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Genera and species of the *Liothrips* lineage (Thysanoptera, Phlaeothripinae) from Taiwan

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Abstract

This paper lists from Taiwan 11 genera and 28 species of Thysanoptera of the *Liothrips* lineage. A key is provided to the 11 genera, and *Psephenothrips baiheensis* **sp.n**. and *P. cymbidas* **sp.n**. are described. A key to the 12 *Liothrips* species recorded from Taiwan is provided, with two new species, *L. dayuilinensis* **sp.n**. and *L. hsuae* **sp.n**. One new combination is presented, *Liophloeothrips terminaliae* (Moulton) **comb.n.**, and *Psephenothrips leptoceras* Okajima from Japan is newly recorded from Taiwan.

Key words: *Gynaikothrips, Leeuwenia, Liophloeothrips. Liothrips, Psephenothrips*

Introduction

Research on the biology and taxonomy of Thysanoptera from Taiwan has so far been focused mainly on Suborder Terebrantia, because many of these thrips cause damage to agricultural crops. In that suborder 113 species under 47 genera are recorded and described (Wang 2002, 2016). However, in suborder Tubulifera about 100 species are recorded from Taiwan, although there have been very few studies on this group. Only a single family is recognized in the Tubulifera, but with two subfamilies, Idolothripinae and Phlaeothripinae, and more efforts are needed to understand the species and genera of these groups. Identification keys and descriptions are available for the Idolothripinae of Taiwan (Wang *et al.* 2018, 2019), and the work presented here is part of an attempt to provide a better understanding of Taiwanese Phlaeothripinae.-

The first formal record of Phlaeothripinae from Taiwan (Moulton 1928a) included 15 new species of Phlaeothripidae, and was based on collections by Takahashi who worked for Taihoku (= Taipei, Taiwan) Agricultural Experimental Station. Subsequently, from Taiwan Priesner (1935) described 11 new Phlaeothripidae species, and Chen (1980) recorded seven genera of Phlaeothripinae in a survey of thrips on mulberry. In a review of publications from 1928 to 1993, Lu (1993) listed 25 genera and 75 species of Phlaeothripinae. Moreover, in an account of the Phlaeothripidae of Japan, Okajima (2006) also recorded some species from Taiwan.

Within the Phlaeothripinae three major lineages are commonly recognized: *Liothrips* lineage, *Haplothrips* lineage (or tribe Haplothripini) and *Phlaeothrips* lineage (Stannard 1957; Mound & Marullo 1996). Species are referred to the *Liothrips* lineage based mainly on three character states: presence of parallel-sided fore wings bearing duplicated cilia; presence on antennal segment III of only one sense cone and on segment IV of three sense cones; and the absence from the prosternum of paired basantra (Mound & Marullo 1996). Thrips of this lineage are leaf-feeders on shrubs and trees, sometimes causing direct feeding damage or inducing leaf deformation and galls. Most of the species are not recorded as harmful to plants, with just a few species considered agricultural pests.

Priesner (1952, 1953, 1968) described 21 genera of the *Liothrips* lineage from the Oriental Region, and 27 species of this lineage were listed from Taiwan by Lu (1993). Dang *et al.* (2014) provided a key to 100 genera of Phlaeothripinae from Southeast Asia, including 34 genera of the *Liothrips* lineage, and Okajima (2006), in an extensive account of the 75 genera of Phlaeothripidae from Japan, included 12 genera of the *Liothrips* lineage. The work presented here is the first attempt to review any substantial part of the Phlaeothripinae fauna of Taiwan.

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Materials and methods

The specimens studied were mainly from three different sources: thrips collected by the authors in Taiwan between 1993 and 2006 and mounted on permanent slides deposited at TARI (Taiwan Agriculture Research Institute); R. Takahashi slides deposited at TARI; L.S. Chen slides deposited at TARI. The identification keys and descriptions provided here are based on these specimens. The following abbreviations are used: Postocular setae (po). Pronotal setae—anteromarginals (am); anteroangulars (aa); midlaterals (ml); epimerals (epim); posteroangulars (pa). Campaniform sensilla (CPS). Metathoracic sternopleural suture (MSS).

Key to genera of *Liothrips* lineage from Taiwan

[* included from description]

1. Fore tarsal tooth present in females and males . . . 2
-. Female without fore tarsal tooth, male with or without this tooth . . . 6
2. Abdominal tergites II–V each with more than 4 pairs of wing-retaining setae . . . *Gigantothrips*
-. Abdominal tergites II–V each with 2 pairs of wing-retaining setae . . . 3
3. Dorsum of head with polygonal reticulations . . . *Crotonothrips*
-. Most of dorsum with transverse striae, polygonal reticles at most exist anteriorly between eyes . . . 4
4. Tube shorter than head; pronotum with transverse sculpture . . . *Liophloeothrips*
-. Tube longer than head; pronotum with transverse sculpture forming several oval spots . . . 5
5. Maxillary stylets retracted to postocular region, close together medially . . . *Agynaikothrips**
-. Maxillary stylets in lower 1/3 of head, separated from each other . . . *Gynaikothrips*
6. Tube very long, longer than twice the length of head . . . *Leeuwenia*
-. Tube never longer than twice length of head . . . 7
7. Pelta with 2 distinct lateral lobes; antennal segment VIII slender . . . *Litotetothrips*
-. Pelta triangular, without lateral lobes; antennal segment VIII shorter than segment VII . . . 8
8. Fore tarsus of male with small tooth . . . *Eugynothrips*
-. Fore tarsus of male with no tooth . . . 9
9. Maxillary stylets retracted into middle of eyes . . . *Psephenothrips*
-. Maxillary stylets not retracted as far as posterior margin of eyes . . . 10
10. Po setae shorter than ocellus; MSS not developed . . . *Phenicothrips*
-. Po setae much longer than diameter of an ocellus, rarely shorter than or equal to an ocellus; MSS present . . . *Liothrips*

Agynaikothrips Okajima

Agynaikothrips Okajima, 2006: 157.

Apart from the type species, *A. okinawaensis* Okajima, this genus includes only *A. venapennis* (Moulton 1928a) that remains known from a single female taken in Taiwan. According to Okajima (2006) the genus is similar to *Gynaikothrips* but with the maxillary stylets retracted to the postocular setae and close together medially, the head long, the fore tarsi of both sexes bearing a tooth, the MSS absent, and the tube longer than the head.

Crotonothrips Ananthakrishnan

Crotonothrips Ananthakrishnan, 1967: 119.

There are 16 species listed in this genus, all from Asia including one from Taiwan (ThripsWiki 2020). The vertex of the head is polygonally reticulate, the pronotal setae rather short, the fore tarsi of both sexes bear a tooth, the MSS are well developed, and the tube long with short anal setae.

Crotonothrips dentifer (Priesner)

Haplothrips (Odontoplothrips) dentifer Priesner, 1935: 365.

Described from the Ryukyu Islands, Japan, this species was transferred to *Crotonothrips* by Okajima (2006).

Specimens examined. Taiwan, Taihoku, 3 males from *Ardisia,* 31.i.1934 & 3.ii.1934; Taihoku (Taipei), 1 female, 1 male from *Bladhia*, 18.iv.1934. (all Takahashi coll.)

Eugynothrips Priesner

Eugynothrips Priesner, 1926: 157.

Within the *Liothrips* group this genus of 16 Asian species is distinguished by the relatively short head and antennae, and the presence of a fore tarsal tooth in males but not in females.

Eugynothrips intorquens (Karny)

Cryptothrips intorquens Karny, 1912: 145.

Described from Java, with the synonym *Gynaikothrips liliaceae* Moulton (1928b) from Taiwan, this species is also known from Japan, Ryukyu Islands.

Specimens examined. Taiwan, Taihoku (Taipei), paratype males and females of *Gynaikothrips liliaceae* Moulton, from *Smilax*, 26.ii–vii.1926 (Takahashi); Guanziling, (Tainan), 2 females from *Firmiana simplex*, v.1993; Shuili (Nantou), 3 females, 1 male from *Smilax china*, viii.1995.

Gigantothrips Zimmermann

Gigantothrips Zimmermann, 1900: 18.

This genus comprises 19 species of large thrips from the Old World tropics. The species are similar to those of *Gynaikothrips* but both sexes have a fore tarsal tooth, abdominal tergites II–V each bear four or more pairs of wing-retaining setae, and the tube is much longer than the head.

Gigantothrips elegans Zimmermann

Gigantothrips elegans Zimmermann, 1900: 18.

This species is found widely from eastern India to southern Japan and northern Australia, living in association with *Ficus* leaves.

Specimens examined. Taiwan, Hakumo (Toseiigun, Taichusha), 8 adults with 4 larvae from *Ficus*, 6.vi.1933 (Takahashi); Hakumo (Formosa), 3 females from *Ficus*, 14.vi.1933 (Takahashi); TARI, 2 females, 1 male from dead leaves, 9.vii.1992; Kendin (Pingtung), 1 female sweeping from grasses, 14.i.1991; Kendin (Pingtung), 1 female from *Aleurites moluccana*, 14.i.1991; Kendin (Pingtung), 1 female from *Bischofia javanica*, 14.i.1993.

Gynaikothrips Zimmermann

Gynaikothrips Zimmermann, 1900: 13

The origin and history of this genus is confusing, but the origin of its name is now accepted as being based on Figure 4 in Zimmerman (1900) for which the figure legend was *Gynaikothrips uzeli*. This was the only species included under that generic name at that time, but on the previous page the species was described under the name *Mesothrips uzeli*, a situation that is now considered to be a lapsus. Many species were subsequently described in *Gynaikothrips*, 11 of them from Taiwan that are all now placed in other genera. Currently there are 41 species listed in *Gynaikothrips* (ThripsWiki 2020), all from the Asian tropics, but only two of these are known from Taiwan. These two species are both found widely around the world galling or folding the leaves of *Ficus* species (Tree *et al*. 2015). The head is longer than wide with the maxillary stylets retracted only into the basal one third, the pronotum often has twisted transverse striae forming several rounded or oval spots, and the fore tarsal tooth is well-developed in males but smaller or even absent in females.

Gynaikothrips ficorum (Marchel)

(Figs 1–3)

Phloeothrips ficorum Marchal 1908: 252.

Gynaikothrips uzeli Zimmermann

(Figs 4–6)

Gynaikothrips uzeli Zimmermann, 1900: 13.
Mesothrips uzeli Zimmermann, 1900: 12. [lapsus]

The biological and morphological similarities between *Gynaikothrips ficorum* and *G. uzeli* make the separation of these two species difficult. Generally, the pronotal epimeral and posteroangular setae are equally long in *G. uzeli*, whereas in *G. ficorum* the posteroangular setae are much shorter than the epimerals. However, there is considerable variation within and between populations (Tree *et al*. 2015). Sometimes useful for distinguishing these two species is the colour of the fore wings (Mound *et al*. 1995), hyaline in *ficorum* but shaded in *uzeli*, and the presence on tergite III of 5–6 pairs of accessary setae in *ficorum* but of 7–8 pairs in *uzeli*.

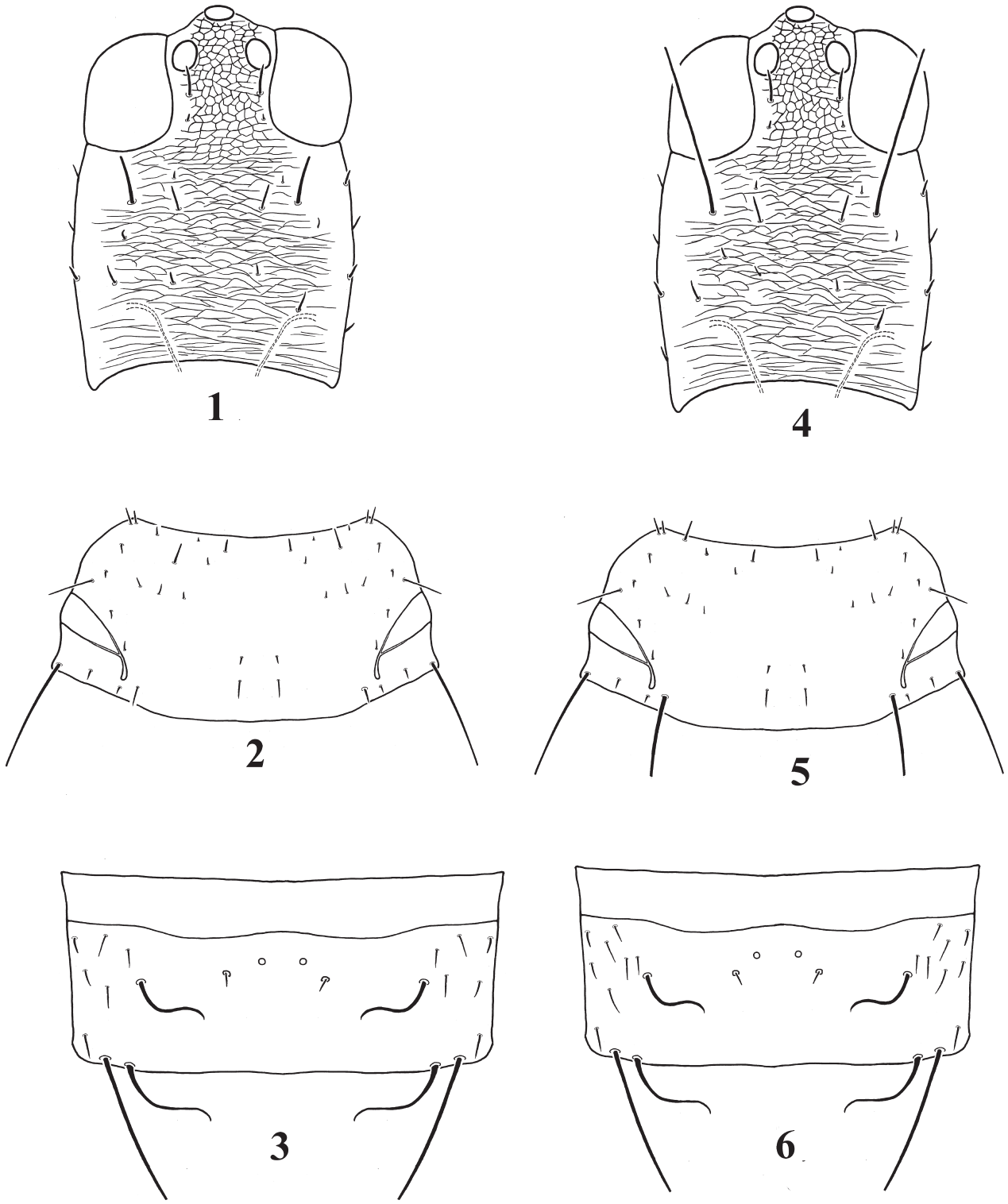
Leeuwenia Karny

Leeuwenia Karny, 1912: 161.

