes. One female has two such setae on sternite III, although this sternite has no discal setae on any of the other specimens. Most females have about four discal setae on sternites IV and V, and about six on VII, however, one female has no discal setae on II–VI and just one on VII placed laterally. The only available male has the abdomen mounted laterally, and is thus difficult to study.

**Specimens examined.** Holotype female macroptera. **Western Australia**, Kununurra, from *Fimbristylis* (Cyperaceae), 22.ii.2005 (LAM 4553).

Paratypes: 2 females taken with holotype; Kununurra, Ivanhoe, 6 female 1 male from grasses, 24.ii.2005; Kununurra, 1 female from *Sesbania*, 22.ii.2005.

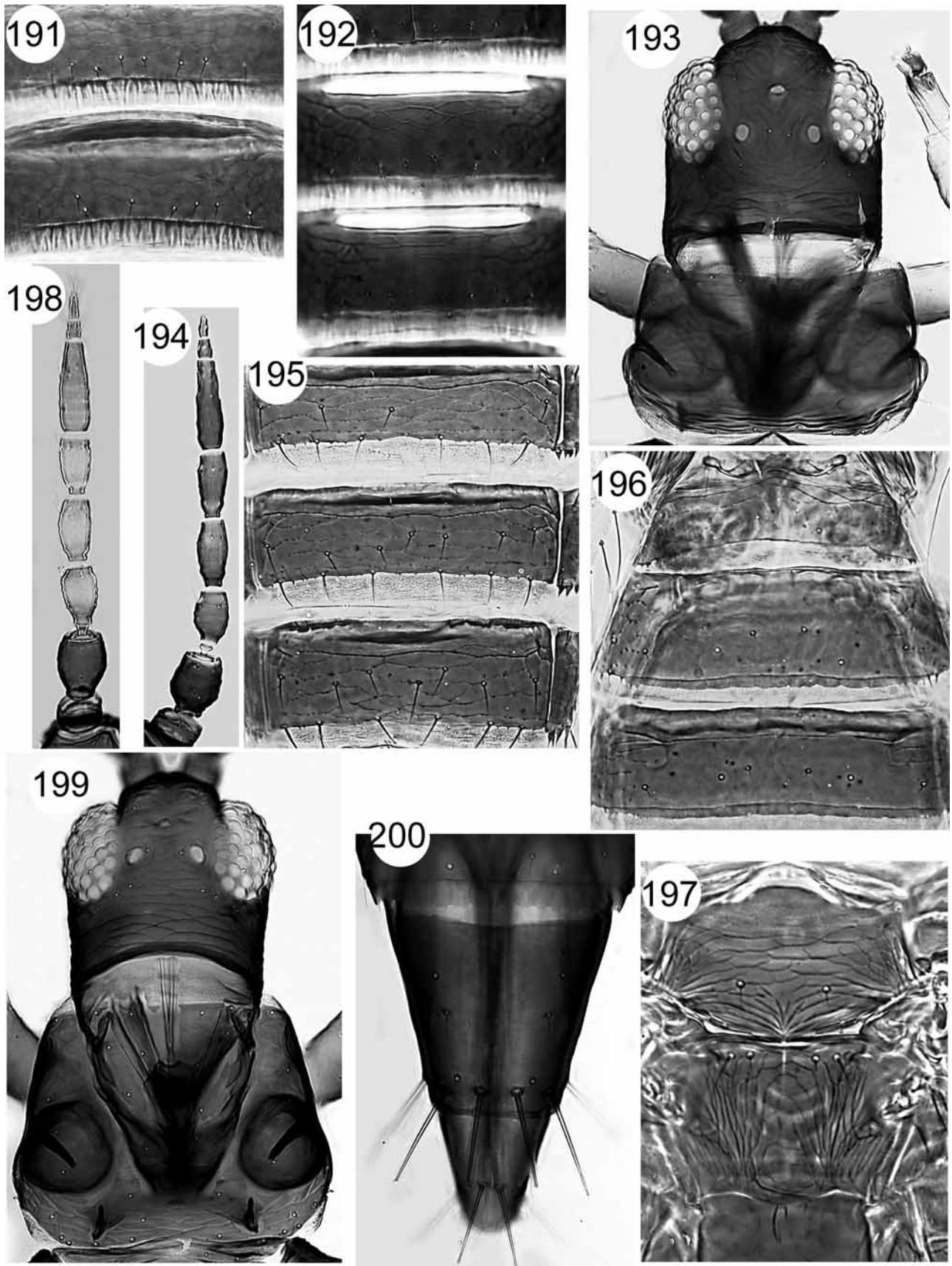
**Comments.** The head is similar to that of *O. fenarius*, but the pronotum is transverse, unlike the trapezoidal condition found in the other species in this genus.

