Zootaxa 4951 (1): 167–181
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4951.1.9
http://zoobank.org/urn:lsid:zoobank.org:pub:C69BBA9F-961B-4369-8FB1-1EBCC1EB130A

Tubuliferous Thysanoptera in Australia with an enlarged tenth abdominal segment (Phlaeothripidae, Idolothripinae), including six new species

LAURENCE A. MOUND[1] & DESLEY J. TREE[2]
[1]*Australian National Insect Collection CSIRO, PO Box 1700, Canberra, ACT 2601.*
laurence.mound@csiro.au; https://orcid.org/0000-0002-6019-4762
[2]*c/o Queensland Primary Industries Insect Collection (QDPC), Department of Agriculture and Fisheries, Queensland, Ecosciences Precinct, GPO Box 267, Brisbane, Qld, 4001.*
treefamily@bigpond.com; https://orcid.org/0000-0002-7704-7750

Abstract

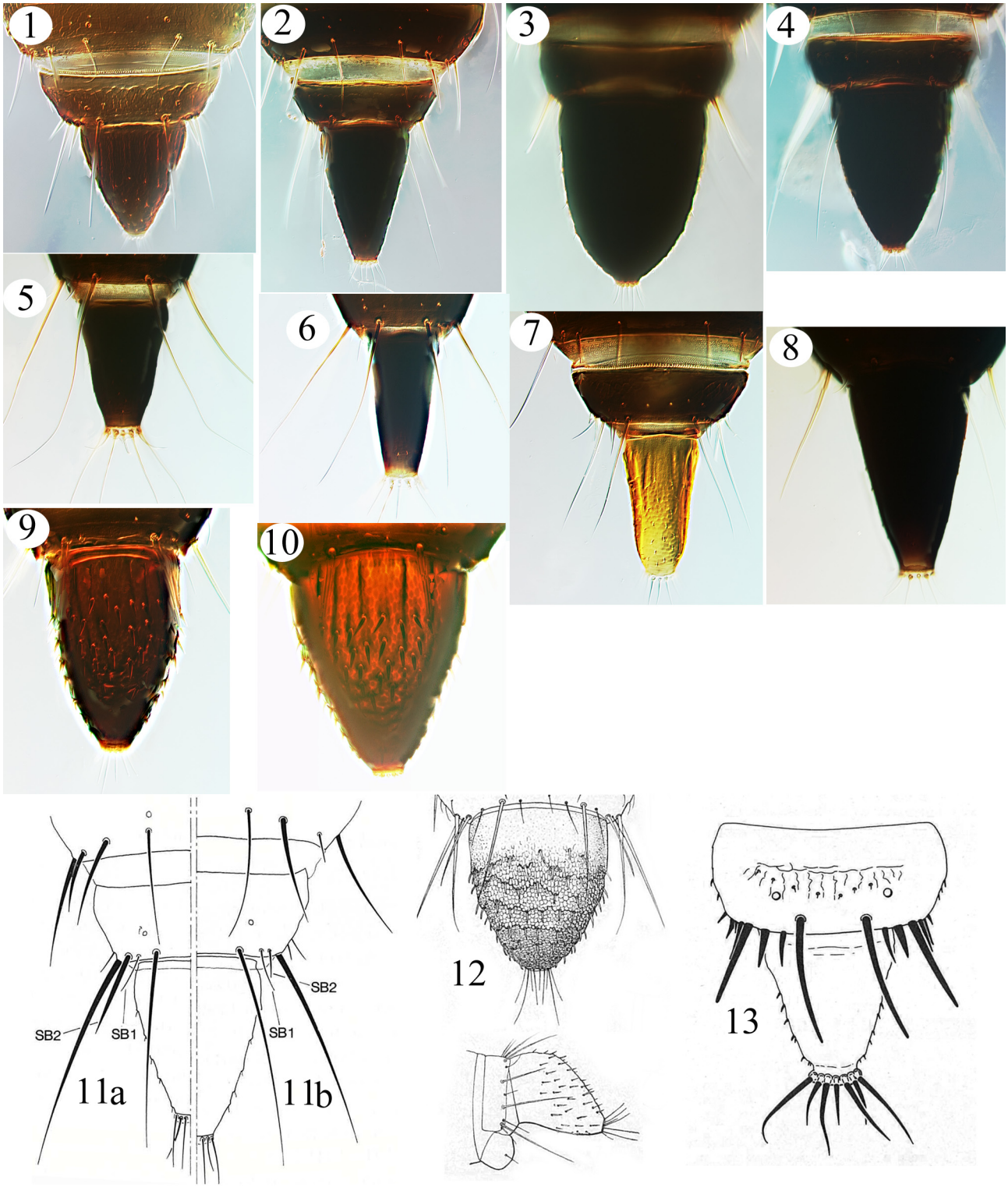
Remarkable structural variation in the tenth abdominal segment of some Phlaeothripidae species is discussed, together with its behavioural significance. Two tropical genera are newly recorded from Australia: in *Acallurothrips* Bagnall four species are recorded, *A. darumbali* **sp.n.**, *A. erubi* **sp.n.**, *A. yagara* **sp.n.** and *A. nogutii* Kurosawa, and in *Neosmerinthothrips* Schmutz two species are recorded, *N. barrowi* **sp.n.** and *N. turrbali* **sp.n.** The genus *Ozothrips* was previously based on five species from New Zealand, but *O. meanjini* **sp.n**. is here described from Queensland. Four species of *Pygothrips* are recorded from Australia, a genus that is widespread in tropical countries.

Key words: chemical repellent, *Acallurothrips*, *Neosmerinthothrips*, *Ozothrips*, *Pygothrips*

Introduction

Adults of the Thysanoptera sub-order Tubulifera have the tenth abdominal segment in the form of a tube, with the genital aperture at the base and the anus at the apex. In most of the 3700 described species, this tube is simple with straight, weakly converging margins. But among various genera in both of the two subfamilies, Idolothripinae and Phlaeothripinae, the tube varies greatly in length, form, and extent of ornamentation. In one Phlaeothripinae genus from the Old World tropics, *Leeuwenia*, the tube may be as long as abdominal segments II–IX and sometimes bears prominent setae laterally (Mound 2004; Mound & Tree 2021). A very similar elongate tube has evolved independently among species of the Idolothripinae subtribe Hystrichothripina that are found mainly in the Neotropics (Mound & Palmer 1983). In contrast, in various unrelated genera of both Phlaeothripidae subfamilies the tube is remarkably short, scarcely twice as long as wide, and in species of various genera it is distinctively swollen, sculptured or variously modified (Figs 1–13). These structural modifications to the tube have sometimes been mentioned in association with particular aspects of thrips behaviour (Mound 2004; Eow *et al*. 2014), although there has been little experimentation. Suzuki *et al*. (1988) observed the gall thrips, *Leeuwenia pasaniae*, using an anal exudate to repel ants, and field studies on species of Phlaeothripinae associated with *Acacia* trees in Australia (Crespi *et al*. 2004) have indicated that among *Dactylothrips* species the short and curiously ornamented tube is involved in defence against predatory ants (see images in ThripsWiki 2021). Moreover, some species of the related Australian genus *Katothrips* produce a repellent chemical from the anus (Crespi *et al*. 2004). Among the species of the genera discussed in this paper the tube has sometimes been observed to be raised over the head and projected forwards, in a position that would direct any secretion from the anus toward a potential aggressor. This raising of the abdominal apex is clearly facilitated by each abdominal sternite being considerably longer than its associated tergite, thus providing protection to the ventral surface when the abdomen is recurved dorsally. The diverse forms of the tenth abdominal segment are presumably of considerable importance to the lives and behaviour of these Phlaeothripidae, considering the remarkable convergent evolution in widely separated evolutionary lineages.

Accepted by A. Cavalleri: 11 Mar. 2021; published: 1 Apr. 2021



FIGURES 1–13. Abdominal segment X variation in shape. *Acallurothrips* species 1–4: **(1)** *darumbali* **sp.n**; **(2)** *nogutti*; **(3)** *yagara* **sp.n**; **(4)** *erubi* **sp.n**. *Neosmerithothrips* species 5–6: **(5)** *barrowi* **sp.n**; **(6)** *turrbali* **sp.n**. **(7)** *Ozothrips meanjini* **sp.n**. *Pygothrips* species 8–10: **(8)** *vicinus* paratype; **(9)** *rugicauda* male; **(10)** *rugicauda* female. **(11 a, b)** *Acallurothrips* tergites VIII–X to show setae SB1 and SB2 (from Okajima 1993). **(12)** *Pygothrips rugicauda* holotype tergite X dorsal and lateral views (from Hood 1915). **(13)** *Pygothrips pygus* tergites IX–X (from Mound 1974a).

