



New Australian spore-feeding Thysanoptera (Phlaeothripidae: Idolothripinae)

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Abstract

Two new genera and six new species of spore-feeding Thysanoptera are described from Australia, with Australian records of two further species, one from California and one from New Zealand. In the Tribe Pygothripini, subtribe Pygothripina, *Ecacleistothrips glorious* **gen. et sp. n.** is a large and highly polymorphic rainforest thrips: the apterous male has a transverse first abdominal tergite, in contrast to the females that have a reduced pelta as is typical of most Phlaeothripidae. Also in this subtribe, *Heptathrips cumberi* Mound & Walker from New Zealand is recorded widely around the southern coasts of Australia. A key is provided to the six genera of Pygothripini subtribe Allothripina in which the terminal sensorium of the maxillary palps is unusually large. In this group, four wingless species are considered: *Minaeithrips alicae* **gen. et sp. n.** and *M. driesseni* **sp.n.** in which the maxillary stylets are wide apart, *Allothrips hamideae* **sp. n.** in which the third antennal segment has a basal flange unlike any other member of this widespread genus, and *Priesneriella citricauda* Hood that was previously known only from California. In the Pygothripini subtribe Macrothripina, *Polytrichothrips geoffri* **sp. n.** is described from rainforest; this genus was known previously from a single species in Sarawak. A further rainforest species, *Malesiathrips australis* **sp.n.**, is described in the Tribe Idolothripini, subtribe Elaphrothripina; this genus was known previously from three species in the Asian and Pacific regions.

Key words: Thysanoptera, Idolothripinae, Australia, California, polymorphism

Introduction

Thrips are commonly thought of as plant pests, yet fungus-feeding species are estimated to comprise almost 50% of the 5500 species listed in the insect order Thysanoptera (Morse & Hoddle, 2006). Of the 700 thrips species listed from Australia (ABRS, 2007) at least 130 feed only on either fungal hyphae or on fungal spores, and this fungus-feeding component is particularly diverse in tropical areas. These thrips live on dead branches and dead leaves, and many live only in leaf litter or at the bases of tussocky grasses and similar plants. The hyphal-feeding species are all members of the subfamily Phlaeothripinae in the suborder Tubulifera, and a few of these have been considered in individual papers (Mound, 1972b, 1995; Mound & Minaei, 2006). However, there is no overview or generic key for this group, and many Australian taxa remain un-described. In contrast, the Australian Idolothripinae, the spore-feeding Phlaeothripidae, have been reviewed (Mound, 1974), and the generic classification of this worldwide subfamily of over 600 species has been revised (Mound & Palmer, 1983).

The taxa described below illustrate the disparate elements that comprise the Australian thrips fauna (Austin et al., 2004). Two of the new species represent a northern tropical element that has strong relationships with the South East Asian fauna (see Mound & Tree, 2007). Two species represent a southern element involving faunal relationships with New Zealand (see Mound 2006), and there is an extensive endemic thrips fauna of uniquely Australian taxa (Crespi et al., 2004). The objective of this paper is to describe from Australia six new Idolothripinae species, also two new genera, and to record from Australia for the first time one species

known only from California, and one New Zealand species that has been taken widely around Australia's southern coasts. One of the new species is particularly remarkable, not just in being exceptionally polymorphic with massively broad forewings that bear unusually short marginal cilia, but in having the male wingless with the first abdominal tergite fully transverse and bearing the spiracles laterally (Fig. 7); the systematic significance of these character states is considered. Four small wingless species are discussed, in each of which the terminal sensorium on the maxillary palps is unusually large (Fig. 9), a condition that has been interpreted as representing a third palp segment devoid of sensoria (Bhatti (1994: 121). Recognition of these taxa brings the total described fauna of Idolothropinae in Australia to 80 species in 23 genera, although several species rich genera such as *Ethirothrips* Karny and *Phaulothrips* Hood remain largely unstudied.

Tribe Pygothripini, Subtribe Pygothripina

The 600 species in almost 80 genera that comprise the subfamily Idolothropinae were assigned by Mound & Palmer (1983) to two Tribes, the Pygothripini and the Idolothropini. The first of these includes a large proportion of taxa from Australia and New Zealand, particularly in one of the six subtribes recognized, the Pygothripina, and it is within this group that the following new genus belongs.

Ecacleistothrips gen.n.

Large bodied polymorphic Idolothropinae, Pygothripini. Antennae 8-segmented, segments III and IV each with 2 sensoria that are scarcely 0.5 as long as maximum width of segment (Fig. 5). Head projecting weakly in front of eyes, with one pair of long preocellar setae (Fig. 2); eyes smaller ventrally than dorsally; vertex with one pair of very long postocular setae between which arises one pair of shorter setae, also one pair of lateral postocular setae almost on cheeks; maxillary stylets broad, retracted to eyes and close together medially; male with stout horn anteroventrally. Pronotum transverse, epimeral sutures complete, ml, epim and pa setae about as long as median length of pronotum. Prosternal basantra anterolateral in position, small, quadrate, bearing one or two setae; ferna large (massive in male), median borders parallel; mesopraesternum complete; metathoracic sternopleural sutures recurved (Fig. 3); anapleural sutures complete. Metanotum reticulate, median setae very long. Fore femora and fore tarsal tooth stout, particularly in male (Fig. 4). Forewing very broad distally, with more than 50 duplicated cilia; cilia around wing apex very short and coarsely rugose. Pelta in female D-shaped with very short lateral wings (Fig. 6), in male transverse and continuous between the lateral spiracles (Fig. 7); tergites II–VI of macropterae each with one pair of weakly sigmoid wing-retaining setae; tergite IX setae more than 50% as long as tube; tube much longer than head with numerous short setae laterally, constricted at apex; anal setae short.

Type-species: *Ecacleistothrips gloriosus* sp.n.

Relationships. Among the Idolothropinae, *Ecacleistothrips* shares with only *Cleistothrips* Bagnall the combination of characters: tube with prominent lateral setae, metathoracic sternopleural sutures well-developed, anapleural sutures complete. *Cleistothrips* comprises a single species, *C. idolothropoides* Bagnall, known only from New Zealand (Mound & Walker, 1986). Nothing is known of its biology, but it has been taken at several sites across North Island, New Zealand, and also in the north west of South Island. The long and very broad maxillary stylets indicate that it feeds by ingesting fungal spores, and collection records suggest that it lives in dead hollow twigs. *Cleistothrips* is considered to be closely related to *Heptathrips* Moulton, another genus from New Zealand that is discussed further below.

Ecacleistothrips and *Cleistothrips* share the following character states:

1. Tube long, constricted distally, with prominent lateral setae;
2. Head long, with 2 pairs of postocular setae;
3. Head with one pair of well-developed preocellar setae;
4. Maxillary stylets long, retracted to level of eyes;
5. Metathoracic sternopleural sutures present;
6. Anapleural sutures complete;
7. Tergites each with only one pair of wing-retaining setae;
8. Antennal segments III and IV each with 2 sensoria;
9. Pronotal anteromarginal setae small;
10. Prosternal ferna large;
11. Mesopraesternum complete;
12. Fore tarsal tooth present in both sexes.

Ecacleistothrips and *Cleistothrips* differ in the following character states:

1. Postocular pairs of setae side-by-side (*Cleistothrips*: one in front of the other);
2. Antennal segment VIII constricted at base (*Cleistothrips*: no suture between VII & VIII);
3. Pronotum with 4 pairs of long setae (*Cleistothrips*: one pair, plus 2 pairs moderately long);
4. Prosternal basantra represented by pair of lateral sclerites (*Cleistothrips*: absent);
5. Metanotum reticulate medially, median setae long (*Cleistothrips*: no sculpture medially, setae small);
6. Forewing broader distally than medially, terminal cilia short (*Cleistothrips*: forewing parallel sided, cilia normal);
7. Wing polymorphic (*Cleistothrips*: both sexes macropterous)
8. Pelta fully transverse in males, D-shaped in female apterae, D-shaped with small lateral wings in macropterae (*Cleistothrips*: pelta with long slender lateral wings);
9. Male with enlarged fore legs, head with tubercle anteroventrally, pronotum massive (*Cleistothrips*: male similar to female except fore tarsal tooth larger).

