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Leaf-litter thrips of the genus *Adraneothrips* from Asia and Australia (Thysanoptera, Phlaeothripinae)

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Abstract

The Oriental genus *Stigmothrips* Ananthkrishnan is synonymised with *Adraneothrips* Hood, a genus in which most species have been described from the Neotropics. Problems with descriptions by T.N. Ananthkrishnan of species from India are discussed, but cannot be fully resolved without access to the holotypes. A key is provided to 23 species of *Adraneothrips* from Asia and Australia, including four new species: *darwini* sp. n. from Northern Territory, Australia; *hani* sp. n. from Taiwan, China; *yunnanensis* sp. n. from Yunnan, China as well as Java, Indonesia; and *wau* sp. n. from Papua New Guinea. One species from the Philippines, *Adraneothrips makilingensis* (Reyes) comb. n., is transferred from *Apelaunothrips*, and the male of *Adraneothrips russatus* (Haga) is described and illustrated for the first time, from Yunnan, China. Two species are newly recorded from Australia: *coloratus* (Mound) previously known only from the Solomon Islands, and *russatus* (Haga) previously known from southern Japan and southern China but with one female recorded here from Fiji. Further new records are, *coloratus* from Java, and *chinensis* (Zhang & Tong) from Malaysia. Colonies of species in this genus are commonly found living on dead leaves, as fungus-feeders, and many species are brightly coloured or bicoloured in patterns of yellow and brown.

Key words: Phlaeothripinae, *Adraneothrips*, new species, synonym, new combination

Introduction

This paper considers a group of small phlaeothripid Thysanoptera that have been found associated with dead leaves in various parts of the tropics and subtropics. These species are presumably fungus-feeders, and long series have been taken from leaf-litter and from freshly dead hanging leaves. A considerable number of species are strikingly bicoloured, with particular patterns of yellow and brown, and many have bright red internal pigments (Figs 1–15). In contrast to many of the Phlaeothripidae that live on dead branches, such as *Hoplandrothrips* species, most species of *Adraneothrips* show limited sexual dimorphism, and thus presumably none of the sub-social behaviour patterns of their larger fungus-feeding relatives (Crespi 1988).

Apart from six species, the members of *Adraneothrips* are known only from the New World and mainly from the Neotropics. Of the six Old World species, two are from Africa, three from India, and one from Australia. However, *Stigmothrips*, erected by Ananthkrishnan (1964) for two species from India, has never been distinguished satisfactorily, and Okajima (2006) indicated that it might need to be considered a synonym of *Adraneothrips*. The only structural difference between these two genera seems to be that the Neotropical species have the prothoracic notopleural sutures complete, whereas the Oriental species placed in *Stigmothrips* have these sutures incomplete. However, these sutures are variable in a long series of *Stigmothrips russatus* from Australia, and the two genera are formally synonymised below.

Several problems have been encountered in studying the members of this genus. The original illustrations by Ananthkrishnan (1971) of species he described in *Stigmothrips* indicate that the notopleural sutures are fully complete. However, specimens identified by Ananthkrishnan in various museum collections, including specimens

from type series of some species, have the notopleural sutures clearly incomplete. The original illustrations are therefore interpreted here as being inaccurate, although it has not proved possible to check any Ananthakrishnan holotypes. Ananthakrishnan sold the bulk of his slide collection to the University of Minnesota, but no holotypes have been found there. It is possible that these remain in the Zoological Survey of India, Kolkata, or in some other collection such as the Indian Agricultural Research Institute, New Delhi, or Loyola College, Chennai, where Ananthakrishnan worked for many years, but no confirmation is available. Further problems associated with Ananthakrishnan slides are mentioned below under the species *limpidus*.

This paper aims at providing a key to the *Adraneothrips* species from Asia and Australia, based mainly on specimens that are available to the authors. Four new species are described, and one species is transferred to the genus from *Apelaunothrips*. Two species are newly recorded from Australia, one of which was previously known only from the Solomon Islands, and the other from Japan and southern China. The genus *Adraneothrips* now includes 77 species, and a key is provided here to the 23 species known from Asia and Australia. The descriptions and original illustrations of some of the species from India are clearly inaccurate, and accurate recognition of these species will remain in doubt until such time as the holotypes of Ananthakrishnan species become available. A further problem is that several species described in *Stigmothrips* were subsequently transferred to *Apelaunothrips*, a genus that includes bicoloured species that are superficially similar to species of *Adraneothrips*. However, *Apelaunothrips* species have the maxillary stylets unusually broad, and they are probably only distantly related. Full nomenclatural information concerning Thysanoptera taxa is web-available (ThripsWiki 2013).

Methods and depositories

Descriptions and drawings are from slide-mounted specimens using Nikon Eclipse 80i & Leica DM4000B microscopes. Images were prepared with a Leica DM2500 using DIC illumination, and processed with Automontage and Photoshop software. Thrips terminology in this paper generally follows Okajima (2006). The following abbreviations are used for the pronotal setae: am (anteromarginal), aa (anteroangular), ml (midlateral), epim (epimeral), pa (posteroangular). The unit of measurements in this paper is micrometre. Specimens from China, including types, are deposited in the National Zoological Museum of China (NZMC), Institute of Zoology, Chinese Academy of Sciences, Beijing, China. Specimens from Australia are in the Australian National Insect Collection (ANIC), CSIRO, Canberra, and the Queensland Primary Industries Insect Collection, Brisbane, Australia (QDPC). Slides have also been studied from The Natural History Museum (BMNH), London, U.K., Senckenberg Museum (SMF), Frankfurt, Germany, the University of Minnesota Insect Collection (UMIC), USA.

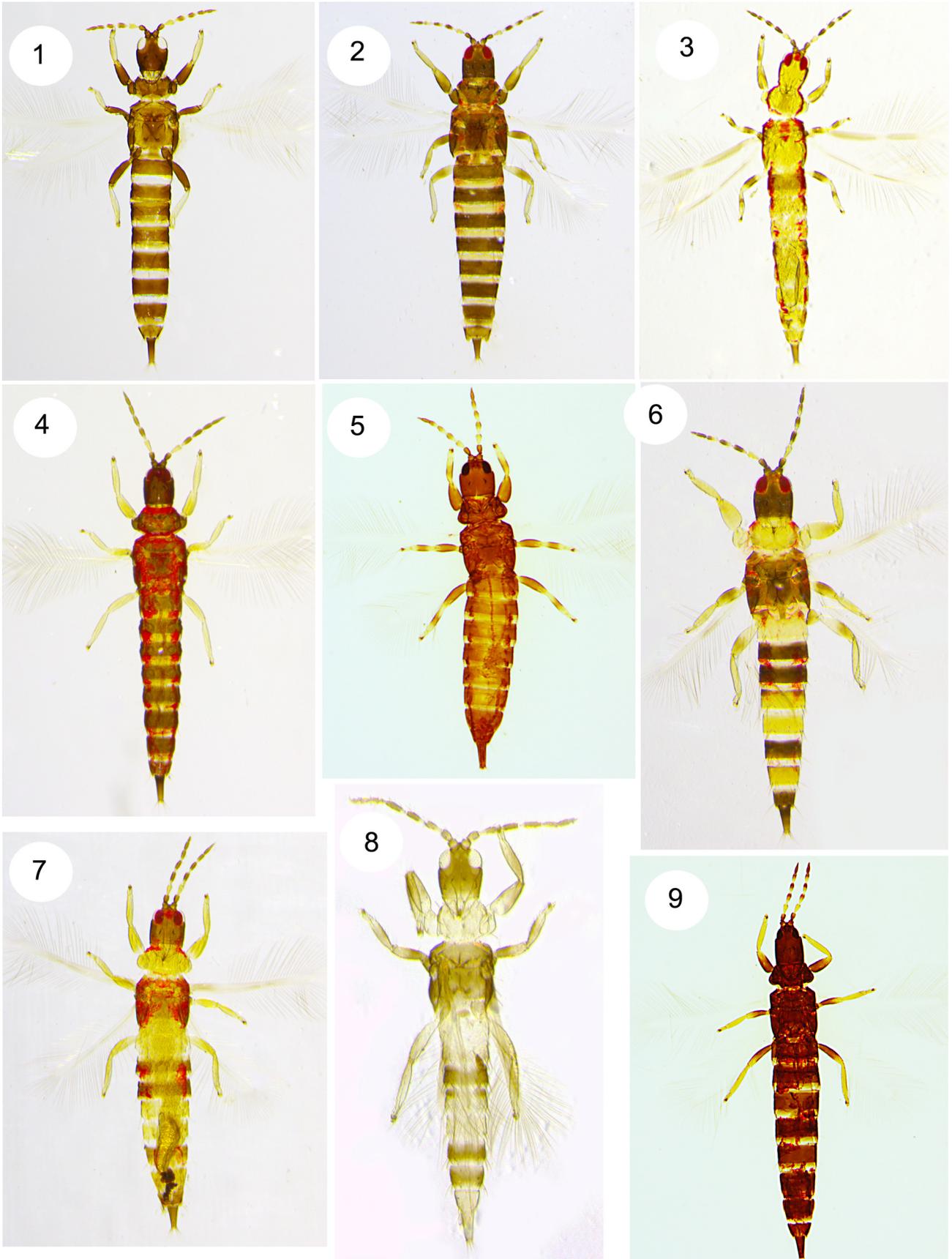
Adraneothrips Hood

Adraneothrips Hood, 1925: 54. Type species: *Haplothrips tibialis* Hood, by original designation.

