



The genus *Liothrips* (Thysanoptera, Phlaeothripidae) in Australia

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Abstract

Eight species of *Liothrips* are recognised from Australia, including *L. burwelli* sp.n., *L. chionanthes* sp.n. and *L. timonii* sp.n., also three species shared with southeast Asia. Evidence is presented that *L. vaneeckeii*, the Lily Bulb Thrips, is widespread in eastern Australia presumably on native plants, and that it has been on this continent for many years. The illustrated identification key includes a ninth species, *L. urichi*, as a potential introduction to Australia for biocontrol purposes. *L. brevifemur* Girault is considered a *nomen dubium* known only from fragments of the unique holotype. Two species are newly transferred from *Liothrips* as *Teuchothrips soror* (Hood) **comb. nov.** and *Kellyia tenuis* (Hood) **comb. nov.** Generic relationships are discussed, particularly with one new species that is intermediate in structure between *Liothrips* and *Gynaikothrips*.

Key words: host plants, identification key, new combinations, new species

Introduction

Across much of the world, but particularly in the tropics, there is a major group of Thysanoptera - Phlaeothripinae living on leaves, and this has been referred to as the “*Liothrips*-lineage”. This group is one of three major segregates within the subfamily Phlaeothripinae, the others being the “*Phlaeothrips*-lineage” of mainly fungus-feeding species, and the “*Haplothrips*-lineage” of mainly flower-living species (Mound & Marullo 1996). These lineages are not distinguished as phylogenetic entities, although *Haplothrips* and related genera are currently considered as the Haplothripini (Mound & Minaei 2007). The genus *Liothrips* is the second most species rich genus of Thysanoptera, with over 270 species listed (ThripsWiki 2023). However, most of these are from tropical areas, with at least 150 described from tropical Asia, about 40 from the Neotropics and 20 from Africa. In contrast, only about 30 are from the Nearctic and 10 from the Palearctic. Unfortunately, the only area from which there is a modern and reliable faunal analysis of this genus is Japan. Okajima (2006) recognised 24 *Liothrips* species from that country, of which six were from the tropical Ryukyu Islands with the remainder from Honshu. It is thus clear that this genus of primarily leaf-feeding species has significantly diversified in tropical areas, presumably in association with the diversity of available host plants.

Liothrips-lineage in Australia

Across much of Australia, leaf-feeding Phlaeothripinae of the *Liothrips* lineage are represented by several genera that are presumably endemic to this continent. In the arid zone there is a remarkable radiation associated with the leaf-like phyllodes of the many endemic *Acacia* species (Crespi *et al.* 2004), including *Akainothrips*, *Katothrips*, *Kellyia* and *Kladothrips*, together with a few even more structurally divergent taxa. In the more mesic habitats,

particularly of the Eastern forests the leaf-feeding habitat is occupied by a series of species that are referred to the genus *Teuchothrips*, many of which remain undescribed. This appears to represent an endemic radiation out of *Liothrips* ancestors, although the two genera currently remain weakly diagnosed (Mound 2008). However, the genus *Liothrips* is here interpreted in the sense of Okajima (2006) as including only those species that lack a fore tarsal tooth in both sexes. As a result, *Liothrips soror* (Hood 1918), that remains known only from a single female bearing a fore tarsal tooth and taken in northern Queensland, is here recognised as *Teuchothrips soror* (Hood) **comb. n.** A further Australian species based only on a single female, *Liothrips tenuis* Hood, is here recognised as *Kellyia tenuis* (Hood) **comb. n.** Moreover, *L. brevifemur* Girault, was based on a single specimen of which only a few broken fragments remain on the type slide (Fig. 37), and this is here considered a *nomen dubium*.

In a recent introduction to the Phlaeothripidae genera of Australia (Mound & Tree 2022) eight species were listed in the genus *Liothrips*. Of the seven species remaining after the removal of *L. soror*, two are known only from single specimens, and as a result, nothing is known of the biology or host plants of *brevifemur* or *tenuis*. In contrast, three new species are described below each based on colonies of specimens taken on plant species known to be widespread in northern Australia, *Chionanthes* spp, *Timonius timon* and *Mallotus philippinensis*. Moreover, three species are known to be widespread in tropical Asia, two inducing leaf-roll galls on *Piper* species and one living in association with *Gynaikothrips* galls on *Ficus* species. The final species has been known as a minor pest forming colonies under the bracts of bulbs of *Lilium* species, but it is here recorded widely in eastern Australia in native forest areas. The objective is to provide an identification system to the eight species of *Liothrips* now known from Australia, together with *L. urichi* that is not established here but has the potential for introduction to Australia for biocontrol purposes of a weedy plant.

Acknowledgements and abbreviations

We are particularly grateful to Prof. Elison Lima of Federal University of Piauí, Brazil, for Figures 41–46 of the holotype of *Liothrips tenuis* Hood, also to Karin Koch for organising the loan of Girault type slides from the Queensland Museum. The following abbreviations are used for pronotal setae: aa—anteroangular; am—anteromarginal; ml—midlateral; epim—epimeral; pa—posteroangular. Setae S1 is the pair of setae on tergite IX closest to the midline. ANIC—Australian National Insect Collection, CSIRO, Canberra. QDPC—Queensland Primary Industries Insect Collection, Department of Agriculture and Fisheries, Brisbane.

Liothrips Uzel

Liothrips Uzel, 1895: 261. Type species *Phloeothrips setinodis* Reuter, by subsequent designation of Hood, 1918: 131.

This genus was erected originally for two species, both from Europe, of which the first was subsequently recognised as a synonym of the second (ThripsWiki 2023). The 270 species currently listed in the genus are remarkably uniform in body structure, although it remains doubtful that they constitute a single phylogenetic lineage. The uniformity of structure has so far defeated attempts to recognise sub-lineages amongst *Liothrips* species, although ThripsWiki (2023) still lists the inadequately diagnosed subgenus *Zopyrothrips*. However, several small genera are recognised in Asia that presumably have evolved out of this larger group, and two of these, *Gynaikothrips* and *Litotetothrips* (Dang *et al.* 2014), are found in the warmer parts of Australia.

Generic diagnosis: Medium sized, usually dark, macropterous Phlaeothripinae. Antennae 8-segmented, III with one sense cone, IV usually with 3 major sense cones (rarely only 2). Head usually longer than wide, usually striate but sometimes weakly reticulate; with one pair of long postocular setae (rarely 2 or 0); eyes large; maxillary stylets retracted to eyes or only halfway to postocular setae, close together or wide apart. Pronotum with 5 pairs of major setae (anteromarginal pair sometimes reduced), notopleural sutures complete; basantra absent, ferna large, mesopresternum transverse or divided into two triangles; metathoracic sternopleural sutures usually well developed. Fore tarsal tooth absent in both sexes; fore wing not constricted medially, with many duplicated cilia. Pelta triangular, tergites II–VII each with 2 pairs of sigmoid wing-retaining setae; IX with setae S1 and S2 usually long and pointed; tube usually shorter than head. Male sternite VIII usually with large pore plate; tergite IX usually with setae S2 shorter than setae S1.