Most of the Australian species considered here have the tube short and black with the margins convex or even remarkably swollen (Figs 1–13). These species are members of three genera, of which two, *Acallurothrips* and

Neosmerinthothrips, are closely related in the subtribe Diceratothripina, whereas *Pygothrips* is more distantly related. The genus *Acallurothrips* is here newly recorded from Australia with four species, of which three are described as new species. Also newly recorded from Australia is the genus *Neosmerinthothrips* with two new species. Both of these genera are widespread in tropical countries. The other two genera discussed in this paper, *Ozothrips* and *Pygothrips*, are placed in the subtribe Pygothripina although their relationships are not clear. The five previously known species of *Ozothrips* were all described from New Zealand, with one subsequently recorded from Norfolk Island (Mound & Wells 2015). The new *Ozothrips* species described here is from Queensland, Australia, and is the third of the six species known in this genus to have the tube sharply yellow (Fig. 7). *Pygothrips* was erected originally for a single species from Australia, but the subsequently described 16 members of this genus are from various tropical countries, with four species now recorded from Australia. The primary objective here is to record the genera from Australia in preparation for an identification system to the 145 genera of Phlaeothripidae from this continent as part of the web-based system *Thysanoptera Australiensis* (Mound & Tree 2020).

Abbreviations and depositories. The major setae on the pronotum are indicated by: am—anteromarginals; aa—anteroangulars; ml—midlaterals; epim—epimerals; pa—posteroangulars. The major setae on the head are the postoculars—po; those on tergite IX are referred to as S1, S2 and S3, where S1 is the nearest to the body midline; The small intermediate setae between S1 and S2 on tergite IX are referred to as SB1 and SB2 (Fig. 11). Holotypes of the new species are deposited in the Australian National Insect Collection (ANIC), CSIRO, Canberra, with some paratypes in the Queensland Primary Industries Insect Collection (QDPC), Brisbane.

Acallurothrips Bagnall

Acallurothrips Bagnall, 1921: 269. Type species *A. macrurus* Bagnall

A full diagnosis of this genus of Idolothripinae was provided by Okajima (2006), but the most important character states are: head short and broad with stylets widely spaced; maxillary palp segment I longer than wide and almost half as long as segment II, terminal sensorium on II large (Fig. 32); antennae 8-segmented but with segments VII–VIII almost completely fused; mesopresternum usually vestigial (Figs 31–32); fore tarsal tooth present in both sexes; fore wings when present without duplicated cilia; tergites shorter than sternites; tube swollen often with convex margins (Figs 1–4).

Among species of Phlaeothripidae the first segment of the maxillary palps is usually scarcely longer than wide, and thus much shorter than the second segment. Only among the species of the Idolothripinae genus *Carientothrips* is the first maxillary palp segment known to be as long as, or even longer than, the second (Eow *et al*. 2014). However, *Acallurothrips* species are also unusual in having the first segment considerably longer than wide, and sometimes about half as long as the second segment. Moreover, the sensorium at the apex of segment II is unusually large, approaching the condition found in *Allothrips* species. Females of *Acallurothrips* species share a character with many other Phlaeothripidae, in that they have two pairs of minor setae on tergite IX between the major setae S1 and S2. Okajima (1993) refers to these setae as SB1 and SB2 (Fig. 11a, b). The setae SB1 are homologous with the setal pair in *Apelaunothrips* species that were discussed as setae iS by Mound (2013). These setae are also sometimes prominent in related genera (Dang *et al*. 2013) such as *Hoplandrothrips* and *Adraneothrips*. Contrary to the interpretation by Okajima, and subsequent to examining male paratypes of both *Acallurothrips casuarinae* and *A.spinurus*, the males of species of *Acallurothrips* are considered to lack on tergite IX the setae known as SB2 in females. Moreover, this pair of (often minute) setae are commonly absent in the males of other Phlaeothripidae. Species differentiation in *Acallurothrips* here relies largely on the form of this setal pair in females, as well as the shape of the tube.

Currently 22 species are listed in this genus (ThripsWiki 2021), with three further species described below. However, relationships between some of the listed species are not secure. For example, *A. judithae* (Faure) from South Africa has a well-developed mesopresternum, a structure that is commonly vestigial or absent in members of this genus (Okajima 2006). The New World genus *Diopsothrips* is currently considered a synonym of *Acallurothrips*, but the three species involved have a relatively well-developed pair of ocellar setae in contrast to the species considered here, and antennal segments VII and VIII are fused with no suture between them. Unfortunately, nothing is known of the mesopresternum in the three species placed originally in *Diopsothrips*. Of the 25 species now placed in *Acallurothrips*, eight are from the Neotropics, four from the Ethiopian Region, seven from Japan or China, and four from Australia.

Key to *Acallurothrips* species from Australia

1. Females with tergite IX setae SB2 minute, smaller than SB1 (Fig. 11b); antennal segment IV with ventral pair of sense cones strongly curved (Fig. 25) 2
-. Females with tergite IX setae SB2 larger than setae SB1(Fig. 11a); antennal segment IV with ventral pair of sense cones straight (Fig. 23) 3
2. Tube 1.3 to 1.5 times as long as maximum width, margins convex (Fig. 4) . . . . . *erubi* **sp.n.**
-. Tube 1.7 as long as maximum width, margins weakly curved (Fig. 2) . . . . . *nogutii*
3. Female with tergite IX setae SB2 slender, more than 0.5 as long as S1 and S2; tube sharply constricted to anal ring (Fig. 3) . . . . . *yagara* **sp.n.**
-. Female with tergite IX setae SB2 short and stout; tube gradually tapering to anal ring (Fig. 1). . . . . *darumbali* **sp.n.**

***Acallurothrips darumbali* sp.n.**
(Figs 1, 16, 23, 34)

Female macroptera. Body brown, head a little darker at anterior margin, distal abdominal segments darker and tube black; femora extensively yellow but shaded brown on basal half, tibiae darker; antennal segments I–II yellow, III–VIII brown but base of III paler; fore wings uniformly shaded. Head wider than long, postocular setae pointed and longer than eye length; two posterolateral ommatidia larger than remaining facets; maxillary stylets retracted to level of eyes, widely spaced (Fig 16, 23).Antennal segment III with 2 sense cones, IV with 4 straight sense cones; suture between segments VII and VIII present ventrally but not dorsally. Prosternal basantra very weakly sclerotised, ferna transverse, mesopresternum reduced to irregular transverse sclerite medially; metathoracic sternopleural sutures broadly eroded. Metanotum weakly reticulate (Fig 34). Fore wing without duplicated cilia, sub-basal setae very small. Pelta reticulate, transverse, posterior margin concave and separated from anterior margin of tergite II; tergite II eroded laterally; tergites III–VIII with no wing-retaining setae defined, setal pair S4 increasingly short and stout; tergite IX setae S1 and S2 long and fine but slightly shorter than tube; intermediate setae SB1 short and fine, SB2 short and stout, also intermediate setal pair between S2 and S3; setae S3 stout and shorter than S2. Tube scarcely longer than wide (Fig 1).

Measurements (holotype female in microns). Body length 1560. Head, length 140; width 180; postocular setae 65. Pronotum, length 110; width 300; major setae—am 12, aa 30, ml 35, epim 70, pa 40. Fore wing, length 700; longest sub-basal seta 10. Tergite V setae S3 45. Tergite IX setae—S1 140, SB1 35, SB2 50, S2 125, S3 70. Tube, length 150; maximum width 135; width at anal ring 25. Antennal segments III–VII length 55, 45, 42, 42, 65.

Male aptera. Very similar to female in colour and structure; large male with fore femora swollen and meso and metanota more transverse; head without ocelli; metanotal reticulation weak; tergite IX lacking setal pair SB2.