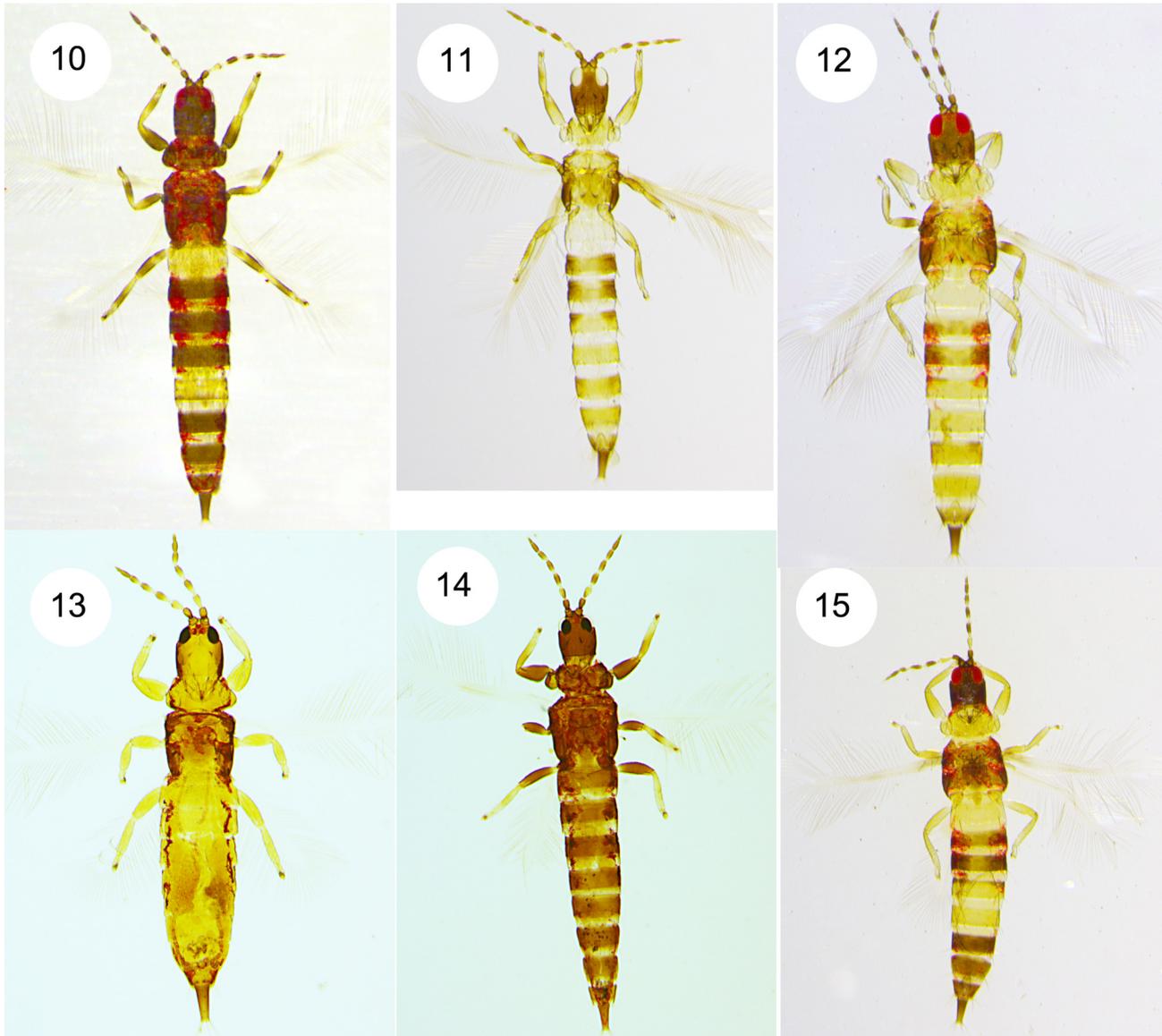
Stigmothrips Ananthakrishnan, 1964: 231. Type species: *Stigmothrips limpidus* Ananthakrishnan, 1964, by original designation. **syn.n.**

Baphikothrips Mound, 1970: 90. Type species: *Baphikothrips antennatus* Mound, by original designation. Synonymised with *Stigmothrips* by Okajima, 1976.

The genus *Adraneothrips* was erected by Hood (1925) for four species from the West Indies, and most of the described species are Neotropical. Mound & Marullo (1996) listed 59 New World species in this genus and provided a key to 32 of these. Okajima (1976) indicated that *Stigmothrips* is similar to *Adraneothrips*, sharing such character states as slender antennal segments, long maxillary stylets, and absence of basantra. Moreover, he suggested that *Stigmothrips* might be considered a subgenus of *Adraneothrips*, although in 2006 he suggested that it could be treated as a synonym of *Adraneothrips*. Mound & Marullo (1996) indicated that the New World species of *Adraneothrips* seemed to represent three divergent groups, the *alternatus*-group, *bellus*-group and *uniformis*-group. Species of the *bellus*-group are distinguished because the eyes are prolonged ventrally on the head. Species of the *uniformis*-group are distinguished because the maxillary stylets are long and close together medially in the head. *Stigmothrips* species are particularly similar to species of the *alternatus*-group, the only difference being that species of *Stigmothrips* have the notopleural sutures incomplete or almost incomplete, whereas these are complete in species of the *alternatus*-group.



FIGURES 1–9. *Adraneothrips* adult colour patterns. (1) *braccatus*; (2) *chinensis*; (3) *coloratus*; (4) *darwini*; (5) *disjunctus*; (6) *hani*; (7) *limpidus*; (8) *makilingensis*; (9) *nilgiriensis*.

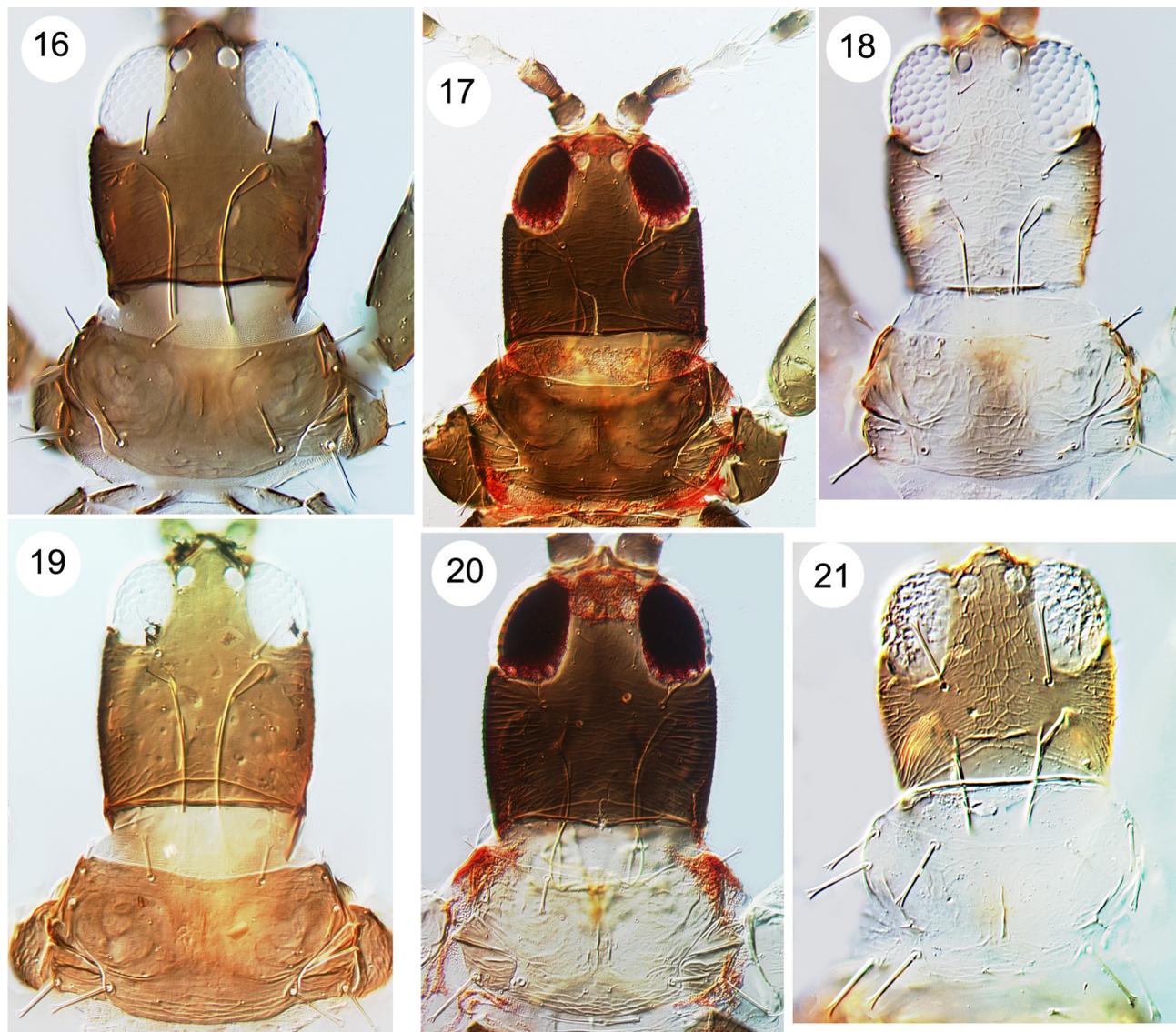


FIGURES 10–15. *Adraneothrips* adult colour patterns. (10) *pteris*; (11) *russatus* (Australia); (12) *russatus* (China); (13) *stannardi*; (14) *wau*; (15) *yunnanensis*.

The original description of *Stigmothrips* does not mention the prothoracic notopleural sutures and the only illustration is unclear. However, as listed below, specimens of both sexes identified by Ananthakrishnan as *limpidus* have these sutures clearly incomplete (Fig. 37). In specimens from Australia that are here identified as *russatus* and *coloratus*, the notopleural sutures are variable, from clearly incomplete to almost complete, and they are not always bilaterally symmetrical. Thus *Stigmothrips* cannot be distinguished satisfactorily from *Adraneothrips* and these are here placed into synonymy. Species of this genus commonly share a character state that is unusual among Phlaeothripinae, in that the pair of accessory setae on tergite IX between the major setae S1 and S2 are long (Figs 38, 39). This also occurs in several Australian species of *Hoplandrothrips* (Mound & Tree 2013). Despite the absence of the metathoracic sternopleural sutures in *Adraneothrips* species, these two genera are possibly related (Mound *et al.* 2013), although the species of *Adraneothrips* exhibit little of the sexual polymorphism that is so common among *Hoplandrothrips* species.

Diagnosis. Head with cheeks slightly constricted behind large eyes; postocular setae usually arise behind inner margin of eyes (Figs 16–25); stylets usually about 1/3 of head width apart, retracted to postocular setae; antennae 8-segmented, III with 2 or 3 sensoria, IV with 3 or 4 (rarely 2); pronotum with 5 pairs of capitate setae, notopleural sutures incomplete or complete; basantra absent, mesopraesternum transverse; metathoracic sternopleural sutures absent; fore tarsal tooth usually not developed; fore wings weakly constricted medially, with or without duplicated

cilia; pelta usually longer than wide (Figs 26–30) and bell-shaped; tergites II–VII with 2 pairs of wing-retaining setae, each posterior pair usually thicker than anterior pair (Figs 27, 28); tergite IX with accessory setae between S1 and S2 almost as long as S1 (Figs 38, 39); tube with straight sides, slightly shorter than head; male sternite VIII with or without pore plate (Figs 33–36).



FIGURES 16–21. *Adraneothrips* heads. (16) *braccatus*; (17) *chinensis*; (18) *coloratus*; (19) *darwini*; (20) *hani*; (21); *makilingensis*.