Key to *Liothrips* species of Australia

(Excluding the *nomen dubium* *Liothrips brevifemur* Girault)

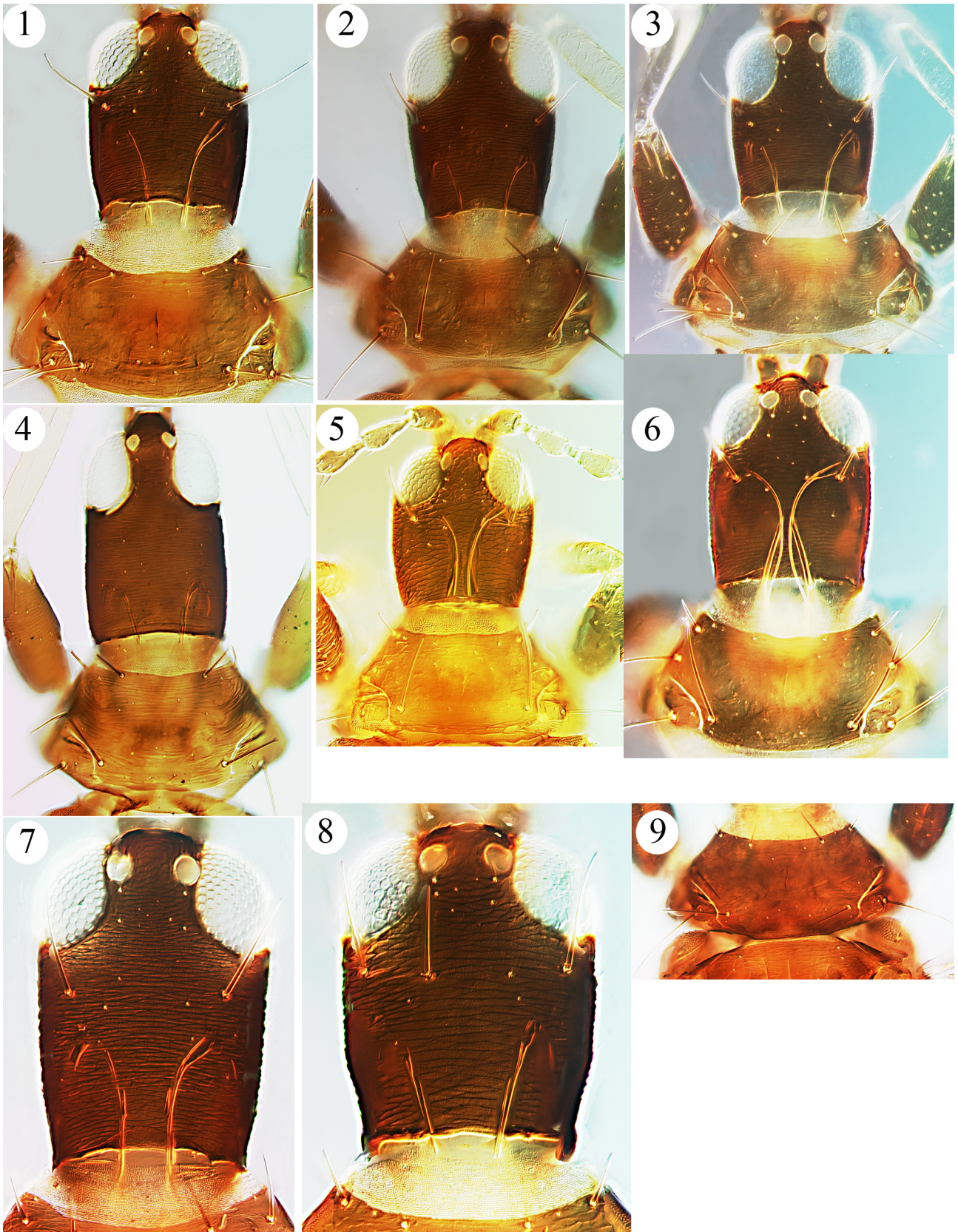
1. Postocular setae not developed (Fig. 4) [mid and hind tibiae yellow with brown on basal third (Fig. 33); metanotum with very closely spaced longitudinal striae; mesopresternum transverse and complete] [in leaf galls on *Timonius*] *timonii* sp.n.
-. Postocular setae well-developed and long 2
2. Mid and hind tibiae yellow, with no more than weak shading near base [metanotum with very closely spaced longitudinal striae (Fig. 20); mesopresternum transverse and complete] [in leaf galls on *Piper* spp]. *pallipes*
-. Mid and hind tibiae brown, or bicoloured with up to distal half yellow 3
3. Maxillary stylets retracted to eyes or to postocular setae, close together medially in head their separation 0.1–0.2 of head width (Figs 5, 6) 4
-. Maxillary stylets not retracted to postocular setae, their separation at least 0.25 of head width (Figs 1–3) 5
4. All tarsi yellow, mid and hind tibiae yellow on distal fifth or more; pronotal major setae dark brown; fore wing extensively shaded brown with dark median longitudinal line, sharply paler sub-basally; metanotal sculpture narrowly reticulate to almost striate (Fig. 25); mouth cone not extending beyond prosternal ferna [on bulbs of *Lilium*] *vaneeckei*
-. Mid and hind tarsi brown, mid and hind tibiae uniformly brown; pronotal major setae pale to weakly shaded; fore wing pale or weakly shaded; metanotal sculpture broadly reticulate (Fig. 24); mouth cone pointed, extending beyond prosternal ferna (on *Miconia crenata*) *urichi*
5. Tergite II close to lateral margin with irregular row of 8–12 discal setae in female (Fig. 32), fewer in male [leaf gall invader on *Ficus* spp.] *takahashii*
-. Tergite II close to lateral margin with irregular row of 3–7 discal setae in female, sometimes none in male (Figs 33–35) 6
6. Antennal segments III–VI evenly and increasingly light brown, not paler at their bases (Fig. 10); antennal segments V–VI sharply constricted to basal neck; mouth cone long and pointed; with 2 pairs of epimeral setae [head slightly longer than tube] [leaves of *Mallotus philippinensis*] *burwelli* sp.n.
-. Antennal segments III–VI largely yellow but with apices increasingly shaded; antennal segments V–VI evenly narrowing to basal neck; mouth cone rounded; with one pair of epimeral setae 7
7. Fore tibiae clear yellow; antennal segment VI entirely yellow; metanotal reticles narrow, almost striate (Fig. 17) [in leaf galls on *Piper* spp] *chavicae*
-. Fore tibiae shaded more or less; antennal segment VI brown on apical half; metanotal reticles relatively broad but longer than wide (Figs 18, 23). 8
8. Metanotal median pair of setae well-developed, about as long as mesonotal lateral pair of setae (Fig. 23); tergite IX setae as long or longer than tube; pronotal am setae well-developed, 0.5 as long as epimeral setae (Fig. 9) [leaves of rainforest tree] *umbratus*
-. Metanotal median pair of setae minute, much smaller than mesonotal lateral pair of setae (Fig. 18); tergite IX setae S1 shorter than tube; pronotal am setae usually minute, less than 0.2 as long as epimeral setae (Fig. 29) [leaves of *Chionanthus*] *chionanthes* sp.n.