Members of this genus are remarkable in having the tube very long with prominent lateral setae. The head is longer than wide, the maxillary stylets widely separated, and both sexes lack a fore tarsal tooth. There are 27 species listed in the genus (ThripsWiki 2020), all from the Asian tropics or from the wet tropical parts of Australia. Three of theses species are recorded from Taiwan, although as indicated below the record of *pasanii* is doubtful.

Key to *Leeuwenia* species from Taiwan

1. Fore tibiae brown with distal half yellow, mid and hind tibiae brown with distal 1/4 yellow; tergites II–VII laterally with more than 10 accessary setae . . . . . *taiwanensis*
- Fore tibiae yellow, mid and hind tibiae brown with distal half yellow; tergites II–VII laterally with less than 5 accessary setae 2
2. Pronotal am setae well-developed, almost as long as pa setae; tube length 3.5–4 times as long as head . . . . . *pugnatrix*
- Pronotal am setae minute, shorter than pa setae; tube length less than 2.5 times as long as head . . . . . *pasanii*



FIGURES 1–6. *Gynaikothrips, ficorum* (1–3): (1) head; (2) pronotum; (3) right half of tergite III; *uzeli* (4–6): (4) head; (5) pronotum; (6) right half of tergite III.

Leeuwenia pasanii (Mukaigawa)

Cryptothrips pasanii Mukaigewa, 1912: 481.

Described from Japan, where it has been reported from Honshu, Shikoku and Kyushu in leaf-roll galls on *Cas-*

tanopsis [Fagaceae] (Okajima 2006). There is also an unsubstantiated record by Han (1997), but no specimens from Taiwan have been seen and the record is possibly in error.

Specimen examined. Japan, Kyoto, 1 female 1male, 22.x.1929 (Kurosawa coll.)

Leeuwenia pugnatrix Priesner

Leeuwenia pugnatrix Priesner, 1935: 373.

Described from Taiwan on *Lithocarpus*, this species has not yet been recorded from any other country.

Specimens examined. Taiwan, Suisha (Formosa), 1 female from *Lithocarpus*, 11.vi.1933 (Takahashi); Huisun Experimental Forest (Nantou), 1 female from *Aleurites moluccana*, 3.viii.1993.

Leeuwenia taiwanensis Takahashi

Leeuwenia taiwanensis Takahashi, 1936: 451.

This species is apparently known only from Taiwan.

Specimen examined. Taiwan, Raisha (Formosa), 1 female (type specimen) from coffee, 26.vi.1935 (Takahashi).

Liophloeothrips Priesner

Liophloeothrips Priesner, 1919: 138.

There are 18 species listed in this genus (ThripsWiki 2020), and keys are available to 13 of these from India (Tyagi & Kumar 2011), and to the three known from Europe including the type species (Minaei & Mound 2014). The species have a fore tarsal tooth present in both sexes, and the setae on tergite IX are long with the apices blunt or expanded.

Liophloeothrips terminaliae (Moulton) comb. n.

(Figs 7–12)

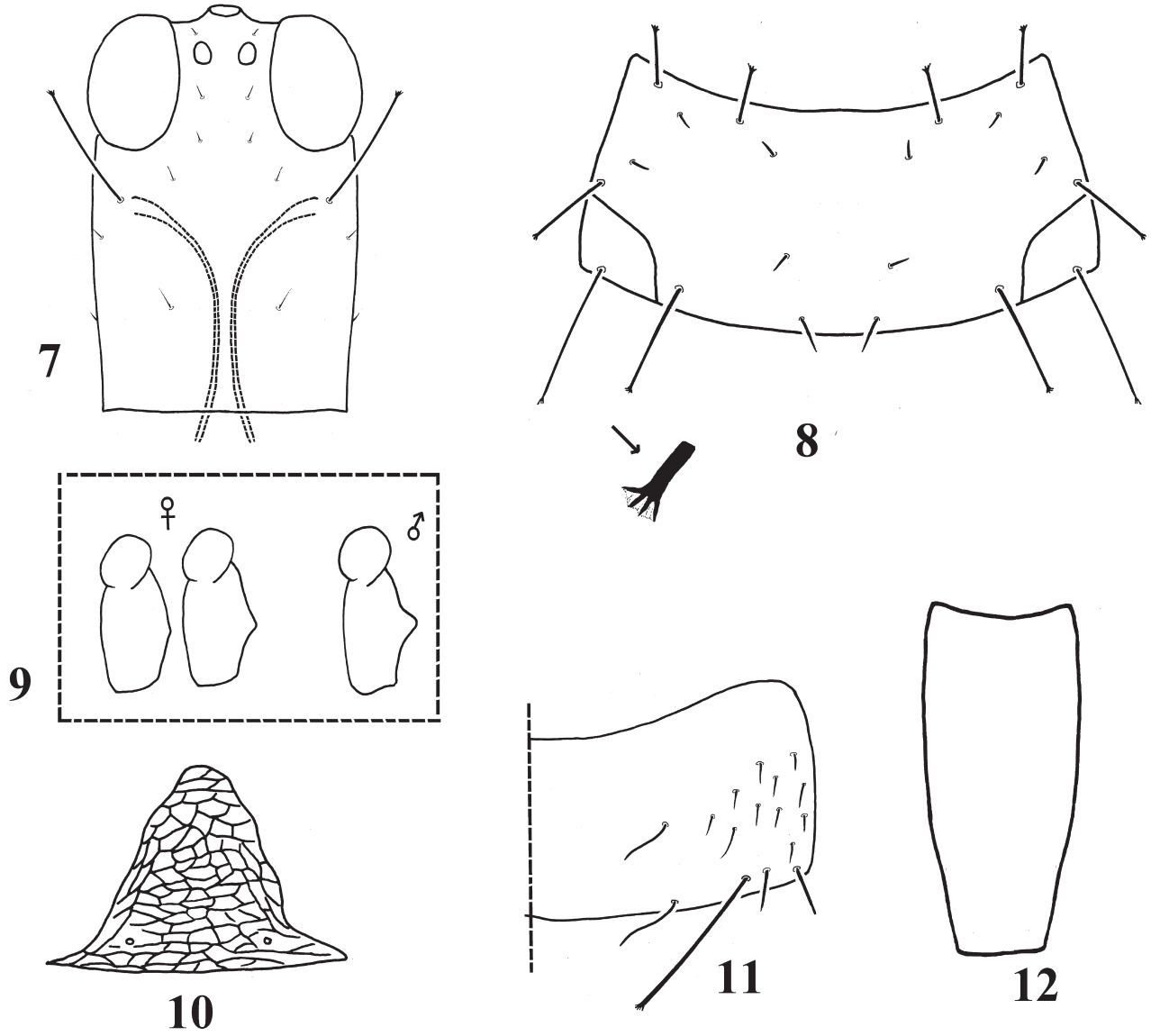
Liothrips terminaliae Moulton, 1928a: 311

Female macroptera. Body brown; antennal segments I and II same colour as head except distal end of II yellowish, III yellow, IV yellow with distal end brownish, V basal half yellow and distal half brown, most of VI and VII–VIII greyish brown; legs brown except distal end of fore tibiae and all tarsi yellowish; fore wings hyaline; tube darkest. Head length 1.5–1.7 times of width (Fig. 7), cheeks straight with 3–5 minute setae; blunt po setae as long as eyes, maxillary stylets reaching po setae, close together medially; antennae 8-segmented, III longest. Pronotum with 5 pairs of prominent expanded setae (Fig. 8), aa setae as long as am setae; pronotum notopleural sutures complete. Mesonotum with 2 pairs of CPS; metanotum with dense straight reticles; MSS very short; fore femora not enlarged, fore tarsus with triangular-shaped tooth, conspicuous in male, smaller in female (Fig. 9 left); fore wing with 11–13 duplicated cilia. Pelta triangular (Fig. 10), with 2 CPS, covered with reticles without inner wrinkles; tergite II laterally with 10–11 pairs of accessary setae (Fig. 11); tergites II–VII with 2 pairs of wing-retaining setae; S1 and S2 on tergite IX blunt to nearly sharp; tube straight-sided, shorter than head (Fig. 12).

Male macroptera. Body similar to female but smaller, fore femora enlarged, pretarsal tooth obvious, in a regular triangular shape (Fig. 9 right).

Specimens examined. **Taiwan**, Guanshan (Taidung), 3 females from *Terminalia*, 9.v.1991; Maobitou (Kenting), 2 females from *Terminalia*, 8.v.1991; Nanjenshan (Kenting), 6 females, 1 male from *Excoecaria kawakami*, 14. iv.1993.

Comments. Described from Taiwan, this species is also known from Japan, Ryukyu Islands (Okajima 2006). The original description by Moulton clearly indicated that the fore tarsus has a minute and blunt tooth (Moulton 1928a), and recent observations has confirmed that this tooth is present in both sexes. Moreover, tergite IX setae S1 and S2 are blunt or expanded. For these reasons this species is here transferred from *Liothrips.*



FIGURES 7–12. *Leophloeothrips terminaliae*: (7) head; (8) pronotum; (9) enlarged pretarsal tooth of femlae (left) and male (right); (10) pelta; (11) right half of tergite II; (12) tube.

Liothrips Uzel

Liothrips Uzel, 1895: 261.

Almost 300 species are listed in this genus worldwide (ThripsWiki 2020). From China Mirab-balou *et al.* (2011) listed 28 *Liothrips* species, including 16 from Taiwan, but for three of these (*invisus*, *luzonensis*, and *claripennis*) the quoted record is not correct, and no valid record from Taiwan has been found (Wang 2002). Han (1997) provided a key to 11 species from China and indicated that seven of these were found in Taiwan. Okajima (2006) provided a full diagnosis of *Liothrips* genus, together with an identification key to 24 *Liothrips* species from Japan, of which seven species were recorded from Taiwan. Members of this genus lack a fore tarsal tooth in both sexes, and the tube is shorter than the head.

Key to *Liothrips* species from Taiwan

1.	Metanotum with reticulate sculpture (Figs 22, 31)	2
-.	Metanotum with longitudinal sculpture lines (Fig. 18)	3
2.	All tarsi yellow	*dayulingensis* **sp.n.**
-.	Fore tarsi yellow, mid and hind tarsi brown	*floridensis*
3.	Maxillary stylets low in head, posterior to po setae	4
-.	Maxillary stylets retracted to level of po setae	8
4.	Po setae short, much less than length of eye; pelta without CPS	*vitivorus*
-.	Po setae about same length as eye, pelta with paired CPS	5
5.	All tibiae light yellow	*pallipes*
-.	Colour of tibiae different, either all brown or brown and yellow	6
6.	Tergite II laterally with 8–10 accessary setae	*takahashii*
-.	Tergite II laterally with less than 5 accessary setae	7
7.	Head about 1.8 times as long as wide; fore wings hyaline	*threobrevis* ***nom.nov.***
-.	Head about 1.2 times as long as wide; fore wings grey	*brevitubus*
8.	Pronotal am setae small, much shorter than aa setae	*kuwayamai*
-.	Pronotal am setae as long as or longer than aa setae	9
9.	Pelta without pair of CPS but with 3–4 small setae posterolaterally	*heptapleuricola*
-.	Pelta with 1 pair of CPS, without setae	10
10.	Pronotal aa setae short, am setae longer than aa setae	*heptapleurinus*
-.	Pronotal aa setae long, longer or equal to am setae	11
11.	Fore wings hyaline; meso and metanotal reticles dense with inner wrinkles	*hsuae* **sp.n.**
-.	Fore wings greyish; meso and metanotal reticles without inner wrinkles	*piperinus*

Liothrips brevitubus Karny
(Figs 13–19)

Liothrips brevitubus Karny, 1912: 156.

Described originally from Java, this species was subsequently described from Taiwan by Moulton (1928a) under the name *Liothrips malloti* and also *L. malloti* var. *flavicornis*. It appears to live on *Mallotus* species, but there is no record of the precise host plant.