Key to *Adraneothrips* from eastern Asia and Australia

[* included from published descriptions]

- | | | |
|----|--|-----------------------|
| 1. | Wings absent; antennal segments III and IV each with 2 sensoria | <i>madrasensis</i> |
| -. | Wings present; segment IV with 3 or 4 sensoria (except possibly <i>bambusae</i>) | 2 |
| 2. | Fore wings without duplicated cilia | 3 |
| -. | Fore wings with duplicated cilia | 8 |
| 3. | Body more or less uniformly brown (Figs 4, 9) | 4 |
| -. | Body distinctly bicoloured yellow and brown (Figs 6–8, 11, 12, 15) | 5 |
| 4. | Mid and hind femora brown (Fig. 9); antennal segment III with 3 sensoria | <i>nilgiriensis</i> |
| -. | Mid and hind femora as yellow as tibiae (Fig. 4); antennal segment III with 2 sensoria | <i>darwini</i> sp. n. |
| 5. | Body largely yellow in contrast to brown tube | <i>bambusae</i> * |
| -. | At least head uniformly brown | 6 |

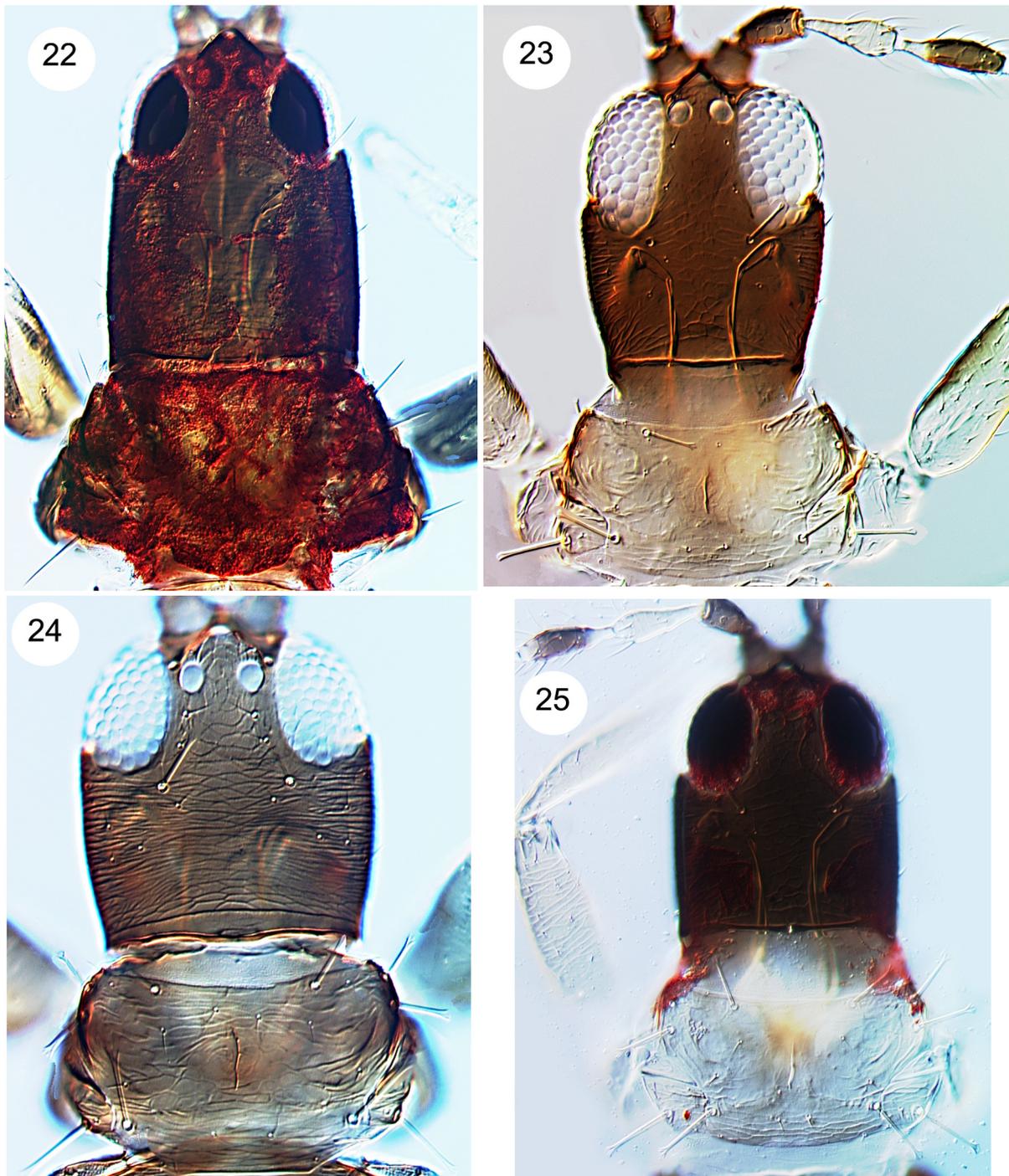
6. Abdominal segments I–III, VI–VII, IX and tube uniformly yellow, in contrast to brown head, pterothorax, abdominal segments IV–V and VIII (Fig. 8) [male sternite VIII with pair of pore plates (Figs 35, 65)] *makilingensis*
 -. At least abdominal segment III and tube brown 7
7. Abdominal segments VII–IX dark brown (Fig. 15) *yunnanensis* **sp. n.**
 -. Abdominal segments VII–IX paler, at least VIII yellow (Figs 11, 12) *russatus*
8. Body uniformly yellow *elegans**
 -. Body uniformly brown or bicoloured yellow and brown 9
9. Body more or less uniformly brown (Figs 2, 5) 10
 -. Body distinctly bicoloured yellow and brown (Figs 3, 13) 17
10. Compound eyes unusually long dorsally, more than 0.5 of head length *laticeps**
 -. Compound eyes dorsal length no more than 0.45 of head length 11
11. Antennal segment III with 2 sensoria, IV with 4 *setosus**
 -. Antennal segment III with 3 sensoria, IV with 3 or 4 12
12. Antennal segment IV with 3 sensoria *disjunctus*
 -. Antennal segment IV with 4 sensoria 13
13. Pronotal anteromarginal setae pointed at apex, shorter than anteroangulars; fore wing sub-basal setae S3 sharply pointed at apex [femora brown, tibiae brown with apex yellow; postocular setae much shorter than half length of eye; male sternite VIII with pair of pore plates laterally] *infirmus**
 -. Pronotal anteromarginal setae expanded at apex, almost as long as anteroangulars; fore wing sub-basal setae S3 capitate or blunt at apex 14
14. Femora “golden yellow with brownish shade”; “fore and hind tibiae yellow, mid tibiae yellow with shaded brown” *okajimai**
 -. At least fore and mid femora brown (Figs 1, 2, 14); all tibiae yellow 15
15. Hind femora brown with basal 1/3 yellow (Fig. 2), fore and mid femora brown with extreme apex yellow; male sternite VIII with large entire pore plate (Fig. 34) *chinensis*
 -. Femora brown; male sternite VIII with or without pair of pore plates 16
16. Pronotum with notopleural sutures complete; pronotum medially without sculpture; male abdominal sternite VIII without pore plate (Fig. 33) *braccatus*
 -. Pronotum with notopleural sutures incomplete; pronotum medially with sculpture lines; male abdominal sternite VIII with pair of pore plates *wau* **sp. n.**
17. Antennal segment III with 3 sensoria 18
 -. Antennal segment III with 2 sensoria 19
18. Antennal segment III yellow at base with apex shaded brown (Fig. 13); segment IV brown with base yellow; campaniform sensilla on pelta at least 12 times their diameter apart *stannardi*
 -. Antennal segment III yellow with basal third weakly shaded (Fig. 3); segment IV uniformly brown; campaniform sensilla on pelta scarcely 4 times their diameter apart (Fig. 27) *coloratus*
19. Antennal segment IV with 4 sensoria 20
 -. Antennal segment IV with 3 sensoria 21
20. Head uniformly brown (Fig. 6); abdominal segments I, VII and IX brown; antennal segment VI largely yellow with apical third brown; fore wing sub-basal setae S3 expanded at apex (Fig. 52); postocular setae about as long as half length of eye (Fig. 49) *hani* **sp. n.**
 -. Head bicoloured, yellow but brownish laterally; abdominal segments I, VII and IX largely yellow; antennal segment VI brown with base yellow; fore wing sub-basal setae S3 pointed at apex; postocular setae shorter than half length of eye *inflavus**
21. Antennae elongated, segment III about 4 times as long as wide; antennal segments III–IV almost equally light brown *antennatus*
 -. Antennal segment III about 2.5 times as long as wide; antennal segment III yellow, IV dark brown with basal third yellow 22
22. Pronotum brown (Fig. 10); abdominal segments II and VI yellow, the rest brown *pteris*
 -. Pronotum yellow (Fig. 7); abdominal segments I–II, V–VI and VIII yellow *limpidus*

***Adraneothrips antennatus* (Mound) comb.n.**

Baphikothrips antennatus Mound, 1970: 93.

Known only from the Solomon Islands, this species differs from other members of *Adraneothrips* in the elongate antennal segments, with segment III about four times as long as wide. The body is bicoloured, with the pronotum yellow but the head and lateral margins of the pterothorax brown, and antennal segments III–IV light brown.

Specimens examined. SOLOMON ISLANDS, Santa Ysabel, holotype female and paratypes from leaf-litter on shore, 20.ix.1965 (BMNH).