Liothrips brevifemur Girault *nomen dubium*

(Fig. 40)

Liothrips brevifemur Girault, 1928: 2

The single specimen on which this name is based was taken from the flowers of *Phaseolus semierectus* at Alderley, Brisbane, Queensland, 29.xii.1927 (in Queensland Museum, Brisbane). The specimen is crushed and largely destroyed under the edge of the coverslip of Girault's type slide (Fig. 37). The original description states "bristles pale, very short, funnel shaped", and this character state does not occur in any species of *Liothrips*. The rest of the five-line description includes no details that can be satisfactorily matched to any genus of Phlaeothripid in the area. The remaining specimens on the slide are all *Megalurothrips usitatus* [Thripidae]. Thus the name *brevifemur* Girault cannot be associated with any known species.



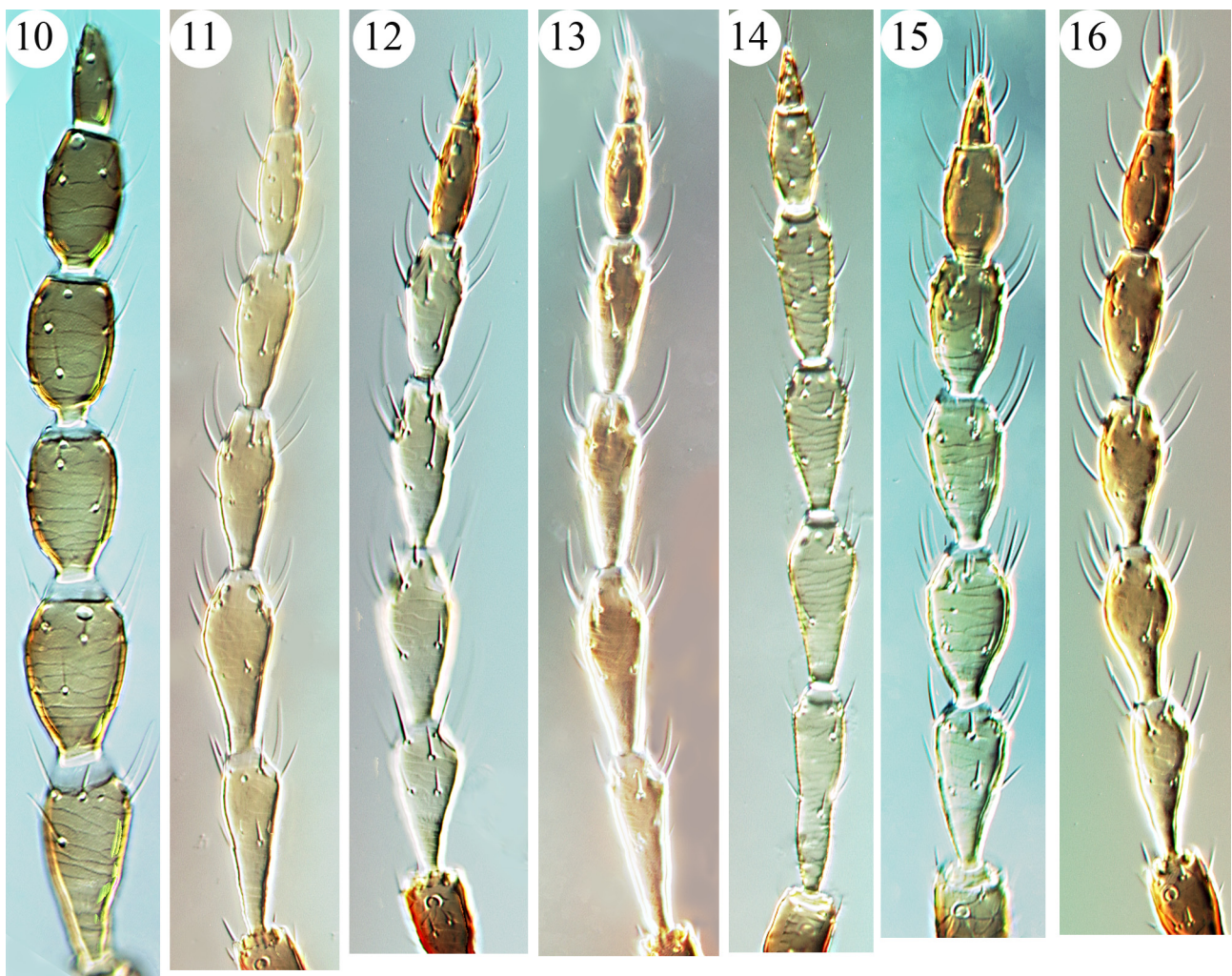
FIGURES 1–9. Australian *Liothrips* heads. (1) *burwelli*; (2) *chavicae*; (3) *pallipes*; (4) *timonii*; (5) *urichi*; (6) *vaneeckeii*; (7) *takahashi*; (8) *umbratus*. (9) Pronotum of *umbratus*.

Liothrips burwelli sp.n.

(Figs 1, 10, 19, 26, 30)

Macropterous female. Body and legs dark brown, except fore tibiae and tarsi brownish-yellow, mid and hind tarsi slightly paler; antennae yellowish brown, segment II yellow largely with brown base and margins, III almost clear yellow, IV–VIII increasingly from light brown to brown; major setae brown; fore wing brownish with brown area around sub-basal setae.

Head about 1.18 times longer than width just behind eyes, slightly narrowed to base (Fig. 1); ocellar region subconical, posterior ocelli close to inner margin of eyes; eyes more than one-third as long as head; postocular setae acute at apex, longer than eye length; maxillary stylets not retracted to postocular setae, medially about 0.3 of head width apart; mouth cone long and pointed. Antennae relatively short (Fig. 10), segment III 1.6 times as long as wide, III with one sense-cone, IV with three; IV–VI sharply constricted at basal neck; segment VIII shorter than VII, not constricted at base. Pronotum almost smooth, with five pairs of major acute setae, anteromarginals developed but shorter than anteroangulars, epimerals the longest, about as long as posteroangulars, a pair of accessory epimeral setae well-developed, slightly shorter than epimerals (Fig. 1). Ferna wide apart, mesopresternum narrowly boat-shaped, eroded medially (Fig. 26); metathoracic sternopleural sutures developed. Metanotum longitudinally reticulate medially (Fig. 19), median setae slender. Fore wing parallel sided, with 12 duplicated cilia, three sub-basal setae slightly blunt at apex. Pelta reticulate, broadly triangular, with pair of campaniform sensilla (Fig. 30); tergites II–VII with two pairs of sigmoid wing-retaining setae (Fig. 30); tergal lateral setae all acute; tergite IX setae S1 and S2 pointed at apex, longer than tube, S3 about as long as tube. Tube slightly shorter than head, anal setae shorter than tube.



FIGURES 10–16. Australian *Liothrips* antennae. (10) *burwelli*; (11) *chavicae*; (12) *pallipes*; (13) *takahashi*; (14) *timonii*; (15) *umbratus*; (16) *vaneeckeii*.