***Ecacleistothrips gloriosus* sp.n.**

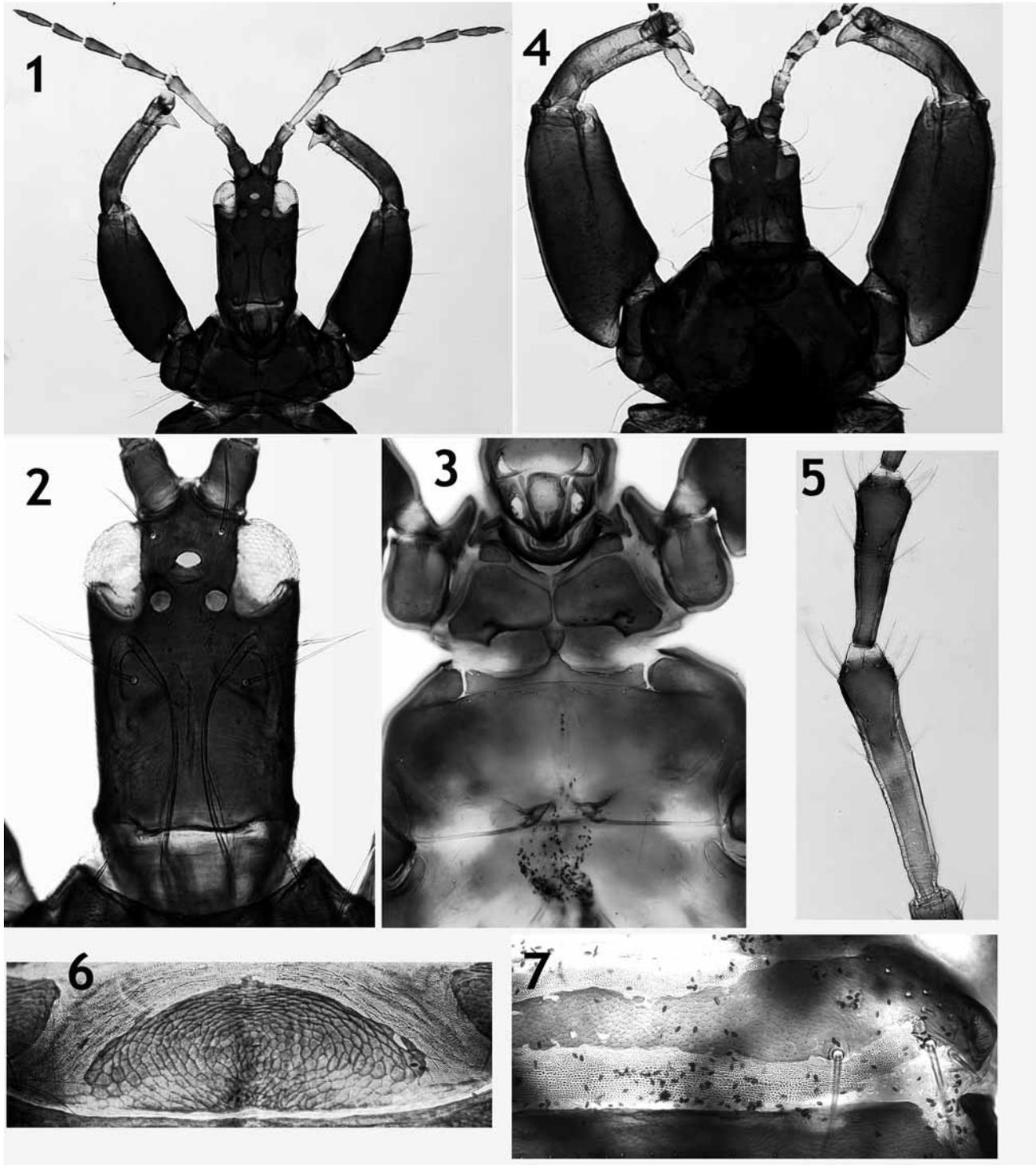
(Figs 1–7)

Macropterous female. Body and legs brown, tube darkest, tarsi paler, antennal segment III basal 0.6 yellowish brown; major setae pale; forewing light brown with base pale. Head longer than wide; median setae on vertex about 0.2, lateral postocular setae about 0.5, as long as major postocular setae; preocellar setae longer than first antennal segment. Sensoria on antennal segments III–IV shorter than apical width of these segments. Pronotum reticulate except posteromedially; mesonotum reticulate, lateral setae long; metanotum reticulate, median setal pair long. Forewing marginal cilia strongly rugose, about 52 smooth duplicated cilia; 4 prominent sub-basal setae present. Abdominal tergites with lateral setae longer than median length of each tergite; major setae on sternites arise submarginally.

Measurements of holotype female in microns. Body length 7800. Head, length 700; width 420; preocellar setae 170; postocular setae 40, 300, 140. Pronotum, length 340; width 670; major setae am 40, aa 120, ml 300, epim 400, pa 400. Metanotum median setae 400. Forewing, length 3000; distal width 600; terminal cilia 100; sub-basal setae 90, 210, 230. Tergite III setae, median 60; wing-retaining 150; lateral marginal 600; posteroangular 600. Tergite IX setae S1 950, S2 950. Tube, length 1400; anal setae 150. Antennal segments III–VIII length, 350, 240, 210, 180, 140, 90.

Apterous female. Similar to macroptera except: head less slender, eyes narrower ventrally, midvertex setae 0.5 as long as major postocular setae. Mesonotal lateral setae very small. Metanotum transverse, with three long pairs setae medially, laterally and anterolaterally (this pair is variable). Pelta D-shaped with lateral wings scarcely visible; tergites II–VI with wing-retaining setae and tergal median setae long and straight.

Measurements of paratype female aptera in microns. Body length 6700. Head, length 640; width 420; pre-ocellar setae 130; postocular setae 130, 340, 140. Pronotum, length 320; width 660; major setae am 60, aa 130, ml 320, epim 400, pa 350. Metanotum median setae 380. Tergite III setae, median 350; wing-retaining 300; lateral marginal 600; posteroangular 550. Tube length 1200



FIGURES 1–7. *Ecacleistothrips gloriose*. 1 & 2, Female holotype; 3, Female prosternites; 4, Male; 5, Holotype antenna; 6, Female macroptera pelta; 7, Male pelta (right half).

Apterous male. Similar to apterous female except: head broader, ocelli reduced, midvertex setae as long as major postocular setae; ventrally with a stout horn arising between anterior pair of interocular setae, also one pair of stout tubercles present ventrolaterally just anterior to clypeal suture. Pronotum massive, not reticulate but with stout median apodeme, am setae long and arising submarginally; ferna occupying most of prosternum. Metanotum strongly transverse, median setae long, lateral setae short and thorn-like. Pelta eroded antero-posteriorly but completely transverse between spiracles across tergite, bearing two pairs of major setae; tergites II–VI with median and wing-retaining setae stout and thorn-like, posteroangulars long; tube relatively short.

Measurements of paratype male aptera in microns. Body length 6350. Head, length 550; width 400; pre-ocellar setae 250; postocular setae 330, 350, 220. Pronotum, length 650; width 950; major setae am 240, aa 350, ml 400, epim 330, pa 420. Metanotum median setae 400. Tergite IV setae, median 75; wing-retaining 75; lateral marginal 450; posteroangular 450. Tube length 950.

Material studied. Holotype macropterous female, **Queensland**, Brisbane Forest Park, Mt Glorious, from rotting branch on ground in rainforest, 9.iii.2006 (LAM 4861).