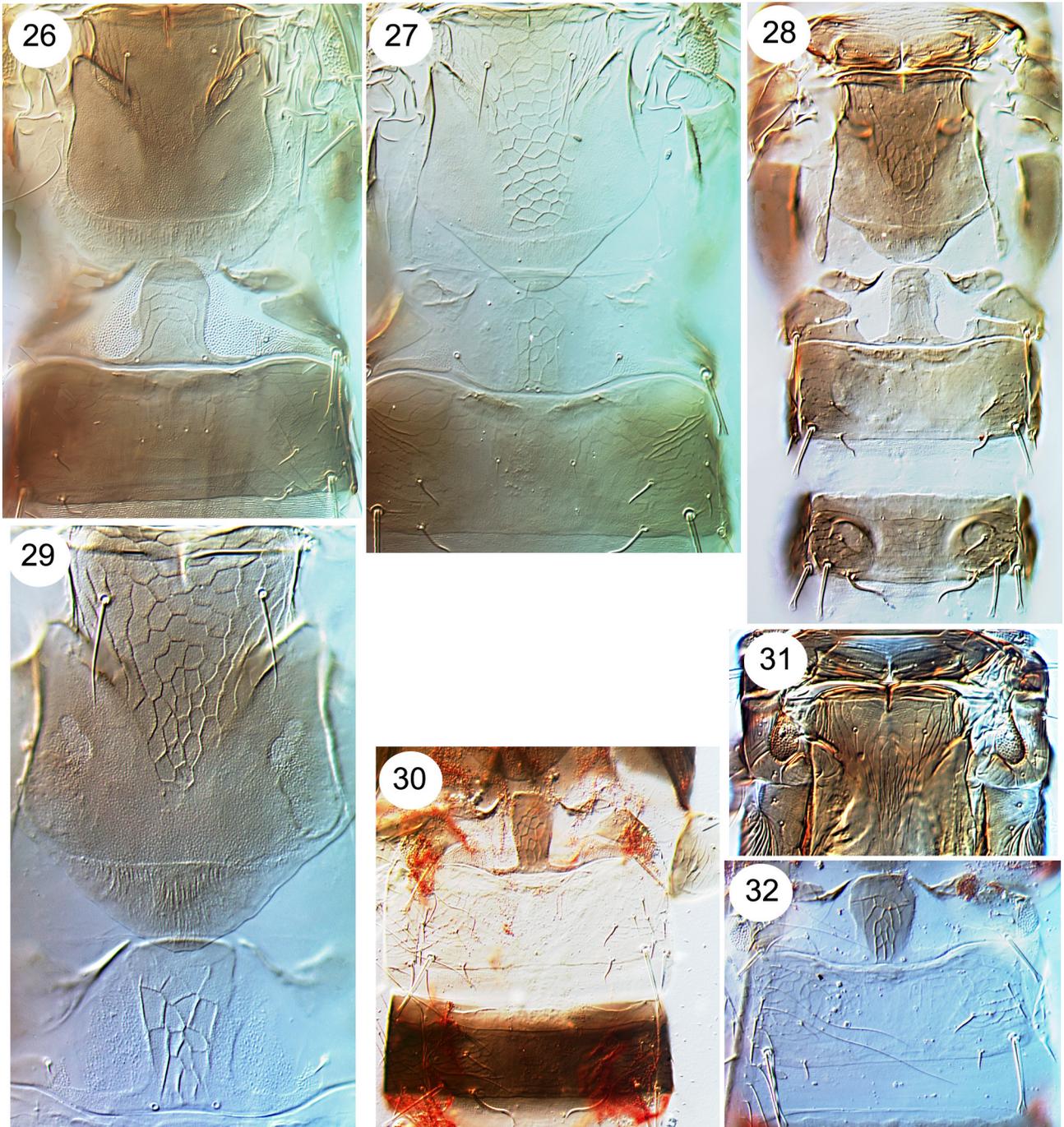


FIGURES 22–25. *Adraneothrips* heads. (22) *nilgiriensis*; (23) *russatus*; (24) *waii*; (25) *yunnanensis*.

***Adraneothrips bambusae* (Ananthakrishnan) comb.n.**

Stigmothrips bambusae Ananthakrishnan, 1964: 232.

This species was described from nine females and four males taken on bamboo spindles at Calicut, India, together with the type series of *S. limpidus*. It was described as lacking fore wing duplicated cilia and with the entire body, apart from the tube, largely yellow. The original description includes few structural details but states “sense cones thin, fine, 2 on 3 and 4”. If this is correct then this arrangement is almost unique among the species of this genus, being recorded otherwise only in *madrasensis*. *A. stannardi* is also extensively yellow in colour, but has three sensoria on the third and fourth antennal segments.



FIGURES 26–32. *Adraneothrips* metanota and tergites. (26) *braccatus*; (27) *coloratus*; (28) *darwini*; (29) *russatus*; (30) *hani*; (31) *waii*; (32) *yunnanensis*.

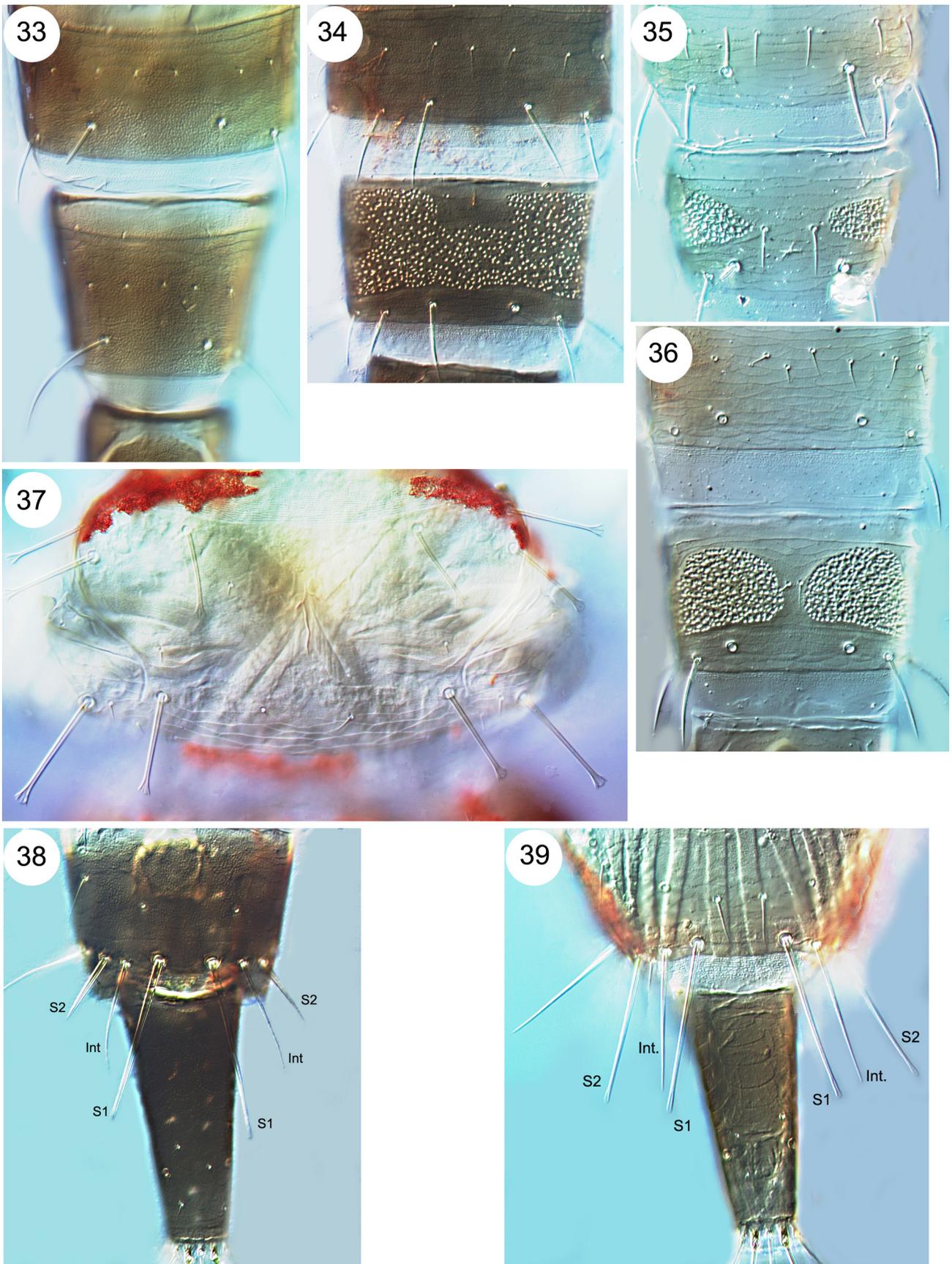
***Adraneothrips braccatus* (Karny)**

(Figs 1, 16, 26, 33)

Haplothrips braccatus Karny, 1920: 35.

Adraneothrips braccatus (Karny) Pitkin, 1973: 319.

Until now, this has been the only member of *Adraneothrips* recorded from Australia, although four species are here treated from this continent. Type material, collected at “Cedar Creek, Queensland” was previously studied from the Swedish Museum of Natural History, Stockholm, and compared to two of the specimens listed below. The colour



FIGURES 33–39. *Adraneothrips* species. Male sternite VIII 33–36: (33) *braccatus*; (34) *chinensis*; (35) *makilingensis*; (36) *russatus*. (37) *limpidus* pronotum. Chaetotaxy of tergite IX 38–39: (38) *hani* male; (39) *limpidus* female.

of the body and legs is similar to that of *nilgiriensis*, but that lacks fore wing duplicated wing cilia and has a more slender head (Figs 1, 9). Among the species with uniformly brown body and presence of fore wing duplicated cilia, *braccatus* can be distinguished by the clear yellow tibiae. This is an unusual member of the genus in having the following characters: pronotal notopleural sutures fully complete; postocular setae variable in position, sometimes relatively far apart (Fig. 16); male sternite VIII with no pore plate (Fig. 33). This is only the second species of *Adraneothrips* for which a large (oedymorous) male has been seen, the other being *simulator* Hood from Trinidad and Costa Rica (Mound & Marullo 1996).

Specimens examined. AUSTRALIA, Queensland: Julatten, 1 female from dead leaves, 6.vii.1995, 1 female from dead *Cyathea* frond, 6.viii.2004; 15km south of Cape Tribulation, 7 females, 10 males from small dead leaves, 6.x.2012; Cairns, Lake Barrine, 2 females, 2 males from dead branches, 10.x.2012, L.A. Mound (ANIC, QDPC).

***Adraneothrips chinensis* (Zhang & Tong) comb.n.**

(Figs 2, 17, 34)

Stigmatopoda chinensis Zhang & Tong, 1990: 196.

This species is known only from China. The large pore plate on abdominal sternite VIII of males is unique within this genus (Fig. 34). *Adraneothrips* species are considered to be fungus-feeding, but the labels of the specimens listed below do not mention whether these thrips came from fresh plants or from dead leaves. It is not unusual to collect *Adraneothrips* specimens from grasses, or even from the leaves of living plants, but with no evidence about their source of food.

Specimens examined. CHINA, Yunnan Prov. (Jinghong Co.), paratype female and male on leaf-litter, 5.iv.1987, X.L. Tong (SMF); Yunnan Prov. (Mengla County, the type locality), 16 females, 9 males on *Mosla chinensis*, *Houttuynia cordata*, *Phalaenopsis* sp., bamboo and an unknown grass, 14–29.iv.1997 and 27.iii.1997, Y.F. Han (NZMC). MALAYSIA, Selangor, Gombak, 1 female from dead branch, 13.x.1973 (BMNH).

***Adraneothrips coloratus* (Mound) Comb.n.**

(Figs 3, 18, 27)

Baphikothrips coloratus Mound, 1970: 91.

This species was described from several sites in the Solomon Islands, but only from females. It is here newly recorded from Australia, but again only from females. The body colour of mature specimens is distinctive, mainly yellow but with the lateral margins of the head and thorax brown, tergite II mainly brown and tergites III, and V–VI brown laterally, also antennal segment III yellow but distinctly shaded in the basal third. The notopleural sutures are almost complete, the postocular setae capitate and arise behind the inner margins of the eyes (Fig. 18), the metanotum is distinctly reticulate (Fig. 27), and antennal segments III and IV both bear three sensoria. This species is similar to *stannardi*, but antennal segment III is more slender and differs in colour as indicated in the key above, and the campaniform sensilla on the pelta are particularly close together medially (Fig. 27).