Measurements (holotype female in microns): Body length 2650. Head, length (median width) 250 (210); postocular setae 120. Pronotum, length (median width) 165 (290); major setae—am 35, aa 55, ml 60, epim 150, accessory epim 100, pa 160. Fore wing length 1070; sub-basal setae 90, 85, 85. Tergite IX setae S1 235, S2 225. Tube, length 225; basal width 95; apical width 50. Antennal segments III–VIII, length (width) 75(35), 70(40), 60(35), 65(35), 55(30), 40(15).

Male macroptera. Similar to female, but smaller; pronotal accessorial epimeral setae minute on the right side; fore tarsal tooth absent; tergite IX setae S1 and S3 longer than tube, S2 less than half of S1 in length, with apex acute; sternite VIII anteromedially with small, irregular and poorly defined pore plate, or with no pore plate visible.

Measurements (paratype male in microns): Body length 2300. Head, length (median width) 240 (180); postocular setae 100. Pronotum, length (median width) 150 (260); major setae—am 15, aa 35, ml 45, epim 145, accessory epim 55, pa broken. Fore wing length 920; sub-basal setae 60, 75, 75. Tergite IX setae S1 200, S2 70. Tube, length 200, basal width 75, apical width 40. Antennal segments III–VIII, length (width) 65(30), 55(35), 55(30), 50(30), 50(25), 30(15).

Specimens studied. Holotype female, AUSTRALIA, Queensland, Brisbane, Moggill Creek, from *Mallotus philippinensis* leaves [Euphorbiaceae], 23.viii.1998 (CJ Burwell), in ANIC.

Paratypes: 6 females, 3 males taken with holotype; Queensland, Mt Tamborine, 16 females, 3 males from *Mallotus philippinensis* leaves (with larvae), 21.iii.1968 (LA Mound 579), in ANIC. Brisbane, The Gap, 20 females, 2 males from leaf galls on *Mallotus* sp., 28.ii.2013; Brisbane, Ashgrove, 5 females, 6 males from *Mallotus philippinensis* leaf galls, 10.viii.2014, in QDPC.

Comments. This species is similar to *umbratus* Hood, but that has the tube slightly longer than the head, antennal segments V–VI less sharply constricted at the base, and the pelta less broadly triangular. Moreover, the tarsi are brownish-yellow in *burwelli* whereas in *umbratus* they are clear yellow, the metanotal sculpture differs between these species, and *burwelli* is particularly unusual in having two pairs of epimeral setae (Fig. 1).

***Liothrips chavicae* (Zimmermann)**

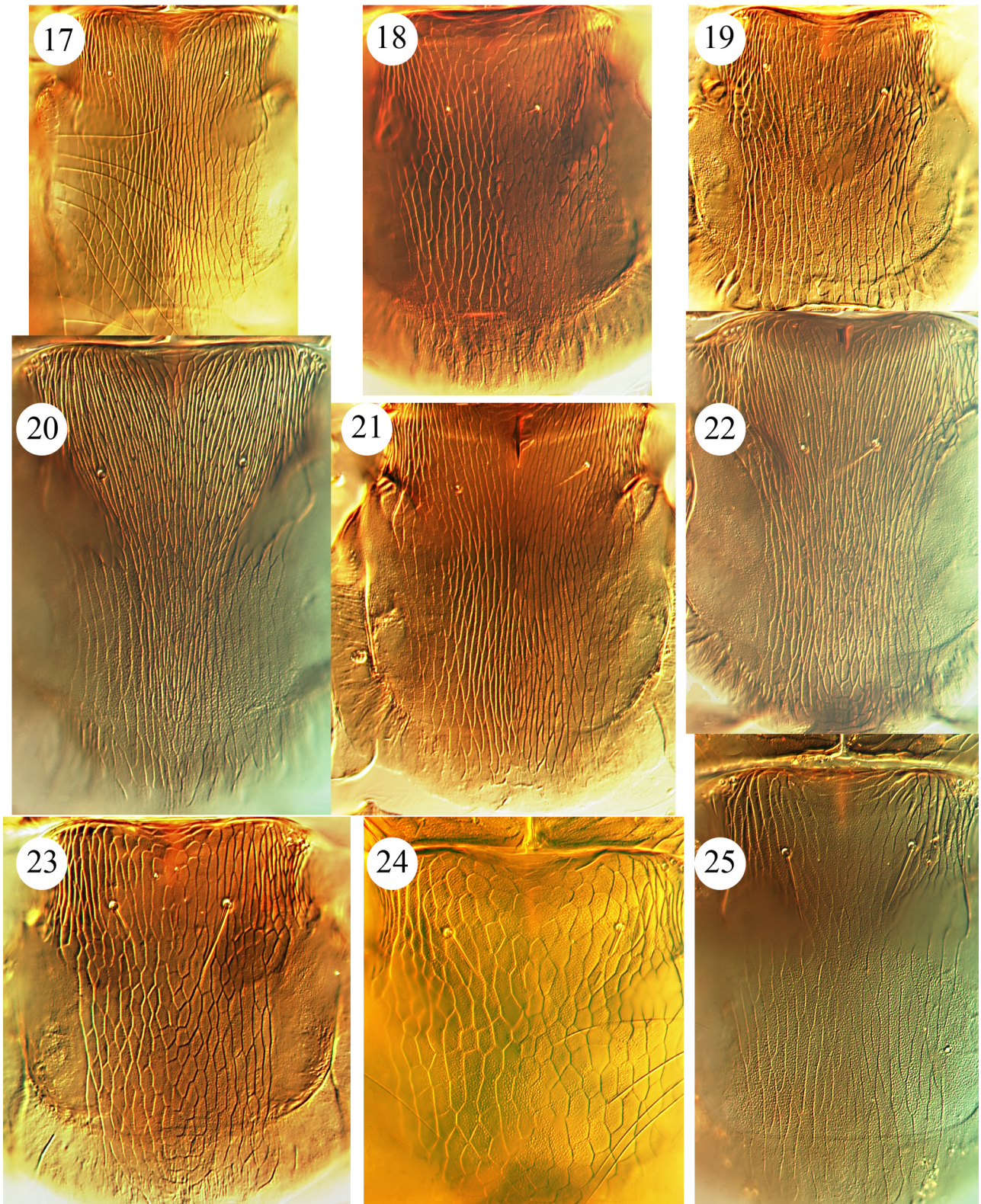
(Figs 2, 11, 17, 31, 38)

Mesothrips chavicae Zimmerman, 1900: 14

Described from specimens found in a rolled leaf gall on *Piper betle* in Java, three further species are placed as synonyms of *chavicae* that were also taken in Java from leaf galls on different species of *Piper* (Mound 2020). The species thus has a wide distribution in high rainfall areas from west Malaysia to almost as far south as Brisbane in Queensland. Antennal segments III–VI are almost clear yellow but VII is variable between samples from almost yellow (Fig. 11) to entirely brown, and the fore tibiae and all tarsi are yellow. The mid and hind tibiae are mainly brown but with the apical sixth or less yellow (Fig. 38), the fore wings are generally pale with a median longitudinal shaded line, and the major setae are dark brown. The metanotal reticles are narrow, almost forming longitudinal striae (Fig. 17) (see also Mound 2020).