Paratypes: 2 female macropterae, 3 female apterae, 1 male aptera, all taken at same locality with holotype and several larvae.

Comments. The adults and larvae of this species were collected from 4cm diameter, soft and decayed, branches on the forest floor in rainforest. This habitat is unusual amongst fungus-feeding Phlaeothripidae, as thrips are usually found on branches and twigs that are only recently dead. Presumably the fungal species on which thrips usually feed are associated with the early stages of fungal decay, in contrast to the wet, rotten wood on which *E. glorious* was living. The gut contents of adults and larvae included closely packed masses of spores of a species of *Xylaria* (Ascomycota).

The variation in form of the pelta in this new species, from the median D-shaped sclerite of winged individuals (Fig. 6) to the irregular transverse sclerite of the wingless male (Fig. 7), is particularly interesting. Bhatti (1994, 1995) indicated that the plesiotypic condition of the pelta, the first abdominal tergite of Phlaeothripidae, must have been fully transverse. Although on theoretical grounds this might be correct, in all present day taxa with a transverse pelta the condition is associated with wing loss. As in the present species, the transverse pelta of such apterous species represents a highly derived character state that has arisen in several unrelated lineages of this family. A further interesting character state is the extreme shortness and rugosity of the cilia around the apex of the forewing. The shortness of these cilia is presumably related aerodynamically to the exceptional forewing width. Similar short terminal cilia occur on the unusually broad forewings of species of *Xaniothrips* Mound, although Bhatti (1994: 121) used this character state to support his recognition of a family, Xaniothripidae. A further recurrent character that is presumably associated with body size and male behaviour rather than phylogenetic relationships, is the presence of a stout horn ventrally on the anterior margin of the head in the male. A similar horn is known in the New Zealand species, *Hoplothrips anobii* Mound & Walker, as well as in species of *Sophiothrips* and *Zaxenothrips*, and is possibly associated with male/male competition.

***Heptathrips* Moulton**

Heptathrips Moulton, 1942: 3. Type-species *H. tonnoiri* Moulton, by monotypy.

Five species from New Zealand are recognized in this genus (Mound & Walker, 1986), together with two species from South Africa and one from Saudi Arabia. These eight species exhibit considerable differences in the length of the tube, but they are essentially similar in the form of the head, thorax and antennae. The New Zealand species that is recorded from Australia has the tube shorter than any other member of the genus.

Heptathrips cumberi Mound & Walker

Heptathrips cumberi Mound & Walker, 1986: 25.

Described originally as widespread throughout New Zealand, yet one paratype was an apterous female from Tasmania, and the species is here recorded widely around the southern coasts of Australia. The shape of the head and the long maxillary stylets close together medially are similar to members of the Holarctic genus *Cryptothrips* Uzel, but antennal segments III and IV both bear only two sensoria, and segments VII and VIII are broadly fused despite having a distinct suture. The thoracic sternites are heavily eroded, with the mesopraesternum not visible in apterae, but evidently fused to the mesoeusternum together with the spinasternum in macropterae. The abdominal tube is conical and strongly sculptured, and often almost yellow, in contrast to the other species of *Heptathrips*. The compound eyes of macropterae usually have four pigmented ommatidia in a longitudinal row ventrally, together with two further such ommatidia posterolaterally. However, in apterae the number of pigmented ommatidia is variably reduced.

Material studied. **South Australia**, Kangaroo Island, Cape Linois, 4 female macropterae, 4 female apterae, 4 male apterae, from dead twigs of dwarf *Eucalyptus*, 28.xii.2002; American River, 2 male apterae from dead *Eucalyptus*, 1.x.2006. **Tasmania**, Lake Pedder, 1 female macroptera, iii.2003. **Western Australia**: 40km north of Albany, 1 female macroptera from *Eucalyptus*, v.2001; Geraldton, 1 female macroptera in Malaise trap, 1.xi.2003.

Tribe Pygothripini, Subtribe Allothripina

The Allothripina is one of six subtribes recognized by Mound & Palmer (1983) within the Pygothripini and, with the new genus described below, now comprises eight genera. The members of six of these genera all have the terminal sensorium on the maxillary palps exceptionally large (Fig. 9), and the terminal sensorium on the labial palps is also well-developed; a key to these genera is provided below. Distinctions between these six genera are based on reductions in character states, including fusion of antennal segments and fusion of thoracic tergites. The 36 species in these six genera clearly comprise a single lineage, and a more rational approach to their classification might be to place them all into one genus. The remaining two genera listed in the Allothripina, involving three species from Africa, are more distantly related.

Key to six genera of Allothripina

1. Antennal segment VIII fused to segment VII with no visible suture 2
- Antennal segment VIII distinguished from segment VII by a suture 5
2. Antennal segment VII constricted to basal neck (Fig. 10) 3
- Antennal segment VII broad at base or fused to VI 4
3. Antennal segment IV with two sensoria *Allothrips* Hood
- Antennal segment IV with four sensoria *Anallothrips* Okajima & Urushihara
4. Head with two pairs of setae more than 0.6 as long as head width *Allopiethrips* Sakimura & Bianchi
- Head with only one pair of major setae, scarcely 0.3 of head width *Priesneriella* Hood
5. Antennal segment VIII narrower at base than VII at apex; antennal segment IV with four sensoria
..... *Pseudocryptothrips* Priesner
- Antennal segment VIII broadly joined to VII with confluent margins (Figs 16, 17); antennal segment IV with two sensoria *Minaeithrips* **gen.n.**

Allothrips Hood

Allothrips Hood, 1908: 372. Type-species *A. megagephalus* Hood, by monotypy.

This genus currently comprises 23 species from various parts of the world. Confusing patterns of variation within and between populations led to the suggestion that these wingless thrips form localised demes, with the result that most of the nominal forms were treated as subspecies associated with one of two clines, one across North America (Stannard, 1955) and one across the Palaearctic (Mound, 1972a). Adding to these problems in species level taxonomy, there is evidence that some of the nominal forms have been dispersed across the world, presumably by human trading involving shipping or aircraft. Thus *A. brasiliensis* Hood is known from Rio de Janeiro and Hawaii (Sakimura & Bianchi, 1977), the three forms described from Australia share many character states with forms known from South-Western USA, and two forms from Northern India are scarcely distinct from forms known from California (Mound, 1972a).

In all but two of the described species (or subspecies) there are four pairs of major setae on the head (interocular, postocular, lateral postocular, and midvertex), but in both *A. brasiliensis* and *A. magnus* Okajima & Urushihara the midvertex setae are scarcely larger than the minor setae on the vertex. The new species described below similarly has this pair of setae unusually small, but in addition the lateral postocular setae are also small, and the interocular setae are only a little larger (Fig. 8). Furthermore, the third antennal segment of this species has a prominent sub-basal flange unlike any other member of the genus (Fig. 10). Despite this difference, a similar sub-basal flange on the third antennal segment occurs in one or more species of several unrelated genera of Phlaeothripidae, suggesting that its use in defining genera needs to be re-considered (Mound & Minaei, 2007).

Allothrips hamideae sp.n.