Specimens studied. Holotype female, **Australia, Queensland**, Capricorn Caves, [S23.165 E150.492], taken by spraying bark and logs, 15.iv.2010 (Monteith & Turco), in ANIC.

Paratypes: 3 females, 1 male taken with holotype; **Northern Territory**, Darwin, Holmes Jungle, 1 female from curled leaves, 2.i.1996. Darwin, 1 male, 7.x.2006, 1 male from dead wood, 5.v.2014; Coburg Peninsular, 1 female from dead twigs, 4.v.1999.

Comments. The head and antennae of *darumbali* are closely similar to those of *yagara*. The tube is similar in shape to that figured by Wang and Tong (2008) for *tubullatus* from southern China, but the SB2 setae on tergite IX of females are exceptionally stout and considerably more so than in *spinurus* from Japan (Okajima 1993). The specimens listed from Darwin have the tube very slightly narrower than the holotype but share a similar chaetotaxy. The specific epithet refers to the original people of the Rockhampton area of Queensland.

***Acallurothrips erubi* sp.n.**
(Figs 4, 15, 25, 35)

Female macroptera. Body brown with distal abdominal segments darker and tube black; legs brown with mid and hind femora variably yellow distally and ventrally; antennal segments I–III mainly yellow with III shaded in apical half, IV–VIII increasingly brown; fore wings strongly shaded with darker longitudinal line. Head wider than long, postocular setae pointed and longer than eye length; maxillary stylets retracted to level of eyes, widely spaced (Fig.

15). Antennal segment III with 2 sense cones, IV with 4, all sense cones curved, the ventral pair on IV being strongly curved; suture between segments VII and VIII present ventrally but not dorsally (Fig 25). Pronotum smooth, with 5 pairs of major setae, am setae smallest, epim setae long; notopleural sutures complete. Prosternal basantra weakly sclerotised but usually bearing one seta, ferna transverse, mesopresternum reduced to irregular median sclerite; metathoracic sternopleural sutures broadly eroded. Metanotum very weakly reticulate. Fore wing without duplicated cilia, one sub-basal seta elongate. Pelta reticulate, transverse, close to anterior margin of tergite II but variably eroded postero-medially (Fig. 35); tergites II–VII with no wing-retaining setae defined, setal pair S3 very long and fine, much longer than posteroangular pair S4; tergite VIII setal pair S1 long and fine, S3 short and slightly stout; tergite IX setae S1 and S2 long and fine and slightly longer than tube, S3 shorter; intermediate setae SB1 short and fine, SB2 half as long as S1. Tube bee-hive shaped, sharply constricted to anal ring (Fig 4).

Measurements (holotype female in microns). Body length 1800. Head, length 155; width 200; postocular setae 90. Pronotum, length 115; width 285; major setae—am 20, aa 25, ml 35, epim 85, pa 65. Fore wing, length 750; longest sub-basal seta 95. Tergite V setae S3 110. Tergite IX setae—S1 200, SB1 35, SB2 15, S2 220, S3 175. Tube, length 220; maximum width 160; width at anal ring 30. Antennal segments III–VII length 55, 50, 50, 45, 70.

Male aptera. Very similar to female in colour and structure, meso and metanota more transverse; head without ocelli; metanotal reticulation weak; tergal setae S1, S2 and S3 long and fine; tergite IX lacking setal pair SB2.

Specimens studied. Holotype female, **Australia, Queensland**, Darnley Island [S9.5797, E143.7790], from dead twigs, 17.xi.2009 (LAM5293), in ANIC.

Paratypes: 4 females taken with holotype; Cairns, James Cook University [S16.814 E 145.685], 2 females, 1 male from dead branches, 3.xi.2008.

Comments. This species is closely similar to *nogutii* Kurosawa but has the tube distinctly more robust (Fig. 4). Erub is an original name for Darnley Island.

Acallurothrips nogutii (Kurosawa)

(Figs 2, 14, 24, 32)

Acallurothrips nogutii Kurosawa, 1932: 234.

Full descriptions of this species from Japan were given by Okajima (1993; 2006), who recorded it from Honshu and the associated Izu Islands. The species has been found widely in rainforest areas of eastern Queensland, between Cairns and Cooloola, and two specimens have been studied from Malaysia, Kuala Lumpur. It is closely similar in colour and structure to the new species *darumbali* and *yagara* described here from Australia, apart from the very small SB2 setae on tergite IX of females (this seta absent in males), and one long sub-basal seta on the fore wing. In these character states it is similar to the new species *erubi*, but has the tube far less "heavy", with the margins less convex and almost straight (Fig. 2).

Specimens studied. **Japan**, Izu Islands, 1 female from dead branches, 27.x.1985. **Malaysia**, Kuala Lumpur, 1 female, 1 male by insecticide fogging of forest trees, xi.2010. **Australia**, **Queensland**, by spraying tree bark with insecticide: Emmagen Creek, 2 females, 2 males, 29.v.2012; Byfield N.P., 4 females, 21.vii.2010; Cooloola, 1 male, 4.ii.2013; Robinsons Creek, 1 female, 14.xi.2014; Millaa Millaa, Downey Creek, 8 females, 7 males, 7.xii.1988; Windsor Tableland, 2 females, 4 males, 27.xii.1988.

Acallurothrips yagara sp.n.

(Figs 3, 26, 31)

Female macroptera. Body brown with apex of abdomen darker and tube black; legs brown with mid and hind femora yellow at apex; antennal segment I yellow, II shaded, III–VIII brown but base of III–V paler; fore wings strongly shaded with darker longitudinal line. Head wider than long, postocular setae pointed and longer than eye length; two posterolateral ommatidia larger than remaining facets; maxillary stylets retracted to level of eyes, widely spaced. Antennal segment III with 2 sense cones, IV with 4 straight sense cones; suture between segments VII and VIII present ventrally but not dorsally (Fig 26). Pronotum smooth, with 5 pairs of major setae, am setae smallest,

epim setae long; notopleural sutures not always complete. Prosternal basantra weakly sclerotised, ferna transverse, mesopresternum reduced to irregular median sclerite (Fig. 31); metathoracic sternopleural sutures present. Metanotum weakly reticulate. Fore wing without duplicated cilia, sub-basal setae not elongate. Pelta reticulate, transverse, but separated from anterior margin of tergite II; tergite II eroded laterally; tergites II–VII without defined wing-retaining setae, setal pair S3 as long and as fine as posteroangular pair S4; tergite VIII setal pair S1 long and fine, S3 short and slightly stout; tergite IX setae S1, S2 and S3 long and fine and slightly longer than tube; intermediate setae SB1 short and fine, SB2 more than half as long as S1; between setae S2 and S3 there is an intermediate seta that is as long as SB1 but stout. Tube bee-hive shaped, sharply constricted to anal ring (Fig. 3).

Measurements (holotype female in microns). Body length 2050. Head, length 160; width 210; postocular setae 90. Pronotum, length 135; width 325; major setae—am 20, aa 30, ml 50, epim 120, pa 75. Fore wing, length 850; longest sub-basal seta 45. Tergite V setae S3 130. Tergite IX setae—S1 215, SB1 75, SB2 130, S2 220, S3 180. Tube, length 230; maximum width 200; width at anal ring 25. Antennal segments III–VII length 65, 55, 55, 50, 75.

Male aptera. Very similar to female in colour and structure but meso and metanota more transverse; head without ocelli; metanotal reticulation weak; tergal setae S2 as long and fine as S3; tergite IX lacking setal pair SB2.

Specimens studied. Holotype female, **Australia, Queensland**, D'Aguilar National Park, Mt Glorious [S27.3325 E152,759], from dead wood, 1.xi.2007 (DJT 554), in ANIC.

Paratypes: **Queensland**: Lamington National Park, O'Reilly's, 2 females 1 male from dead twigs, 9–11.x.2006; Bunya Mts, 2 females, 6.x.1984, 1 female 30.xii.2010, 1 female, 22.xii.2011, from dead branches; Yarraman, 3 females from dead branches, 27.iv.2010; Blackbutt Range, 1 female, 1 male from dead branch, 27.iv.2010; Kenilworth, 1 female from dead branch, 26.ii.2010; Atherton, 2 females from dead mossy twig, 1.viii.2004.