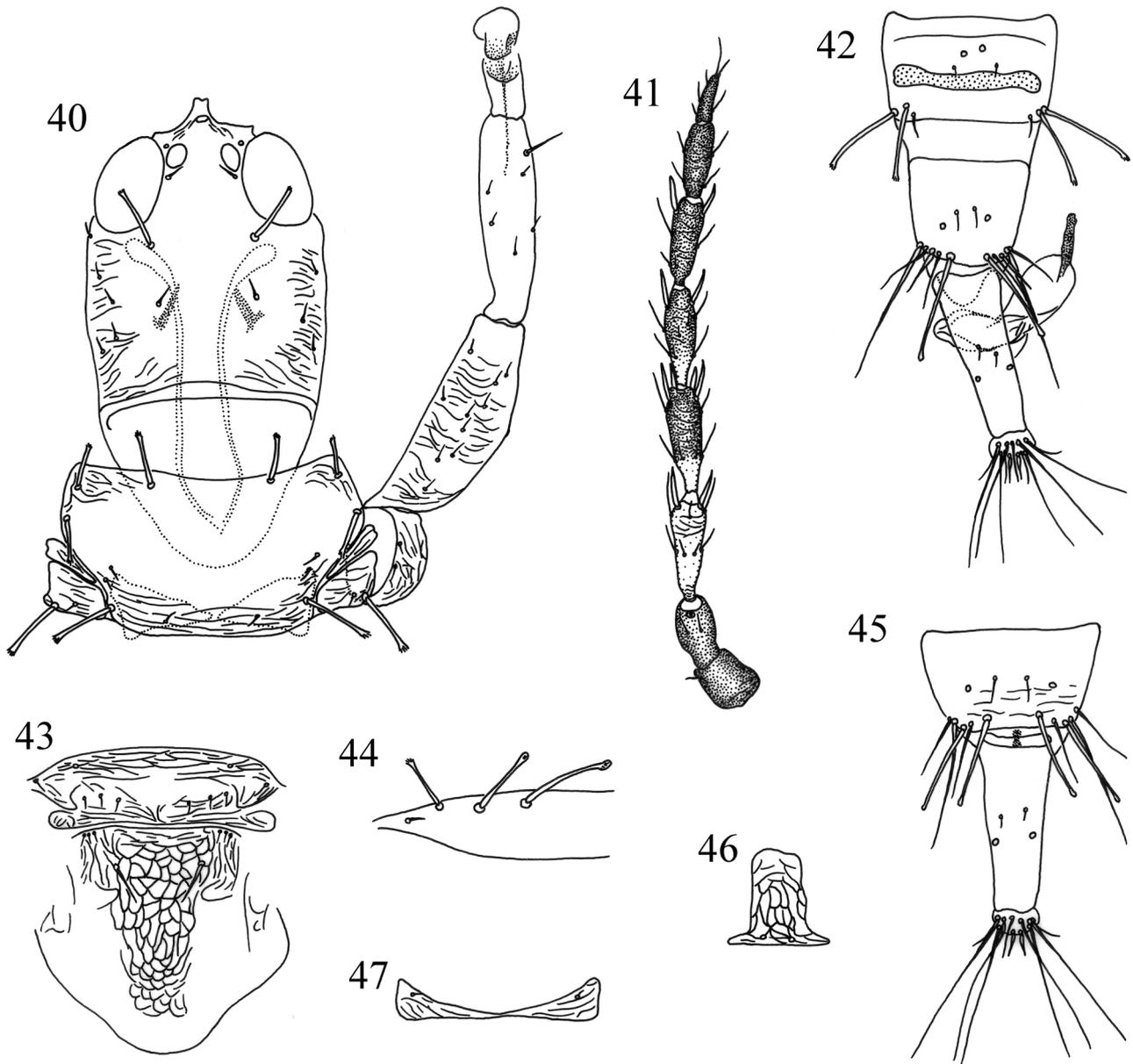
Specimens examined. SOLOMON ISLANDS, Florida Island, Vatilau, paratype female, 2.xii.1965 (ANIC). AUSTRALIA, Queensland, Cape Tribulation, 4 females from grasses and dead *Calamus* fronds, vii.1995, 17 females from dead hard leaves, 7–8.x.2012 (ANIC). INDONESIA, Java, Bogor Botanic Gardens, 1 female from dead leaves, 26.x.1973 (BMNH).

***Adraneothrips darwini* sp. n.**

(Figs 4, 19, 28, 40–47)

Female macroptera. Body uniformly light brown, with all femora, tibiae and tarsi clear yellow (Fig. 4); antennal segments I–II brown, III yellow, IV–VIII light brown with IV–V paler at base; fore wing pale; tube dark brown but paler distally; major setae hyaline.

Head 1.4 times as long as wide (Figs 19, 40), dorsal surface with no sculpture medially but weakly striate laterally; eyes about one third as long as head, postocular setae capitate, about half the length of eye; maxillary stylets about one fifth of head width apart, retracted to postocular setae. Antennal segment III with 2 sensoria, IV with 4. Pronotum with no sculpture medially, transversely reticulate near posterior margin; five pairs of capitate setae present; notopleural sutures complete or nearly complete. Prosternal ferna triangular, pointed medially; mesopraesternum irregular, lateral paired triangles weakly connected medially. Metanotum weakly reticulate, median setae acute (Figs 28, 43). Fore wing without duplicated cilia; three sub-basal setae long and capitate (Fig. 44). Pelta typical of genus, with paired campaniform sensilla (Fig. 46); tergites III–V with lateral setae stout and capitate, IX with setae S1 and S2 weakly capitate (Fig. 45); tube shorter than head, anal setae a little shorter than tube.



FIGURES 40–47. *Adraneothrips darwini* sp. n. Female: (40) dorsal view of head, pronotum and foreleg; (41) antenna; (43) dorsal view of mesonotum & metanotum; (44) base of fore wing; (45) dorsal view of abdominal tergites IX–X; (46) pelta; (47) mesopraesternum. Male: (42) abdominal sternite VIII and tergites IX–X.

Measurements (holotype female, in microns). Total body length 1740. Head, length 200, width across cheeks 160; postocular setae length 40. Pronotum, length 110, width 225; setae: am 35, aa 25, ml 35, epim 40, pa 70; metanotal median setae 30. Fore wing, length 660; sub-basal setae S1 35, S2 45, S3 60. Pelta length 65; tergite IX posteromarginal setae S1 60, S2 55, S3 90; tube length 115; anal setae length 100. Antennal segments I–VIII length (width): 35 (35), 40 (25), 70 (24), 71 (25), 70 (25), 60 (25), 50 (20), 30 (10).

Male macroptera. Similar in colour and structure to female, but smaller; pronotum with notopleural sutures nearly complete; abdominal sternite VIII with a transverse, slender pore plate (Fig. 42); tergite IX setae S2 short and stout.

Measurements (paratype male, in microns). Total body length 1545. Head, length 215, width across cheeks 140; postocular setae length 40. Pronotum, length 90, width 195; setae: am 25, aa 25, ml 35, epim 45, pa 40; metanotal median setae 25. Fore wing, length 580; sub-basal setae S1 35, S2 37, S3 40. Pelta length 60, tergite IX posteromarginal setae S1 70, S2 35, S3 100; tube length 115; anal setae length 90. Antennal segments I–VIII length (width): 27(30), 40 (25), 60 (20), 65 (25), 65 (20), 55 (20), 45 (20), 30 (10).

Specimens examined. Holotype female, **AUSTRALIA**, Northern Territory, Darwin, Litchfield, on dead twigs & grasses, 31.vii.1995, LAM 2941 (ANIC).

Paratypes: 8 females, 2 males, with similar data to holotype (ANIC).

Remarks. This new species is similar to *braccatus*, but differs as follows: body light brown, femora yellow; fore wings without duplicated cilia; antennal segment III with two sensoria; male sternite VIII with slender transverse pore plate.

***Adraneothrips disjunctus* Ananthakrishnan**

(Fig. 5)

Adraneothrips disjunctus Ananthakrishnan, 1972b: 439.

Described from seven females and five males, two specimens from the type series have been studied. The available male has the median abdominal segments rather paler, but it is not possible to know whether this is because the specimen is slightly teneral or if the body is naturally slightly bicoloured. The original description and illustration referred to short postocular setae, but in the male listed below these setae are 40 microns long, extending well beyond the posterior margin of the eyes. The length of these setae in the female cannot be determined because their apices are obscured by the pigmented eyes. In both sexes the postocular setae arise laterally to the inner margin of the eyes, and are thus slightly further apart than the typical position found in this genus. There are three sensoria on the third and fourth antennal segments, and the dorsal length of the eyes is about one third of the head length.

Specimens examined. **INDIA**, Tirupathi, 1 female, 1 male from dry twigs, 22.i.1972, T.N. Ananthakrishnan (UMIC).

***Adraneothrips elegans* Ananthakrishnan**

Adraneothrips elegans Ananthakrishnan, 1972a: 426.

This species was described from four females and four males, taken from dry leaves at Aryankavu, India. The yellow body colour was considered similar to that of *stannardi* (and hence to *bambusae*). However, the fore wings were described as having duplicated cilia, and it is the only yellow species known with such fore wings. Unfortunately, no mention was made of the number of sensoria on the antennae, and no specimens were available for study.

***Adraneothrips hani* sp. n.**

(Figs 6, 20, 30, 38, 48–57)

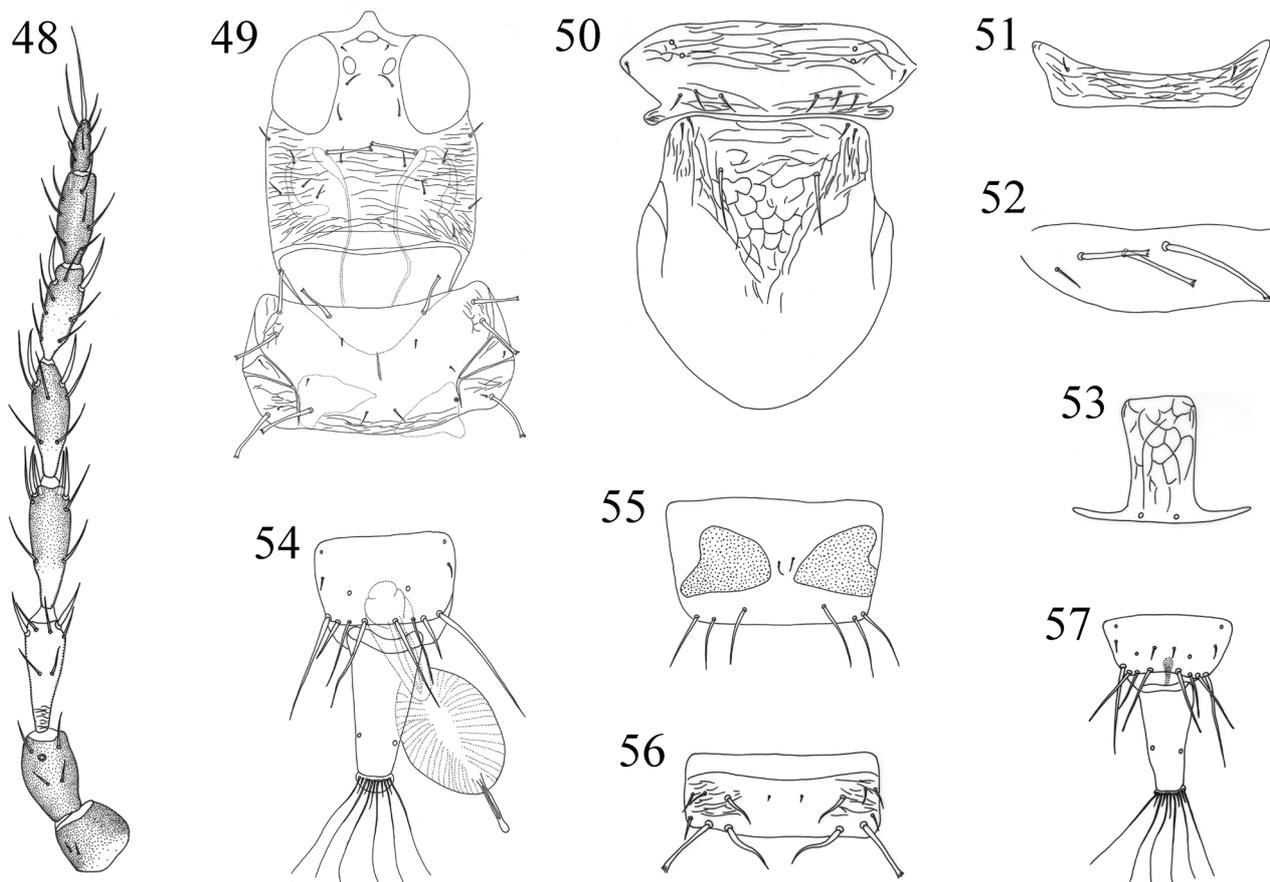
Female macroptera. Body sharply bicoloured yellow and brown (Fig. 6); head brown, paler between eyes;

