



## Key to the non-fossil species of the genus *Taeniothrips* (Thysanoptera, Thripidae)

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### Abstract

A table is provided of the 24 non-fossil species currently listed in *Taeniothrips*. One species, *pediculae*, is clearly not a member of this genus, *dealatus* and *sexnotatus* remain *nomina dubia*, and *angustiglandus* is unrecognisable having been based on males only. A key is provided to the remaining 20 species of the genus, including *Taeniothrips damansarae* **sp.n.** from Malaysia that has unique setal apices. Many of these 20 species involve recognition problems that are discussed based largely on type material.

**Key words:** *Taeniothrips*, species identification, Southeast Asia, new species

### Introduction

*Taeniothrips* is one of the oldest generic names in the Thysanoptera. Linnaeus and his contemporaries recognised only the single genus *Thrips*, but Haliday (1836) added 10 genera, and Amyot & Serville (1843) a further five genera including *Taeniothrips*. Over the succeeding century and a half, *Taeniothrips* was interpreted in many different ways. Even throughout much of the 1960's and 1970's authors continued to use this genus in a non-phylogenetic sense. For example, Mound (1966) included in *Taeniothrips* several species from Britain that are now placed in four different genera - *Ceratohrips*, *Mycterohrips*, *Tenohrips*, or *Thrips*, and Schliephake & Klimt (1979) treated the German fauna in a similar way. O'Neill (1972) provided a major advance by indicating the significance of paired ctenidia on the abdominal tergites among Thripinae, and this character was subsequently used (Mound *et al.* 1976) to distinguish the British species of *Thrips* from those of *Taeniothrips*. The position was crystallised by Bhatti (1978), who provided a major contribution to Thysanoptera systematics by distinguishing *Taeniothrips* from several distinct lineages with which it had been conflated. The classification in that paper remains widely accepted. The only revisionary account of *Taeniothrips* species (Priesner 1938) long predates modern concepts of systematic relationships, and is now of no practical use. Most of the species described by Priesner from Asia remain known only from the original specimens, and these are poorly mounted onto slides and usually not in a suitable condition for critical study. Those slides were prepared by H. Karny, who mounted thrips ventral side uppermost because he considered that the mouth parts might provide suitable characters for identification and classification (teste H. Priesner to LAM in 1967). The identification key and notes given here are based on these original specimens (Fig. 1), but this key should be considered as little more than an introductory guide. The information is provided here with the intention of helping students in Asia to sort specimens of this genus, to facilitate studies on the biology and host associations of these thrips.

### *Taeniothrips* Amyot & Serville

*Taeniothrips* Amyot & Serville, 1843: 644. Type species *Thrips primulae* Haliday, a junior synonym of *Thrips picipes* Zetterstedt, by subsequent designation of Karny, 1907: 45.

*Taeniothrips (Fetothrips)* Bhatti, 1995: 92. Type species *Taeniothrips tigris* Bhatti.

Species in this genus share with those in the genus *Thrips* the character state of lacking a pair of setae immediately in front of the first ocellus (ocellar setae pair I) (Figs 4, 5). However, in contrast to the species of *Thrips* genus, they do not have ctenidia on the abdominal tergites (Fig. 14). Both sexes in *Taeniothrips* have a long and regular comb of microtrichia on the posterior margin of tergite VIII (Fig. 14), and ocellar setae pair III arise within the ocellar triangle. The first vein of the fore wing has a long gap in the setal row, and in females sternite VII has both median pairs of setae (S1 and S2) arising in front of the margin (except *arbuti* and *inconsequens* where S2 are almost marginal). The head is relatively elongate, and the median pair of metanotal setae usually arises close to the anterior margin (Figs 2–6). In contrast to several Thripinae taxa that are similar in general appearance, the first antennal segment of *Taeniothrips* species does not bear a pair of dorso-apical setae.

There are now 45 species listed in *Taeniothrips*, of which 21 are based only on fossils. Table 1 lists the non-fossil species, but a full synonymic list including the fossil species is available on the web (Mound 2012). Of the remaining 24 species, four are European in origin, one is from western North America, and the rest are from Asia. Of these Asian species, four are either clearly not members of this genus or remain unrecognisable (see section 7 below). Identification problems within the genus have remained particularly severe with the Asian species, primarily because of the lack of targeted field sampling and biological studies in this region. There is little information available on variation within and between populations in tropical Asia, and even some temperate zone species seem likely to have extensive distributions across the northern hemisphere.