(Figs 8–10)

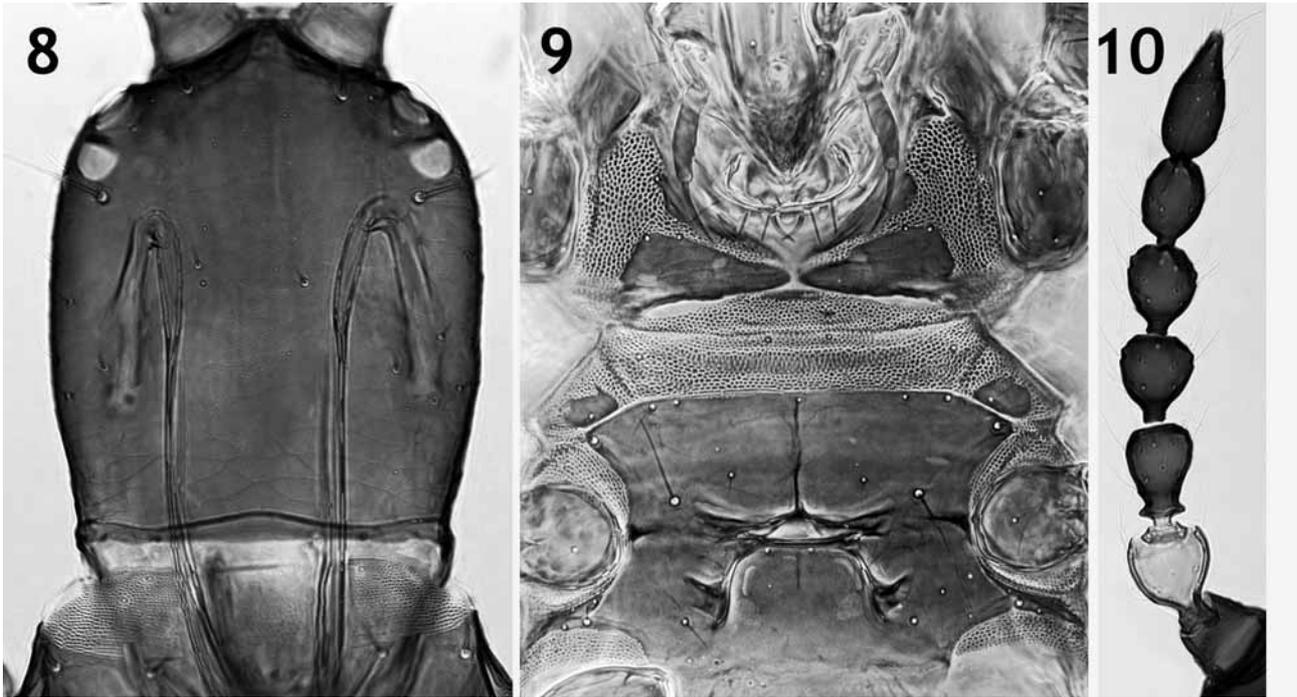
Female aptera. Colour light brown, tarsi paler, antennal segment II and basal pedicel of III yellow in sharp contrast to brown of segments III–VIII; tube reddish-brown with grey apical band. Head longer than wide; eyes reduced to three dorsolateral ommatidia; postocular setae long and pointed, interocular setae short, mid-vertex setae no longer than minor setae on vertex; maxillary stylets retracted to postocular setae, sub-parallel medially about one-third of head width apart (Fig. 8); mouth cone broadly rounded, maxillary palps with large sensorium (Fig. 9). Antennal segment III with prominent basal ring (Fig. 10). Pronotum with five pairs of major setae, epimeral sutures complete; prosternal basantra weak; mesopraesternum and spinasternum not developed, mesoeusternum entire (Fig. 9). Mesonotum transverse, lateral setae pointed, posterior margin with two pairs of small finely pointed setae. Metanotum without sculpture, one pair of prominent setae medially. Pelta with transverse line of sculpture near posterior margin; tergites II–VII with one pair of long marginal setae laterally; tergite IX setae S1 slightly shorter than tube.

Measurements of holotype female in microns. Body length 1600. Head, length 200; width 160; postocular setae 55. Pronotum, length 120; width 200; major setae am 25, aa 25, ml 40, epim 50, pa 45. Metanotal median setae 45. Tergite IX setae S1 90, S2 125. Tube, length 120; anal setae 125. Antennal segments III–VII+VIII length, 45, 40, 37, 37, 60.

Material studied. Holotype female, **Australian Capital Territory**, Black Mountain, from dead twigs, 18.x.2005 (Kambiz Minaei).

Paratypes: 1 female taken with holotype; 1 female at same site, ix.2005 (DM1158); 1 male at same site, 14.iii.2006 (Shuji Okajima).

Non-paratypes: **Queensland**, Dalby, Lake Broadwater road, 2 females from dead branches, 8.iii.2006 (Shuji Okajima).



FIGURES 8–10. *Allothrips hamideae*. 8, Head; 9, Prosternites; 10, Antenna.

Minaeithrips gen n

Apterous Idolothripinae, Allothripina. Antennae 8-segmented, VII–VIII closely joined, VII sharply constricted to basal neck (Figs 16, 17); segment III with either 2 or no sensoria, IV with 2 sensoria. Head about as wide as long, eyes not large (Figs 11, 13); maxillary stylets wide apart, retracted to postocular setae; mouth cone broadly rounded, maxillary palps with terminal sensorium large. Pronotum weakly sclerotised, epimeral sutures sometimes incomplete; anteromarginal and midlateral setae minute, remaining three pairs of major setae small. Fore tarsal tooth absent in both sexes. Prosternal basantra absent or faintly indicated; mesopraesternum and mesoeusternum anterior margin strongly eroded, metathoracic sternopleural sutures broad. Metanotum transverse, without sculpture, median setae small. Pelta extending almost full width of tergite II; tergite II lateral margins strongly eroded; tergal setae small or minute; tergite IX setae S1 shorter than tube; female with fustis scarcely longer than width, almost circular; tube much shorter than head, anal setae about as long as tube (Figs 12, 14); sternites with a few minute discal setae, marginal setae small.

Type-species. *Minaeithrips alicae* sp.n.

Relationships. The two species placed in this new genus invoke the typical problems associated with systematic studies on apterous Phlaeothripidae, in that most of the characteristic features they have in common are “loss apomorphies”. On the basis of the large sensorium on the maxillary palps they are members of the Allothripina but, as indicated in the key below, the differences between them are considerable. Unlike several other members of the Allothripina, the males do not have a fore tarsal tooth.

Key to species of *Minaeithrips*

1. Antennal segment III with no sensoria; interantennal projection broad, equal to width of antennal segment III (Fig. 11); eyes narrowed ventrally but shorter ventrally than dorsally; postocular setae acute; tarsi and

tibiae brown; tube brown with base slightly paler, scarcely 1.1 times as long as basal width (Fig. 12).....

.....*aliceae* sp.n.

- Antennal segment III with two sensoria; interantennal projection narrow, about half width of antennal segment III (Fig. 13); eyes narrowed and prolonged ventrally; postocular setae weakly capitate; tarsi and apices of tibiae yellow; tube largely yellow with apical dark grey band, about 1.4 times as long as basal width (Fig. 14).....*driesseni* sp.n.

***Minaeithrips alicae* sp.n.**

(Figs 11, 12, 16)

Apterous female. Colour brown, distal antennal segments and tube darkest, antennal III pedicel yellowish. Head with cheeks convex; eyes slightly angular, about 12 ommatidia on dorsal surface and 5 ventrally; postocular setae acute, shorter than eye width; one pair of minute interocular setae, vertex without setae medially (Fig. 11). Antennal segment III with no sensoria, pedicel slender and parallel sided; segments IV–VII each sharply constricted to a basal pedicel (Fig. 16). Pronotal major setae small to minute. Thoracic sternites extensively eroded. Meso and metanota apparently fused but with complete transverse ridge indicating suture position. Pelta weakly reticulate anteromedially. Tergite IX setae pointed, S3 finely acute.

Measurements of holotype female in microns. Body length 1450. Head, length 150; width 155; postocular setae 25. Pronotum, length 95; width 160; major setae am 5, aa 15, ml 5, epim 20, pa 15. Metanotal median setae 15. Tergite IX setae S1 40, S2 65, S3 120. Tube, length 70; anal setae 75. Antennal segments III–VII+VIII length, 45, 35, 40, 40, 70.

Material studied. Holotype female, **Australian Capital Territory**, Black Mountain, from dead *Acacia* twigs, 13.iv.2006 (LAM 4892).