Comments. This species is closely similar to *spinurus* Okajima from Honshu, Japan, but has the tube distinctly more robust, and setae SB2 on tergite IX more slender. Also similar is *tubullatus* Wang & Tong (2008) from Guangdong, China, but the original illustration indicates a shorter and broader tube. Most of the collection localities listed above are from within 200km northwest of Brisbane, in rainforest areas; Atherton however is in northern Queensland. The name of this species refers to the people of Southeastern Queensland.

Neosmerinthothrips Schmutz

Neosmerinthothrips Schmutz, 1913: 1051. Type species *N. fructuum* Schmutz.

This genus of Idolothripinae-Diceratothripina is weakly diagnosed, but an identification key to the 18 included species was provided by Mound (1974b), with an additional three species added subsequently (ThripsWiki 2021). Very little is known about any of the species, as most of them are based on few specimens. The only species for which extensive measurements and illustrations are available is *N. insularis*, of which Okajima (2006) studied good series of both sexes from the Ryukyu Islands, Japan. Wingless males of this species were described as exhibiting considerable variation in body size and setal lengths, although the setae on tergite IX are generally slightly shorter than the length of the tube. Moreover, the macropterous females were described as differing in structure and chaetotaxy from the wingless males. In consequence, species recognition within this genus is probably insecure. Individuals of *Neosmerinthothrips* species are usually beaten from dead branches where, judging from the gut contents of available specimens, the adults feed on fungal spores. The two new species described here were both found in northern Australia. One of them, *N. barrowi* **sp.n.**, has the head longer than wide (Fig. 17), the fore tarsus with a small tooth, and the median length of each sternite considerably longer than the corresponding tergite. The second species, *N. turrbali* **sp.n**., has the head almost as wide as long (Fig. 18), the fore tarsus without a tooth, and the length of each pair of tergites and sternites not differing greatly.

Neosmerinthothrips barrowi sp.n.

(Figs 5, 17, 27, 36)

Female microptera. Body brown to dark brown with tube black; legs brown with tibiae and tarsi paler; antennal segment I dark brown, II yellow in apical half, III–V largely dark yellow changing to pale brown distally, VI light

brown, VII–VIII darker; major setae dark brown. Head longer than wide, with weak sculpture posterolaterally; compound eyes smaller ventrally than dorsally, posterior ocelli close to eye margin; maxillary stylets retracted to po setae, about one third of head width apart po setae exceptionally long (Fig. 17). Antennae 8-segmented, VIII unusually short; segment III with 2 sense cones, IV with 4, the length of the sense cones is less than half the apical width of their segment (Fig. 27). Pronotum short, with almost no sculpture lines, 5 pairs of major setae well-developed, notopleural sutures complete. Mesonotal lateral setae small; metanotum with almost no sculpture medially. Prosternal basantra apparently present, ferna sub-circular, mesopresternum transverse but slender; metathoracic sternopleural sutures long. Fore tarsus with small tooth on inner apical margin. Fore wing lobe length about half of pterothorax width, with 3 dark sub-basal setae. Pelta reticulate, hat-shaped (Fig. 36); tergites II–VI each with one pair of wing-retaining setae, weakly sigmoid on III–V but straight on II and VI; lateral setae increasingly elongate on posterior tergites, on IX much longer than tube (Fig. 5); tube robust, narrowing to anal ring, anal setae about as long as tube. Sternites with median length much greater than the length of their tergite; up to 20 very small discal setae in transverse row medially; posteromarginal setae less than half as long as their sternite.

Measurements (holotype female in microns). Body length 2900. Head, length 325; width 250; po setae 160. Pronotum, length 140; width 325; major setae—am 65, aa 45, ml 65, epim 100, pa 100. Fore wing lobe 220. Tergite IV median length 120; sternite IV median length 200. Tergite VII longest lateral seta 280. Tergite IX setae—S1 350, S2 330, S3 280. Tube, length 215; maximum width 150; minimum width 60. Antennal segments III–VIII length 110, 100, 85, 70, 50, 30.

Female macroptera. Very similar in structure and sculpture to microptera. Fore wing pale with area around sub-basal setae shaded, with about 20 duplicated cilia.

Measurements (paratype female same locality as holotype). Body length 2500. Head length 300. Tube length 200. Fore wing length 900.

Male microptera. Colour and structure differing from female as follows: Fore femora swollen, fore tarsal tooth stout and about as long as tarsal width. Pronotum robust with prominent median longitudinal apodeme but no sculpture. Tergal wing-retaining setae not sigmoid.

Measurements (paratype male same locality as holotype). Body length 2600. Head length 340. Pronotum, length 220; width 370. Tergite IX setae S1 280. Tube length 200.

Specimens studied. Holotype female microptera, **Western Australia**, Barrow Island, beaten from vegetation, v.2007 (S. Callan), in ANIC.

Paratypes: 8 female macropterae, 3 male micropterae from same locality as holotype, iv–v.2005 (J. Majer). Western Australia, Broome, Willie Creek, 1 female, 1 male macropterae from *Acacia* stems, 2.iii.2005.

Comments. In the key by Mound (1974b) this species runs to *parvidens* from Panama, based on the dark basal antennal segments, the pale fore wings, and the presence of a fore tarsal tooth in females. It differs from *parvidens* in having the head considerably more elongate (in *parvidens* only 1.1 times as long as wide and 1.1 times as long as the tube), and the major setae all dark brown rather than pale. The available specimens vary greatly in body size and setal lengths. The body length of the paratype female taken near Broome is 2300 microns whereas the largest female from Barrow Island is 3100 microns long. The specimen selected as holotype is the only micropterous female; the macropterae from the same site are all damaged due to having been collected with a suction apparatus but are remarkable similar in structural details to the holotype microptera. The presence or absence of the prosternal basantra is difficult to determine, but in this species the prosternal chitinous islets appear to be fused into a pair of sclerites.

Neosmerinthothrips turrbali sp.n.

(Figs 6, 18, 28, 37)

Female macroptera. Body brown to dark brown with tube darkest; legs brown, including tibiae and tarsi; antennal segments mainly brown, II paler at apex, III yellowish-brown on basal half; fore wings light brown with darker longitudinal lines; major setae all dark brown. Head about as long as wide, vertex without sculpture lines (Fig. 18); compound eyes narrowed ventrally, with 3 pigmented facets; posterior ocelli close to compound eyes; maxillary stylets retracted to po setae, arranged in a wide V-shape (Fig 18). Antennae 8-segmented, VIII slender and narrowed to short pedicel (Fig. 28); III with 2 sense cones, IV with 4; sense cones small, about 0.8 as long as apical width of their segments. Pronotum with strong median longitudinal line, 5 pairs of major setae; notopleural sutures complete.

Mesonotal lateral setae small; metanotum reticulate on posteromedian half (Fig 37). Prosternal basantra not clearly developed, ferna transverse, mesopresternum complete but slender; metathoracic sternopleural sutures long. Fore tarsus without tooth. Fore wing with 10–12 duplicated cilia. Pelta hat-shaped with stout brim (Fig. 37); median length of tergites and sternites not greatly different; tergites II–VII each with one pair of sigmoid wing-retaining setae, lateral setae increasingly elongate on posterior tergites, on IX slightly longer than tube; tube narrowing to anal ring, anal setae slightly longer than tube (Fig 6). Sternites with median row of about 12 small discal setae; posteromarginal setae shorter than sternite lengths.

Measurements (holotype female in microns). Body length 2250. Head, length 260; width 250; po setae 90. Pronotum, length 125; width 280; major setae—am 35, aa 40, ml 50, epim 90, pa 60. Fore wing length 900. Tergite VII longest lateral seta 250. Tergite IX setae—S1 215, S2 220, S3 215. Tube, length 195; maximum width 95; minimum width 45. Antennal segments III–VIII length 80, 70, 70, 65, 40, 40.

Specimens studied. Holotype female macroptera, **Australia, Queensland**, D'Aguilar National Park, from dead wood, 1.viii.2012 (K.M.Thomson) (in ANIC).

Paratypes: Same site as holotype, 3 female macropterae from *Eucalyptus* nuts, 16.ii.2012.