***Ozanaphothrips perotis* sp. n.**  
(Figs 198–204)

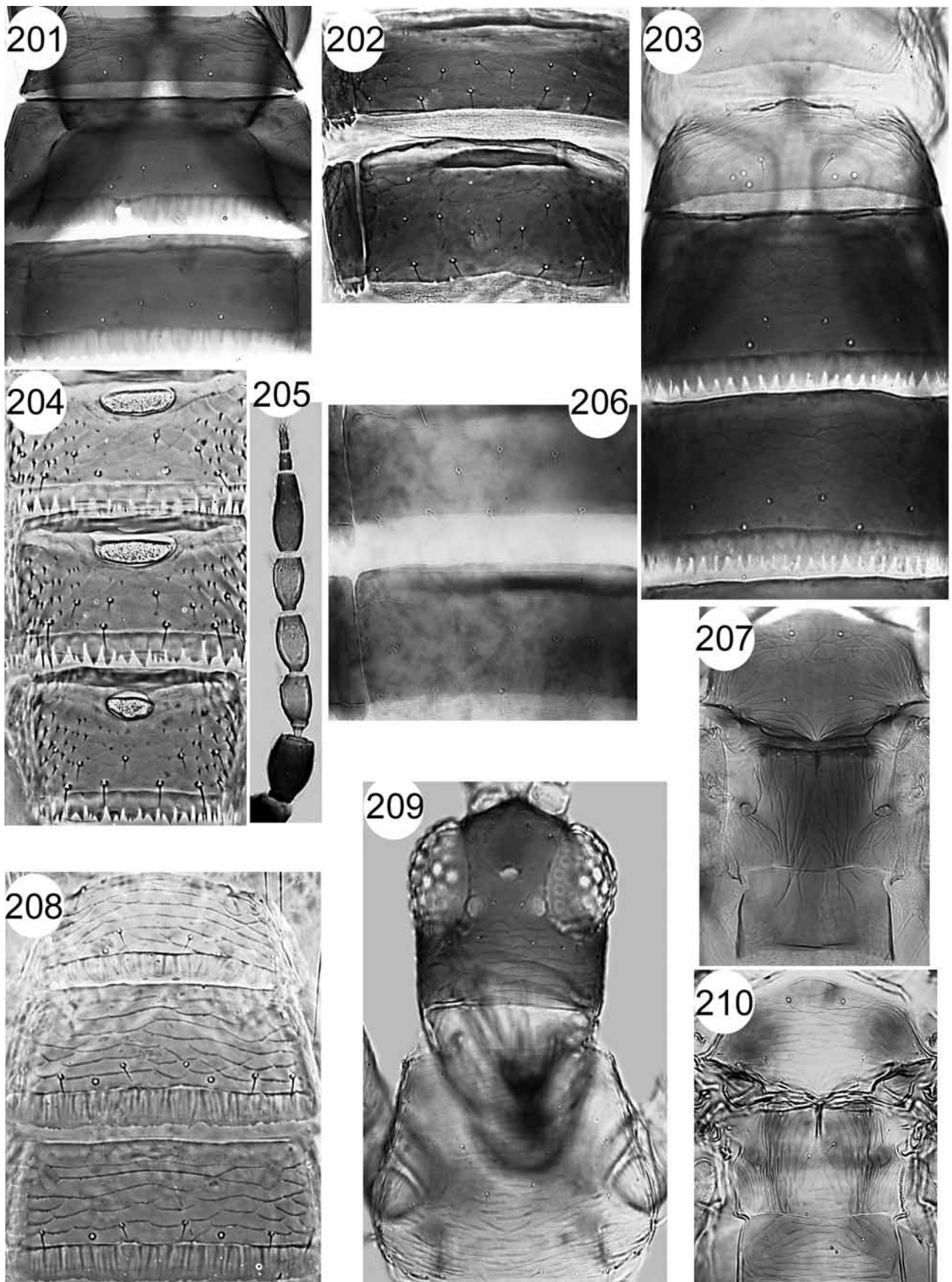
*Female macroptera.* Body and legs light brown, except apices of tibiae and all tarsi yellow; antennal segment I as brown as head, II dark brown, III–V yellow, VI–VIII very light brown (Fig. 198); fore wing weakly shaded particularly on posterior half. Head projecting in front of eyes, with two swellings over base of antennal segment I, fore ocellus reduced (Fig. 199); ocellar setae pair I placed far forward of pair II, sometimes absent, pair III between posterior ocelli; eyes large, cheeks straight. Antennal segment IV with sensorium forked, IV–V with very few microtrichia. Pronotum trapezoidal, weakly sculptured, setae all small. Mesonotum reticulate, median pair of setae not close to posterior margin. Metascutum reticulate, median setae arise medially, no MCS. Mesothoracic sternopleural sutures incomplete at anterior margin; furca with weak spinula. Fore wing first vein with 5 basal and 2 distal setae, second vein with 5 setae; clavus with 3 veinal setae. Abdominal tergite I reticulate, with no craspedum; tergites II–VIII very weakly reticulate medially with broad posteromarginal craspedum bearing many small lobes (Figs 200, 201); campaniform sensilla close to posterior margin; tergite IX MD setae slender but arising medially; tergites IX–X dorsal setae stout and weakly capitate (Fig. 200). Sternites without craspeda, marginal setae arise submarginally, 4 to 10 discal setae in irregular transverse row medially (Fig. 202).