**TABLE 1.** Checklist of *Taeniothrips* species (excluding fossil species).

Species	Author	Year	Original genus	Original locality
<i>amomi</i>	Priesner	1938	<i>Taeniothrips</i>	Indonesia—Sumatra
<i>angustiglandus</i>	Han & Cui	1992	<i>Taeniothrips</i>	China—Szechuan
<i>arbuti</i>	Bournier	1983	<i>Taeniothrips</i>	France
<i>cognaticeps</i>	Priesner	1935	<i>Taeniothrips</i>	Taiwan
<i>coreanus</i>	Woo	1974	<i>Taeniothrips</i>	Korea
<i>damansarae</i>	sp.n.	2012	<i>Taeniothrips</i>	Malaysia
<i>dealatus</i>	Priesner	1928	<i>Taeniothrips</i>	Indonesia—Java
<i>eucharitii</i>	Whetzel	1923	<i>Physothrips</i>	Bermuda
<i>euophthalmos</i>	Moulton	1940	<i>Taeniothrips</i>	Papua New Guinea
<i>fallax</i>	Priesner	1936	<i>Taeniothrips</i>	Indonesia—Java
<i>glanduculus</i>	Han	1990	<i>Taeniothrips</i>	China—Tibet
<i>inconsequens</i>	Uzel	1895	<i>Physopus</i>	Bohemia
<i>major</i>	Bagnall	1916	<i>Taeniothrips</i>	Northern India
<i>miorhizae</i>	Priesner	1938	<i>Taeniothrips</i>	Indonesia—Java
<i>montivagus</i>	Priesner	1938	<i>Taeniothrips</i>	Indonesia—Java
<i>nomoceras</i>	Karny	1921	<i>Mecothrips</i>	Indonesia—Java
<i>orchidi</i>	Ananthakrishnan	1968	<i>Taeniothrips</i>	Northern India
<i>oreophilus</i>	Priesner	1935	<i>Taeniothrips</i>	Taiwan
<i>orionis</i>	Treherne	1924	<i>Taeniothrips</i>	Canada
<i>pediculae</i>	Han	1988	<i>Taeniothrips</i>	China
<i>picipes</i>	Zetterstedt	1828	<i>Thrips</i>	Sweden
<i>sexnotatus</i>	Zehntner	1897	<i>Physopus</i>	Indonesia—Java
<i>tigris</i>	Bhatti	1995	<i>Taeniothrips</i> ( <i>Fetothrips</i> )	India
<i>zurstrasseni</i>	Zawirska	2007	<i>Taeniothrips</i>	Poland

Some members of this genus are associated with flowers. This includes the type species, *picipes*, that is common across Europe in the flowers of several small herbs, and *oreophilus* that seems to occupy a similar niche in Japan. A closely related species, *zurstrasseni*, was described from the flowers of various herbaceous plants

growing in damp places in Poland, and the oriental species *eucharii* is associated with the flowers and leaves of various Liliaceae (Mound & Tree 2009). In contrast, the Holarctic species *inconsequens* appears to be associated commonly with young leaves, and in north-east America can cause severe damage to the emerging young leaves of sugar maple trees (Teulon *et al.*, 1994). In Japan, *inconsequens* occurs very early in spring when few other thrips are around, and at this time many individuals are found not only on young leaves but also in leaf-buds, flower-buds and flowers of several plant families (teste M.Masumoto in litt. 2012). Very little is known of the biology of most of the other species in this genus.