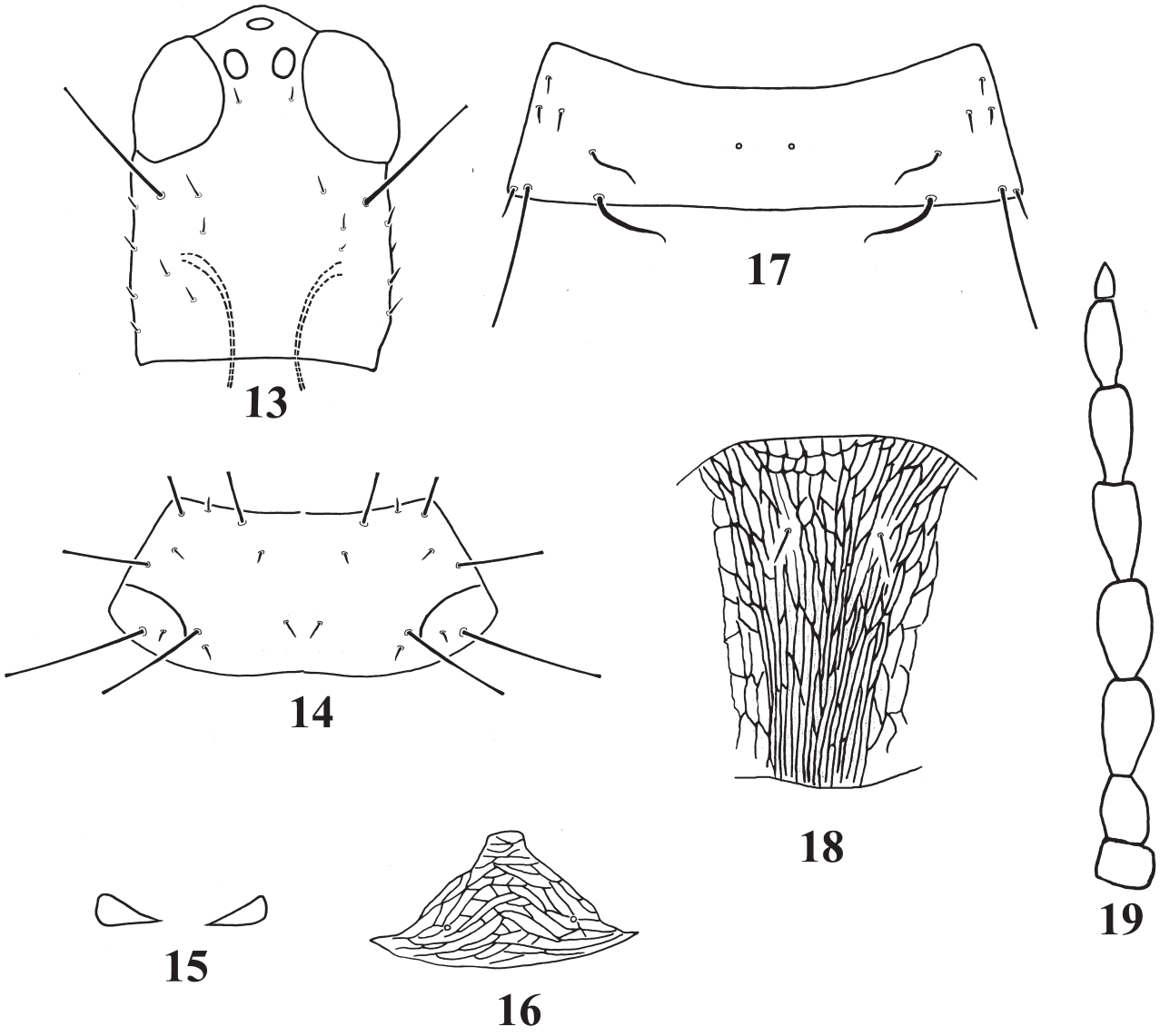
Female macroptera. Body length 2.1–2.2 mm on slide. Head and thorax brown, abdomen dark brown; antennal segment I and most of II brown, same colour as head, III–VI and most of VII yellow, distal end of VII and segment VIII greyish brown; fore femora brown, fore tibiae yellow, mid and hind femora and tibiae brown, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae brown.

Head length about 1.4 times of width (Fig. 13), po setae blunt, longer than eyes; maxillary stylets retracted only to posterior third of head, moderately separated, about 1/3 of head width; antennal segment III 1.4 times, IV 1.5 times as long as II (Fig. 19). Pronotum with 5 pairs of strong setae, am setae equal to aa setae in length (Fig. 14); mesopresternum separated into 2 parts (Fig. 15); metanotum covered with dense longitudinal striae (Fig. 18). Pelta triangular with flat apex (Fig. 16); tergite II laterally with 2–5 accessary setae (Fig. 17); tube a little shorter than head.

Specimens examined: Taiwan, Mt. Daiton (Taipei), 20 adults with larvae and pupae from *Mallotus* sp., 29.iv.1935 (Takahashi) [on 3 slides]; Rokki (Kaohsiung), 2 females, 1 male from *Mallotus* sp., 19.v.1935 (Takahashi).

Liothrips dayulingensis sp. n.
(Figs 20–27)

Female macroptera. Body length 2.6 mm. Color brown; antennal segments I and II dark brown, same colour as head, III yellow, IV yellow with distal end greyish brown, V basal half yellow and distal half brown, VI mostly brown with basal 1/3 yellow, VII & VIII dark brown, same colour as head; all femora brown, fore tibiae yellow and brownish in median portion, mid and hind tibiae brown, except distal ends yellow, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae brown.



FIGURES 13–19. *Liothrips brevitubus*: (13) head; (14) pronotum; (15) mesopresternum; (16) pelta; (17) tergite II; (18) metanotum; (19) shape of antenna.

Head 1.5 times as long as wide (Fig. 20), po setae blunt, behind eyes, almost as long as eye length; maxillary stylets retracted to between po setae and posterior margin of eyes, close together medially; antennal segment III 1.6 times as long as II, segment IV 1.4 times as long as II (Fig. 27). Pronotum with 5 pairs of major setae, all blunt, am setae longer than aa setae (Fig. 21); ml, epim and pa setae about same length; mesopresternum separated in middle (Fig. 23); metanotum covered with hexagonal reticles medially (Fig. 22); fore wing with 11–16 duplicated cilia. Pelta triangular (Fig. 24) with pair of CPS; tergite II laterally with 2 accessary setae (Fig. 25); tergites II–VII with 2 pairs of wing-retaining setae; tube straight-sided, shorter than head (Fig. 26).

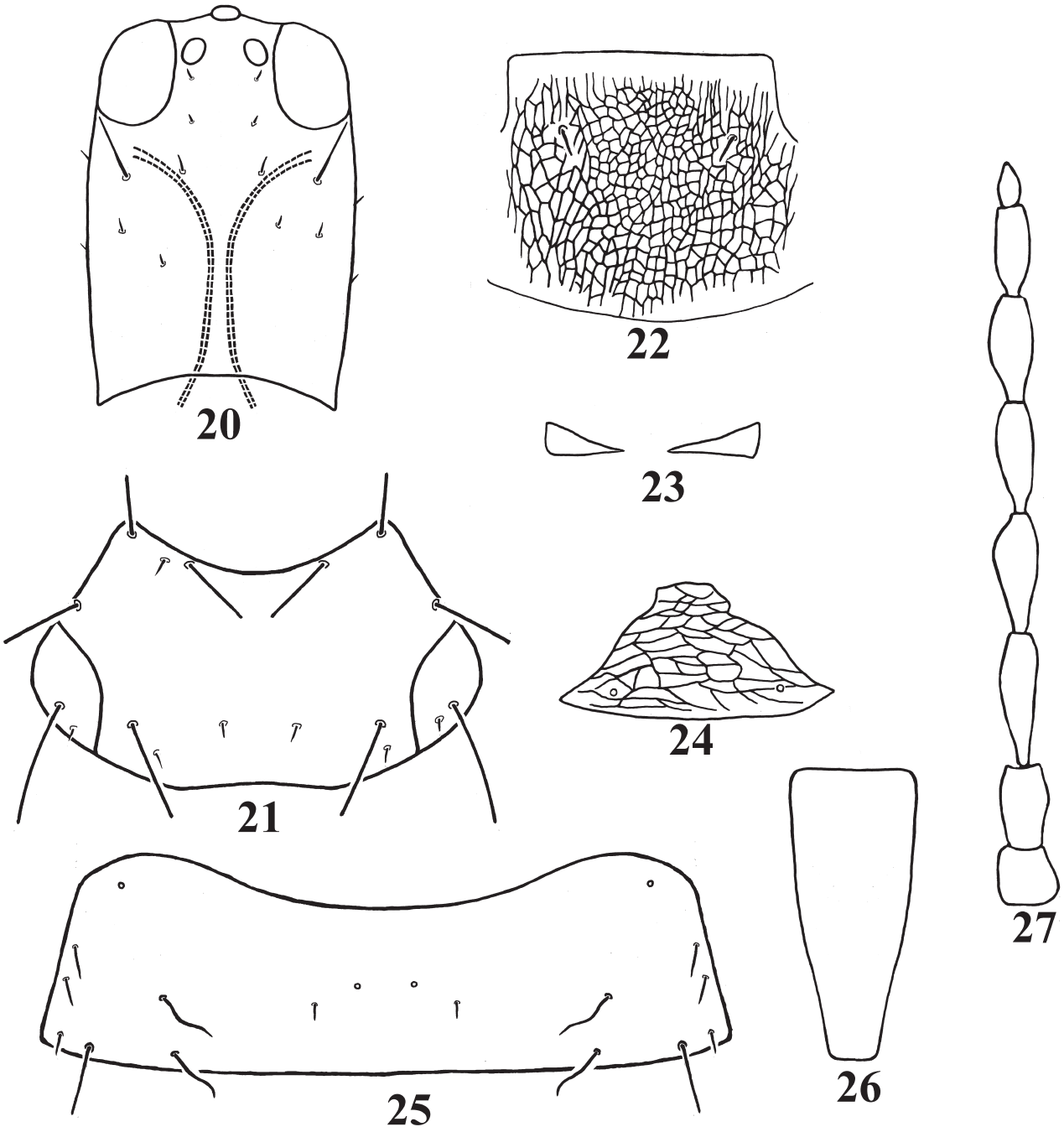
Male macroptera. Body length 2.1 mm on slide, colour and shape similar to female.

Measurements. (holotype in microns). Body length 2600. Head, median length 330; largest width 250; po setae 70; antennal segments (L/W) I 50/50, II 70/40, III 110/30, IV 100/40, V 90/40, VI 90/35, VII 70/25, VIII 40/20, total length 620. Pronotum median length 200; greatest width 450; am setae 55, aa setae 38; fore wing length 1250. Pelta, length 130; width 250. Tube length 250.

Specimens examined. Taiwan, female holotype, Dayuling (Nantou), grasses, 21.iv.1993. Paratypes, 1 female, 1 male, same data as holotype.

Etymology. This species is named after Dayulin, a ridgeline area of 2500–2600 m high in central Taiwan where the specimens were collected.

Comments. The form of the metanotal striae is different in this species from most *Liothrips* species. It is similar to *L. floridensis* but they can be distinguished by their colours and shape of the mesopresternum. The new species has antennal segments V and VI half yellow and half brown, and brownish fore wings, whereas *L. floridensis* has antennal segments V and VI yellow, and completely transparent fore wings. Moreover, the mesopresternum of *dayulingensis* is in two parts but in *floridensis* it is complete (Fig. 32).



FIGURES 20–27. *Liothrips dayulingensis* **sp.n.**: (20) head; (21) pronotum; (22) metanotum; (23) mesopresternum; (24) pelta; (25) tergite II; (26) tube; (27) shape of antenna.