**Measurements** (holotype, in microns). Body length 1400. Head, length 110; width across eyes 125. Pronotum, length 140; maximum width 185. Fore wing, length 700; first vein longest seta in basal row 10. Tergite IV S1 setae 20. Tergite IX, MD setae 20; PM S1 setae 55. Tergite X PM S1 setae 50. Antennal segments III–VIII, 35, 30, 30, 45, 10, 15.

*Female microptera.* Similar to macroptera, ocelli present, wing lobe shorter than median length of mesonotum; mesonotum and metascutum transverse.



**FIGURES 191–200.** *Ozanaphothrips* species. *O. fenarius* 191–192: (191) sternites; (192) male sternites. *O. kununurrai* 193–197: (193) head & pronotum; (194) antenna; (195) sternites IV–VI; (196) tergites I–III; (197) meso & metanotum. *O. perotis* 198–200: (198) antenna; (199) head & prothorax; (200) tergites VIII–X.



**FIGURES 201–210.** *Ozanaphothrips* species. *O. perotis* 201–204: (201) tergites I–III; (202) sternites VI–VII; (203) male tergites; (204) male sternites. *O. thulius* 205–207: (205) antenna; (206) sternites V–VI; (207) meso & metanotum. *O. torridus* 208–210: (208) tergites I–III; (209) head & pronotum; (210) meso & metanotum.

*Male microptera*. Sharply bicoloured; mainly yellow, abdominal segments II–III dark brown, IV lighter brown around anterior and lateral margins; head shaded with brown laterally and at anterior margin; antennal segment I brown, II dark brown, III–V yellow, VI–VIII light brown. Head and pronotum similar to female; abdominal tergites II–VIII with craspeda deeply lobed (Fig. 203); tergite IX median setae small and far apart, two pairs of stout posterolateral setae; sternites III–VIII with increasingly smaller transversely oval pore plates close to antecostal ridge, lateral discal areas of sternites with many stout microtrichia (Fig. 204).

**Specimens examined.** Holotype female macroptera. **Western Australia**, 20km east of Broome, from *Perotis rara* (Poaceae), 1.iii.2005 (LAM 4650).