Paratypes: 2 females, 1 male taken with holotype; 2 females at same site from dead branches, 5.iv.2006 (Kambiz Minaei); 4 females, 5 males, at same site from dead branches, 14.iii.2006 (Shuji Okajima); 1 female at same site, 9.iv.1995; 2 females, 2 males at same site, from dead branches, 7.iv.2007 (Alice Wells). **South Australia**, Whyalla, Middleback, 1 male from dead *Acacia*, 3.v.1995 (LAM 2667).

Comments. This minute thrips has been taken several times from dead twigs, in association with several more common fungus-feeding species, such as *Strepterothrips tuberculatus* (Girault), *Idolothrips spectrum* Haliday and *Carientothrips mjobergi* (Karny).

***Minaeithrips driesseni* sp.n.**

Apterous female. Colour brown, tarsi, apices of tibiae and basal two-thirds of tube yellow; head sometimes paler medially; antennal segment II apex paler than pedicel of segment III. Head with cheeks convex; eyes rounded, with at least 20 ommatidia on dorsal surface and 15 ventrally; ocelli present but very small; postocular setae weakly capitate, shorter than eye width; one pair of minute interocular setae, vertex without setae medially (Fig. 13). Antennal segment III with two sensoria, pedicel slightly ridged; segments IV–VII each sharply constricted to a basal pedicel (Fig. 17). Pronotal am and ml major setae minute, aa, epim and pa major setae short and weakly capitate. Thoracic sternites extensively eroded (Fig. 15), but mesopraesternum weakly indicated. Meso and metanota with complete transverse suture. Pelta eroded posteromedially; tergites II–VII each with one pair of marginal setae with apices rounded; tergite IX three pairs of major setae rather stout with apices rounded.

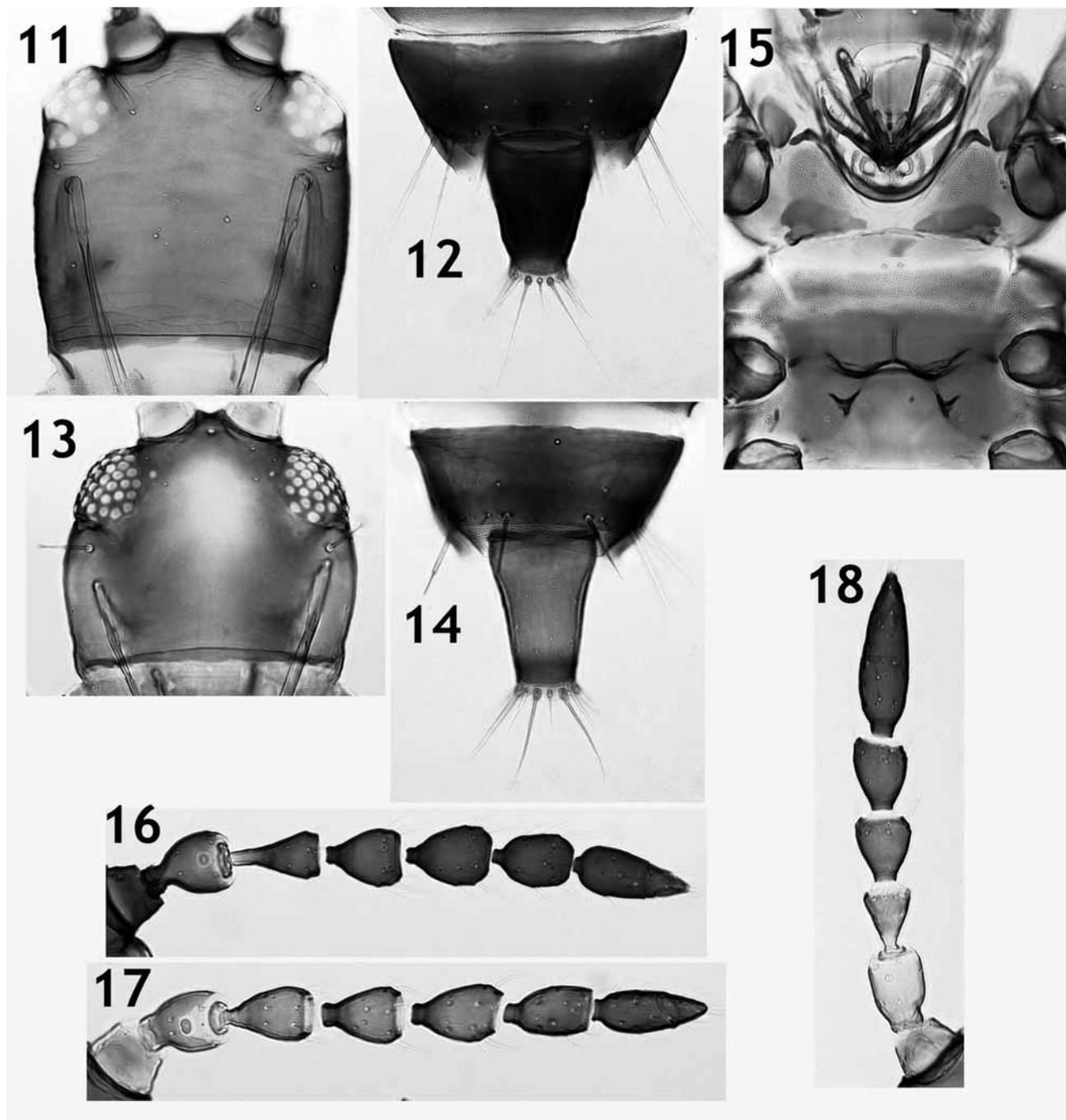
Measurements of holotype female in microns. Body length 1400. Head, length 150; width 180; postocular setae 35. Pronotum, length 100; width 220; major setae am 5, aa 20, ml 5, epim 35, pa 20. Metanotal median

setae 15. Tergite IX setae S1 45, S2 55, S3 60. Tube, length 95; anal setae ?60. Antennal segments III–VII+VIII length, 40, 40, 40, 40, 60.

Material studied. Holotype female, **Tasmania**, Lake St Clair, ii–iii. 2004 (M. Driessen).

Paratypes: same date and locality as holotype 2 females 1 male; Lake Pedder, 5 females 2 males, ii–iii. 2004.

Comments. This species was collected during a survey of invertebrates associated with “button-grass moorland” in Tasmania. The dominant plant in these areas is *Gymnoschoenus* (Cyperaceae), and this thrips presumably feeds on fungi at the bases of these sedges.



FIGURES 11–18. *Minaeithrips* and *Priesneriella*. 11, *M. alicae* head; 12, *M. alicae*, Tergite IX and tube; 13, *M. driesseni*, Head; 14, *M. driesseni*, Tergite IX and tube; 15, *M. driesseni*, Prosternites; 16, *M. alicae*, Antenna; 17, *M. driesseni*, Antenna; 18, *P. citricauda*, Antenna.

***Priesneriella* Hood**

Priesneriella Hood, 1927: 198. Type-species *P. citricauda* Hood, by monotypy.

This genus comprises nine species worldwide, three from North America, four from Europe, and one each from New Zealand and Senegal. However, this West African species, described by Bournier (1994), does not belong in this genus: it should be referred to as *Nesothrips vercambrei* (Bournier) **comb.n.** Indeed, there is nothing in the original description and illustrations to distinguish this from the widespread species *N. propinquus* (Bagnall). Mound & Palmer (1983) placed three genera into synonymy with *Priesneriella*, these having been distinguished mainly on the number of sensoria on the third antennal segment. The type-species of the genus is similar to *P. gnomus* Mound & Palmer from New Zealand and to *P. seminole* (Hood) from Florida in lacking sensoria on the third antennal segment and in the wide-apart position of the maxillary stylets (Mound & Palmer, 1983). In these three species, the ocellar setae are reported to be small, but among the Australian specimens they are well developed and slightly capitate in the macropterous female as well as in one apterous female, and one of these setae is well-developed in a micropterous female. This variation further supports the decision by Mound & Palmer (1983) to recognize only one genus for these nine species. As is common in such species that are usually wingless, the thoracic sternites are weakly sclerotised, the basantra almost absent, the ferna small, the mesopraesternum absent, and the anterior margin of the mesoeusternum often heavily eroded.