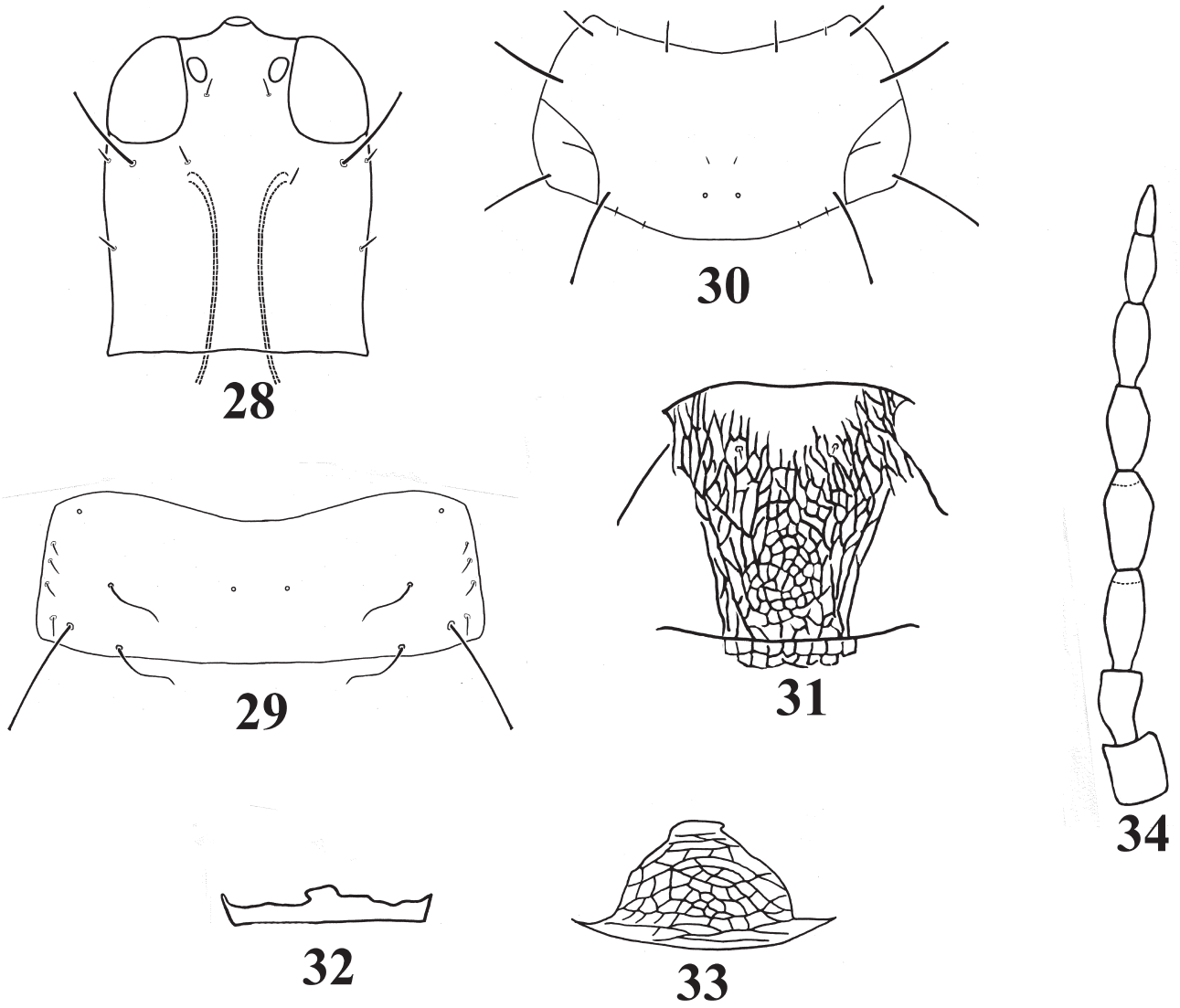
***Liothrips floridensis* (Watson)**
(Figs 28–34)

Cryptothrips floridensis Watson, 1913: 145.

Described from Florida and widespread in Japan, this species is also recorded from Sri Lanka as well as Taiwan (Okajima 2006). It lives on the leaves of *Cinnamomum camphor*, the widely planted camphor laurel tree.

Female macroptera. Body length 2.8 mm. Color brown; antennal segments I and II dark brown, same colour as head, III–VI yellow, VII greyish brown, VIII dark brown; all femora and tibiae brown except distal end of fore tibia yellowish; fore tarsi yellow, mid and hind tarsi brown; fore wings hyaline, greyish only at base; pronotal setae hyaline, wing-retaining setae brown.

Head 1.3 times as long as wide (Fig. 28), po setae situated near eyes, blunt and about same length as eyes; maxillary stylets retracted to level of po setae, about 1/5 of head width apart; antennal segment III 1.3 times, segment IV 1.2 times as long as II (Fig. 34). Pronotum with 5 pairs of setae with expanded apices (Fig. 30), aa and am subequal in length, shorter than other pairs; one pair of mini-setae between aa and am setae; mesopresternum protruding irregularly in middle (Fig. 32); metanotum sculptured with regular reticles medially (Fig. 31). Pelta triangular with irregular apex and sharp lateral angles (Fig. 33); tergite II laterally with 4 accessary setae (Fig. 29); tube shorter than head.



FIGURES 28–34. *Liothrips floridensis*: (28) head; (29) tergite II; (30) pronotum; (31) metanotum; (32) mesopresternum; (33) pelta; (34) shape of antenna.

Specimens examined. Taiwan, Taihoken (Taipei), 1 female from camphor, 13.iv.1933 (Takahashi); Sandimen (Pingtung), 16 females from camphor, 21.ix.1992; Wuzhishan (Taipei), 1 female from camphor, 15.xii.1993; TARI, 1 female from *Ficus*, 17.ix.1994; Gukeng (Chiayi), 1 female, 1 male in woods, 4.v.1999.

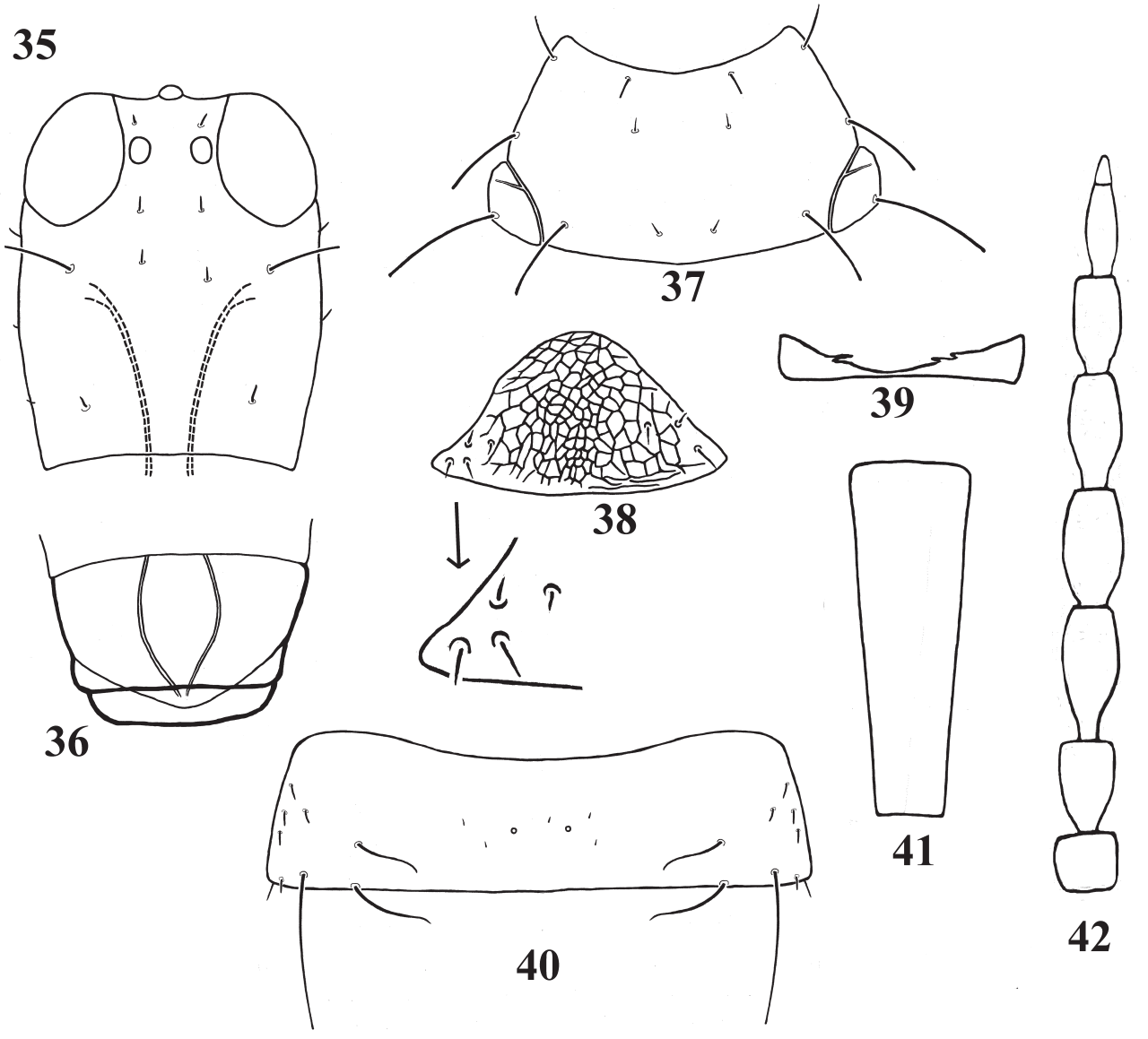
Comments. Watson identified as *L. floridensis* some specimens sent to him from Taiwan by Takahashi, although those specimens had somewhat larger and darker setae than the Florida specimens (Watson 1925). Most

Liothrips species have yellow tarsi, whereas the brown colour of the mid and hind tarsi of *floridensis* make this species readily distinguished from others.

***Liothrips heptapleuricola* (Takahashi)**
(Fig. 35–42)

Smerinthothrips heptapleuricola Takahashi, 1937: 341–343.

Female macroptera. Body length 2.1–2.3 mm. Color brown; antennal segments I and II brown, same colour as head, except distal portion of II yellowish, III–VI and basal 1/3 of VII yellow, most of VII and VIII greyish brown; all femora brown, fore tibiae yellow, mid and hind tibiae brown, except apices yellow, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae brown.



FIGURES 35–42. *Liothrips heptalpleuricola:* (35) head; (36) mouth cone; (37) pronotum; (38) pelta; (39) mesopresternum; (40) tergite II; (41) tube; (42) shape of antenna.

Head 1.3 times as long as wide (Fig. 35), with regular reticulation on dorsum anterior to and between eyes, followed by transverse reticles; cheeks with 3–4 pairs of short setae, po setae blunt, shorter than length of eyes; maxillary stylets retracted to level of po setae, about 1/5 of head width apart; mouth cone wide and rounded (Fig.

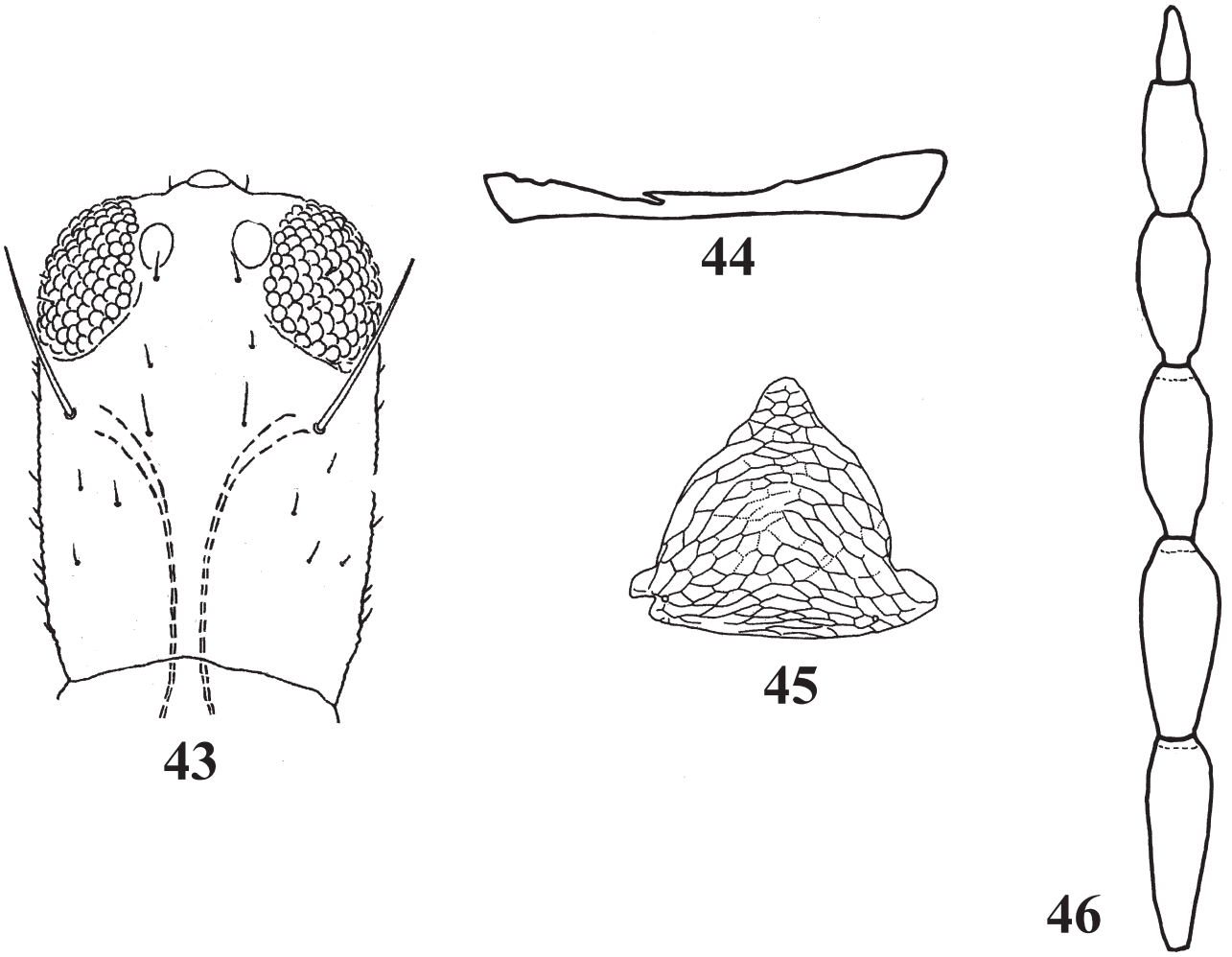
36); antennal segment III 1.5 times, segment IV 1.3 times as long as II (Fig. 42). Pronotum with 5 pairs of major setae (Fig. 37), all blunt, aa setae longer than am setae, shorter than other pairs; mesopresternum boat shape, some with irregular margins (Fig. 39); metanotal sculpture dense and longitudinal; fore wing with 11–15 duplicated cilia. Pelta triangular, 2–4 short setae on each side (Fig. 38), CPS absent; tergite II laterally with 3–4 accessary setae (Fig. 40), tube straight-sided, about same length as head (Fig. 41).

Male macroptera. Body length 1.8–2.0 mm; colour and shape similar to female.