Comments. According to the key to *Neosmerinthothrips* species (Mound 1974b) this new species shares only with three other species the following character states: fore tarsal tooth absent; basal two antennal segments dark. One of these three, *N. robustus* (Ananthakrishnan) from India, has yellow fore femora and pale fore wings. A second species, *N.affinis* (Bagnall) from Sri Lanka, is known only from a single crushed specimen. The third, *N. collaris* (Bagnall), is recorded under four different names from the West Indies and West Africa (ThripsWiki 2021). According to the lengthy description of *dominicanus* (Hood), a synonym of *collaris*, the head is longer than wide, the fore tibiae and tarsi are yellow and the major setae on tergite IX are shorter than the tube. For these reasons *N. turrbali* is considered a new species. It is similar to the illustrations of *N. insularis* Okajima from the Ryukyu Islands of Japan, but that species has a well-developed fore tarsal tooth in both sexes. The presence or absence of the prosternal basantra is difficult to determine in this species but the prosternal chitinous islets do not seem to be fused into a pair of sclerites. One macropterous female of a very similar species to *turrbali* has been studied from Timor Leste, but that has fewer fore wing duplicated cilia, tergite IX setae S1 distinctly shorter than the tube, and antennal segment VIII shorter and not constricted at the base. The specific epithet refers to an original language of the people of Southeastern Queensland.

Ozothrips Mound & Palmer

Ozothrips Mound & Palmer, 1983: 24. Type species *O. priscus* Mound & Palmer.

This genus is distinguished from *Acallurothrips* by the more closely approximated maxillary stylets, the presence of fore wing duplicated cilia, the presence of a well-developed mesopresternum, the tapering and almost straight margins of the tube, and the complete fusion of antennal segments VII and VIII. The species of both *Acallurothrips* and *Ozothrips* share many character states with various species placed in the widespread tropical genus *Neosmerinthothrips* (Mound & Palmer 1983) that is here newly reported from northern Australia. However, *Ozothrips* is currently considered more closely related to *Pygothrips* because of the position of the maxillary stylets less than one-third of the head width apart, rather than wide apart.

Ozothrips meanjini sp.n.
(Figs 7, 19, 29, 33)

Female macroptera. Body brown with distal abdominal segments slightly darker but tube golden yellow (Fig. 7); legs including tibiae brown with mid and hind femora variably yellow at apex, mid and hind tarsi brown but fore tarsi almost yellow; antennal segment I yellow, II weakly shaded, III yellow on basal half, IV–VIII increasingly brown; fore wings weakly shaded and paler medially; all major setae light brown. Head wider than long, postocular setae pointed and as long as dorsal eye length; eyes slightly prolonged ventrally; maxillary stylets retracted to level of eyes and almost one-third of head width apart (Fig. 19). Antennal segment III with 2 sense cones, IV with 4, all

sense cones short and stout; segments VII and VIII fused with no trace of suture (Fig 29). Pronotum smooth, with 5 pairs of long and pointed major setae; notopleural sutures complete. Prosternal basantra bearing one seta, ferna transverse; mesopresternum posterior margin strongly convex and recessed into concave anterior margin of mesoeusternum (Fig. 33); metathoracic sternopleural sutures well-developed. Metanotum weakly reticulate, with pair of long fine setae. Fore wing with about 15 duplicated cilia, with three long pointed sub-basal setae. Pelta reticulate, transverse, close to anterior margin of tergite II; tergites III–VI with setal pair S2 curved or even weakly sigmoid, S3 very long and fine, much longer than posteroangular pair S4; tergite VIII setal pair S1 long and fine, S3 short and slightly stout; tergite IX setae S1, S2 and S3 long and fine but slightly shorter than tube; intermediate setae SB1 and SB2 short and fine. Tube robust, narrowing distally and sharply constricted to anal ring. Each sternite shorter than corresponding tergite, with posteromarginal setae very small; discal setae minute in regular transverse row.

Measurements (holotype female in microns). Body length 2050. Head, length 175; width 225; postocular setae 65. Pronotum, length 165; width 330; major setae—am 40, aa 35, ml 50, epim 90, pa 75. Fore wing, length 950; sub-basal setae 50, 65, 80. Tergite V setae S3 150. Tergite IX setae—S1 170, SB1 50, SB2 25, S2 160, S3 170. Tube, length 190; maximum width 110; width at anal ring 45. Antennal segments III–VII length 75, 65, 55, 55, 75.

Specimens studied. Holotype female, **Australia, Queensland**, Yarraman, [S26.857 E151.994], collected by insecticide spraying of tree bark, 27.iv.2010 (Monteith)(DJT1116) in ANIC. Paratypes: 2 females collected with holotype.

Comments. This species is distinguished from the previously described five members of *Ozothrips* by the enlarged mesopresternum in which the posterior margin protrudes into a deeply concave anterior margin of the mesoeusternum. In contrast, wingless members of this genus have the thoracic sternites largely eroded. The only other member of the genus recorded from Australia, *janus* Mound & Palmer, has the compound eyes greatly prolonged on the ventral surface of the head (Mound & Wells 2015). The species epithet is derived from an original name for part of southeastern Queensland.

Pygothrips Hood

Pygothrips Hood, 1915: 49. Type species *P. rugicauda* Hood.

There are currently 17 species listed in this genus (ThripsWiki 2021), of which eight are from the warmer parts of the Americas, three from southern Japan, one from Indonesia, two from Fiji and four from Australia (including one that is widespread in southeast Asia). The type species has previously been known only from a single wingless female that was taken in northern Queensland, but specimens taken widely across Australia are reported here as closely similar to this holotype and are identified provisionally as this species. In a revision of the nine *Pygothrips* species known from the Old World, Okajima (1990) provided a detailed diagnosis of the genus in which he stated that antennal segment IV has four (rarely two) sense cones. At that time, it had not been confirmed that the type species, *rugicauda*, is the only species in the genus with just two sense cones on this segment. Moreover, *rugicauda* is the only species among the nine discussed by Okajima that has the tube grossly swollen and bearing large numbers of prominent short setae on the surface. Currently, *Pygothrips* is distinguished from *Acallurothrips* at sub-tribal level because of the position of the maxillary stylets close together medially in the head (Figs 20–22). As indicated above in the Introduction, convergence in the form of the tenth abdominal segment among these thrips is presumably associated with their behaviour. Two of the species considered here, *pygus* and *shavianus*, are probably only distantly related to the other members of *Pygothrips*, judging from the presence of a complete mesopresternum, the slightly wider separation between the maxillary stylets in the head, a pronotum that is remarkably short medially (Fig. 20), and less rounded median antennal segments. These two species differ remarkably from each other in the form of the tube. They were both described originally in the genus *Cryptothrips* despite having four sense cones on antennal segment IV, whereas the type-species of *Cryptothrips* has only three sense cones on that segment. In *Pygothrips* species the sense cones on antennal segments III and IV are often small; the inner sense cone on III is sometimes scarcely visible, and the ventral pair of sense cones on segment IV may be less than half the length of the dorsal pair.

Key to *Pygothrips* species from Australia

1. Maxillary stylets about one-fifth of head width apart (Figs 20–21); mesopresternum well-developed and complete; pronotum unusually short in midline (Fig. 20), width about 3.0 times as long as median length 2
-. Maxillary stylets close together medially in head (Fig. 22); mesopresternum reduced to small median or lateral sclerites; pronotum longer medially, width about 2.5 times median length 3
2. Pelta broadly triangular (Fig 39); tergite IX with no short stout setae; tergite X tapering evenly, margins without any setae . . . . . *shavianus*
-. Pelta with long slender lateral wings (Fig. 38); tergite IX with 3 pairs of short, stout setae; tergite X converging sharply to apex, laterally with many short setae (Fig. 13) . . . . . *pygus*
3. Antennal segment IV with 2 sense cones; abdominal segment X swollen dorsally and with convex lateral margins, bearing many short stout setae (Figs 9, 10, 12). . . . . *rugicauda*
-. Antennal segment IV with 4 sense cones; abdominal segment X tapering evenly with no robust lateral setae . . . . . *vicinus*

Pygothrips pygus (Mound)

(Figs 13, 20, 30, 38)

Cryptothrips pygus Mound, 1974a: 43

Described from a single female taken south of Adelaide, two further females have been studied from near Renmark in South Australia. The tube is sharply constricted near the anal ring, and some of the setae on tergites VIII and IX are very short and stout (Fig. 13). On tergite IX one stout pair is homologous with setae SB2 discussed above under *Acallurothrips* but there is a second stout pair ventrolaterally, and setae S3 are also short and stout. As indicated in the original illustration, the posterior ocelli are confluent with the inner posterior margin of the compound eyes, and the only pair of pronotal major setae is the epimerals (Fig. 20). The fore tarsal tooth of these females is very short and directed forwards not laterally (Fig. 30). The fore wings are unusually broad and bear about 15 duplicated cilia.