Paratypes: 2 female macropterae, 5 female 2 male apterae taken with holotype; **Western Australia**, Broome, 1 female macroptera, lawn grass, 28.ii.2005; Kununurra, 1 female aptera, *Echinochloa* (Poaceae), 22.ii.2005, 1 female macroptera, from grass, 24.ii.2005, 1 female without data, i.1991. **Northern Territory**, Darwin, Holmes Jungle, 1 female 1 male apterae, grasses, 2.i.1996.

**Comments.** The head, pronotum and fore wings are similar to those of *O. fenarius*, but the sternites lack craspeda and the metascutum lacks campaniform sensilla.

### ***Ozanaphothrips thulius* sp. n.**

(Figs 205–207)

*Female macroptera*. Body and legs brown, all tarsi and apices of tibiae yellow; antennal segment I brown, II dark brown, III–V yellow with base and apex weakly shaded (Fig. 205), VI–VIII light brown; fore wings weakly shaded. Head with anterior part of vertex slightly swollen, fore ocellus reduced; ocellar setae pairs I and II close together, pair III between posterior ocelli; eyes large, cheeks straight. Antennal segment IV with sensorium forked, IV–V with very few microtrichia. Pronotum trapezoidal, weakly sculptured around margins, setae small but posteromarginal pair S8 at least twice as long as pair I. Mesonotum weakly reticulate, median pair of setae distant from posterior margin. Metascutum with irregular longitudinal reticulation (Fig. 207), median setae arise at anterior margin, no MCS. Mesothoracic sternopleural sutures apparently complete at anterior margin; furca with weak spinula. Fore wing first vein with 7 basal and 2 distal setae, second vein with 5 setae; clavus with 5 veinal setae. Abdominal tergite I reticulate, with no craspedum; tergites II–VIII with little sculpture medially, broad posteromarginal craspedum entire or slightly dentate; campaniform sensilla twice their diameter from posterior margin; tergite IX MD setae moderately long, marginal setae long and slender. Sternites without craspeda, marginal setae arise at margin, 4 to 10 discal setae in irregular transverse row medially (Fig. 206).

**Measurements** (holotype, in microns). Body length 1480. Head, length 105; width across eyes 120. Pronotum, length 150; maximum width 175. Fore wing, length 740; first vein longest seta in basal row 15. Tergite IV S1 setae 10. Tergite IX, MD setae 25; PM S1 setae 90. Tergite X PM S1 setae 60. Antennal segments III–VIII, 35, 30, 27, 45, 10, 15.

**Specimens examined.** Holotype female macroptera. **Northern Territory**, Darwin, Holmes Jungle, from grasses, 20.xii.1995 (LAM 3071).

Paratypes: 3 females taken with holotype.

**Comments.** Although very similar to *A. perotis* and *A. fenarius* in many character states, including the form of the head and pronotum, the metascutal sculpture and the position of the sternal marginal setae are very different.

### ***Ozanaphothrips torridus* sp. n.**

(Figs 208–210)

*Female macroptera*. Bicoloured, body and legs mainly yellow, head, pterothorax and abdominal segments VIII–X light brown, pronotum with faint brown markings; antennal segments II and VI–VIII brown; fore



wings pale to very weakly shaded. Head projecting slightly in front of eyes (Fig. 209), vertex scarcely swollen over base of antennal segment I; fore ocellus reduced; ocellar setae pair I slightly anterior to II, pair III close together between posterior ocelli; eyes large, cheeks straight. Antennal segment IV with simple sensorium, IV–V with few weak microtrichia; pedicel of III slightly swollen. Pronotum trapezoidal, with transverse sculptured lines, discal setae small; 6 posteromarginal setae, pair S8 twice as long as minor setae. Mesonotum with sculptured lines, median pair of setae wide apart and distant from posterior margin. Metascutum weakly reticulate medially (Fig. 210), median setae arise medially, no MCS; metascutellum with sculpture and pair of setae. Mesothoracic furca without spinula. Fore wing first vein with 7 setae on basal half and 2 setae distally, second vein with 5 setae; clavus with 5 veinal setae. Abdominal tergites fully reticulate, I–VIII with broad craspedum (Fig. 208); campaniform sensilla close to posterior margin; tergite IX MD setae long. Sternites without craspeda, marginal setae arise at margin, including S1 on VII; 2 discal setae on sternite II, 3 setae on III, increasing to about 10 on VII.