Specimens examined. Taiwan, Taihoku (Taipei), Syntype 16 females, 7 males, from leave galls of *Heptapleurinum arboricolum,* 31.x.1936 (Takahashi); 15 females, 5 males, Lianhuachi (Nantou), from *Schefflera arboricola*, 27.ix.1992.

Comments. As indicated above, Takahashi described this species from specimens taken on leaves of *Heptapleurinum arboricolum* (=*Schefflera arboricola*) at Sozan near Taihoku. Specimens deposited in TARI have the same data as with the original type description, and these specimens are here assumed to be syntypes. Takahashi pointed out that this species differs from *heptapleurinus* in two insignificant characters: colour of the leaf galls and shapes of the mouth cone (Takahashi 1937). Our further studies showed that these two species can be distinguished as follows: *heptapleuricola* po setae about 0.5 as long as dorsal length of eyes; pronotal am setae shorter than aa setae; pelta without CPS but with setae present laterally. In contrast, *heptapleurinus* po setae are longer than eyes; pronotal am setae are longer than aa setae; pelta is with CPS but without setae laterally.

***Liothrips heptapleurinus* (Priesner)**
(Figs 43–46)



FIGURES 43–46. *Liothrips heptapleurinus*: (43) head; (44) shape of antennal segments III–VIII; (45) mesopresternum; (46) pelta (modified from Okajima, 2006)

Smerinthothrips heptapleurinus Priesner, 1935: 360–361.

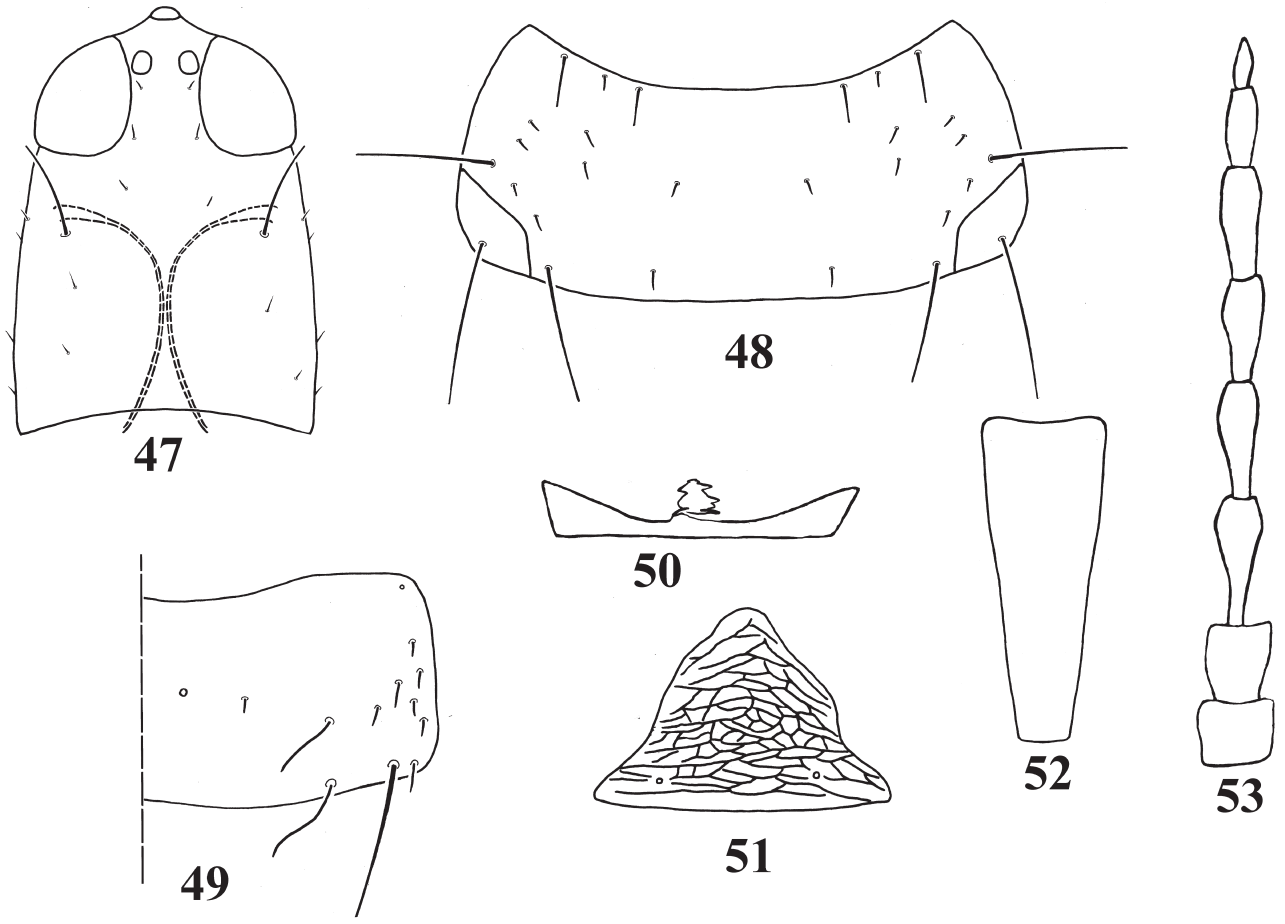
This species was collected by Takahashi at Taihoku, Taiwan, 23.xii.1926, from *Heptapleurum* (=*Schefflera*). Two syntypes were studied by Okajima (2006) who recorded this thrips from Japan, Ryukyu Islands, together with a full re-description. The following notes are based on that description.

Female macroptera. Body length 2.6 mm, dark brown, all femora dark brown, fore tibiae yellow to brownish yellow, mid- and hind tibiae dark brown, all tarsi yellowish brown; antennal segment I dark brown, II dark brown with antero-exterior half yellowish, remaining segments largely yellowish, very slightly shaded with brown at anterior half of segment VII and whole of VIII (Fig. 46); fore wings hyaline, with a faint greyish longitudinal stripe, reaching distal third; major body setae brownish, but tergum IX setae S1 and S2 somewhat paler.

Head about 1.5 times as long as wide (Fig. 43); po setae longer than eyes, narrowly blunt at apex; maxillary stylets retracted to level of po setae, rather close together. Pronotal am setae shorter than aa setae; mesopresternum connected medially (Fig. 44); metanotum sculptured with fine longitudinal striae or reticles; fore wing with 14–16 duplicated cilia. Pelta bell-shaped, with a pair of CPS (Fig. 45); tube conical, sides straight.

***Liothrips hsuae* sp.n.**
(Figs 47–53)

Female macroptera. Body length 3.2–3.7 mm. Color brown, antennal segments I and basal half of II brown, same colour as head, distal half of II yellowish, III–VI yellow, VII & VIII dark brown; all femora brown, fore tibiae yellow with basal half brownish, mid- and hind tibiae brown except distal end yellow, all tarsi yellow; fore wings hyaline.



FIGURES 47–53. *Liothrips hsuae* **sp.n.:** (47) head; (48) pronotum; (49) tergite II; (50) mesopresternum; (51) pelta; (52) tube; (53) shape of antenna.

Head 1.4 times as long as wide (Fig. 47), po setae blunt, as long as eyes, maxillary stylets close together medially, retracted anterior to po setae; antennal segment III 1.5 times, segment IV 1.4 times the length of segment II (Fig. 53). Pronotum with 5 pairs of major setae, all blunt, am setae about same length as or shorter than aa setae (Fig. 48); mesopresternum boat-shaped with median protrusion (Fig. 50); metanotum with dense longitudinal striae, reticles with inner wrinkles; fore wing with 20–24 duplicated cilia; fore tarsal tooth absent. Pelta triangular (Fig. 51), with regular reticles, 1 pair of CPS; tergite II laterally with 6 accessary setae (Fig. 49); tergites II–VII with 2 pairs of wing-retaining setae, tube straight, shorter than head (Fig. 52).

Measurements. (holotype in microns). Body length 3250. Head, median length 330; greatest width 240; po setae 90. Antennal segments (L/W) I 40/40, II 60/30, III 110/30, IV 100/40, V 90/40, VI 90/40, VII 60/20, VIII 40/15, total length 5900. Pronotum, median length 170; greatest width 450, am setae 50, aa setae 50; fore wing length 1200. Pelta, length 150; width 180; tube length 250.

Male. Unknown.

Specimens examined. Holotype female, **Taiwan**, Nanjan Mt. (Kendin), from *Ficus*, 14.iv.1993. Paratype female with same data as holotype.

Etymology. This species is named after Miss Mon-Yu Hsu of TARI who collected the specimens.

Comments. This species shares several characteristics with *L. piperinus* but they can be distinguished by color of fore wings and striae on meso and metanotum as mentioned in the key above. Besides, shapes of mesopresternum are different; it is narrowly connected or even separated in *piperinus* (Fig. 68), but well connected and protruded irregularly in the middle in this new species (Fig. 50).

***Liothrips kuwayamai* (Moulton)**

(Figs 54–59)

Gynaikothrips kuwayamai Moulton, 1928a: 302.

Described originally from a single female taken on an unknown plant at Koshun, Taiwan, 25.xi.1926, the following description is based on the female indicated below.

Female macroptera. Body length about 4 mm. Color brown, antennal segments I and II dark brown, same colour as head, III yellow, IV–V mostly yellow with distal ends darker, VI yellow with distal end greyish brown, VII and VIII dark brown; all femora brown, fore tibiae brownish yellow, mid and hind tibiae brown, all tarsi yellow; fore wings hyaline; major body setae brown.

Head 1.7 times as long as wide (Fig. 54), po setae near middle of dorsum, blunt and as long as eyes; maxillary stylets retracted to middle of head, nearly to po setae, close together medially; antennal segments III and IV each twice as long as segment II (Fig. 59); pronotum with 2 pairs of aa setae that are as short as discal setae, and less than half length of aa setae (Fig. 55); mesopresternum boat-shaped, with irregular median protrusion (Fig. 56); metanotal sculpture dense and longitudinal; pelta triangular (Fig. 57); tergite II laterally with 2 accessary setae (Fig. 58); tube shorter than head.

Specimen examined. **Taiwan**, Karapin (Chiayi), 1 female from *Viburnum* a*rboricolum*, 17.iv.1928 (Takahashi).

***Liothrips pallipes* Karny**

(Figs 60–65)

Liothrips pallipes Karny, 1913: 110.
Gynaikothrips kuwanai Moulton, 1928b: 308; Mound, 2020: 389.
Liothrips reynvaanae Priesner, 1968: 203; Mound, 2020: 389.

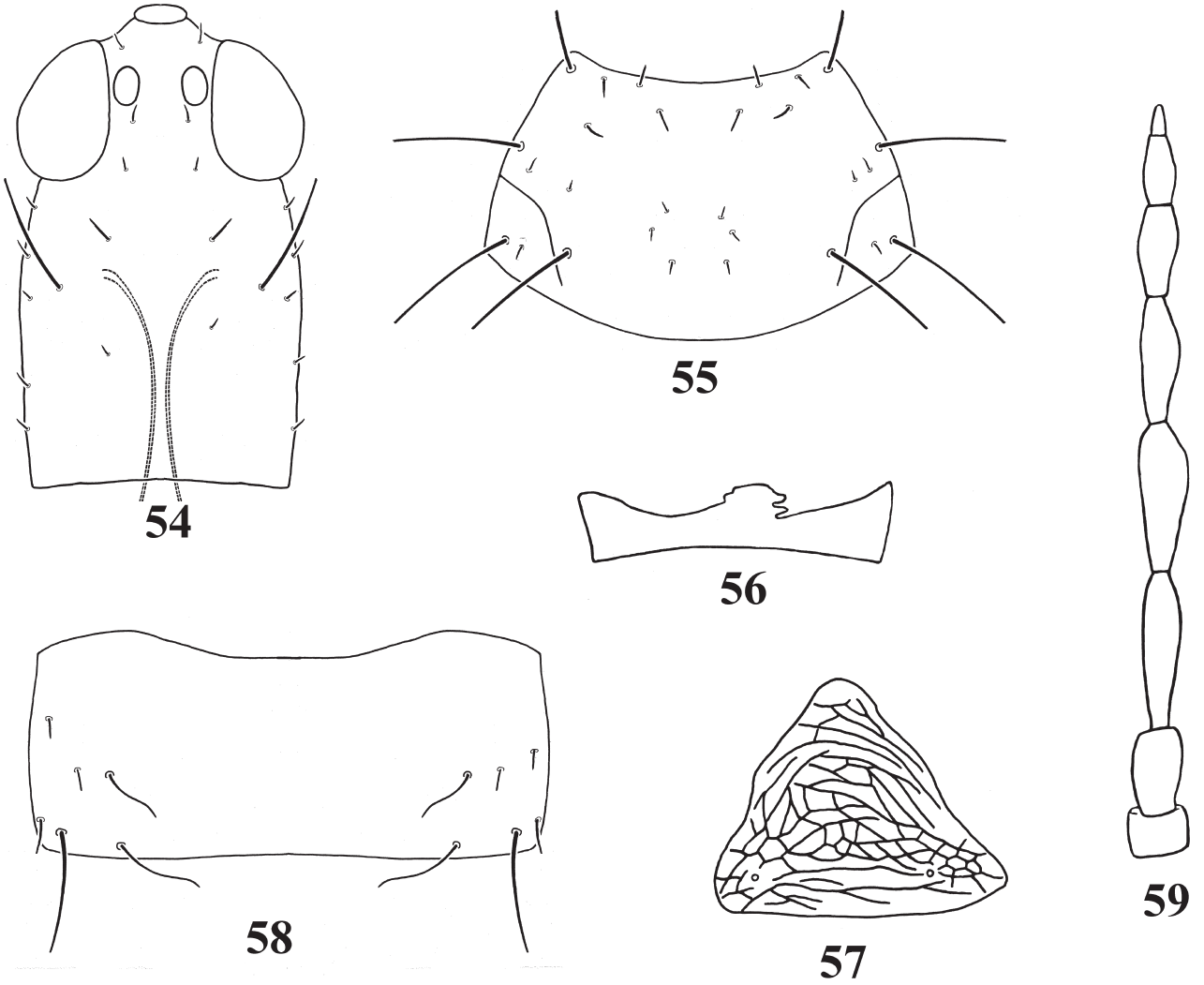
Female macroptera. Body length 2.8–3.1 mm. Color brown, antennal segments I and II dark brown, same colour as head, III–VI yellow, VII and VIII greyish brown; all femora brown, tibiae and tarsi yellow; fore wings pale brown with a darker stripe; major body setae hyaline.