### Key to *Taeniothrips* species

\* included only from description; see Note 7 below for four excluded species

1. Fore wing with alternating dark and light bands . . . . . 2
- Fore wing uniformly shaded or with base paler . . . . . 3
2. Fore wing with two transverse dark bands alternating with sub-basal and median paler areas, apex of wing dark. . . . . *tigris*\*
- Fore wing with one dark band, apex of wing pale . . . . . *coreanus*\*
3. Abdominal tergites IV–VII with weak reticulation medially between setal pair S2 (Fig. 16) . . . . . *major*; *orionis*; *glanduculus*
- Abdominal tergites IV–VII with no sculpture mesad of setal pair S2 (Fig. 15) . . . . . 4
4. Fore wing first vein with 2 setae near apex but none medially . . . . . *fallax*
- Fore wing with at least one seta medially as well as 2 or more setae near apex. . . . . 5
5. Fore wing first vein with 3–6 setae distally; female sternite VII setal pair S2 arising at margin . . . . . 6
- Fore wing first vein with only 2 setae distally and one medially; female sternite VII setal pair S2 arising sub-marginally . . . . . 7
6. Fore tarsus with strongly recurved terminal claw; pronotal inner posteroangular setal pair less than 0.65 as long as pronotum; sternal pore plates of male 30 microns wide . . . . . *inconsequens*
- Fore tarsus with no terminal claw; pronotal inner posteroangular setal pair more than 0.8 as long as pronotum; sternal pore plates of male 70 microns wide. . . . . *arbuti*
7. Fore wing paler at base, with clavus usually darker . . . . . 8
- Fore wing evenly shaded including base and clavus . . . . . 10
8. Antennal segment III mainly dark brown; pronotum usually with transverse lines of sculpture medially; antennal segment VI usually without microtrichia near base . . . . . *eucharii*
- Antennal segment III yellow or weakly shaded near apex; pronotum with no sculpture lines medially; antennal segment VI with a few microtrichia near base . . . . . 9
9. Abdominal tergite I median setae longer and stouter than median pair on tergite II; metanotal median setae not at anterior margin . . . . . *zurstrasseni*\*
- Abdominal tergite I median setae neither longer nor stouter than median pair on tergite II; metanotal median setal pair close to anterior margin . . . . . *picipes*; *oreophilus*; *orchidi*
10. Antennal segments III–VIII pale, III often almost clear yellow (Fig. 19) . . . . . 11
- Antennal segments III–VIII mainly dark brown, III scarcely paler (Figs 18, 20) . . . . . 14
11. Ocellar setae III (Figs 8, 9) and pronotal posteroangular setae (Fig. 3) with apices blunt or bearing two apical microtrichia . . . . . *damansarae* **sp.n.**
- Ocellar setae III and pronotal major setae finely acute . . . . . 12
12. Pronotal posterior margin with 4 pairs of setae; pronotum and vertex strongly transversely striate; ocellar setae pair II sometimes duplicated . . . . . *euophthalmos*
- Pronotal posterior margin with 2 pairs of setae; pronotum weakly reticulate/striate; ocellar setae pair II never duplicated . . . . . 13
13. Antennal segment IV about 65 microns, subequal to segment III . . . . . *amomi*
- Antennal segment IV about 85 microns, 1.2 times as long as segment III. . . . . *nomoceras*
14. Metanotal median setal pair very close together, distance between their basal pores scarcely twice the diameter of these pores (Fig. 4). . . . . *montivagus*
- Distance between basal pores of median metanotal setae at least 3 times their diameter. . . . . 15
15. Antennal segment III about 85 microns long, with elongate apical neck. . . . . *mirrhizae*
- Antennal segment III about 65 microns long, with apex narrowed (Fig. 18) . . . . . *cognaticeps*

### Notes on *Taeniothrips* species

The 24 non-fossil species currently listed worldwide in this genus are given in Table 1, but see Note 7 below. The notes given here are intended to draw attention to some of the taxonomic problems in the genus. Many of the slides studied are indicated in Fig. 1.