**Measurements** (holotype, in microns). Body length 1280. Head, length 110; width across eyes 110. Pronotum, length 150; maximum width 160. Fore wing, length 640; first vein longest seta in basal row 20. Tergite IV S1 setae 10. Tergite IX, MD setae 50; PM S1 setae 85. Tergite X PM S1 setae 85. Antennal segments III–VIII, 30, 27, 27, 45, 10, 10.

*Female microptera*. Similar in colour and sculpture to macroptera; head without ocelli; fore wing lobe shorter than median length of mesonotum; mesonotum transverse, reticulate, median pair of setae distant from posterior margin, with two pairs of campaniform sensilla; metascutum weakly reticulate, with 4 setae medially, no MCS.

**Specimens examined**. Holotype female macroptera. **Northern Territory**, Darwin, Humpty Doo, from *Callitris intratropica*, 15.v.1999 (LAM 3707).

Paratypes: Three female macropterae taken with holotype. **Western Australia**, 150km south of Broome, one female microptera from *Cenchrus echinatus* (Poaceae), 3.iii.2005.

**Comments**. Although the macropterae were taken from *Callitris* trees, this thrips probably breeds on grasses or sedges. In most details of its structure it resembles *O. perotis*, although the sternal marginal setae arise on the margins of these sclerites. However, there are undescribed species of Thripinae on grasses in northern Australia that are also closely similar in structure, but have two pairs of prominent pronotal posteroangular setae. The microptera of *O. torridus* is interesting in that despite the lack of ocelli a very small wing lobe is present, in contrast to the apterae of two species described above. One further macropterous female that possibly represents this species has been seen from Bowen, **Queensland** (in QDPI, Brisbane).