prothorax and abdominal segments II and V–VI yellow; pterothorax and abdominal segments I, III–IV, VII–IX and tube brown; legs mainly yellow, mid and hind coxae brown, mid femora and apical half of hind femora shaded with brown; antennal segments I–II, and VII–VIII brown, III uniformly yellow, IV–VI brown with bases yellow; fore wing distinctly shaded brown at middle; major body setae mainly hyaline.

Head 1.2 times as long as wide, dorsal surface weakly striated (Figs 20, 49); eyes about half as long as head; postocular setae capitate, half as long as eye; antennal segment III with 2 sensoria, IV with 4. Pronotum without sculpture medially, transversely reticulate near posterior margin, with 5 pairs of capitate setae, notopleural sutures nearly complete (Fig. 49). Ferna triangular, pointed medially. Mesopraesternum broadly boat-shaped (Fig. 51). Metanotum weakly reticulate medially, median setae acute (Fig. 50). Fore wing with 4 or 5 duplicated cilia; sub-basal setae capitate (Fig. 52). Pelta typical of genus, with paired campaniform sensilla (Figs 30, 53); tergite IX setae S1 and S2 narrowly blunt at apex, intermediate setae almost as long as S1 (Fig. 57); tube about 0.6 times as long as head, anal setae a little shorter than tube.

Measurements (holotype female, in microns). Total body length 2040. Head length 225, width across cheeks 205; postocular setae length 45. Pronotum, length 120; width 270, setae: am 40, aa 40, ml 40, epim 50, pa 50; metanotal median setae 35. Fore wing, length 735; sub-basal setae S1 40, S2 45, S3 75. Pelta length 75; tergite V, length 95, width 215; tergite IX, length 70, width 125, setae S1 75, S2 70, S3 100; tube length 130; anal setae 105. Antennal segments I–VIII length (width): 35 (40), 50 (30), 65 (25), 75 (25), 70 (20), 55 (20), 50 (20), 30 (10).

Male macroptera. Very similar in color and structure to female, but abdominal segment VIII yellow with brown shading anterolaterally; sternite VIII with paired pore plates (Fig. 55); tergite IX setae S2 short.



FIGURES 48–57. *Adraneothrips hani* sp. n. Female: (48) antenna; (49) dorsal view of head and pronotum; (50) dorsal view of mesonotum & metanotum; (51) mesopraesternum; (52) base of forewing; (53) pelta; (56) abdominal tergite V; (57) dorsal view of abdominal tergites IX–X. Male: (54) abdominal tergites IX–X; (55) abdominal sternum VIII pore plate.

Measurements (paratype male, in microns). Total body length 1635. Head length 200, width across cheeks 180; postocular setae length 40. Pronotum length 100; width 230; setae: am 30, aa 35, ml 40, epim 45, pa 40; metanotal median setae 20. Fore wing length 630; sub-basal setae S1 35, S2 30, S3 50. Pelta length 60; tergite V length 80,

width 160; tergite IX length 80, width 100, setae S1 70, S2 30, S3 100; tube length 105; anal setae 90. Antennal segments I–VIII length (maximum width): 35(33), 45 (30), 60 (25), 65 (25), 65 (20), 55 (20), 45 (15), 32 (10).

Specimens examined. Holotype female. **CHINA**, Taiwan Prov., Pingdong County, Nanjen Mountain, 22.10°N, 120.08°E, on dead leaves, 11.iii.2003, N.T. Zhang (NZMC). Paratypes: 1 female 2 males, with same data as holotype (NZMC).

Remarks. This new species is similar to *limpidus* in colour pattern (Figs 6, 7), but that has only three sensoria on the fourth antennal segment. The colour pattern is also similar to that of *russatus* and *yunnanensis* (Figs 12, 15), but they have no duplicated cilia on the fore wings, and only three sensoria on the fourth antennal segment. It differs from *inflavus*, according to the original description of that species, as indicated in the key.

Etymology. This species is named in honour of the thrips expert, Han Yun-Fa, in recognition of his contributions to thrips taxonomy in China.

***Adraneothrips infirmus* (Ananthakrishnan) comb.n.**

Stigmothrips infirmus Ananthakrishnan, 1971: 181.

Described from India, this species was recorded from Japan by Okajima (1976, 2006) who indicated that he had studied the holotype female. Okajima states that the tibiae are brown with the apex yellow, whereas the original description states that the tibiae are yellow. Moreover, the original description of the male claims that sternite VIII has a distinct, large pore plate, whereas Okajima (2006) illustrates this structure as a pair of pore plates. Also, the prothoracic notopleural sutures were complete in the original illustration, but Okajima states that these are incomplete. The specimens from Japan differ from the specimens from India as follows: pronotal anteromarginal setae pointed and small, and antennal segment III shaded brown; in contrast the description from India indicates that the pronotal anteromarginal setae are capitate and about as long as the anteroangulars, and antennal segment III is yellow. Either the species from Japan is not the same as *infirmus* from India, or there is considerable inter-population variation, or the descriptive details given by Ananthakrishnan are not accurate. The characters given in the original description are similar to those of *chinensis*, with the following differences: all femora uniformly brown in female, but uniformly yellow in male (*chinensis*—fore and mid femora brown with apex yellow, hind femora yellow with brown on apical half in both sexes); postocular setae much shorter than half length of eyes (*chinensis* – postocular setae longer than half length of eyes).

***Adraneothrips inflavus* (Okajima) comb.n.**

Stigmothrips inflavus Okajima, 2006: 591.

Described from almost 100 specimens, of both sexes, this species was collected from dead leaves in the Ryukyu Islands of southern Japan, close to Taiwan. Judging from the original description, this species is similar to *hani* **sp. n.**, from which it is distinguished in the key above.

***Adraneothrips laticeps* (Okajima) comb.n.**

Adraneothrips laticeps Okajima, 1987: 297.

Described from two females collected in Kalimantan, Borneo, this species has three sensoria on antennal segment III and four on IV. The fore wing bears several duplicated cilia, but the description of colour suggests that the body and legs are varying shades of light brown with no striking differences.

***Adraneothrips limpidus* (Ananthakrishnan) comb.n.**

(Figs 7, 37, 39)

Stigmothrips limpidus Ananthakrishnan, 1964: 231.

This is the type-species of *Stigmothrips*, although the original description did not indicate how to distinguish that genus from *Adraneothrips*. The type material was given as three females and two males from Bamboo spindles at Calicut, 4.ix.1963, but none of these specimens has been available for study. However, the seven specimens listed below were all identified and labeled by Ananthakrishnan as *limpidus* (one he clearly misidentified, as it has antennal segment III of different shape and with three sensoria, despite being similar to *limpidus* in body colour). All of these specimens have the prothoracic notopleural sutures incomplete (Fig. 37), contrary to the illustration with the original description. The number of sensoria on the antennae was not given, but each of the six specimens has two on segment III and three on IV. A further problem is that the original description does not indicate if the original male had pore plates on sternite VIII. However, Ananthakrishnan (1971: 176) states in a key to species that the male of *limpidus* is “without glandular areas” in contrast to *pterus*. But, all three of the available males identified by Ananthakrishnan as *limpidus* have a clearly defined pair of pore plates on VIII similar to those of *makilingensis*, *pterus* and *russatus* (Figs 35, 36).

Specimens examined. INDIA, Kallar, 2 females from decaying *Areca*, 10.ix.1967, 2 males from grass, 22.ii.1966; Madras, 2 females from bamboo, 12.x.1964 (one of these is a different species – see above); Papanassam, 1 male from grass, 24.vii.1965 (BMNH); Bannerghatta, 2 females from *Cassia* dead leaves, x.2005 (ANIC).

***Adraneothrips madrasensis* Ananthakrishnan**

Adraneothrips madrasensis Ananthakrishnan, 1968: 41.

Described from 25 females collected on grass in Madras, this species is known only from wingless individuals. It is a brown species, with antennal segment III and all tibiae and tarsi brownish-yellow. The original description lacks details concerning the body structure, but the original illustration indicates that the notopleural sutures are complete. Unfortunately, the specimen studied and listed below is too imperfectly cleared to see the condition of this suture. The pronotal anteromarginal setae are less than 0.5 the length of the anteroangular setae, although this is contrary to the description. Antennal segments III and IV apparently each bear only two sensoria (see comment above under *bambusae*).

Specimen examined. INDIA, Madras, 1 female from grass, 29.viii.1966 (SMF).