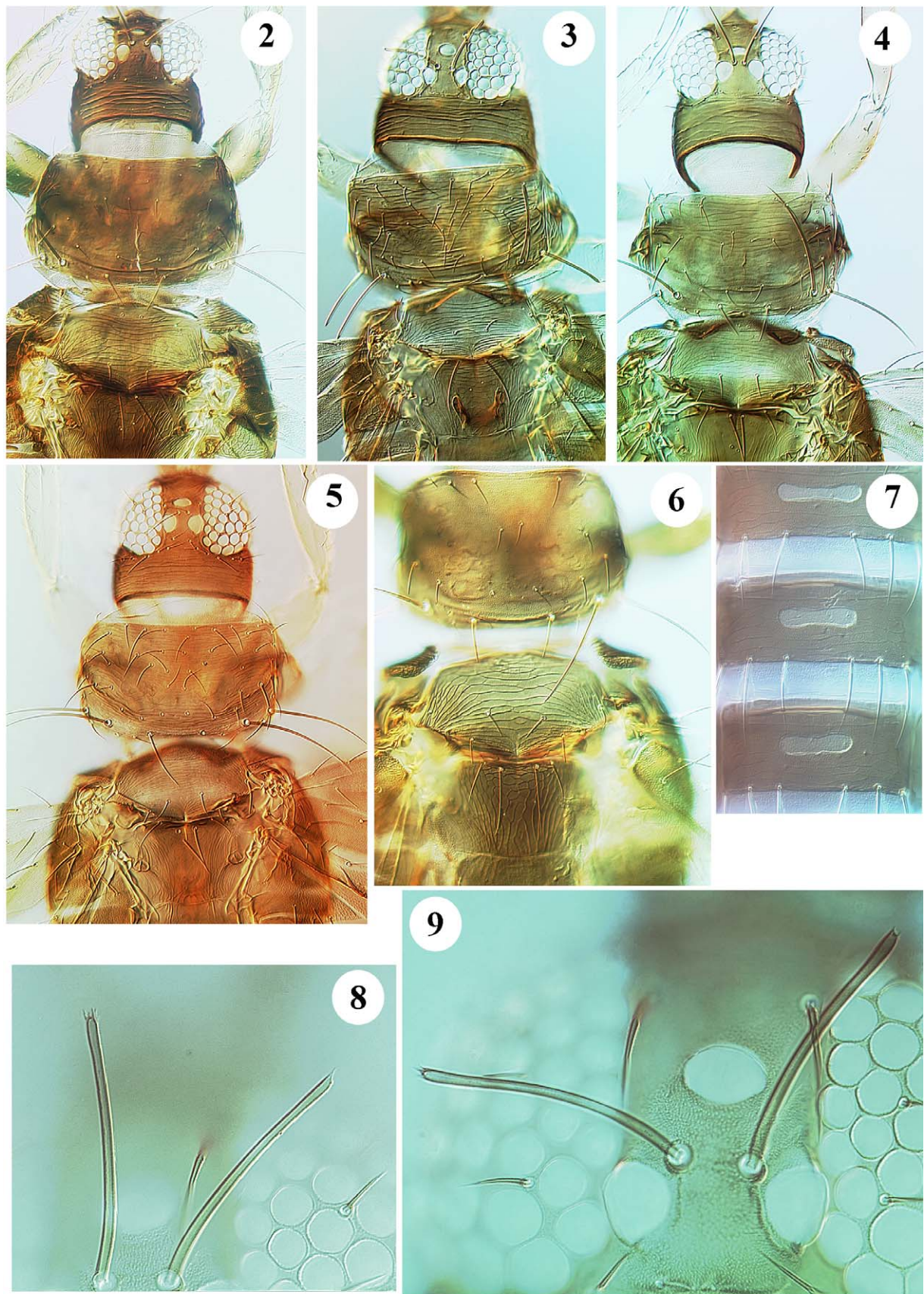
1. The type species of *Taeniothrips* is the widespread European species, *picipes*. However, females from Europe cannot be distinguished satisfactorily from those of *orchidi*, a species described from northern India. Anan-

thakrishnan provided no comparison to any other thrips species in describing *orchidi*, but three females bearing type data have been studied (Fig. 1) and these have antennal segments IV and V bright yellow in at least their basal halves (Fig. 21). Also closely similar is *oreophilus*, described from Taiwan, and considered widespread in various flowers in the mountains of Japan (teste M. Masumoto in litt. 2012). Females identified here as *oreophilus* have been studied from Pahang, Central Highlands of Peninsular Malaysia (CISUKM), and a male and female have been studied from Chiang Mai, Thailand. The females of these three species cannot be distinguished satisfactorily from each other, but among males there are possibly slight differences in the genitalia and chaetotaxy of the ninth tergite. Despite this, there remains a possibility that these three nominal forms represent a single widespread Palearctic species.