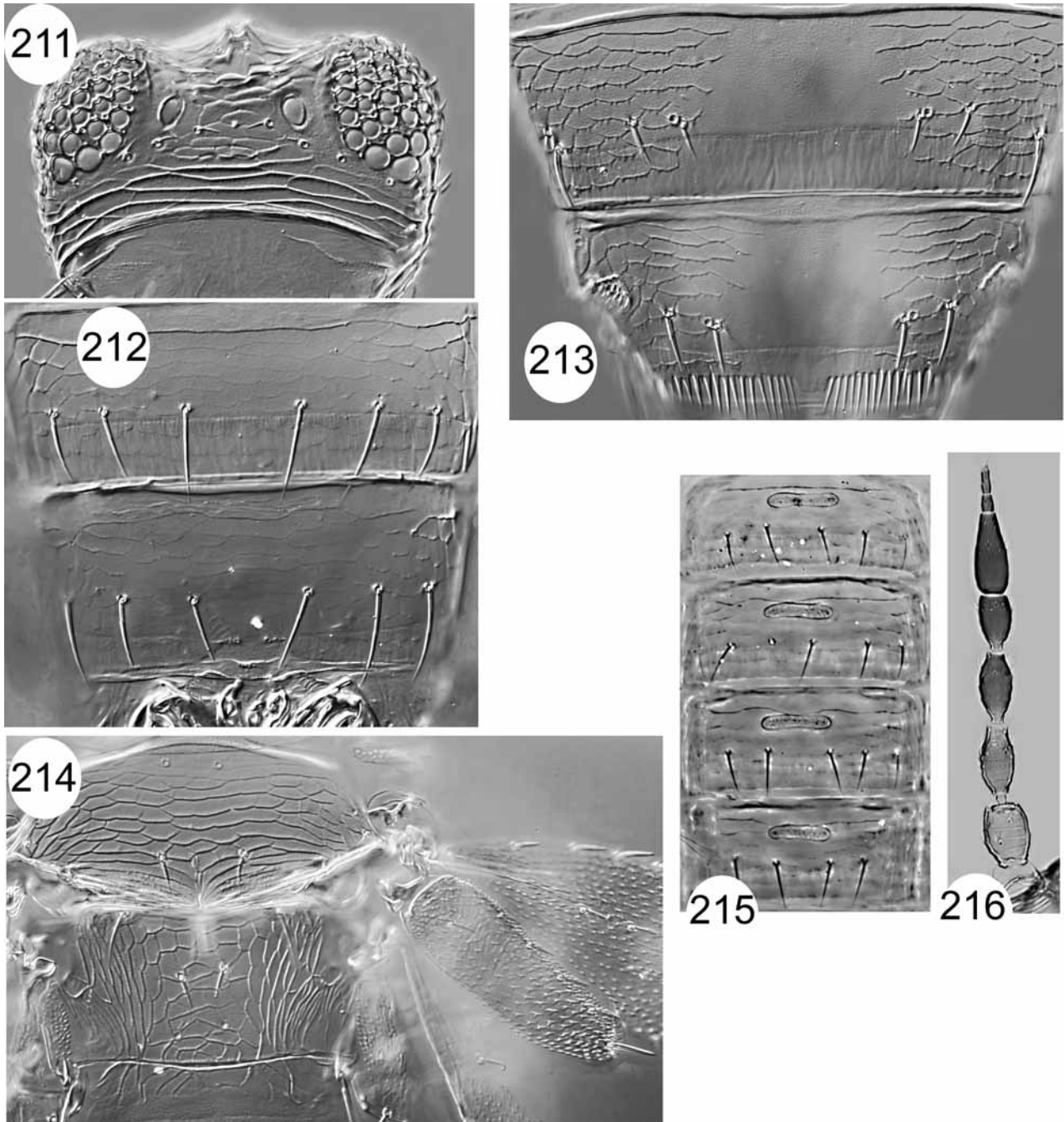
### ***Pandorathrips* gen. n.**

**Diagnosis**. Macropterous; antennae 8-segmented (Fig. 216), III–IV with apex constricted, sensoria forked; microtrichia present on III–V. Head wider than long, slightly depressed in front of ocelli, cheeks shorter than compound eyes; eyes without pigmented facets; ocellar setae III outside triangle, lateral or posterolateral to fore ocellus. Pronotum transverse, with no long setae. Mesonotum with paired campaniform sensilla present anteromedially. Metascutum reticulate, MCS present; median pair of setae far from anterior margin. Prosternal ferna entire; basantra without setae; mesothoracic sternopleural sutures complete, furca with weak spinula. Metapre-episternum transverse. Fore wing with costal setae short; first and second veins with setal rows irregular; clavus with 5 veinal and 1 discal setae (Fig. 214). Tergites II–VIII median setae wide apart, close to campaniform sensilla; tergites VI–VII setae S3 much smaller than S4; tergite I with very narrow craspedum, II–VII with broad craspedum, VIII with fine posteromarginal comb arising from broad craspedum but comb interrupted at middle (Fig. 213); tergite IX with two pairs of campaniform sensilla, MD setae long and arising medially; X short with longitudinal split. Sternites without discal setae; II–VI with broad craspedum, VII with craspedum absent medially (Fig. 212), all setae in front of posterior margin. Male sternites III–VII each with a small transverse pore plate (Fig. 215).



Type species *Pandorathrips ascius* **sp. n.**

**Comments.** The only species placed in this new genus differs from all *Anaphothrips* species in having tergal craspeda, and also in having one discal seta on the fore wing clavus. It differs from similar looking Neotropical anaphothripines, such as *Desertathrips* De Borbon and *Ameranothrips* Mound & Marullo, in having males with typical pore plates on several sternites. The form of the posteromarginal comb on the ninth tergite is almost unique, although similar to that of *Lomatothrips paryphis* from New Zealand (Mound & Walker, 1982: Fig. 203). However, the genus *Lomatothrips*, despite the presence of tergal craspeda, is considered to be closely related to the *Frankliniella* genus group (Mound, 2006).



**FIGURES 211–216.** *Pandorathrips*. (211) head; (212) sternites VI–VII; (213) tergites VII–VIII; (214) meso & metanotum with clavus; (215) male sternites; (216) antenna.