***Priesneriella citricauda* Hood**

(Fig. 18)

Priesneriella citricauda Hood, 1927: 199

Until now, this species has been known only from apterae collected in Santa Clara County, California (Cott, 1956). In contrast, it is here recorded from four different sites in the north west of Western Australia. The specimens listed by Cott (1956) from California have been re-examined, and they are considered to represent the same species as the Australian specimens that include apterae of both sexes, as well as female micropterae and one female macroptera. Three specimens taken near Broome have the posteroangular setae on tergites VI–VIII weakly capitate and shorter than the tergites, whereas in the Californian apterae these setae are finely acute and longer than each tergite. Similarly, the pronotal setae differ in form between these samples. Moreover, the apex of antennal segment V is truncate in the Broome individuals (Fig. 18), and there is a faint suture visible between segments VI and VII, whereas segment V is weakly constricted apically in the Californian specimens and segments VI–VII are fused with no suture present. Despite these differences, two specimens taken near Dampier are similar to Californian specimens in all character states, and one male from Barrow Island has the tergal posteroangular setae intermediate, being long but capitate. Interpopulation variation is to be expected in wingless species, and presumably the disjunct distribution represents another example of the transoceanic dispersal that has been recognised in several other fungus-feeding thrips (Mound, 1983). Furthermore, considering the variation in the Australian specimens, the species probably originally came from this continent.

Macropterae have not previously been recorded in this, nor most congeneric, species. The available macropterous female has parallel-sided forewings with no duplicated cilia, and tergites III–VII each have one pair of unusually elongate sigmoid wing-retaining setae.

Material studied. Western Australia; Broome, 1 female aptera from lawn grass, 28.ii.2005; 20km east of Broome, 1 female microptera from dead wood, 28.ii.2005; 20km east of Broome, 1 female macroptera from *Cenchrus setiger*, 1.iii.2005; 90km south east of Dampier, 1 female microptera, 1 male aptera from *Acacia coriacea*, 23.ix.1995; Barrow Island, 1 male aptera, v.2006.

Tribe Pygothripini, Subtribe Macrothripina

A total of 13 genera are currently recognized in this subtribe (Mound & Palmer, 1983), and most of the included species are from the Asian and Pacific tropics. Seven of these genera each contains a single species, and a further four genera each have less than six species. Only *Machatothrips* Bagnall, with 14 species, and *Ethirothrips* Karny, with more than 30 species, are more diverse. The new Australian species described below in *Polytrichothrips* Priesner is the second member of this genus.

Polytrichothrips geoffri sp.n.

(Figs 19–23)

Apterous female. Body and legs brown to dark brown, tube almost black, antennal segments III–V paler at base; major setae brown. Head longer than wide; cheeks almost parallel, with about 6 stout setae, and ventro-laterally in posterior fifth with pair of clear ommatidium-like structures; maxillary stylets broad, retracted to eyes and close together medially; postocular setae long, ocellar setae small (Fig. 19); mouth cone broadly rounded. Antennae 8-segmented, III with two sensoria, IV with four sensoria, VIII narrowed to base. Pronotum short and transverse, with four pairs of long, finely pointed major setae, anteromarginals short; epimeral setae on small tubercles, epimeral sutures complete. Prosternal basantra transverse, ferna large and pointed medially; mesopraesternum slender and transverse; metathoracic sternopleural sutures not developed. Fore tarsus with prominent, curved lateral tooth. Metanotum transverse, with no sculpture, median setae slender. Pelta broad, with little sculpture (Fig. 22); tergites without sculpture; posteroangular tergal setae on II–IV shorter than tergites, on VI–VII much longer than tergites, on IX as long as tube. Sternites without discal setae, prominent transverse row of pores present in front of antecostal ridge.

Measurements of holotype female in microns. Body length 2600. Head, length 350; width 270; postocular setae 140. Pronotum, length 160; width 400; major setae am 25, aa 85, ml 80, epim 125, pa 120. Metanotum median setae 35. Tergite IX setae S1 270, S2 270. Tube, length 280; anal setae 150. Antennal segments III–VIII length, 90, 90, 90, 75, 55, 55.

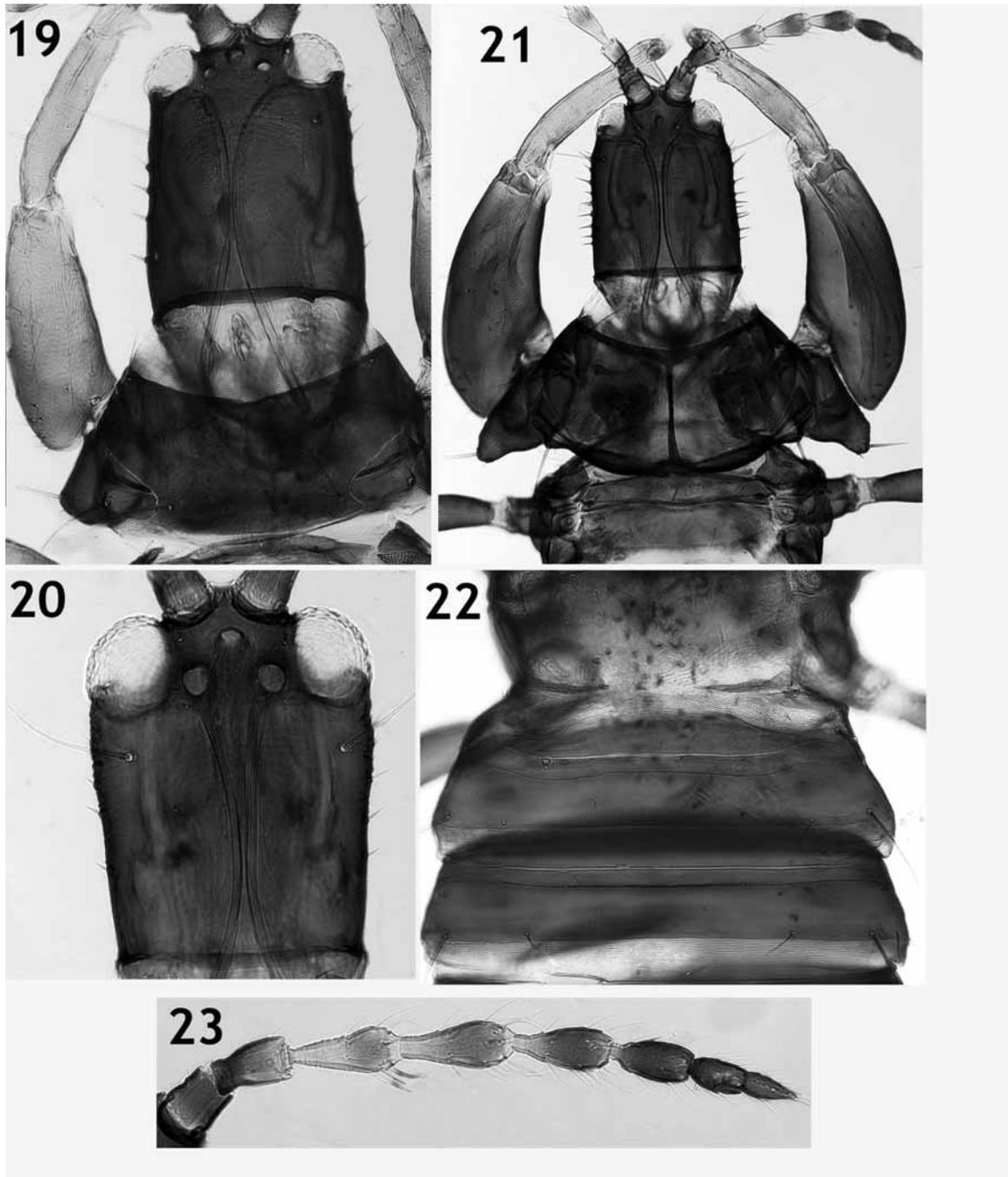
Macropterous female. Head with cheeks almost straight, narrowing to base; ocelli well-developed (Fig. 20); mesonotal lateral setae minute; metanotum without sculpture medially, median setae small and slender; forewing with three sub-basal setae, S2 arising posterior to S1, with 15 duplicated cilia; pelta broad, with a few lines of sculpture at anterior margin and laterally; tergites without sculpture, with one pair of almost straight wing-retaining setae.