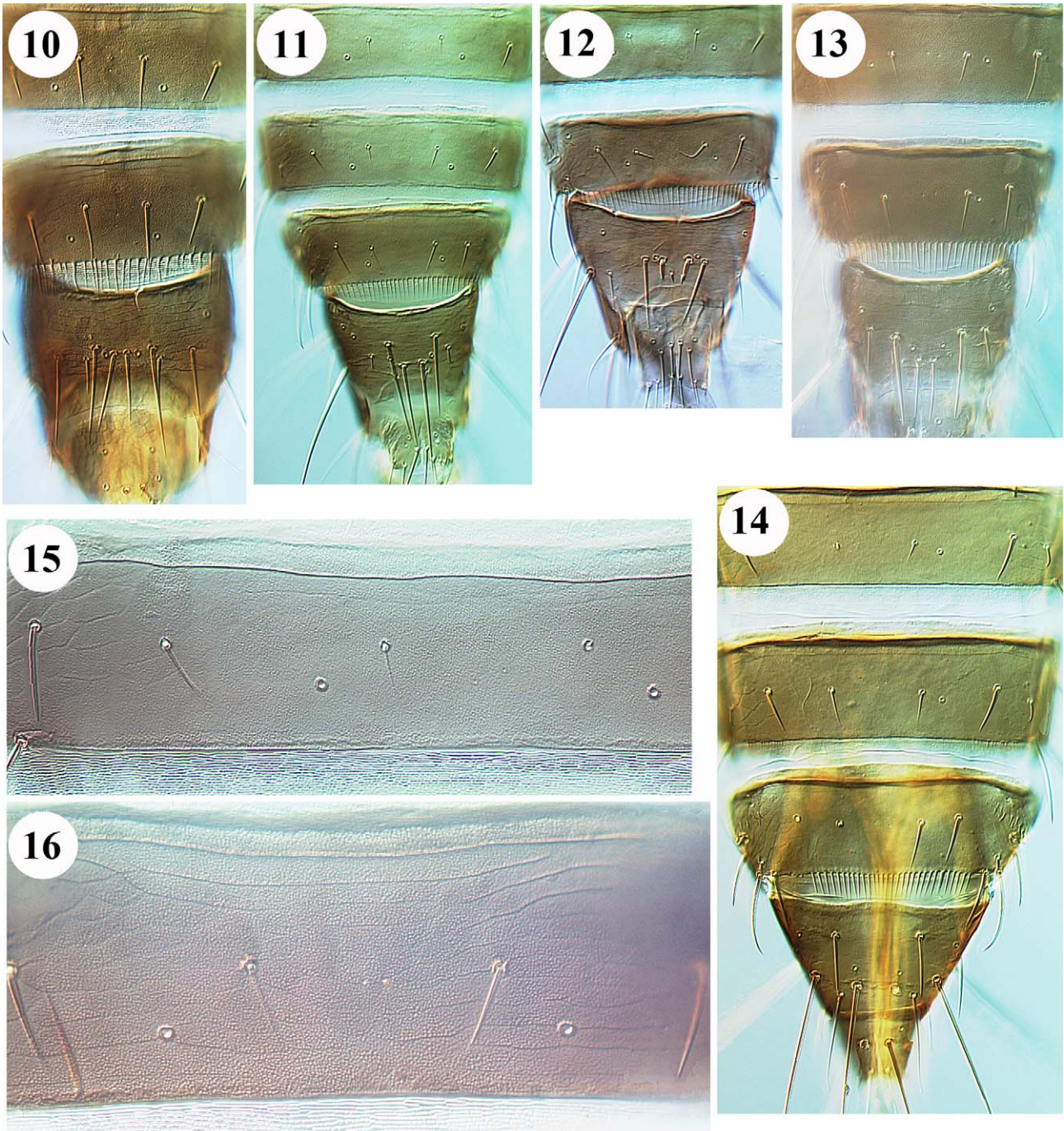
2. One pair of Holarctic species, *major* from the Himalayas and *orionis* from western North America, also cannot be distinguished from each other. Females are unusual within the genus in having distinct, but sometimes weak, reticulate sculpture medially on at least the anterior half of the abdominal tergites (Fig. 16). Moreover, these females usually lack a seta medially on the first vein of the fore wing, although specimens of both species have been studied in which one (or even two) setae are present in this position although usually only on one wing. The males of both *major* and *orionis* have long slender setae medially on tergite IX (Fig. 10), and the sternal pore plates are oval, variable in size and usually less than 40 microns wide. Also related is *glanduculus* Han described from Xizang, Tibet. A paratype of both sexes of this species have been studied (in BMNH). These cannot be distinguished satisfactorily from *major*, and they probably represent that species. A further name, *microglandus* Han, was a mis-spelling of *glanduculus*, not a validly described species.



FIGURE 1. Type slides of some *Taeniothrips* species.



**FIGURES 2–9.** *Taeniothrips* species. (2) *picipes*; (3) *damansarae*; (4) *montivagus*; (5) *fallax*; (6) *major*; (7) *damansarae* male sternites; (8–9) *damansarae* ocellar setae pair III – 8, paratype female; 9, holotype female.