***Pandorathrips ascius* sp. n.**

(Figs 211–216)

*Female macroptera.* Body and legs brownish yellow, pronotum with brown area medially; antennal segments I–III pale, VI–VIII brown; fore wings pale but very weakly shaded in basal half. Pronotum with transverse anastomosing striae. Mesonotum with transverse anastomosing striae; median pair of setae far from posterior margin. Fore wing with costal setae short; first vein with 7 setae near base, 1 seta at middle, 2 setae near apex; second vein with about 9 setae.

**Measurements** (holotype, in microns). Body length 1050. Head, length 70; width across eyes 140. Pronotum, length 110; maximum width 165. Fore wing, length 480; first vein longest seta in basal row 13. Tergite IV S1 setae 10. Tergite IX, MD setae 35; PM S1 setae 45. Tergite X PM S1 setae 50. Antennal segments III–VIII, 37, 30, 27, 37, 10, 15.

*Male macroptera.* Similar to female, including comb on tergite VIII; tergite IX with 4 slender setae.

**Specimens examined.** Holotype female macroptera, **New South Wales**, Jamberoo Mt Road [15km west of Kiama], from *Pandorea* vine young leaves, 3.xi.2002 (LAM 4210).

Paratypes: 14 females 4 males, taken with holotype; same locality and date, 1 female 2 males, from *Morinda* vines, 1 female from *Cissus antarctica*; Taree, Breakneck Hill, 13 females 2 males from *Indigofera*, 14.iv.2002. **Queensland**, Brisbane, Indooroopilly, 1 female, 27.ix.1998; Mt Glorious, 1 female from *Cyathea* frond, 13.x.2006; Lamington, O'Reilly's, 2 females from *Solanum* flowers, 11.x.2006. **Northern Territory**, Standley Chasm, 5 females 3 males from *Pandorea doratoxylon* vine, 31.x and 1.xi.1999; Jabiru, 16 females 2 males from *Livistona humilis* flowers, 22.xii.1996.

**Comments.** This species appears to be associated with leaves of various vines in the genus *Pandorea* (Bignoniaceae).

### **Acknowledgements and type depositaries**

The holotypes of new species described in this paper are in the Australian National Insect Collection, CSIRO Entomology, Canberra. Paratypes, where available, will be deposited in the Natural History Museum, London, the Forschungsinstitut Senckenberg, Frankfurt, and the Yokohama Plant Protection Station, Yokohama, Japan. A study visit to Canberra by M. Masumoto was kindly facilitated by staff of Plant Protection Division of MAFF, and the colleagues and Head of Yokohama Plant Protection Station. We are grateful to the many entomologists in Australia who have provided support during these and other studies, in particular staff at the Queensland Museum, Brisbane, and the QDPI insect collections, Indooroopilly. Northern Australian Quarantine Service facilitated field studies in remote areas of northern and northwestern Australia. Alice Wells provided extensive assistance with field studies and the identification of host plants. CSIRO Entomology provided research space at the Australian National Insect Collection, Canberra. The photomicrographs were produced using the image processing software Automontage, mostly with a phase contrast Nikon microscope, although a few with a Leica D.I.C.(Nomarski) illumination system that produces a cleaner edge to images.

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**Table 1. Putative host-associations among Australian species of the *Anaphothrips* genus-group**

**APOCYNACEAE**

*Parsonsia straminea*  
*Anaphothrips parsonsiae*

**ASTERACEAE**

*Cassinia* spp.  
*Anaphothrips ambiguus*  
*Anaphothrips aptilotus*  
*Anaphothrips walchae*

*Helichrysum diosmifolium*  
*Anaphothrips walcha*

*Xerochrysum bracteatum*  
*Anaphothrips dubius*

**BIGNONIACEAE**

*Pandorea* spp.  
*Pandorathrips ascius*

**CHENOPODIACEAE**

*Atriplex paludosa*  
*Anaphothrips atriplicis*

*Rhagodia parabolica*  
*Anaphothrips glenysiae*

**CYPERACEAE**

*Fimbristylis* sp.  
*Ozanaphothrips kununurrai*

**DILLENIACEAE**

*Hibbertia scandens*  
*Anaphothrips gillespiei*

**ERICACEAE**

*Astroloma styphelioides*  
*Anaphothrips astrolomi*  
*Leucopogon* sp.  
*Anaphothrips epacrida*  
*Monotoca elliptica*  
*Anaphothrips epacrida*