Specimens studied. **South Australia**: Aldinga, holotype female, from *Eucalyptus* flowers, 3.xii.1967; Renmark District, 1 female in malaise trap, 18.xi.1998, 1 female in pitfall trap, 20.xii.1998 (in ANIC).

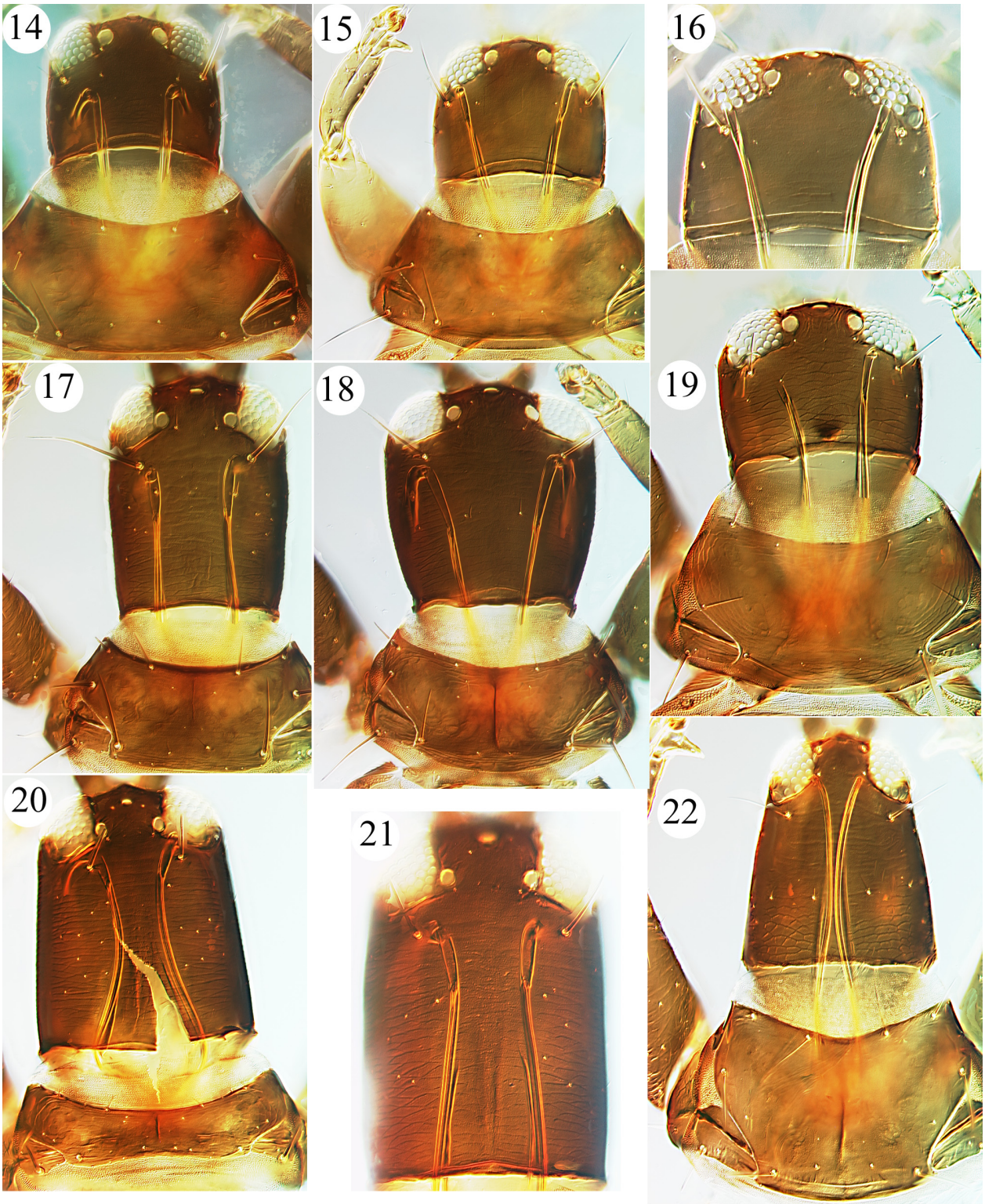
Pygothrips rugicauda Hood

(Figs 9, 10, 12, 22)