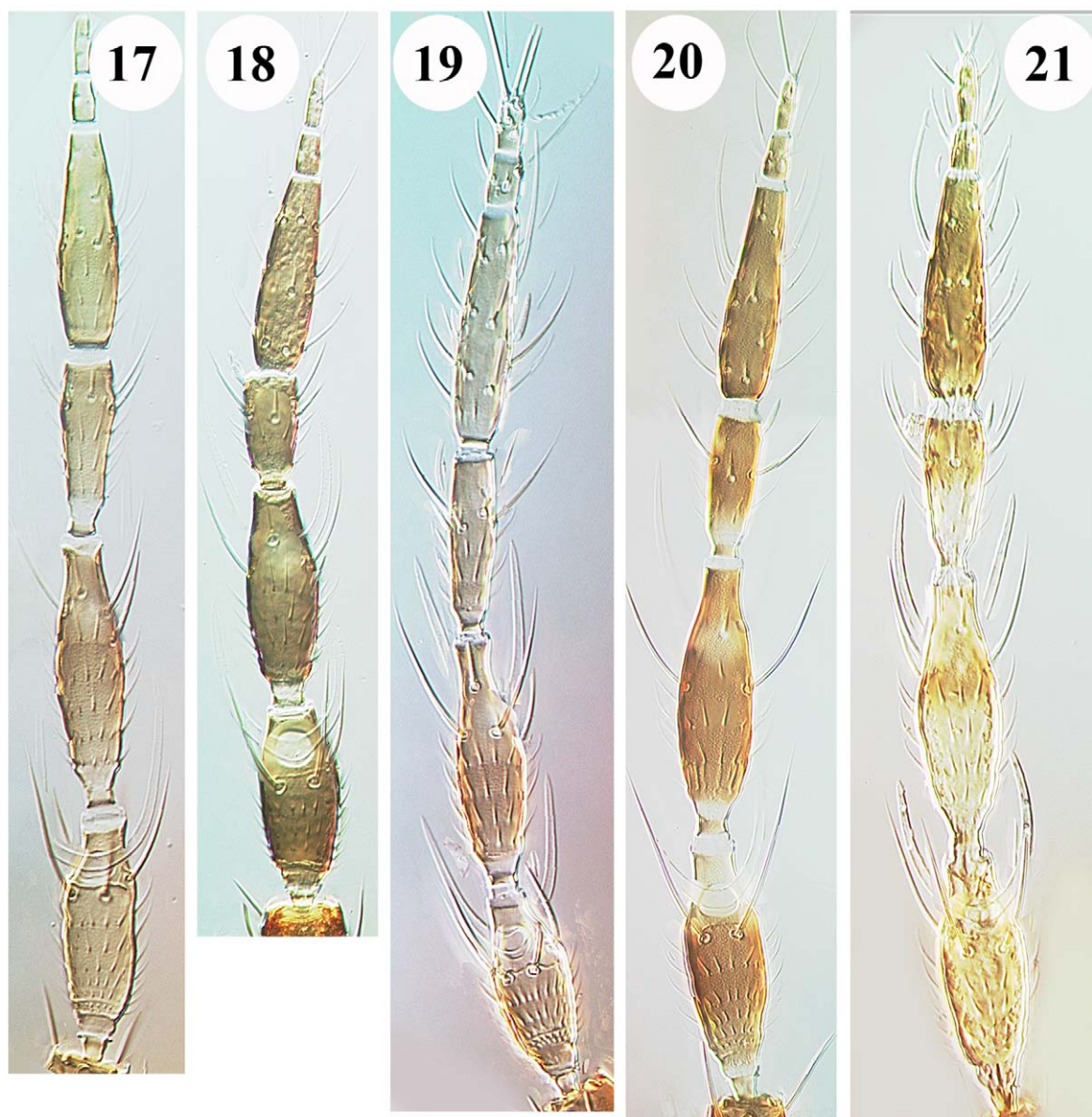


**FIGURES 10–16.** *Taeniothrips* species. Male tergites VIII–IX 10–13: (10) *orionis*; (11) *eucharii*; (12) *fallax*; (13) *damansarae*. (14) *damansarae* female tergites VI–X. Female tergite V 15–16: (15) *eucharii*, (16) *major*.

3. Although described originally from Bermuda, *eucharii* is an Oriental species that is associated with various Liliaceae and related plants, particularly *Hymenocallis*. Specimens have been studied from between Malaysia, Japan and northern Australia (Mound & Tree 2009). Similar in structure, but here interpreted as a distinct species, *cognaticeps* was described from two females taken in Taiwan. One of these has been studied, from the locality Rarasan (Figs 1, 18), and this specimen is smaller than *eucharii*, with shorter antennae in which the segment apices are less attenuated, and the fore wings more uniformly dark to the base.