Measurements of macropterous female in microns. Body length 3050. Head, length 390. Forewing length 1350. Tergite IX setae S1 350. Tube, length 380. Antennal segments III–VIII length, 105, 105, 100, 85, 55, 55.

Apterous male. More robust than apterous female; head with at least 12 pairs of cheek setae, ocelli very small. Pronotum (Fig. 21) with anterior and posterior margins thickened, median apodeme strong; prosternal ferna massive with curved anterior margins; coxae protruding laterally with a stout terminal seta; fore femora enlarged and curved; fore tibia with two small tubercles on inner margin, one subterminal and one terminal; fore tarsal tooth longer than tarsal width; sternites with small discal setae.

Measurements of apterous male in microns. Body length 2850. Head, length 400; width 300; postocular setae 200. Pronotum, length 250; width 530; width across coxae 800; major setae am 30, aa 125, ml 175, epim 130, pa 130. Metanotum median setae 50. Tergite IX setae S1 300, S2 300. Tube, length 320; anal setae 160. Antennal segments III–VIII length, 95, 95, 95, 75, 55, 55.

Material studied. Holotype female aptera, **Queensland**, 12km west of Bartle Frere Summit, 17°26' 145°42', from logs by pyrethrum spraying, 4.xii.1993 (Montieth), in Queensland Museum.



FIGURES 19–23. *Polytrichothrips geoffri*. 19, Female holotype; 20, Female macroptera; 21, Male; 22, Female aptera, metanotum to tergite III; 23, Antenna.

Paratypes, all taken by pyrethrum spraying of logs: 2 female aptera collected with holotype; 1 female aptera, 17°36' 145°42', 18.v.1995; 2 male apterae, 13km west of Mossman, Paul's Luck, 16°26' 145°15', 29.xi.1990; 1 male aptera, 16°22' 145°15', 18.x.1991; 1 female aptera, 1 female macroptera, 38km north west of Mossman, 16°16' 145°03', 8.i.1989.

Comments. The genus *Polytrichothrips* Priesner currently includes only one species, *P. laticeps* (Bagnall), of which there is also one synonym, and the species is known only from the two holotypes, both of which are macropterous females that were collected in Sarawak (Mound & Palmer, 1983). In *P. laticeps* the head is slightly longer than in the new species described here (1.5 rather than 1.4 times as long as wide), and the cheeks are distinctly convex. Moreover, the head bears a pair of prominent postocellar setae and also a pair

of prominent mid-vertex setae, from which the generic name is derived. Despite these differences, the other character states of the macropterous female of *P. geoffri* are essentially the same as those of *P. laticeps*, and there seems little justification for erecting a further monobasic genus for the Australian species. Amongst the other Macrothripina, the Indonesian species *Diaphorothrips clavipes* Priesner has a similar ommatidium-like structure laterally on the head near the posterior margin, but the stylets are wide apart and the pelta of a different shape. Species of *Celidothrips* Priesner, of which two of the four are known from Australia, have an even longer head with an ommatidium-like structure immediately behind the compound eyes. Also similar in structure are South East Asian species in *Dichaetothrips* Hood and *Tarassothrips* Mound & Palmer, but these have much longer sensoria on the antennae and a different shaped pelta.

Tribe Idolothripini, Subtribe Elaphrothripina

Only three subtribes are recognized in this Tribe and, despite *Idolothrips* itself being an Australian endemic, a high proportion of the taxa involved are from the New World. The genus *Malesiathrips* that is recorded below for the first time from Australia, is probably related to the Hawaiian genus *Dermothrips* Bagnall, but although currently placed in the Elaphrothripina neither of these is closely related to the other genera in this subtribe (Mound & Palmer, 1983).

***Malesiathrips* Palmer & Mound**

Malesiathrips Palmer & Mound, 1978: 196. Type-species *M. malayensis* Palmer & Mound, by original designation.

The genus *Malesiathrips* Palmer & Mound comprises three species, from Guam, the Solomon Islands, and Malaysia. The new species described below was found at several sites in the rain forests of North Eastern Australia in association with the dead stems and fronds of the scrambling palm, *Calamus*. In Java, many of the paratypes of the type species, *M. malayensis*, were also taken from dead palm fronds. These two thrips species are very similar in colour and structure, the new species differing as follows: sensoria on antennal segment III shorter, not extending beyond midpoint of segment IV; antennal segments III–V with apices of dorsal setae blunt, not expanded; pronotal anteromarginal, posteroangular and posteromedian discal major setae all small, less than 0.3 as long as epimerals and pointed.

***Malesiathrips australis* sp n.**

(Figs 24–27)

Apterous female. Brown to dark brown; head paler between eyes and with pair of submedian longitudinal paler areas; pterothorax and abdominal segment IX sometimes paler than blackish brown abdomen; tube yellowish red brown; legs and antennae dark brown, tarsi and basal pedicel of segment III yellow. Head projecting in front of rounded eyes (Fig. 24); cheeks convex, constricted behind eyes; interocular area reticulate, also a longitudinal row of reticulation posteromedially; ocelli small, postocellar and major postocular setae capitate. Antennae 8-segmented (Fig. 27), segment I with two large setae of which the outer is longer than the inner; III with two sensoria, IV with four sensoria, these sensoria on neither segment extending beyond midpoint of succeeding segment. Pronotal epimeral setae arise on prominent tubercles. Prosternal basantra transverse (Fig. 25), mesopraesternum entire. Mesonotum transverse, with no wing remnant (Fig. 26); metanotum reticulate, median setae small. Pelta transverse; tergal chaetotaxy and tube as in *M. malayensis*; tergite IX setae S1 and S2 broadly blunt, S3 finely acute.