Head 1.4 times as long as wide (Fig. 60); po setae situated near middle of dorsum, almost pointed and longer

than eyes; maxillary stylets retracted into posterior third of head, widely separated; antennal segments III and IV same length, 1.6 times length of segment II (Fig. 65). Pronotum with 5 pairs of strong setae (Fig. 61), blunt or weakly expanded, aa setae shorter than or equal to am setae; mesopresternum boat-shaped, with irregular median protrusion (Fig. 62); metanotal sculpture dense and longitudinal. Pelta triangular (Fig. 63); tergite II laterally with 4–5 accessary setae (Fig. 64); tube shorter than head.

Specimens examined. Taiwan, Taihoku (Taipei), paratype female from *Smilax*, 31.x.1926 (Moulton 2214); Shulin (Taipei), 4 females, 2 males from *Smilax* sp., 17.xi.1930 (coll. Takahashi); Kendin (Pingtung), 3 females from *Albizia julibrissin*, 13.i.1993.

Comments. The yellow colour of all the tibiae contrasting with the brown colour of all the femora make this species easy to recognise.



FIGURES 54–59. *Liothrips kuwayamai*: (54) head; (55) pronotum; (56) mesopresternum; (57) pelta; (58) tergite II; (59) shape of antenna.

Liothrips piperinus **Priesner**
(Figs 66–71)

Liothrips piperinus Priesner, 1935: 361–362.

Described from an unspecified number of females taken in Taiwan in association with *Liothrips kuwanai*, this species is also recorded widely in southern Japan as well as Hainan Island, China (Okajima 2006; Mound 2020).

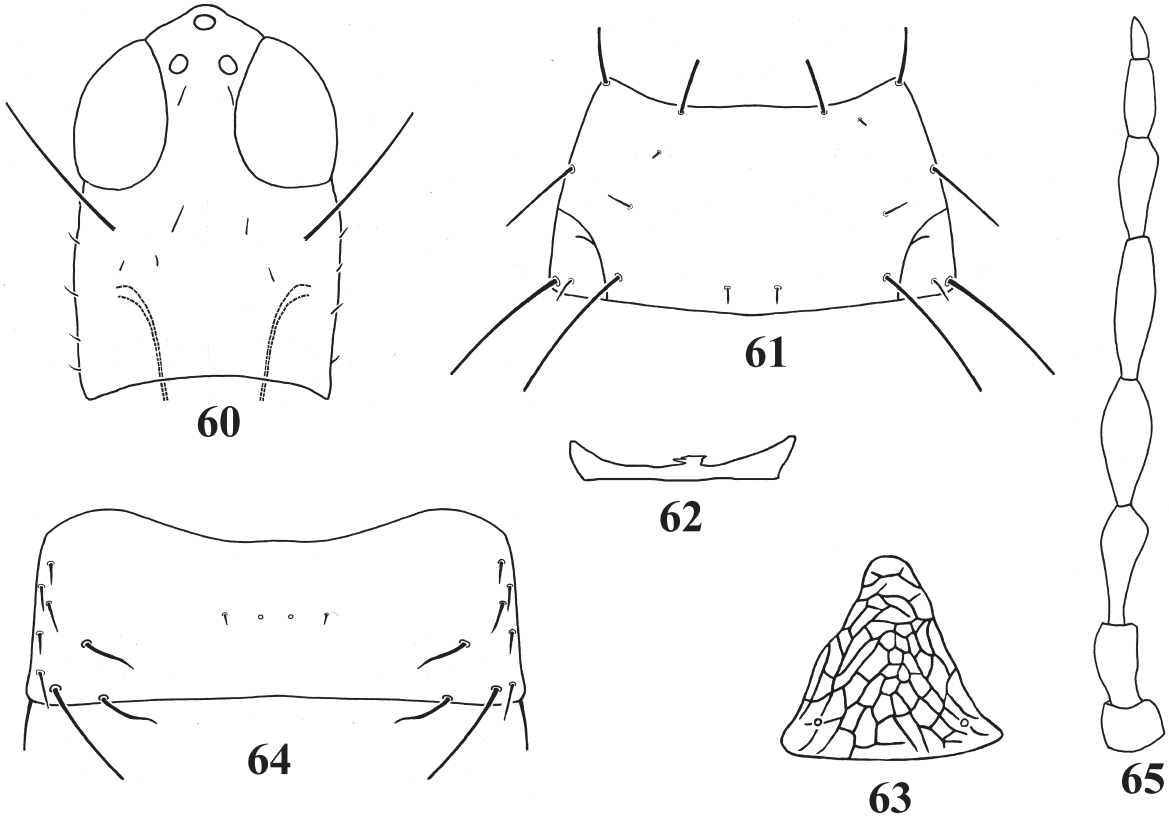
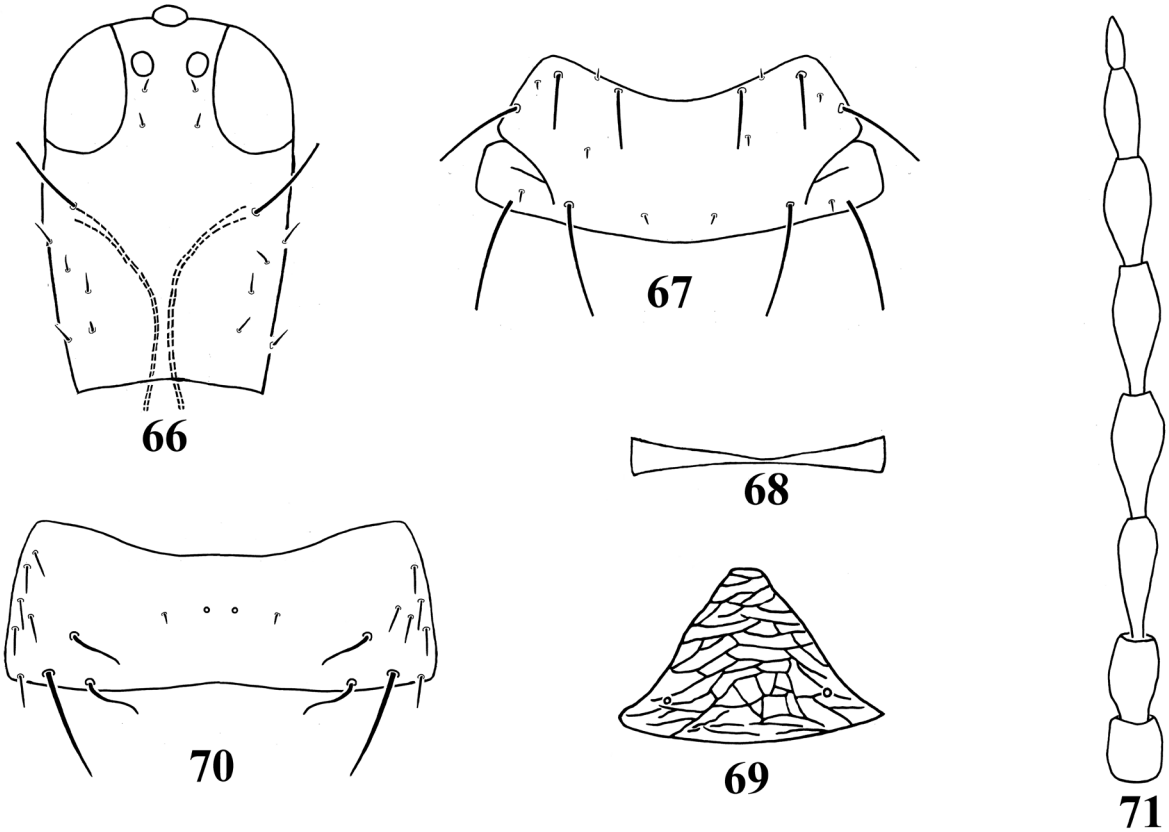


FIGURE 60–65. *Liothrips pallipes*: (60) head; (61) pronotum; (62) mesopresternum; (63) pelta; (64) tergite II; (65) shape of antenna.



FIGURES 66–71. *Liothrips piperinus*: (66) head; (67) pronotum; (68) mesopresternum; (69) pelta; (70) tergite II; (71) shape of antenna.

Female macroptera. Body length 2.5 mm. Color brown, antennal segments I and II dark brown, same colour as head, III–IV yellow, V & VI yellow with distal half greyish brown, VII &VIII greyish brown; all femora brown, fore tibiae yellow, mid and hind tibiae brown with distal end yellow, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae hyaline.

Head 1.2–1.5 times as long as wide (Fig. 66), cheeks straight; po setae blunt, about same length as eye; maxillary stylets close together medially, reaching po setae; antennal segments III and IV each 1.5 times as long as segment II (Fig. 71), pronotal am setae and aa setae almost equal in length (Fig. 67), shorter than other major pronotal setae; mesopresternum boat-shaped (Fig. 68); metanotal sculpture dense and longitudinal; pelta triangular with 2 CPS (Fig. 69); tergite II laterally with 4–6 accessary setae (Fig. 70); tube shorter than head.

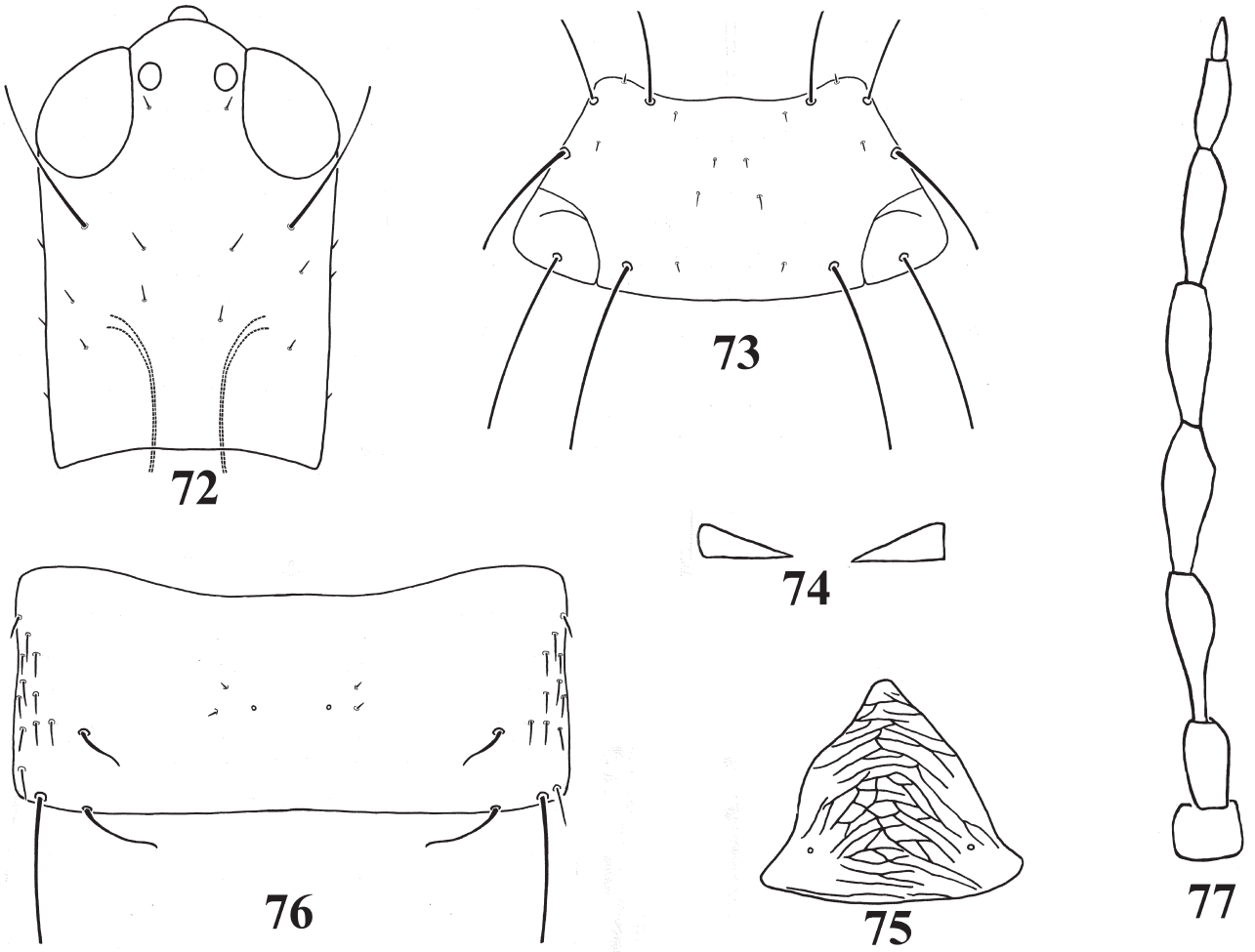
Comments. Compared with the specimens collected by authors, the available female collected by Takahashi is smaller in size, the metanotal striae are looser, and the mesopresternum is higher laterally.