4. Moulton (1940) described *euophthalmos* from seven females and two males taken from Zingiberaceae at “Koitaki, New Guinea”. This species was transferred to *Amomothrips* by Bhatti (1978), but the type species of that genus, *A. associatus*, has ocellar setae pair I present (see Fig. 1 in Bhatti, 1978), whereas this pair of setae is not

present in the holotype of *euophthalmos* (see Fig. 57 in Mound & Ng, 2009), nor in two available paratypes (in BMNH). However, the paratype female and male, but not the holotype, have ocellar setae pair II duplicated, a condition very similar to that illustrated by Bhatti for *A. associatus*. Two further males and females of *euophthalmos* have been studied (in BMNH), collected from *Ellateria cardamomum* (Zingiberaceae) in New Britain, and these also lack ocellar setae pair I, have ocellar setae pair II duplicated, and the pronotum and vertex strongly striate. However, one male has been studied from Terengganu, West Malaysia (in BMNH), that appears to be the same species but has ocellar setae pair I present just in front of the first ocellus, and ocellar setae pair II duplicated. The chaetotaxy of the head of this specimen is thus essentially similar to that of *A. associatus* as illustrated by Bhatti. There is thus a possibility that a species of *Taeniothrips* living on the flowers of cardamon plants in south-east Asia has the number of ocellar setae unstable. If further field collecting proves this to be true, then *Amomothrips* might need to be considered a synonym of *Taeniothrips*.



FIGURES 17–21. *Taeniothrips* species antenna. (17) *fallax*; (18) *cognaticeps*; (19) *damansarae*; (20) *montivagus*; (21) *orchidi*.

5. Seven species listed in *Taeniothrips* were described from Indonesia, one from Sumatra but the others from Java. Two of these are considered below to be unrecognisable (see Note 7). Of the other five, each was described from an unspecified number of both sexes. One of these, *amomi*, was stated by Priesner to be very similar to *nomoceras* Karny, and this similarity is here confirmed as indicated by the key above. No further specimens of these two

have been studied, and their identity remains unclear. The available original specimens of *fallax* are mounted ventrolaterally with many characters obscured (Fig. 1), but in both sexes the fore wing lacks a seta medially on the first vein, antennal segment IV is slender and elongate, segment VI has three rows of microtrichia on the basal half, and the male is unusual in this genus in having one pair of stout, almost thorn-like, setae medially on tergite IX (Fig. 12). On the basis of these characters, a series of specimens (8 males, 3 females) from Pahang, Central Highlands of Peninsular Malaysia (in CISUKM), are here identified as *fallax*. These females of *fallax* (Figs 5, 17) are similar to the single available female of *nomoceras*, but in that female antennal segment VI has small setae on the basal half with no microtrichia, and the fore wing has a seta medially on the first vein.

6. The other two species described by Priesner from Indonesia, *miorhizae* and *montivagus*, are much larger and darker than *amomi* and *fallax*. However, although distinguished in the key above by the position of the metanotal median setae, there remains a possibility that *miorhizae* is no more than a large form of *montivagus*. The original description of *montivagus* was based on specimens from several localities. Two females from “Panangro” labelled “paratypes” have been studied (Fig. 1), although no holotype was designated with the original description. These two females have one or two rows of microtrichia on the basal third of antennal segment VI; the available female of *miorhizae* has a single microtrichium ventrally on the basal third of this segment. In contrast, a series of 10 females that are here identified as *montivagus*, from Pahang, Central Highlands of Peninsular Malaysia (in CISUKM), have small setae but no microtrichia on the basal third of antennal segment VI. The body length among this series of specimens varies from 1.6 to 2.3 mm, and the pronotal posteroangular setae of the larger specimens are longer than the median length of the pronotum.

7. The single specimen from which *dealatus* was described has presumably been lost (Bhatti, 1978: 188), but the original illustration (Priesner, 1928: 44, Fig. 1) indicated that ocellar setae pair III arise on the anterior margins of the ocellar triangle, not within the triangle. Thus *dealatus* is not a species of *Taeniothrips* as now defined. Another long lost species, *sexnotatus* Zehntner, was stated by Priesner (1938: 526) to be presumably not a *Taeniothrips*. A female paratype of *pediculae* Han has been studied (in BMNH) and this has no comb on tergite VIII and ocellar setae pair I are present; this is therefore not a species of *Taeniothrips*. Also described from China, *angustiglandus* Han & Cui, was based on four males with the body yellow not dark brown, and the pore plates occupying at least 20% of the width of the sternites. Females of this species have not been mentioned in published literature, and the identity of the species remains in doubt.