Specimens studied. AUSTRALIA, Queensland, in *Piper* leaf galls, in QPDC: South Emmagen Creek, 3 females, 3 males, 8.x.2012; Cairns, Cathedral fig tree, 3 males, 3.x.2012; Flecker Botanic Gardens, 4 females, 11 male, 4.xi.2008; Josephine Falls, 2 females, 1 male, 2.x.2015; Witches Falls, Tamborine, 3 females, 2 males, 24.ix.2012; O'Reillys, 4 females, 10.x.2006, 2 females, 12.iii.2007, 1 female, 23.ix.2012; Noosa, Tea Tree Bay, 6 females, 3 males from leaf roll on *Piper novaehollandiae*, 14.iv.2007; Cooloola Nat. Pk, 20 females, 2 males in leaves, 6.iv.1987. SINGAPORE, Zoo, 5 females, 2 males, 25.ix.2007, Sentosa, 3 females, 11.ii.2006.

AUSTRALIA, Queensland, in *Piper* leaf galls, in ANIC: Cairns Botanic gardens, 8 females, 7 males, 4.xi.2008; Redlynch, Crystal Creek, 4 females 3 males from leaf roll on *Piper hederacea*, 5.xi.2008; O'Reilly's 2 females, 1 male from leaf roll on *Piper novaehollandiae*, 10.x.2006; Babinda, The Boulders, 1 female, 2.x.2015; Noosa Hill, 4 females from *Piper novaehollandiae*, 27.ix.1998. MALAYSIA, Bangi, UKM, 7 females, 3 males from *Piper* leaf galls, 8.xii.2017. TIMOR LESTE, Aileu, office of U.S. Dept of Agriculture, 5 females from *Piper sarmentosum*, 22.viii.2018.



FIGURES 17–25. Australian *Liothrips*. Metanotum: (17) *chavicae*; (18) *chionanthes*; (19) *burwelli*; (20) *pallipes*; (21) *takahashi*; (22) *timonii* (23) *umbratus*; (24) *urichi*; (25) *vaneckekei*.

Liothrips chionanthes sp.n.

(Figs 18, 29)

Macropterous female. Body and legs dark brown, except fore tibiae light brown, tarsi brownish-yellow, mid and hind tarsi slightly paler, also extreme apices of mid and hind tibiae; antennal segment I dark, II paler at apex, III-V almost clear yellow, VI brown in apical half, VII-VIII brown; major setae brown; fore wing shaded with brown area around sub-basal setae. Head about 1.2 longer than wide, slightly narrowed to base; ocellar region subconical, posterior ocelli close to inner margin of eyes; eyes about one-third as long as head; postocular setae acute or slightly blunt at apex, about as long as eye length; maxillary stylets not retracted to postocular setae, medially about 0.3 of head width apart. Antennal segment III almost 2.0 times as long as wide, III with one sense-cone, IV with three; IV-VI evenly narrowed to basal neck; segment VIII not constricted at base. Pronotum with little sculpture, with four pairs of bluntly pointed major setae, anteromarginals very small (Fig. 29). Prosternal basantra absent, ferna wide apart, mesopresternum of two triangles weakly connected medially; metathoracic sternopleural sutures developed. Metanotum narrowly reticulate medially (Fig. 18), median setae slender and minute. Fore wing parallel sided, with about 15 duplicated cilia, three weakly pointed sub-basal setae. Pelta weakly reticulate, broadly triangular, with pair of campaniform sensilla; tergites II-VII with two pairs of sigmoid wing-retaining setae; tergal lateral setae all acute; tergite IX setae S1 and S2 pointed at apex, shorter than tube. Tube shorter than head, anal setae shorter than tube.

Measurements (holotype female in microns): Body length 3300. Head, length (median width) 290(225); postocular setae 95. Pronotum, length (median width) 200(375); major setae—am 10, aa 45, ml 75, epim 135, pa 100. Mesonotal lateral setae length 50. Metanotal median setae length 10. Fore wing length 1200; sub-basal setae 60, 80, 70. Tergite IX setae S1 250, S2 230. Tube, length 305; basal width 105; apical width 50. Antennal segments III-VIII, length (width) 90(40), 85(45), 60(40), 55(40), 65(30), 30(15).

Male macroptera. Similar to female, but smaller; fore tarsal tooth absent; tergite IX setae S1 shorter than tube, S3 longer than tube, S2 less than half of S1 in length, with apex pointed; sternite VIII with an irregular long and narrow pore plate.

Measurements (paratype male in microns): Body length 2680. Head, length (median width) 265(205); postocular setae 85. Pronotum, length (median width) 175(315); major setae—am 10, aa 35, ml 60, epim 125, pa 105. Mesonotal lateral setae length 40. Metanotal median setae length 10. Fore wing length 950; sub-basal setae 60, 65, 70. Tergite IX setae S1 205, S2 80, S3 255. Tube, length 240; basal width 95; apical width 45. Antennal segments III-VIII, length (width) 80(35), 80(40), 75(40), 70(35), 50(25), 35(15).

Specimens studied. Holotype female, AUSTRALIA, **Queensland**, Behana Gorge, 30km south of Cairns, 3.xi.2008 (LAM 5182) in ANIC.

Paratypes: 2 females, 1 male taken with holotype; Queensland, Cairns, 1 male (with larvae) from *Chionanthus*, 14.ii.1998; Cooktown to Rossville, 2 females, 2 males from ?*Chionanthus*, 11.xi.2010 (in ANIC).

Comments. As indicated by the key above, this species is one of a group of at least three species that are particularly similar to each other in structure. Antennal segment III is intermediate in length between that of *chavicae* and *umbratus*. The metanotal sculpture is distinct from that of *chavicae* but it is similar to that of *umbratus* (Figs 17, 18, 23). This new species is very similar to *umbratus*, of which three specimens have also been collected from *Chionanthus* leaves.

Liothrips pallipes (Karny)

(Figs 3, 12, 20, 27)

Gynaikothrips pallipes Karny, 1913: 110.

Described from specimens found in a rolled leaf gall on *Piper* in Java, three further species are placed as synonyms of *pallipes* (Mound 2020), all from leaf galls on *Piper* spp and taken in Java, southern Japan, Taiwan and Philippines. Okajima (2006: 436) fully described and illustrated this species under the name *kuwanai*. It has been found in Queensland at the same site as *chavicae*, but possibly not on the same species of *Piper*. In contrast to that species, antennal segment VII is brown (Figs. 12), all tibiae and tarsi are clear yellow, the fore wings are weakly shaded and the major setae are all pale. However, the metanotal sculpture does not greatly differ between these two species (Figs 17, 20).