Specimens examined. **Taiwan**, Rarasan (Taoyuan), 1 female in *Piper* gall of *L. kuwanai*, 31.vi.1933 (Takahashi); Shihding (Taipei), 1 female, 2 males from wild climbing vine, 23.ix.1993; Ruifeng (Chiayi), 1 female from Solanaceae, 16.xii.1993; Sun Mong Lake (Nantou), 1 male from grasses, vii.1993.

Liothrips takahashii (Moulton)

(Figs 72–77)

Gynaikothrips takahashii Moulton, 1928b: 313



FIGURES 72–77. *Liothrips takahashi*: (72) head; (73) pronotum; (74) mesopresternum; (75) pelta; (76) tergite II; (77) shape of antenna.

Female macroptera. Body length 3.5–3.8 mm. Color brown, antennal segments I and II dark brown, same colour as head, III yellow with distal end brownish, IV–VI brown with basal 1/4–1/3 yellow, VII and VIII dark brown; fore femora brown, fore tibiae brownish yellow, mid and hind femora and tibiae brown, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae brown.

Head 1.6 times as long as wide (Fig. 72), po setae longer than eyes; maxillary stylets retracted only to posterior third of head, moderately separated; antennal segment III 1.8 times as long as segment II, segment IV 1.9 times as long as II (Fig.77). Pronotum with 5 pairs of long setae (Fig. 73), aa setae and am setae about same length, ml setae longer, epim and pa setae longest, about equal to pronotum length; mesopresternum divided into 2 parts (Fig. 74); metanotal sculpture dense and longitudinal; pelta triangular (Fig. 75); tergite II laterally with 8–11 accessary setae (Fig. 76); tube shorter than head.

Specimens examined. **Taiwan**, Taihoku (Taipei), 2 females, 2 males paratypes from *Ficus retusa*, 12.iii.1922 (Takahashi); Wuzhi Mt. (Taipei), 4 females from *Ficus*, 15.xii.1993. Nanshi (Taichung), 3 females, 2 males from *Liquidambar*, iii.1995.

Comments. Compared to other species, females of *takahashi* have a greater number of accessary setae laterally on tergite II, although the number may be less in males.

Liothrips threobrevis nom. nov

(Figs 78–83)

Gynaikothrips citricornis Moulton, 1928a: 300; homonym of *Phyllothrips citricornis* Hood, 1908: 305.

This species was described from Taiwan by Moulton as *citricornis* in the genus *Gynaikothrips* but was subsequently transferred to the genus *Liothrips*. However, it thus became a homonym of *citricornis* Hood from North America that had previously been described in *Phlyllothrips*, a genus now recognized as a synonym of *Liothrips*. As a result, a new name is proposed here for the species described by Moulton from Taiwan.

Female macroptera. Body length 3.1 mm. Brown; antennal segment I and most of II brown, same colour as head, III–VI and basal half of VII yellow, distal half of VII and all of VIII greyish brown; all three pairs of legs brown with yellow tarsi; fore wings hyaline; major body setae hyaline.

Head about twice as long as wide (Fig. 78), po setae on middle of dorsum, about 0.8 times length of eyes; maxillary stylets present only in posterior fourth of head, about 1/3 of head apart; antennal segment III 2.2 times, IV 1.8 times as long as II (Fig. 83). Pronotal am setae (1 or 2 pairs) much shorter than aa setae (Fig. 79); mesopresternum boat-shaped (Fig. 80), connected in middle; metanotum covered with dense longitudinal striae. Pelta triangular with sharp lateral angles (Fig. 81); tergite II laterally with 4 accessary setae (Fig. 82); tube shorter than head.

Specimens examined. Taiwan, Taihoku (Taipei), female paratype from *Liquidambar yormosana*, 20.vi.1926 (Moulton No. 2211); Taihoku, 1 female from *Liquidambar formosana*, 20.vi.1921 (Takahashi).

Etymology. This species differs from *L. citricornis* (Hood) mainly by having shorter maxillary stylets and shorter pronotal aa and am setae. The name *threobrevis* indicates these characteristics.

Liothrips vaneeckei Priesner

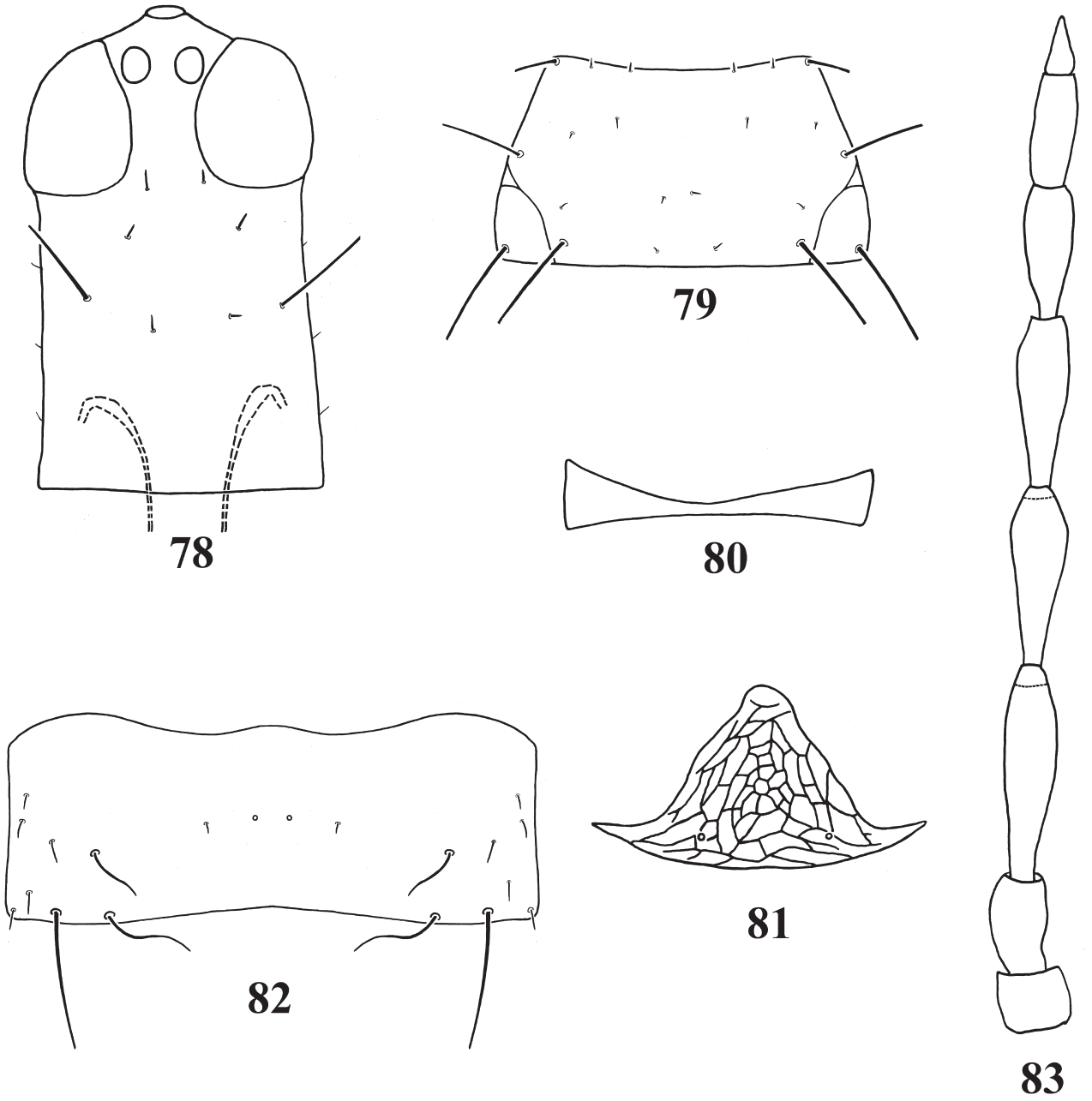
Liothrips vaneeckei Priesner, 1920: 211.

This species is reported as living on the bulbs of cultivated lilies in various parts of the world. However, in Taiwan it has never been recorded from lily plants growing in field conditions, although it has been found in stored lily bulbs imported from other countries. Therefore, this species is not included here in this paper as Taiwanese *Liothrips*.

Liothrips vitivorus (Priesner)

(Figs 84–89)

Smerinthothrips vitivorus Priesner, 1935: 364. Nomen novum for *Gynaikothrips claripennis* of Moulton, 1928b: 308, not Karny, 1916.



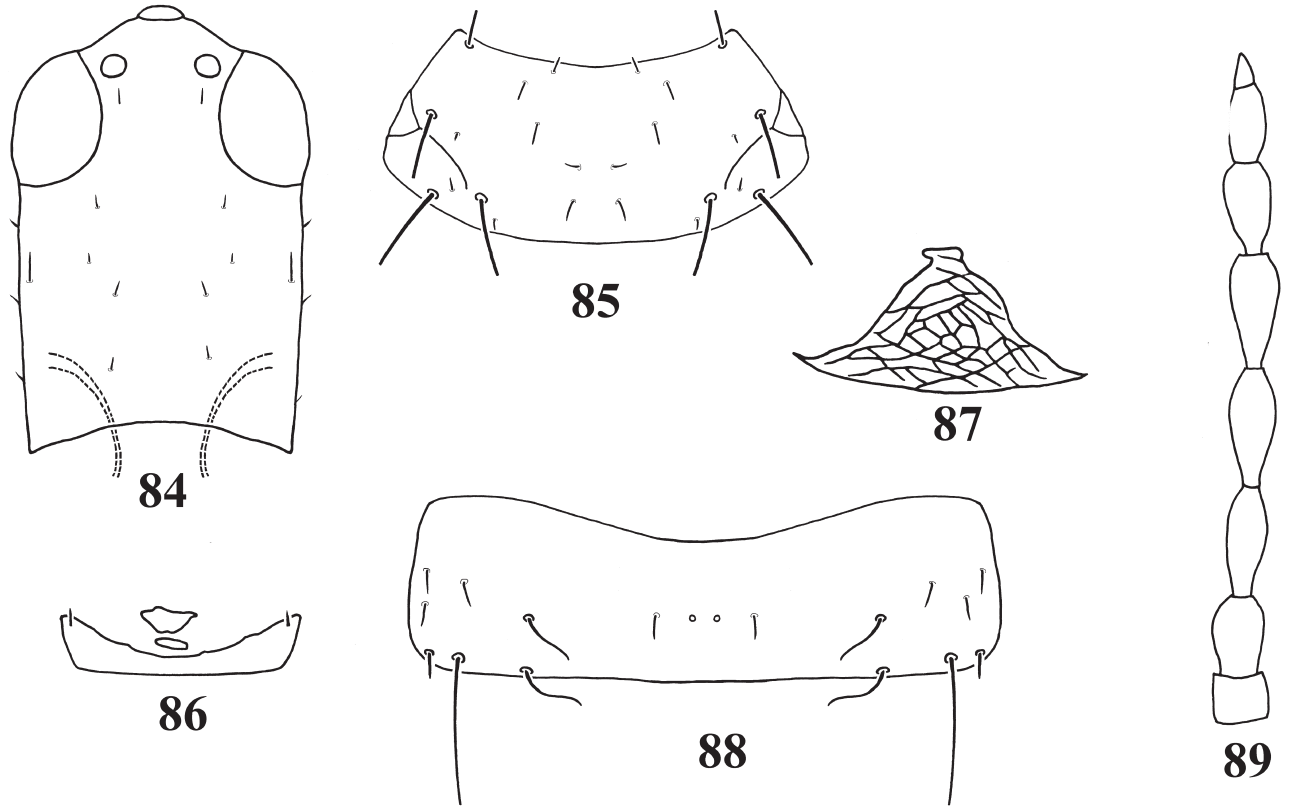
FIGURES 78–83. *Liothrips threobrevis* **nom.nov.**: (78) head; (79) pronotum; (80) mesopresternum; (81) pelta; (82) tergite II; (83) shape of antenna.

Female macroptera. Body length 1.8–2.5 mm. Color brown, antennal segment I as dark brown as head, II dark brown in basal half and yellow in distal half, III–VII yellow, VIII yellow or lightly shaded with greyish brown; fore femora brown, fore tibiae yellow, mid and hind femora and tibiae brown with distal ends of tibiae yellow; all tarsi yellow; fore wings hyaline, base and margins greyish yellow; major body setae brown.

Head 1.5 times as long as wide (Fig. 84), po setae variable in length, always shorter than eyes; maxillary stylets retracted into posterior fourth of head, moderately separated; antennal segments III and IV each 1.3 times as long as segment II (Fig. 89). Pronotal am setae very short and weak, aa setae also short but a little stronger (Fig. 85); mesopresternum boat-shaped, median with irregular separated parts (Fig. 86); metanotal sculpture dense and longitudinal; pelta triangular, without CPS (Fig. 87); tergite II laterally with 2–3 accessary setae (Fig. 88); tube shorter than head.