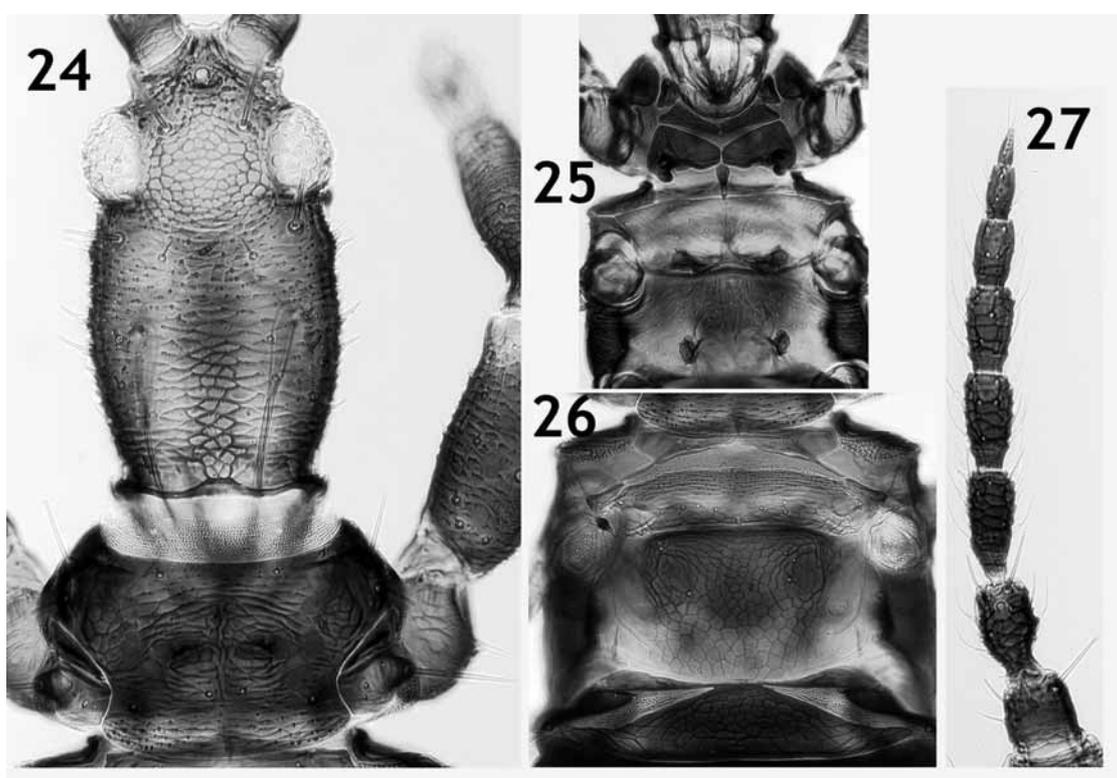
Measurements of holotype female in microns. Body length 2550. Head, length 380; width 200; postocellar setae 50; postocular setae - inner 20, outer 55. Pronotum, length 155; width 280; major setae am 15, aa 55, ml 30, epim 80, pa 20. metanotal median setae 20. Tergite IX setae S1 90, S2 95, S3 90. Tube, length 320; anal setae 100. Antennal segments III–VIII length, 85, 70, 65, 50, 40, 30.

Apterous male. Similar to female but tube as dark as abdomen; with minute fore tarsal tooth.

Material studied. Holotype female, **Queensland**; Babinda, from *Calamus* dead frond, 11.viii.2004 (LAM 4474).

Paratypes: 6 females taken with holotype; Cape Tribulation, 1 female from *Calamus* dead frond, 9.vii.1995; Mt Spurgeon, 2 females 1 male by pyrethrum fogging, 17.x.1991; Daintree Ferry, 4 females, 4 males from *Calamus* dead fronds, 4.viii.2004.

Comments. This new species may eventually be demonstrated to be no more than the southern form of *M. malayensis*, should that species be shown to be more widely distributed on dead palm fronds across southern Indonesia.



FIGURES 24–27. *Malesiathrips australis*. 24, Head and pronotum; 25, Thoracic sternites; 26, Meso and metanota and pelta; 27, Antenna.

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Brisbane. Paratypes, where available, will be deposited in other major collections. Abbreviations for the pronotal major setae are: am (anteromarginals); aa (anteroangulars); ml (midlaterals); epim (epimerals); pa (posteroangulars).

References

- ABRS. (2007) <<http://www.environment.gov.au/biodiversity/abrs/>>
- Austin, A.D., Yeates, D.K., Cassis, G., Fletcher, M.J., LaSalle, J., Lawrence, J.F., McQuillan, P.B., Mound, L.A., Bickel, D.J., Gullan, P.J., Hales, D.F. & Taylor, G.S. (2004) Insects 'Down Under' – Diversity, endemism and evolution of the Australian insect fauna: examples from select orders. *Australian Journal of Entomology*, 43, 216–234.
- Bhatti, J.S. (1994) Phylogenetic relationships among Thysanoptera (Insecta) with particular reference to the families of the Order Tubulifera. *Zoology (Journal of Pure and Applied Zoology)*, 4 (1993), 93–130.
- Bhatti, J.S. 1995. Studies on some Phlaeothripidae (Insecta: Tubulifera). *Zoology (Journal of Pure and Applied Zoology)*, 5, 97–110.
- Bournier, A. (1994) Thysanoptères du Sénégal: espèces et genres nouveaux. *Annales de la Société entomologique de France* (N.S.), 30, 419–429.
- Cott, H.E. (1956) Systematics of the Suborder Tubulifera (Thysanoptera) in California. *University of California, Publications in Entomology*, 13, 1–216.
- Crespi, B.J., Morris, D.C. & Mound, L.A. (2004) *Evolution of ecological and behavioural diversity: Australian Acacia thrips as model organisms*. Australian Biological Resources Study & Australian National Insect Collection, CSIRO, Canberra, Australia. 328pp
- Hood, J.D. (1908) New genera and species of Illinois Thysanoptera. *Bulletin of the Illinois State Laboratory of Natural History*, 8, 361–379.
- Hood, J.D. (1927) New western Thysanoptera. *Proceedings of the Biological Society of Washington*, 40, 197–204.
- Morse, J.G. & Hoddle, M.S. (2006) Invasion biology of thrips. *Annual Review of Entomology*, 51, 67–89.
- Moulton, D. (1942) Seven new genera of Thysanoptera from Australia and New Zealand. *Bulletin of the Southern California Academy of Science*, 41, 1–13.
- Mound, L.A. (1972a) Polytypic species of spore-feeding Thysanoptera in the genus *Allothrips* Hood (Phlaeothripidae). *Journal of the Australian Entomological Society*, 11, 23–36.
- Mound, L.A. (1972b) Species complexes and the generic classification of leaf-litter thrips of the Tribe Urothripini (Phlaeothripidae). *Australian Journal of Zoology*, 20, 83–103.
- Mound, L.A. (1974) Spore-feeding Thrips (Phlaeothripidae) from Leaf Litter and Dead Wood in Australia. *Australian Journal of Zoology*. Supplement, 27, 1–106.
- Mound, L.A. (1983) Natural and disrupted patterns of geographical distribution in Thysanoptera (Insecta). *Journal of Biogeography*, 10, 119–133.
- Mound, L.A. (1995) *Jacotia* (Phlaeothripidae), a second genus of Thysanoptera with disjunct distribution between Australia and South Africa. *Journal of the Australian Entomological Society*, 34, 90–94.
- Mound, L.A. (2006) Vicariance or dispersal – trans-Tasman faunal relationships among Thysanoptera (Insecta), with a second species of *Lomatothrips* from *Podocarpus*. *Papers and Proceedings of the Royal Society of Tasmania*, 140, 11–15.
- Mound, L.A. & Minaei K. (2006) New fungus-feeding thrips (Thysanoptera-Phlaeothripinae) from tropical Australia. *Zootaxa*, 1150, 1–17.
- Mound, L.A. & Minaei K. (2007) Australian thrips of the *Haplothrips* lineage (Insecta: Thysanoptera). *Journal of Natural History* [in press]
- Mound, L.A. & Palmer, J.M. (1983) The generic and tribal classification of spore-feeding Thysanoptera (Phlaeothripidae: Idolothripinae). *Bulletin of the British Museum (Natural History). Entomology*, 46, 1–174.
- Mound L.A. & Tree D.J. (2007) Oriental and Pacific Thripidae (Thysanoptera) new to Australia, with a new species of *Pseudodendrothrips* Schmutz. *Australian Entomologist* 34: 7–14.
- Mound, L.A. & Walker, A.K. (1986) Tubulifera (Insecta: Thysanoptera). *Fauna of New Zealand*, 10, 1–140.
- Palmer, J.M. & Mound, L.A. (1978) Nine genera of fungus-feeding Phlaeothripidae (Thysanoptera) from the Oriental Region. *Bulletin of the British Museum (Natural History). Entomology*, 37, 153–215.
- Sakimura K. & Bianchi F.A. (1977) A review of the Hawaiian species of Idolothripinae (Phlaeothripidae: Thysanoptera). *Proceedings of the Hawaiian entomological Society*, 22, 495–521.
- Stannard, L.J. (1955) The species and sub-species of North American *Allothrips* (Thysanoptera; Phlaeothripidae). *Annals of the entomological Society of America*, 48, 151–157.