Specimens studied. AUSTRALIA, Queensland: Redlynch, Crystal Creek, 4 females, 4 males in leaf roll on *Piper canina*, also 4 females, 2 males from leaf roll on *Piper* sp., 5.xi.2008, in ANIC (4 females, 3 males with similar data in QDPC); Gordonvale, Big Tree, 2 females from leaf gall on *Piper* sp., 3.x.2012, in ANIC; Cairns, Cathedral Fig Tree, 1 female, 1 male in *Piper* gall, 3.x.2012; Lake Barrine, 2 females, 1 male in *Piper* gall, 11.xii.2013, in QDPC. PAPUA NEW GUINEA, East Sepik Prov., Hayfield, 1 female, 1 male in village garden, 21.xi.2017, in ANIC. TIMOR LESTE, Baucau, 3 females, 2 males in *Piper betle* curled leaf, 15.vii.2000, in ANIC.

***Liothrips takahashii* (Moulton)**

(Figs 7, 13, 21, 32)

Gynaikothrips takahashii Moulton, 1928: 313

Described on specimens taken on *Ficus retusa* in Taiwan, three further species are listed as synonyms of *takahashii* (ThripsWiki 2023) taken in Malaysia, Singapore and Sumatra. The species has also been recorded from southern Japan (Ryukyu Islands), Java and Taiwan by Okajima (2006), who also provided a full description and illustrations. The large number of discal setae in a row on the lateral margins of the second tergite (Fig. 32) currently appears to be particularly unusual to this species. It is commonly found in small numbers as an invader of leaf galls induced by *Gynaikothrips* species on *Ficus* leaves. Presumably it has been introduced to the American continent by the horticultural trade in such plants.

Specimens studied. AUSTRALIA, Queensland, Cairns, 4 females, 4 males from leaf galls on *Ficus microcarpa* [Moraceae], 17.ix.2013, in QDPC (1 female in ANIC). TAIWAN, Taichung, 5 females, 2 males from *Ficus benjamina* and *microcarpa*, viii.2013, in ANIC (2 females, 3 males with same data in QDPC); Chiayi City, 1 female from *Ficus microcarpa*, 13.iii.2014, in QDPC. The following specimens are all in QDPC: MALAYSIA, Kuala Lumpur, 2 males from *Ficus benjamina*, 25.viii.2013, Selangor, Hulu Langat, 3 females from *Ficus* leaf gall, 6.viii.2012. SINGAPORE, 1 female from *Ficus benjamina* leaf gall, 11.ii.2016. THAILAND, Chiang Rai, 1 female, 2 males from *Ficus* leaf gall, 04.iii.2015. CHINA, Sichuan, Chengdu Botanic Gardens, 2 females from *Ficus* leaf galls, 10.viii.2012. USA, California, Long Beach, 1 male from *Ficus ?nitida* gall, 11.vii.2013. COSTA RICA, Heredia, 3 females from *Ficus benjamina*, 14.v.2014 (2 females with same data in ANIC).

***Liothrips timonii* sp.n.**

(Figs 4, 14, 22, 28, 33, 36)

Macropterous female. Body and femora dark brown, fore tibiae with yellow, mid tibiae yellow but brown on basal fifth, hind tibiae yellow but brown on basal third (Fig. 36), all tarsi yellow (Fig. 36); antennae largely yellow, segment I and basal half of II brown, VIII yellowish brown (Fig. 14); major setae brown; fore wing uniformly paler.

Head elongate, about 2.43 times longer than width just behind eyes (Fig. 4); ocellar region swollen, fore ocellus on hump, posterior ocelli close to inner margin of eyes; eyes more than one-third as long as head; postocular setae slender and minute, not reach posterior margin of eyes; maxillary stylets not retracted to postocular setae; mouth cone long and pointed. Antennae slender and long (Fig. 14), segment III 5.0 times as long as wide, III with one sense-cone, IV with three; V–VI slightly constricted at base; VIII shorter than VII, broad at base. Pronotum with transverse lines on front half part and near posterior margin, five pairs of major capitate setae, anteromarginals as long as anteroangulars, accessory epimeral setae minute. Prosternal basantra absent, ferna developed, mesopresternum boat-shaped, broad medially (Fig. 28); metathoracic sternopleural sutures present. Metanotum with very narrow longitudinal reticulations medially, with linear markings in the reticles (Fig. 22), median setae slender. Fore wing parallel sided, with 8–12 duplicated cilia, three sub-basal setae capitate. Pelta triangular but with small lateral lobes, sculptured with simple reticulation, pair of campaniform sensilla present (Fig. 33); tergites II–VII each with two pairs of sigmoid wing-retaining; tergal lateral setae all capitate; tergite IX setae S1 and S2 blunt at apex, about as long as tube, S3 shorter than tube. Tube much shorter than head, anal setae as long as tube.

Measurements (holotype female in microns): Body length 2450. Head, length (median width) 265(175); postocular setae 15. Pronotum, length (median width) 150(250); major setae—am 45, aa 45, ml 65, epim 85, pa 70.

Fore wing length 910; sub-basal setae 50, 70, 65. Tergite IX setae S1 175, S2 140. Tube, length 175; basal width 75; apical width 40. Antennal segments III-VIII, length (width) 95(25), 75(30), 65(25), 65(25), 50(20), 30(10).

Male macroptera. Similar to female, but smaller, mid and hind tibiae largely yellow, with brownish at basal part; fore tarsal tooth absent; tergite IX setae S2 about half of length of S1, with apex capitate; sternite VIII pore plate extending laterally to pair of rounded areas laterally on tergite.

Measurements (paratype male in microns): Body length 2280. Head, length (median width) 300(175); postocular setae 15. Pronotum, length (median width) 155(235); major setae—am 20, aa 35, ml 45, epim 75, pa 50. Fore wing length 820; sub-basal setae 55, 60, 70. Tergite IX setae S1 170, S2 55. Tube, length 175; basal width 60; apical width 35. Antennal segments III-VIII, length (width) 105(25), 75(30), 75(25), 75(25), 55(20), 30(10).

Specimens studied. Holotype female, AUSTRALIA, **Northern Territory**, Humpty Doo, from *Timonius* lvs, 15.v.1999 (LAM 3712), in ANIC.

Paratypes: 3 females, 4 males taken with holotype; **Northern Territory**: Darwin, Holmes Jungle, 10 females, 6 males in curled leaves of *Timonius timon* [Rubiaceae], 2.i.1996; Kakadu N.P., 5 females, 4 males from distorted leaves, 5.viii.1993 (in ANIC).

Comments. This species is intermediate in structure between *Liothrips* and the genus *Gynaikothrips*. It is the only species of *Liothrips* to completely lack postocular setae, a condition here interpreted as a reversal. In contrast to *Gynaikothrips*, as diagnosed by Mound and Tree (2021), the metathoracic sternopleural sutures are developed, and the pronotum has a full set of five major setae.

***Liothrips umbratus* Hood**

(Figs 8, 15, 23, 34)

Liothrips umbratus Hood, 1918: 132

This species was based on three females taken in 1913 by “sweeping in jungle at Nelson” (=Gordonvale, Cairns) in northern Queensland. The only other known specimens are the six females and one male listed below, and the images given here are of the specimens from Redlynch, Cairns. These were compared with the type specimens in the US National Museum collections at Washington in 1998. The head and tube lengths of the holotype in the original description were 0.307 mm and 0.312 mm.