**FABACEAE**

*Pultenaea procumbens*  
*Pultenaea subspicata*  
*Anaphothrips pultenaeae*

**HAEMODORACEAE**

*Anigozanthos* spp.  
*Conostylus* spp.  
*Anaphothrips occidentalis*

**LAMIACEAE**

*Westringia fruticosa*  
*Anaphothrips westringiae*

**LILIACEAE**

*Dianella coerulea*  
*Anaphothrips carlylei*

**MYOPORACEAE**

*Eremophila* spp.  
*Myoporum* spp.  
*Anaphothrips augustae*  
*Anaphothrips cobari*  
*Anaphothrips eremophilae*  
*Anaphothrips yalgooi*

**ORCHIDACEAE**

*Prasophyllum affine*  
*Anaphothrips orchis*

**POACEAE**

*Anaphothrips chortinus*  
*Anaphothrips dalbyi*  
*Anaphothrips incertus*  
*Anaphothrips moundi*  
*Anaphothrips obscurus*  
*Anaphothrips sudanensis*  
*Anaphothrips swezeyi*  
*Anaphothrips varii*  
*Anaphothrips woodi*  
*Ozanaphothrips condominei*  
*Ozanaphothrips fenarius*  
*Ozanaphothrips perotis*  
*Ozanaphothrips thulius*  
*Ozanaphothrips torridus*

**PITTOSPORACEAE**

*Bursaria spinosa*  
*Anaphothrips cucurbiti*  
*Anaphothrips monga*

**RUTACEAE**

*Geleznovia verrucosa*  
*Anaphothrips geleznoviae*

**SANTALACEAE**

*Exocarpos* spp.  
*Anaphothrips exocarpi*  
*Anaphothrips exocarpoidea*

**SAPINDACEAE**

*Dodonaea viscosa*  
*Dodonaeathrips eremiae*

**SOLANACEAE**

*Lycium ferossissimum*  
*Duboisia* sp.  
*Anaphothrips cecili*

**Table 2. Australian *Anaphothrips* with sternal pore plates in males.**

A: males with C-shaped pore plates

B: males with pore plates not C-shaped

C: males with pore plate(s) only on sternite III

D: males without pore plates

E: males not known

| A                   | B                | C                  | D                | E                   |
|---------------------|------------------|--------------------|------------------|---------------------|
| <i>astrolomi</i>    | <i>callani</i>   | <i>augustae</i>    | <i>ambiguus</i>  | <i>exocarpoides</i> |
| <i>atriplicis</i>   | <i>cucurbiti</i> | <i>barringtoni</i> | <i>aptilotus</i> | <i>geijerae</i>     |
| <i>carlylei</i>     | <i>newmani</i>   | <i>barrowi</i>     | <i>dalbyi</i>    | <i>keatsi</i>       |
| <i>cecili</i>       | <i>woodi</i>     | <i>cobari</i>      | <i>glenysae</i>  | <i>nimbus</i>       |
| <i>chortinus</i>    |                  | <i>eremophilae</i> | <i>walchae</i>   | <i>obscurus</i>     |
| <i>desleyae</i>     |                  |                    | <i>yalgooi</i>   | <i>orchis</i>       |
| <i>dubius</i>       |                  |                    |                  | <i>varii</i>        |
| <i>epacrida</i>     |                  |                    |                  | <i>whyalla</i>      |
| <i>exocarpi</i>     |                  |                    |                  |                     |
| <i>geleznowiae</i>  |                  |                    |                  |                     |
| <i>gillespiei</i>   |                  |                    |                  |                     |
| <i>incertus</i>     |                  |                    |                  |                     |
| <i>monga</i>        |                  |                    |                  |                     |
| <i>moundi</i>       |                  |                    |                  |                     |
| <i>occidentalis</i> |                  |                    |                  |                     |
| <i>parsonsiae</i>   |                  |                    |                  |                     |
| <i>pultenaeae</i>   |                  |                    |                  |                     |
| <i>sudanensis</i>   |                  |                    |                  |                     |
| <i>swezeyi</i>      |                  |                    |                  |                     |
| <i>westringiae</i>  |                  |                    |                  |                     |