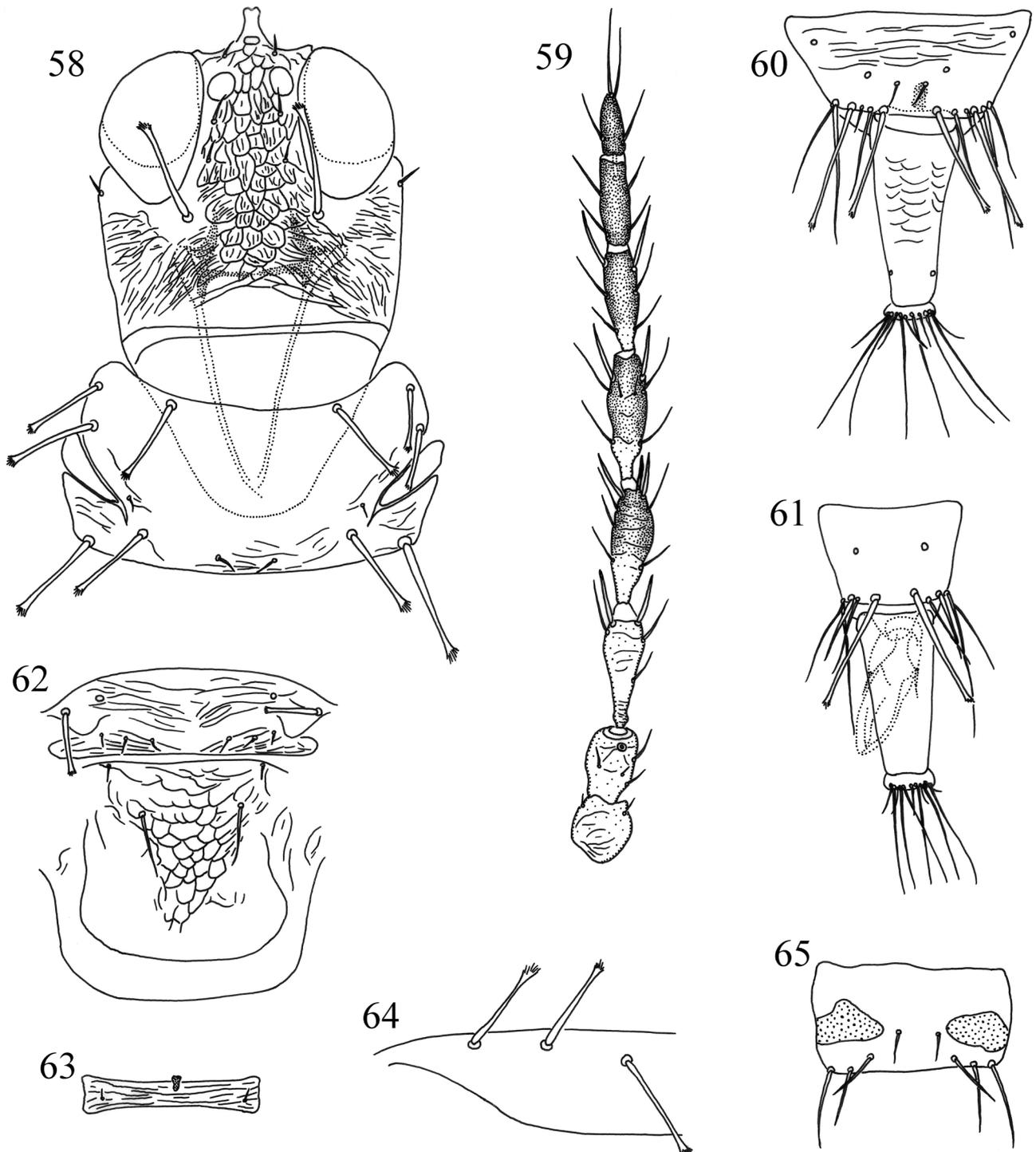
***Adraneothrips makilingensis* (Reyes) comb.n.**

(Figs 8, 21, 35, 58–65)

Apelaunothrips makilingensis Reyes, 1994: 362.

Described from five females and two males, the type specimens listed below do not have the relatively broad maxillary stylets that are typical of *Apelaunothrips* species, as discussed in Mound *et al.* (2013). Contrary to the original illustration, the prothoracic notopleural sutures are incomplete (Fig. 58). This character state, together with the capitate postocular setae that are close together (Figs 21, 58), and the presence of paired pore plates on sternite VIII of the male (Figs 35, 65), indicates that this species is best placed in *Adraneothrips*. Within this genus it appears to be a member of the *A. alternatus* species-group.

Specimens examined. THE PHILIPPINES, Luzon, holotype female and paratype male, in leaf-litter, 27.vi.1987, C.P. Reyes (ANIC).



FIGURES 58–65. *Adraneothrips makilingensis*. Female: (58) dorsal view of head and pronotum; (59) antenna; (60) dorsal view of abdominal tergites IX–X; (62) dorsal view of mesonotum & metanotum; (63) mesopraesternum; (64) base of forewing. Male: (61) abdominal tergites IX–X; (65) abdominal sternum VIII pore plate.

***Adraneothrips nilgiriensis* (Ananthakrishnan) comb.n.**
(Figs 9, 22)

Stigmothrips nilgiriensis Ananthakrishnan, 1971: 177.

Described from 25 females and 13 males, two of the original females have been studied and are listed below. It is a dark brown species (Fig. 9), with the head relatively elongate (Fig. 22). Antennal segment III has 3 sensoria, and segment IV has 4. This species shares some character states with *darwini*, but the femora are brown, the postocular setae pointed to blunt, the notopleural sutures incomplete, the fore wing sub-basal setae S3 pointed, and the major setae on tergite IX pointed and almost as long as the tube. In contrast, the original illustration indicates widely complete notopleural sutures.

Specimens examined. INDIA, Ooty, 2 females from dry fern, 5.vii.1970, T.N. Ananthakrishnan; Davikulam, 1 female from dry fern, 9.ix.1970, T.N. Ananthakrishnan (UMIC).

***Adraneothrips okajimai* (Muraleedharan & Sen) comb.n.**

Stigmothrips okajimai Muraleedharan & Sen, 1981: 227.

Described from 10 females collected from dry leaves and twigs in Tripura, eastern India, this species was compared to *Stigmothrips consimilis*, a species now placed in *Apelaunothrips*. However, the pronotal notopleural sutures were illustrated as incomplete, and the generic position adopted here is presumably correct. Dr Kaomud Tyagi kindly informed us that there are 10 paratypes in the collections of the Zoological Survey of India, Kolkata, and that these all have three sensoria on antennal segment III and four sensoria on segment IV. This is a brown species, with the femora described as “golden yellow with brownish shade” the fore and hind tibiae yellow but the mid tibiae shaded brown.

***Adraneothrips pteris* (Ananthakrishnan) comb.n.**

(Fig. 10)

Stigmothrips pteris Ananthakrishnan, 1971: 180.

Two specimens have been examined from the original type series of 41 females and 23 males. These specimens clearly show that the notopleural sutures are not complete, despite being indicated as fully complete in the original illustration. The description did not mention the number of antennal sensoria, but there are two on III and three on IV, and although segment III is mainly yellow it is shaded light brown on the apical half, and the basal stem is very weakly shaded grey rather than clear yellow.

Specimens examined. INDIA, Kodaikanal, 1 female, 1 male from dry fern, 4.viii.1970, T.N. Ananthakrishnan No. 479 (BMNH).

***Adraneothrips russatus* (Haga) comb.n.**

(Figs 11, 12, 23, 29, 36)

Baphikothrips russatus Haga, 1973: 74.

Stigmothrips russatus (Haga) Okajima, 1976: 129.

Described originally from Japan, Osaka, but subsequently recorded from the Ryukyu Islands by Okajima (1976), and from several Provinces of southern China by Tong & Zhang (1989), this species is here recorded from Australia, in north and south Queensland as well as Norfolk Island. All of these records are based only on females, and the redescription by Okajima (2006) also refers only to females. However, one male is reported here from Yunnan, southern China. This is a sharply bicoloured species (Figs 11, 12), with antennal segment III clear yellow (Fig. 23), and the metanotum distinctly reticulate (Fig. 29). Specimens of both sexes from Yunnan have antennal segment VI largely yellow but clouded at the apex, whereas specimens from Australia and Japan have this segment brown in the apical half and yellow at the base. Specimens from Yunnan, Taiwan and Japan have the prothoracic notopleural sutures incomplete, but these sutures are variable in the specimens from Australia, fully complete, nearly complete or incomplete (Fig. 23).

Male macroptera. Similar in structure to female, but smaller and paler; abdominal segments III–IV slightly darker than II, IX brown with apical half yellow; tergite IX posteromarginal setae S2 much shorter and stouter; sternite VIII with pair of pore plates laterally (Fig. 36).

Specimens examined. CHINA. Yunnan Prov. (Mengla County), 2 females, 1 male on unknown grasses and withered tree leaves, 17–22.iv.1997, Y.F. Han (NZMC); Taiwan Prov. (Pingdong County), 17 females on withered tree leaves, 3.ix.2001, 19.i.–21.ix.2002, 16.ii.–11.iii.2003, N.T. Zhang (NZMC). AUSTRALIA, Queensland: Cape Tribulation, 1 female on dead hard leaves, 8.x.2012, 1 female on grasses, 8.vii.1995, 1 female on freshly dead leaves, (LAM); Cairns, Crystal Creek, 4 females on dead palm frond and leafy branch, 4.x.2012 (LAM); Mt Malloy Julatten, 2 females on dead leaves, 5–6.vii.1995 (LAM); Townsville, 1 female from rainforest litter, P. Greenslade; Lamington National Park, O'Reillys, 4 females in leaf litter, vii–viii.2007 (in QDPC); Norfolk Island, 5 females on dead branches and leaves, 1 female on *Metrosideros* & *Ipomoea*, 27.xii.2012 (A. Wells); 1 female on dead twigs and leaves, 21.xii.2012, 3 females on dead palm fronds and *Cordyline* dead leaves, 22.xii.2012, 5 females on Palm & *Grevillea* dead leaves, 27.xii.2012; 8 females from *Eucalyptus* dead leaves, 10.vii.2013 (LAM)(ANIC). FIJI, Viti Levu, Nandaravatu, 1 female from base of grasses, 20.iv.1982 (LAM)(ANIC).

***Adraneothrips setosus* (Okajima) comb.n.**

Stigmothrips setosus Okajima, 2006: 595.

Described from a series of both sexes taken in leaf litter of an evergreen forest at Honshu, Japan, this species is included here based on the original description and illustrations. It is a typical member of the genus, with capitate postocular setae arising behind the inner margins of the eyes, and sternite VIII of males with a pair of pore plates.

***Adraneothrips stannardi* Ananthkrishnan**

(Fig. 13)

Adraneothrips stannardi Ananthkrishnan, 1969: 290.

Described from 14 females and one male collected at Madras, the wording of the original description could be read to imply that this mainly yellow species (Fig. 13) is similar to *A. bambusae*. Moreover, the original illustration indicates that the notopleural sutures are complete, and the description states that there are no duplicated cilia on the fore wings. However, two females collected with the holotype have been studied (Fig. 13), and these have several duplicated cilia, the notopleural sutures are incomplete or weakly complete, and the lateral margins of the head are distinctly shaded brown. This species is similar to *coloratus*, and both of them have three sensoria on the third and the fourth antennal segments. However, they differ as follows: *stannardi* – antennal segment III yellow at base with apex shaded brown and no more than 2.0 times as long as wide, segment IV yellow at base, all legs uniformly yellow, anal setae about 1.3 times as long as tube, pelta with campaniform sensilla at least 12 times their diameter apart; *coloratus* – antennal segment III largely yellow with base distinctly shaded, segment IV uniformly brown, femora and tibiae bicoloured, anal setae a little shorter than tube, pelta with campaniform sensilla less than four times their diameter apart.