Specimens studied. AUSTRALIA, **Queensland**, Cairns, Redlynch, Freshwater Creek, 3 females from large leafed mesophyte in rainforest, 11.viii.1968 (J.A.L.Watson); Tully, 1 female from *Chionanthus ramiflorus*, 12.viii.2004 in ANIC. Cape Tribulation, 1 female, 1 male from ?*Chionanthus* leaves, 28.x.2004, in QDPC.

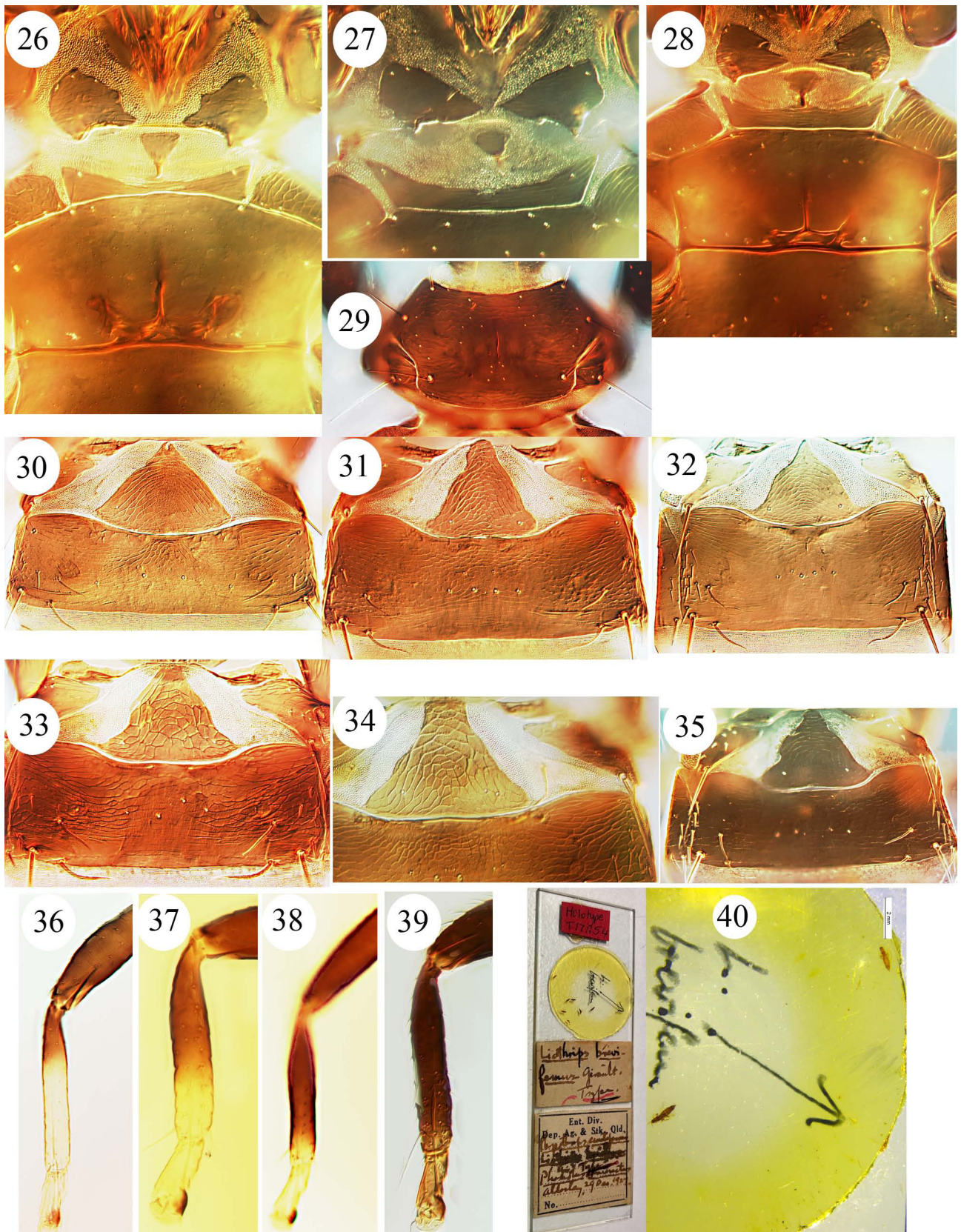
***Liothrips urichi* Karny**

(Figs 5, 24, 39)

Liothrips urichi Karny, 1924: 160

This species does not occur in Australia; but is included here because there is a possibility that it may be considered for introduction for the biocontrol of an invasive weed. It was described originally from Trinidad on the leaves of *Clidemia hirta* (= *Miconia crenata*), a shrubby plant commonly known as Koster's curse in the family Melastomataceae. The plant is invasive of tropical pastures, and various attempts have been made to deploy *L. urichi* as a potential biocontrol agent. It was first introduced to Fiji in 1930, and aggregations of feeding larvae have, in sunny sites in Hawaii, been shown to reduce terminal growth of the plant but with a limited effect on flowering and fruiting (Reimer & Beardsley 1989). Unfortunately, when the plants are growing in shaded areas the thrips does not seem to flourish. *L. urichi* is one of the members of the genus with the maxillary stylets deeply retracted into the head and usually extending into the hind margin of the eyes (Fig. 5). Amongst such species, it is distinguished by the uniformly dark hind legs (Fig. 39), reticulate metanotal sculpture (Fig. 24), and elongate pointed mouth cone. In the male, sternite VIII is fully occupied by a pore plate, and tergite IX setae S2 are half as long as the S1 setae.

Specimens studied. HAWAII, North Kulani Road, 7 females 6 males from *Clidemia hirta* [Melastomataceae], 1.v.2020 (T.Johnson), in ANIC; 5 females, one male on *Miconia crenata*, 01.iv.2021 (D. Comben), in QDPC (reared at Quarantine Laboratory from sample imported from Hawaii).



FIGURES 26–40. Australian *Liothrips*. Prosternum 26–28: (26) *burwelli*; (27) *pallipes*; (28) *timoni*. (29) Pronotum of *chionanthes*. Pelta & tergite II 30–35: (30) *burwelli*; (31) *chavicae*; (32) *takahashi*; (33) *timonii*; (34) *umbratus*; (35) *vaneckeii*. Hind tibiae 36–40: (36) *timoni*; (37) *vaneckeii*; (38) *chavicae*; (39) *urichi*. (40) Holotype of *L. brevifemur*.

***Liothrips vaneekerei* Priesner**

(Figs 6, 16, 25, 35, 37)

Liothrips vaneekerei Priesner, 1920: 2011

Described originally from Europe in a glasshouse in the Netherlands, the Lily Thrips has apparently been widely distributed around the world by the commercial trade in lily bulbs. Okajima (2006) recorded the species from Honshu, Japan, and provided a detailed illustrated description of the species. It is one of the species with maxillary stylets deeply retracted and close together medially in the head (Fig. 6). Antennal segment IV is shorter than in many *Liothrips* species of similar body size and segment VIII is slightly longer, with VI and VII both constricted basally to a narrow neck (Fig. 16). The metanotal reticulation is narrow, almost producing striation (Fig. 25), and the pelta is recessed into the second abdominal tergite (Fig. 35).