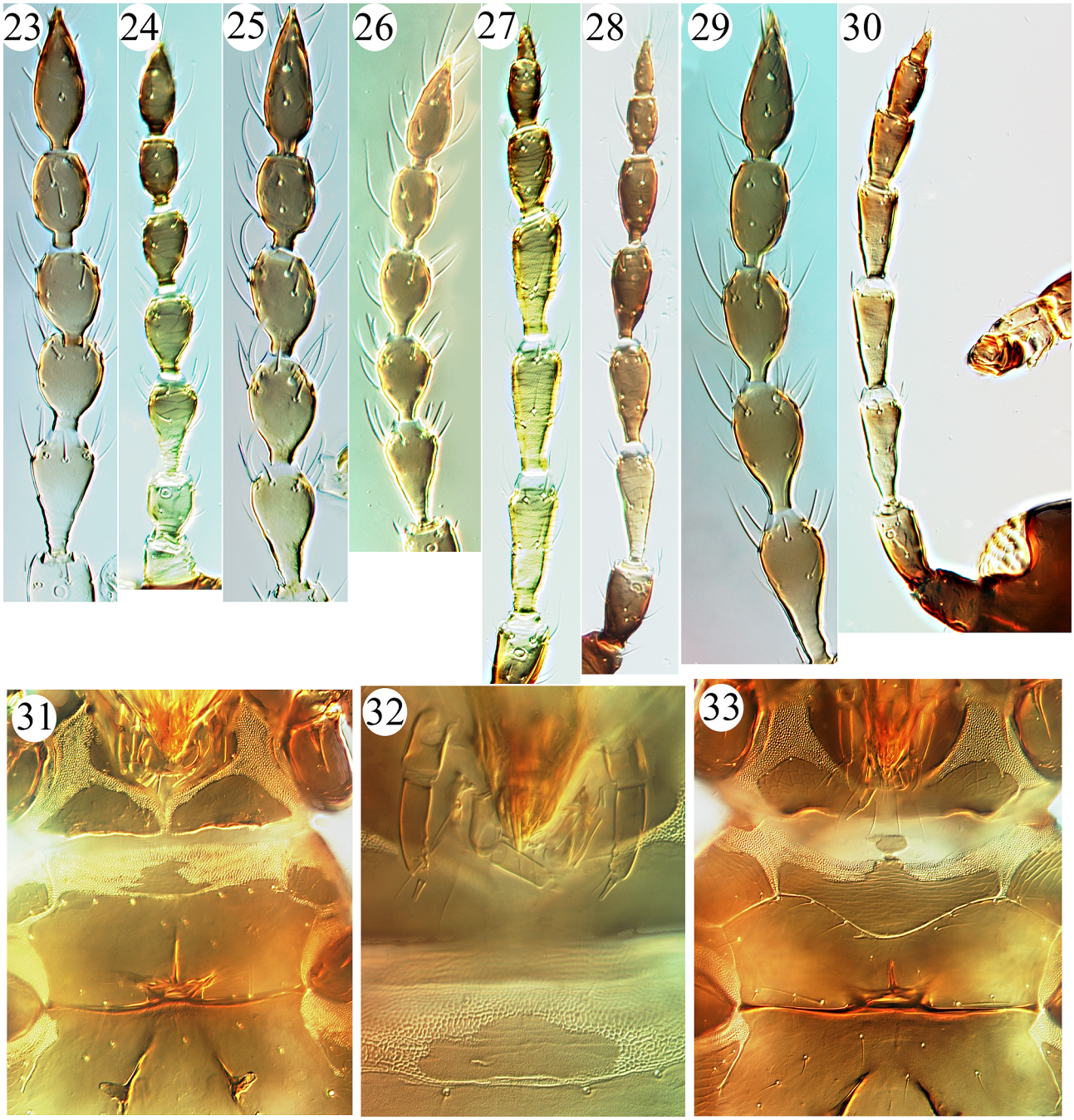
Pygothrips rugicauda Hood, 1915: 50

For many years this remarkable species remained known only from the wingless female holotype that was collected in northern Queensland by A.A. Girault, 17.viii.1912. However, in recent years specimens have been taken at various sites between southern Queensland and southern New South Wales as well as in South Australia, and these are here all provisionally identified as the same species. The shape of the tube was illustrated by Hood, such that the ventral surface is almost flat but the upper surface swollen in the basal third and from there slopes down to the anus (Fig. 12). In dorsal view the lateral margins are strongly curved from the broad base to the narrowly constricted anal ring. However, there is considerable variation between the available individuals in the form of the tube, even within the same sample. Most individuals of both sexes have the tube margins strongly convex (Fig. 10), but a few have the tube slightly more slender (Fig. 9). Unfortunately, there are problems in slide-mounting these thrips, such that the swollen tube is commonly crushed or collapsed, with no possibility of seriously assessing the variation within and between samples. The series taken near Canberra was beaten from dead *Eucalyptus* branches that had extensive Scolytid beetle galleries, and among these specimens the pelta is sometimes so weakly sclerotised that it is almost absent. Apterous individuals have the mesopresternum reduced to a small median sclerite, but macropterae have the mesopresternum transverse and partly fused to the anterior margin of the mesoeusternum. One unidentified large *Pygothrips* female from Canberra, taken from a branch together with the more typical *rugicauda* females, has the tube with a series of very stout setae, and the tergite IX major setae long, fine and considerably longer than the tube. In addition to the specimens listed below, the following three specimens (in QDPC) have been studied in which the tube is robust but not swollen, and these seem likely to represent undescribed species: Canberra, one apterous fe-

male, 26.ii.2011; Tasmania, Binnalong Bay, two males, 10.xii.2012. Two females listed below from Western Australia near Perth are similar to *rugicauda*, but the macroptera has the tube more elongate and the pelta well-developed, broadly triangular and similar to that of *P. shavianus*; again, these possibly represent an undescribed species. Among the specimens listed below, the head, antennae, and pronotum are essentially identical, but the tube varies slightly in shape within and between samples. Without more extensive field data it is not possible to decide how many of the available specimens represent a single variable species and how many further species exist.

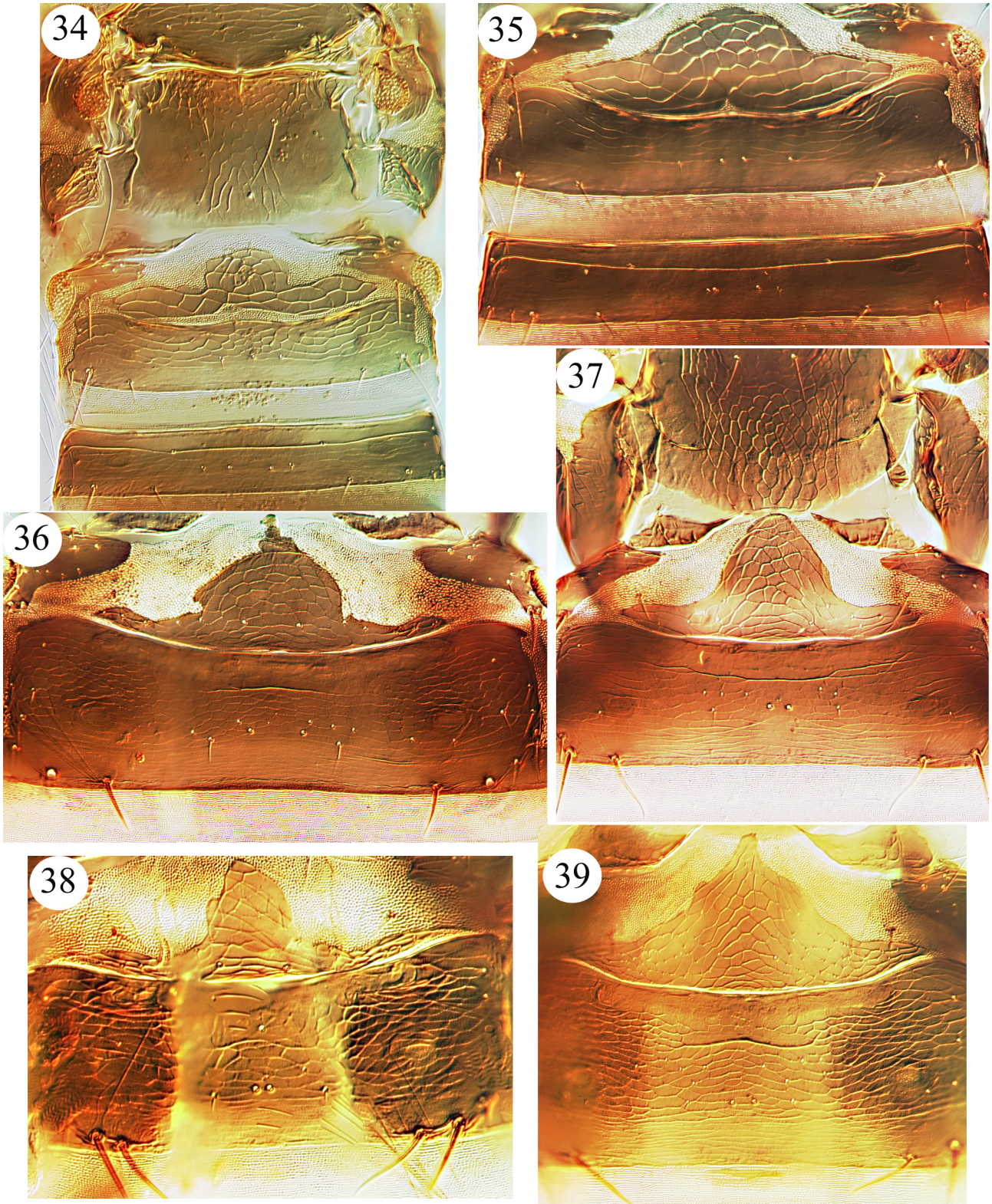


FIGURES 14–22. Heads of *Acallurothrips*. *Neosmerinthothrips*, *Ozothrips* and *Pygothrips* species. **(14)** *A. nogutti*. **(15)** *A. erubi* **sp.n**. **(16)** *A.darumbali* **sp.n**. **(17)** *N.barrowi* **sp.n**. **(18)** *N.turrbali* **sp.n**. **(19)** *O. meanjini* **sp.n**. **(20)** *P. pygus*. **(21)** *P. shavianus*. **(22)** *P. rugicauda*.



FIGURES 23–33. Species of *Acallurothrips*. *Neosmerinthothrips*, *Ozothrips* and *Pygothrips*. Antennae 23–30: **(23)** *A. darumbali* **sp.n**. **(24)** *A. nogutti*. **(25)** *A. erubi* **sp.n**. **(26)** *A. yagara* **sp.n**. **(27)** *N. barrowi* **sp.n**. **(28)** *N. turrbali* **sp.n**. **(29)** *O. meanjini* **sp.n**. **(30)** *P. pygus*. Mouth cone & mesopresternum 31-33: **(31)** *A. yagara* **sp.n**. **(32)** *A. nogutti*. **(33)** *O. meanjini* **sp.n**.

Specimens studied. **Australian Capital Territory**, from *Eucalyptus* dead branches: Black Mt., 2 female macropterae, 1 female, 1 male apterae, 6.iii.2011; 3 female apterae, ii.2011; 1 male aptera, 12.iv.2014; 6 female apterae, 1 female macroptera, 19.iv.2011. **ACT**, Oakey Hill, 1 female, 2 male apterae, iii–iv.2011. **New South Wales**, Holbrooke, 1 female, 1 male apterae from *Eucalyptus* mistletoe, ix.2007. **South Australia**, Bridgewater, 1 female aptera from gall on *Eucalyptus*, 18.vii.1999. **Queensland**: D'Aguilar National Park, Mt Glorious, 1 male aptera from dead *Eucalyptus*, 25.ii.2016; Kuranda, 1 male aptera from dead twigs, 2.xi.2008. **Western Australia**, Albany 40km north, 1 female macroptera, 1 female aptera, by insecticide fogging of *Eucalyptus*, v.2001 (in ANIC).