Specimens examined. INDIA, Madras, 2 females on *Thevetia* twigs, 13.ix.1968, T.N. Ananthkrishnan (UMIC).

***Adraneothrips wauai* sp. n.**

(Figs 14, 24, 31)

Female macroptera. Body uniformly brown (Fig. 14); antennal segments I–II, VII–VIII brown, segment III shaded brown in basal third with pedicel and apex yellow, segments IV–VI brown with basal 1/4 yellow; all femora brown, all tibiae and tarsi yellow; fore wing pale; major body setae brown.

Head 1.2 times as long as wide, dorsal surface reticulate between eyes and posteromarginally (Fig. 24); eyes a

little shorter than half the length of head; postocular setae capitate, about as long as half the length of eye; antennal segment III with 3 sensoria, IV with 4. Pronotum with many irregular sculpture; major setae capitate; notopleural sutures nearly complete (Fig. 24). Prosternal ferna triangular, pointed medially; mesopraesternum boat-shaped. Metanotum reticulate on anterior (Fig. 31), but with linear sculpture on posterior half, median setae blunt. Fore wing with 5 duplicated cilia; sub-basal setae capitate, S3 sometimes blunt. Pelta typical of genus, with pair of campaniform sensilla; tergite IX setae S1 and S2 pointed to blunt at apex; tube about half as long as head, anal setae a little shorter than tube.

Measurements (holotype female in microns). Total body length 1550. Head length 190, width across cheeks 165; postocular setae length 35. Pronotum, length 100; width 190; setae: am 35, aa 30, ml 30, epim 50, pa 45. Metanotal median setae 20. Fore wing, length 680; sub-basal setae S1 30, S2 35, S3 70. Pelta length 55. Tergite IX posteromarginal setae S1 65, S2 50, S3 70. Tube length 100; anal setae 80. Antennal segments I–VIII length (width): 30 (30), 40 (25), 55 (25), 60 (25), 50 (22), 45 (20), 45 (20), 25 (10).

Male macroptera. Similar in structure to female, but smaller; abdominal segments I–VII more or less paler; pronotal notopleural sutures incomplete; abdominal sternite VIII with pair of pore plates laterally; tergite IX posteromarginal setae S2 much shorter.

Specimens examined. Holotype female. **PAPUA NEW GUINEA**, Bulolo, on branchlet of *Araucaria cunninghamii* with *Hylurdrectonus araucariae* (Coleoptera, Scolytidae), 2.ii.1968, B. Gray (BMNH). Paratypes (in BMNH and ANIC): 2 females, 1 male, with same data as holotype; 4 females at same locality, on frass left by *H. araucariae* in *Araucaria* branchlet, 1.ii.1968, B. Gray, 1 male on branchlet of *A. cunninghamii* infested by *H. araucariae*, 29.ix.1967, B. Gray.

Remarks. This new species is similar to *braccatus* in body color and structure, but differs in having the pronotum with many irregular sculpture lines (Fig. 24), the notopleural sutures clearly incomplete, the pelta slender, antennal segment III shaded in basal third with pedicel and apex yellow, and sternite VIII with a pair of pore plates. In contrast, *braccatus* has the pronotum smooth with sculpture lines only near the posterior margin, the notopleural sutures complete, pelta broad, antennal segment III uniformly yellow, and sternite VIII without pore plates. It is also similar to *infirmitus* and *chinensis*, but differs from them as indicated in the key. It differs from *darwini* sp. n. in having several duplicated cilia on the fore wings, three sensoria on antennal segment III, and all femora brown.

***Adraneothrips yunnanensis* sp. n.**

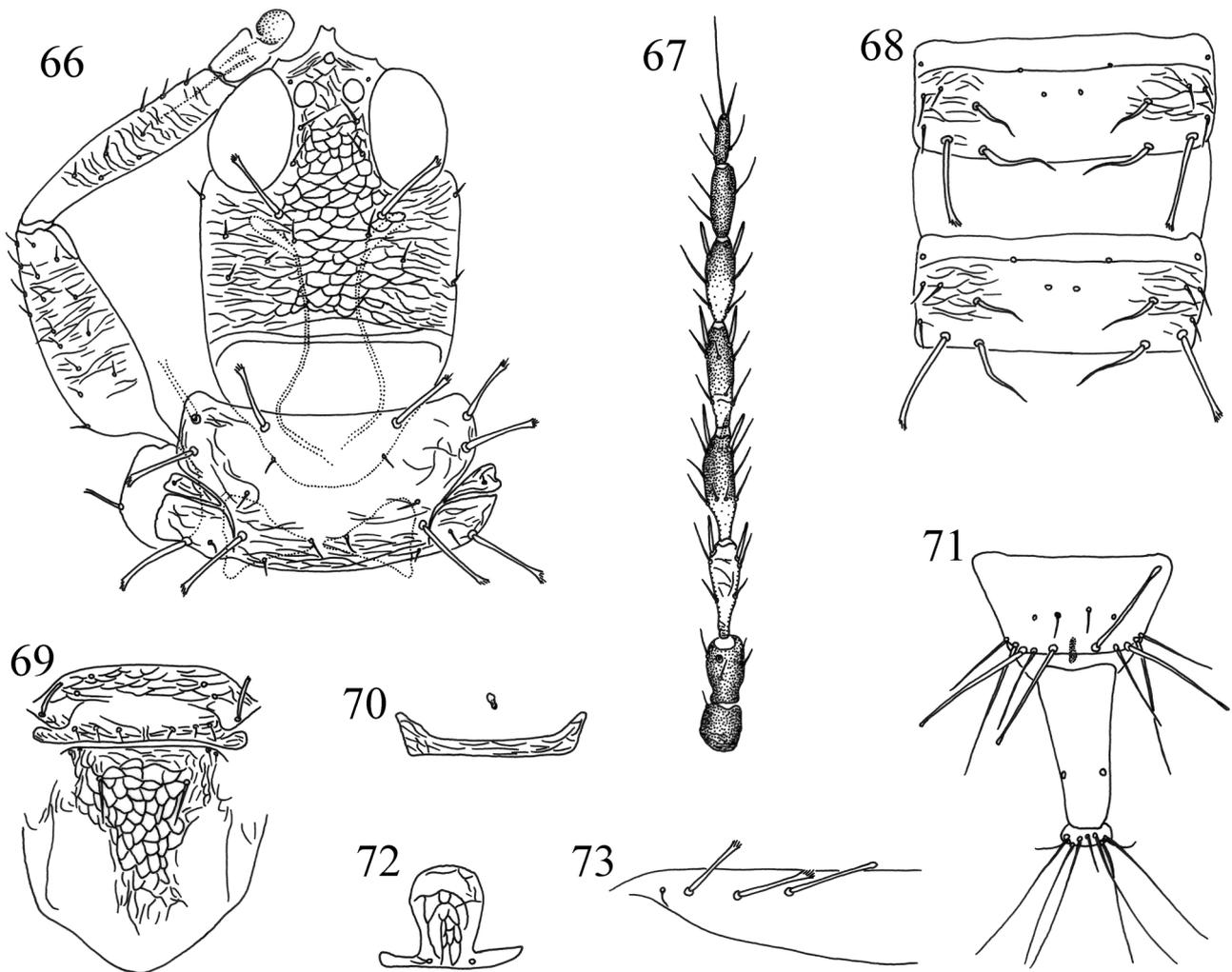
(Figs 15, 25, 32, 66–73)

Female macroptera. Body bicoloured yellow and brown (Fig. 15); antennal segments I–II, VII–VIII brown, segment III uniform yellow, segments IV–V brown with basal 1/3 yellow, VI brown with basal half yellow; head brown; prothorax mainly yellow, pterothorax uniformly brown with lateral margins darker; legs largely yellow, but mid and hind coxae brown, basal half of mid femora shaded with brown; fore wing shaded; pelta brown with lateral lobes yellow, abdominal segments II and IV uniformly yellow, V yellow but brown anterolaterally, remaining segments brown; major body setae brown.

Head 1.1 times as long as wide, dorsal surface reticulate medially (Figs 25, 66); eyes a little shorter than half the length of head; postocular setae capitate, a little longer than half the length of eye (Fig. 66); antennal segment III with 2 sensoria, IV with 3. Pronotum without sculpture except near posterior margin (Fig. 66); major setae capitate; notopleural sutures nearly complete. Prosternal ferna triangular, pointed medially; mesopraesternum boat-shaped (Fig. 70). Metanotum reticulate on anterior half, median setae pointed. Fore wing without duplicated cilia; sub-basal setae capitate (Fig. 73). Pelta typical of genus, with pair of campaniform sensilla (Fig. 72); tergite IX setae S1 and S2 blunt at apex (Fig. 71); tube about half as long as head, anal setae a little shorter than tube.

Measurements (holotype female in microns). Total body length 1725. Head length 210, width across cheeks 165; postocular setae length 50. Pronotum, length 105; width 220; setae: am 40, aa 42, ml 50, epim 55, pa 50. Metanotal median setae 35. Fore wing, length 650; sub-basal setae S1 45, S2 50, S3 65. Pelta length 56. Tergite IX posteromarginal setae S1 75, S2 80, S3 100. Tube length 110; anal setae 100. Antennal segments I–VIII length (width): 30 (32), 45 (25), 65 (25), 70 (20), 70 (22), 55 (20), 50 (20), 30 (10).

Male. Unknown.



FIGURES 66–73. *Adraneothrips yunnanensis* sp. n. Female: (66) dorsal view of head and pronotum; (67) antenna; (68) dorsal view of abdominal tergites IV–V; (69) dorsal view of mesonotum & metanotum; (70) mesopraesternum; (71) abdominal tergites IX–X; (72) pelta; (73) base of forewing.

Specimens examined. Holotype female. **CHINA**, Yunnan Prov., Jinghong County, on dead branches and leaves, 12.iv.1997, Y.F. Han (NZMC). Paratypes: 1 female, with same data as holotype (NZMC). **INDONESIA**, Java, Bogor Botanic Gardens, 2 females in leaf litter, 26.x.1975 (BMNH; ANIC).

Remarks. This new species is similar to *russatus*, but differs in having only abdominal segments II and VI yellow, with V yellow with brown anterior and the other segments brown. In contrast, *russatus* has abdominal segments I–II, VI, and VIII yellow, and V yellow with brown anterior, IX brown with yellow anterior. This new species is also similar to *hani* but differs in lacking fore wing duplicated cilia, and antennal segment IV with three sensoria, whereas *hani* has duplicated cilia present, and antennal segment IV with four sensoria.

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