Hodson (1935) gave a detailed account of the life history of *vaneekerei*, recording substantial aggregations under the scales of commercial lily bulbs, and indicating a possibility that the species may have originated on a native *Lilium* species around Oregon in northwestern USA. Bailey (1939) reviewed the available information on distributions and the range of *Lilium* species on which the species had been found, including several orchid species. In Australia, it was first recorded by Malipatil *et al.* (2002) who also provided further references to published information on biology. However, because this insect lives below ground it is rarely found except on cultivated plants, and as a result there is no information on the potential host range away from commercial plantings. The adults listed below suggest that this species is widespread in eastern Australia, presumably living on the subterranean parts of native Australian plants, and that it has been here for many years. This is the first indication that this thrips may have a wider host range away from cultivated plants.

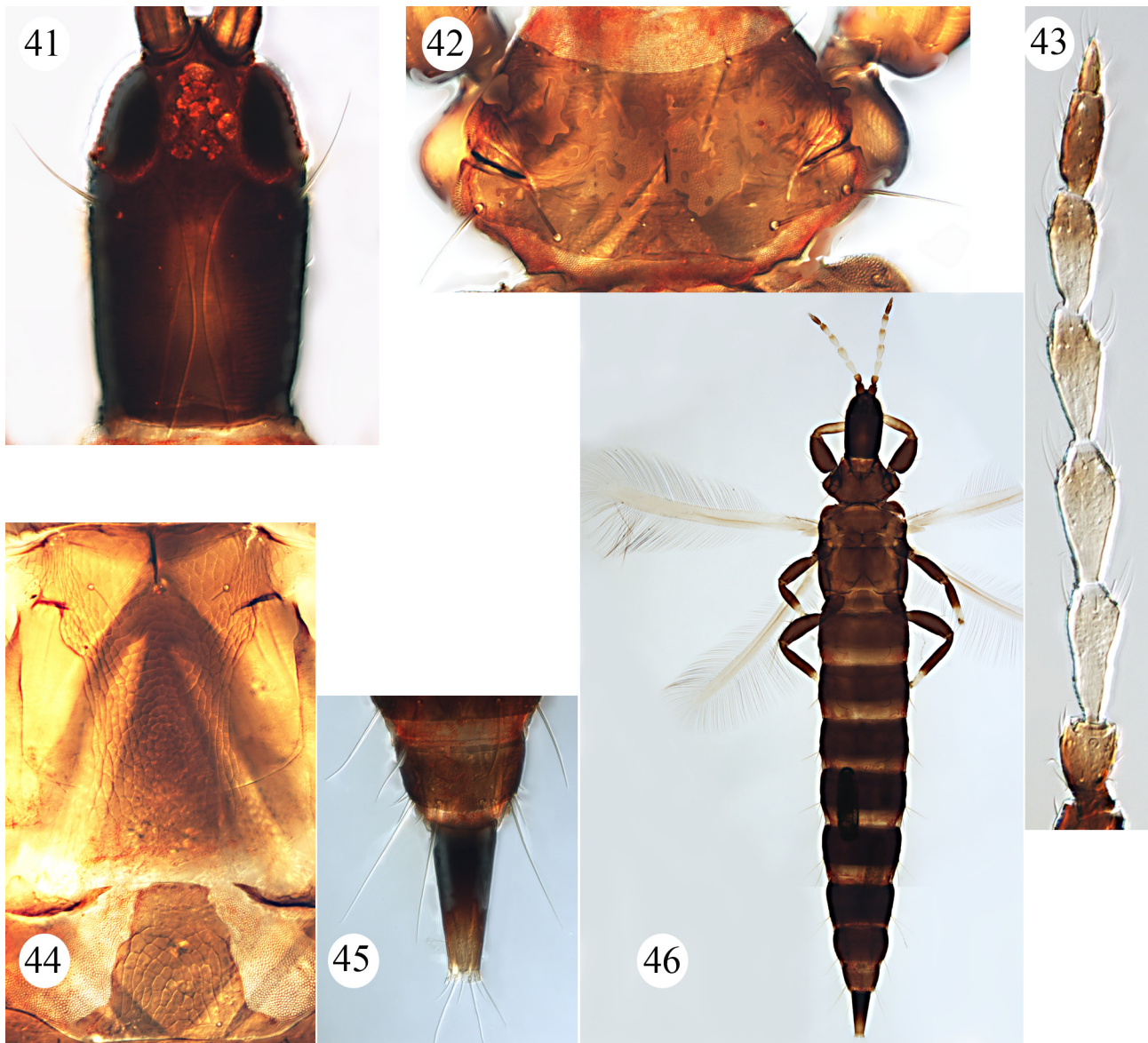
Specimens studied. AUSTRALIA, **Victoria**, Warragul, 2 females, 1 male with larvae from Asiatic *Lilium* bulb, 2.v.2001 (D. Bruce), in ANIC, also 6 females, with identical data in QDPC. **New South Wales**, Budderoo National Park, Carrington Falls, 3 females in Malaise Trap, i.2022. **Tasmania**, Lake St Claire Rd, 2004 (in ANIC). **Queensland**, Toowoomba, 2 females, 2 males from lily bulbs in supermarket, 7.iv.2001; Brisbane Forest Park, 1 female from bark spray on *Acacia melanoxylon*, 25.xi.2008; Bunja Mts, 1 female in Malaise Trap, 24.iv.1986; Bribie Island, 1 female in Malaise Trap, 24.x.2010, in QDPC. ENGLAND, Sheffield, 1 female from *Paphiopedilum*, ii.1992, in ANIC.

***Kellyia tenuis* (Hood) comb.n.**

(Figs 41–46)

Liothrips tenuis Hood, 1918: 133

This species remains known only from the holotype female (in U.S. National Museum of Natural History, Washington). This was taken by “sweeping in jungle at Nelson” in northern Queensland in 1914 (Fig. 46). At that time, this was a sugar-cane town that was renamed as Gordonvale in 1914 and since 1995 has become a southern district of the city of Cairns. The bold reticulate sculpture of the metanotum (Fig. 44) and the long head with long stylets very close together (Fig. 41), indicate that it is not a species of *Liothrips*, although it shares the typical character states of other members of the *Liothrips*-lineage including the antennal sense cone formula and absence of prosternal basantra. In view of the head, metanotum, and broadly transverse mesopresternum this species is here referred to the genus *Kellyia*. However, in contrast to the 13 described species in that genus antennal segment III is less elongate (Fig. 43), and the notopleural sutures on the pronotum are incomplete (Fig. 42). There are many specimens of *Kellyia* in ANIC at Canberra, but these remain unidentified due to complexities in variation within and between samples. Members of this genus live as opportunist invaders of abandoned galls and thrips domiciles on *Acacia* species (Crespi *et al.* 2004).



FIGURES 41–46. Holotype of *Liothrips tenuis* Hood. (41) head; (42) pronotum; (43) antenna; (44) metanotum & pelta; (45) tergites IX–X; (46) female [prepared from stack of images taken by Elisa Lima, Federal University of Piauí, Brazil]

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