### ***Taeniothrips damansarae* sp. n.**

*Female macroptera.* Body brown, legs mainly yellow with posterior femora lightly shaded; major setae all light brown; fore wings uniformly dark, including clavus; antennal segments I–II brown, III largely yellow but distinctly shaded medially, IV–VIII light brown with IV darkest. Head slightly wider than long, cheeks strongly rounded but constricted behind eyes; ocellar setae pair III arising within the triangle, on tangent joining anterior margins of posterior ocelli, apices of these setae blunt and bearing 2 or 3 microtrichia (Figs 8–9); postocular setae small (Fig. 3). Antennal segment III with apex constricted, forked sensorium extending beyond basal third of IV; segment IV with apex elongate and constricted, sensorium extending to mid-point of V; VI with 2 long and one short sensoria, several microtrichia present on basal third (Fig. 19). Pronotum with bold transverse lines and about 25 discal setae; posteroangular setae with apices blunt, sometimes with a terminal microtrichium (Fig. 3); posterior margin with 2 pairs of setae. Fore tarsal apical bladder at inner apex with minute claw-like process (much smaller than in *inconsequens*). Mesonotal anterior campaniform sensilla absent. Metanotum transversely striate on anterior half, weakly sculptured on posterior half; campaniform sensilla on anterior half; median pair of setae at anterior margin, closer to lateral pair than to each other (Fig. 3). Mesofurca with spinula, metafurca without spinula; meso and metasterna each with 40–50 fine setae. Fore wing second vein with about 11 setae; first vein with 2 setae near apex, 1 medially, about 9 setae on basal half; clavus with 5 veinal and 1 discal setae. Tergites I–VIII with no sculpture medially; VIII with long posteromarginal comb, and ctenidium-like group of irregular microtrichia anterior to both spiracles (Fig. 14); X much shorter than IX. Sternites with weak transverse reticulation, VII with setae S1 and S2 arising far ahead of posterior margin.

*Measurements* (holotype female in microns). Body length 1600. Head, length 150; width across cheeks 175; ocellar setae—II 30, III 65. Pronotum, length 125; width 225; posteroangular setae—inner 90, outer 75. Fore wing,



length 840. Tergite IX, median dorsal setae 75; setal pair S1 150. Antennal segments III–VIII length 70, 80, 55, 80, 15, 15.

*Male macroptera.* Similar to female, but smaller; sternites III–VII with transverse pore plate; tergite IX setae S1 (Fig. 13) varying from 0.5–0.8 as long as setae S2.

*Measurements* (paratype male in microns). Body length 1200. Head, length 125; ocellar setae III 55. Pronotum, length 110; posteroangular setae—inner 80, outer 65. Fore wing, length 700. Tergite IX setae S1 21; S2 55. Sternal pore plate width, on V 65, on VII 50. Antennal segments III–VIII length 55, 70, 50, 85, 10, 15.

**Material studied.** Holotype female, **Malaysia**, Selangor, Hutan Simpan (Forest Reserve), Kota Damansara, in flower of *Curculigo latifolia* (Liliaceae—Hypoxidaceae), 18.iv.2011 (A.R.Khadijah), in BMNH.

Paratypes: 4 females 2 males collected with holotype, in MZUM and ANIC.

Non-paratypes: Malaysia, Perak, Taiping, 1 female, 2 males from *Phaeomeria speciosa* (Zingiberaceae), 13.iii.2007 (Mark Hoddle 36), in ANIC.

**Comments.** This species is distinguished from *nomoceras* by the remarkable apices of the ocellar setae, and the blunt apices of the pronotal major setae. The apices of these setae are consistent in their form throughout all of the specimens listed above, and at present are unique amongst Thripidae. The three specimens excluded from the type series are badly damaged, but the structure of the apices of the ocellar setae is readily visible.

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Abbreviations for depositaries: ANIC—Australian National Insect Collection, Canberra; BMNH—the Natural History Museum, London; MZUM—Zoological Museum, University of Malaya, Kuala Lumpur; CISUKM—Centre for Insect Systematics, Universiti Kebangsaan Malaysia, Bangi.

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