FIGURES 34–39. Pelta & tergite II of *Acallurothrips*. *Neosmerinthothrips* and *Pygothrips* species. **(34)** *A. darumbali* **sp.n**. **(35)** *A. erubi* **sp.n**. **(36)** *N. barrowi* **sp.n**. **(37)** *N. turrbali* **sp.n**. **(38)** *P. pygus*. **(39)** *P. shavianus*.

Pygothrips shavianus (Bagnall)
(Figs 21, 39)

Cryptothrips shavianus Bagnall, 1918: 216

Described from "two males" taken 31.i.1916 on *Acacia* at Healesville, Victoria, these specimens are dark and opaque, and the specimen selected as Lectotype is "probably a female" (Mound 1968: 77). One female has also been seen from southern New South Wales, and another from Tasmania. The head and thorax are similar to those of *P. pygus* but the pelta (Fig. 39), also the tube and setae on tergite IX, are different. As in that species, the base of antennal segment VIII is narrower than the apex of segment VII, and the fore wing bears about 20 duplicated cilia.

Specimens studied. **Australia**: **New South Wales**, Dalmeny, 1 female from dead branches, 26.xii.2010. **Tasmania**, Huon Valley, 1 female from dead branch, 31.i.2001 (in ANIC).

Pygothrips vicinus Okajima
(Fig. 8)

Pygothrips vicinus Okajima, 1990: 97

Having been described from the tropical islands of southern Japan and recorded from Thailand and Java, this species is here recorded from two areas of northern Australia—Horn Island in the Torres Straits, and also the southern margin of the Gulf of Carpentaria. It appears to be associated with dead branches of *Casuarina* trees. The tube has weakly convex margins (Fig. 8) but without prominent setae and the area of the anal ring is not sharply constricted. The head and thorax are similar in structure to *rugicauda*, although usually with rather less erosion of various sclerites. The mesopresternum is sometimes transverse and slender, but frequently eroded. Similarly, the median posterior margin of the pelta is usually slightly eroded, but in one large male it is fully eroded to a pair of small irregular sclerites.

Specimens studied. **Japan**, Okinawa, from dead *Casuarina* branches, 1 paratype female macroptera, 15.ix.1988, 1 male aptera, 3.iii.1990. **Australia, Queensland**: Horn Island, 5 female macropterae from dead *Dianella*, 20.ix.2009; Burketown 130km northwest, 8 female macropterae, 1 male aptera from dead *Casuarina* cones, 5.vii.2011 (in ANIC).

Acknowledgements

We are particularly grateful to Dr Mark Schutze who kindly organised several loans of slides to Canberra from the Queensland Primary Industries Insect Collection (QDPC). Figure 11 is based on illustrations in Okajima (1993) and Figure 12 is based on drawings in Hood (1915). We are also grateful to the Editor Adriano Cavalleri and two reviewers for much support.

References

Bagnall, R.S. (1918) Brief descriptions of new Thysanoptera IX. *Annals and Magazine of Natural History*, 1 (9), 201–221. https://doi.org/10.1080/00222931808562303

Bagnall, R.S. (1921) On Thysanoptera from the Seychelles Islands and Rodrigues. *Annals and Magazine of Natural History*, 7 (9), 257–293. https://doi.org/10.1080/00222932108632523

Crespi, B.J., Morris, D.C. & Mound, L.A. (2004) *Evolution of ecological and behavioural diversity: Australian* Acacia *thrips as model organisms*. Australian Biological Resources Study, Canberra & Australian National Insect Collection, Canberra, 328 pp.

Dang, L.-H., Mound, L.A. & Qiao, G.-X. (2013) Leaf-litter thrips of the genus *Adraneothrips* from Asia and Australia (Thysanoptera, Phlaeothripinae). *Zootaxa*, 3716 (1), 001–021. https://doi.org/10.11646/zootaxa.3716.1.1

Eow, L.-X., Mound, L.A., Tree, D.J.& Cameron, S.L. (2014) Australian species of spore-feeding Thysanoptera in the genera

Carientothrips and *Nesothrips* (Phlaeothripidae: Idolothripinae). *Zootaxa*, 3821 (2), 193–221. https://doi.org/10.11646/zootaxa.3821.2.2
Hood, J.D. (1915) A remarkable new thrips from Australia. *Proceedings of the Biological Society of Washington*, 28, 49–51.
Kurosawa, M. (1932) Descriptions of three new thrips from Japan. *Kontyu*, 5, 230–242.
Mound, L.A. (1968) A review of R.S. Bagnall's Thysanoptera collections. *Bulletin of the British Museum (Natural History)*. *Entomology* Supplement, 11, 1–181.
Mound, L.A. (1974a) Spore-feeding Thrips (Phlaeothripidae) from Leaf Litter and Dead Wood in Australia. *Australian Journal of Zoology*. Supplement, 27, 1–106. https://doi.org/10.1071/AJZS027
Mound, L.A. (1974b) The *Nesothrips* complex of spore-feeding Thysanoptera (Phlaeothripidae: Idolothripinae). *Bulletin of the British Museum (Natural History)*. *Entomology*, 31, 109–188. https://doi.org/10.5962/bhl.part.29485
Mound, L.A. (2004) Australian long-tailed gall thrips (Thysanoptera, Phlaeothripinae, Leeuweniini), with comments on related Old World taxa. *Australian Journal of Entomology*, 43, 36–45. https://doi.org/10.1111/j.1440-6055.2004.00406.x
Mound, L.A. (2013)Species diversity in the Palaeotropical leaf-litter genus *Apelaunothrips* (Thysanoptera, Phlaeothripinae). *Zootaxa*, 3741 (1), 181–193. https://doi.org/10.11646/zootaxa.3741.1.7
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. (2020) *Thysanoptera Australiensis* – Thrips of Australia. Lucidcentral.org, Identic Pty Ltd, Queensland, Australia. Available from: https://keys.lucidcentral.org/keys/v3/thrips_australia/ (accessed 11 November 2020)
Mound, L.A. & Tree. D.J. (2021) Structural variation among species of *Leeuwenia* (Thysanoptera, Phlaeothripinae) with three new species from Australia. *Zootaxa*, 4903 (3), 439–447. https://doi.org/10.11646/zootaxa.4903.3.9
Mound, L.A.& Wells, A. (2015) Endemics and adventives: Thysanoptera (Insecta) Biodiversity of Norfolk, a tiny Pacific Island. *Zootaxa*, 3964 (2), 183–210. https://doi.org/10.11646/zootaxa.3964.2.2
Okajima, S. (1990) The Old World species of *Pygothrips* (Thysanoptera: Phlaeothripidae). *Systematic Entomology*, 15, 87–99. https://doi.org/10.1111/j.1365-3113.1990.tb00306.x
Okajima, S. (1993) The genus *Acallurothrips*Bagnall (Thysanoptera, Phlaeothripidae) from Japan. *Japanese Journal of Entomology*, 61, 85–100.
Okajima, S. (2006) *The Suborder Tubulifera (Thysanoptera). The Insects of Japan*, 2, 1–720. [The Entomological Society of Japan, Touka Shobo Co. Ltd., Fukuoka]
Schmutz, K. (1913) Zur Kenntnis der Thysanopterenfauna von Ceylon. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften*, 122 (7), 991–1089.
Suzuki, T., Haga, K., Kodama, S., Watanabe, K. & Kuwahara, Y. (1988). Secretions of thrips II. Secretions of three gall-inhabiting thrips (Thysanoptera: Phlaeothripidae). *Applied Entomology and Zoology*, 23, 291–297. https://doi.org/10.1303/aez.23.291
ThripsWiki (2021) *ThripsWiki - providing information on the World's thrips*. Available from: http://thrips.info/wiki/ (accessed 19 January 2021)
Wang, J.& Tong, X.-L. (2008) A new species of the genus *Acallurothrips* Bagnall (Thysanoptera: Phlaeothripidae) from China. *Oriental Insects*, 42, 247–250. https://doi.org/10.1080/00305316.2008.10417549