Specimens examined. Taiwan, Taihoku (Taipei), 1 female from *Vitex* sp., 20.xi.1925 (Takahashi); Xinshe (Taichung), 10 females, 2 males from Hemsley's Rockvine (*Tetrastigma*) (Vitaceae), 22.viii.2002.

Comments. *Gynaikothrips claripennis* Karny, described from Java, was recorded from Taiwan by Moulton (1928a), based on specimens taken with the female listed above from *Vitex* on 20.xi.1925. Priesner (1968) recognized this misidentification and proposed the new name, *L. vitivorus*, for these specimens.



FIGURES 84–89. *Liothrips vitivorus*: (84) head; (85) pronotum; (86) mesopresternum; (87) pelta; (88) tergite II; (89) shape of antenna.

Litotetothrips Priesner

Litotetothrips Priesner 1929: 449.

The 10 species listed in this genus have been found in countries between Peninsular Malaysia and Taiwan, feeding on leaves but without inducing leaf galls. They all have the maxillary stylets deeply retracted into the head, antennal segment VIII is long and slender, neither sex has a fore tarsal tooth, the bell-shaped pelta has slender lateral lobes, and the tube is shorter than the head.

Litotetothrips rotundus (Moulton)

Gynaikothrips rotundus Moulton, 1928a: 304.
Litotetothrips cinnamomi Priesner, 1929: 450.

Described originally from a single male taken on "camphor tree, March 1927" at Taihoku, Taiwan, Priesner described *cinnamomi* from the same locality based on two males from *Cinnamomum camphora*, 14.iii.1921. The species is found widely in Japan, and also known from Hong Kong (Okajima 2006).

Specimens examined. **Taiwan**, Taihoku (Taipei), 1 female, 1 male from *Cinnamomum camphora*, 14.iii.1927; "Southern Formosa", 1 female from leaf of unknown plant, xi.1930; Taihoku (Taipei), 1 female, v.1932; Sozan, 1 female from *Lithocarpus*, 29.vi.1933; Barubune (Formosa), 1 male, vi.1936 (all Takahashi); Wushe (Nantou), 1 female, 4 males, 7.ix.1992.

Litotetothrips pasaniae Kurosawa

Litotetothrips pasaniae Kurosawa, 1937: 219–221.

According to Okajima (2006) this thrips lives on *Castanopsis* species (Fagaceae) in Honshu and Kyushu, Japan, as well as being recorded from Taiwan.

Specimens examined. Japan, Yokohama, 1 female from *Castanopsis sieboldii*, 10.i.1937 (same data as type); **Taiwan**, Ruifeng (Chiayi), 1 male from Solanaceae, 16.xii.1993.

Phenicothrips Bhatti

Phenicothrips Bhatti, 1995: 107. Replacement name for *Phaenothrips* Priesner, not *Phenothrips* Ananthakrishnan, 1968.

The type species of this genus is *Gynaikothrips daetymon* Karny, and there are a further seven species listed in the genus, all from southeast Asia and Indonesia. However, as indicated by Okajima (2006), *Phenicothrips* is scarcely separable from *Liothrips*. Some characters used by Bhatti (1995) to diagnose the genus are variable and show clines, including lengths of antennal sense cones and postocular setae. For example, *Liothrips vitivorus* shares some character states with *Phenicothrips* including short postocular setae and widely separated maxillary stylets, but the antennal sense cones are not very long. Despite this problem, *Phenicothrips* species in general share the following character states: head longer than wide, postocular setae short, maxillary stylets wide apart, antennal segments III & IV with long slender sense cones, fore tarsal absent in both sexes, and the tube shorter than the head.

Phenicothrips siamensis (Karny)

Gynaikothrips siamensis Karny, 1923: 349.

Described from Thailand, this species was recorded from Taiwan by Takahashi (1936) based on the specimens noted below.

Specimens examined. Taiwan, Suisha (Formosa), 2 females from *Lithocarpus*, 11.vi.1933 (Takahashi).

Genus *Psephenothrips* Reyes

Psephenothrips Reyes, 1994: 478.

Five species are listed in this genus, one from southern India, one from Philippines, and three from Japan of which one is also found in Taiwan. The species are similar to those of *Liothrips*, but have the maxillary stylets very long, retracted to the eyes and close together or overlapping in the middle of the head. A fore tarsal tooth is not present in either sex, the males lack a pore plate on sternite VIII, and the tube is shorter than the head.

Key to *Psephenothrips* species

(*from descriptions, Reyes 1994, Okajima 2006, Tyagi & Kumar 2012)

1. S1 setae on abdominal tergite IX almost as long as tube or longer . . . . . *strasseni**
-. S1 setae on abdominal tergite IX shorter than tube 2
2. Distal half of antennal segment V, and antennal segments VI–VIII dark brown, same colour as head . . . . . *baiheensis* **sp.n.**
-. Antennal segment V, VI yellow with distal portion brownish, VII all brown or with yellow base, VIII brown 3
3. Mesopresternum widely separated into 2 parts . . . . . *cymbidas* **sp.n.**
-. Mesopresternum boat shaped 4
4. Setae po on head much shorter than eye (60–80 microns vs 105–107 microns) . . . . . *cinnamomi**
-. Setae po on head longer or equal to length of eye 5
5. MSS present and distinct 6

-. MSS vestigial short or absent 7
6. Pronotal aa setae longer than am setae (43–50 microns vs 28–35 microns) . . . . . *moundi**
-. Pronotal aa setae shorter than am setae (30–40 microns vs 40–50 microns . . . . . *cinnamomi**
7. Antennal segment VIII length 50 microns, segment VII 52 microns. . . . . *leptocerus*
-. Antennal segment VIII length 42 microns, segment VII 63 microns. . . . . *machili**

***Psephenothrips baiheensis* sp. n.**
(Figs 90–97)

Female macroptera. Body length 3.6 mm. Color brown with tube darkest, eyes with red pigment; antennae segments I and II dark brown, same colour with head except distal end of II yellowish, III yellow, IV yellow with distal end brownish, V basal half yellow and distal half dark brown, VI–VIII dark brown; all femora, tibia and tarsi brown except fore tarsi yellow, fore wings hyaline; major body setae hyaline.

Head longer than width (Fig. 90), cheeks straight, blunt po setae subequal to length of eyes, maxillary stylets deeply reaching middle of eyes, touching or overlapping medially; antennal segment III and IV longest, about 1.4 times length of segment II , segment VIII cornical and shorter than VII (Fig. 97).

Pronotum with 5 pairs of prominent setae (Fig.91), all blunt; aa setae as long as or a little longer than am setae; pronotum notopleural suture complete. mesopresternum boat shaped with a sharp median protruding (Fig. 94); metanotum reticulated medially (Fig. 92); MSS present; fore femora slightly enlarged, pretarsal tooth absent; fore wing with 23–26 duplicated cilia.

Pelta triangular, with 2 CPS (Fig. 95); tergite II laterally with 2 accessary setae (Fig. 93); tergites II–VII with 2 pairs of wing-retaining setae, anterior margins of tergites III-VIII membranous (Fig. 93); tube shorter than head (Fig. 96).

Measurements (holotype in microns) Body length 3580, head median length 470; greatest width 340; postocular setae length 105, antennal segment (L/W) I 60/65, II 70/50, III 120/40, IV 100/50, V 80/40, VI 80/38, VII 60/32, VIII 50/18, total length 620, pronotum median length 220; greatest width 500; fore wing length 1500; pelta length 150, width 270; tube length 300.

Male macroptera. Body length 2.5 mm. Similar to female, fore tarsus without tooth.

Specimens examined. **Taiwan**. Holotype female, Guanziling (Baihe), dead wood, v. 1993; paratypes 1 female, 1 male with same data as holotype.

Etymology. Indicate the place Baihe, Tainan, where it was collected.

Comments. The dark brown color of distal half of antennal segment V and segments VI-VIII make this species distinct. Besides, the membranous anterior margins of tergites III-VIII make this species different from other *Psephenothrips* species.

***Psephenothrips cymbidas* sp. n.**
(Figs 98–105)

Female macroptera. Body length 2.2–2.4 mm. Color brown; Antennal segment I dark brown, same colour as head, II brown, III brownish yellow, IV–VI greyish brown with yellow base, VII brown, VIII dark brown; all femora brown, fore tibiae yellow, mid tibiae greyish brown with distal half yellow, all tarsi yellow; fore wings pale brown with a darker stripe; major body setae hyaline.

Head square (Fig. 98), po setae blunt, arising at middle of dorsum, about same length as eyes; maxillary stylets retracted to eyes posterior margins, touching medially and sometimes overlapping; antennal segment III and IV longest, about 1.3 times length of segment II, segment VIII cornical and shorter than VII (Fig. 105). Pronotum with 5 pairs of major setae (Fig. 99), all blunt; epim, pa and pm setae brown with white ends; aa setae and am setae about equal in length; mesopresternum narrowly connected or separated into 2 parts (Fig. 101); metanotum sculptured with longitudinal striae and irregular reticles (Fig. 100); MSS present though short; fore wing with 12 duplicated cilia. Pelta triangular, blunt laterally (Fig. 102), 1 pair of CPS; tergite II laterally with 4 accessary setae (Fig. 103); tergites II–VII with 2 pairs of wing retaining setae; tube shorter than head (Fig. 104).

Measurements (holotype in microns). Body length 2400. Head, median length 300; greatest width 285; postoc-

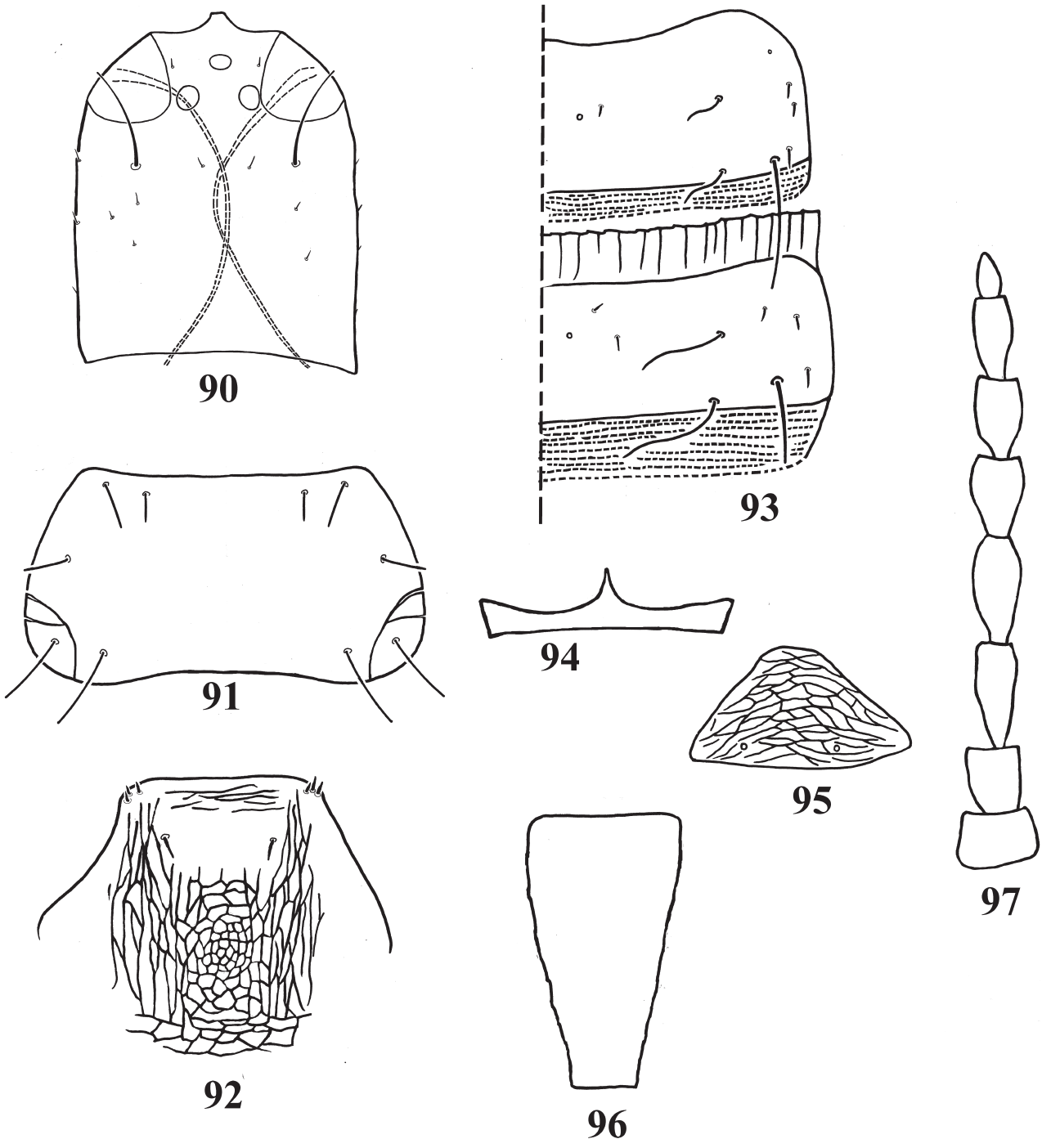
ular setae length 90. Antennal segments (L/W) I 45/37, II 50/32, III 90/30, IV 70/35, V 60/33, VI 70/30, VII 55/23, VIII 35/10, total L 475. Pronotum, median length 160; greatest width 400; am setae 52, aa setae 50. Fore wing length 900. Pelta, length 110; width 170. Tergite IX setae S1 220; tube length 220.

Male macroptera. Body length 2.3 mm; colour and shape similar to female.

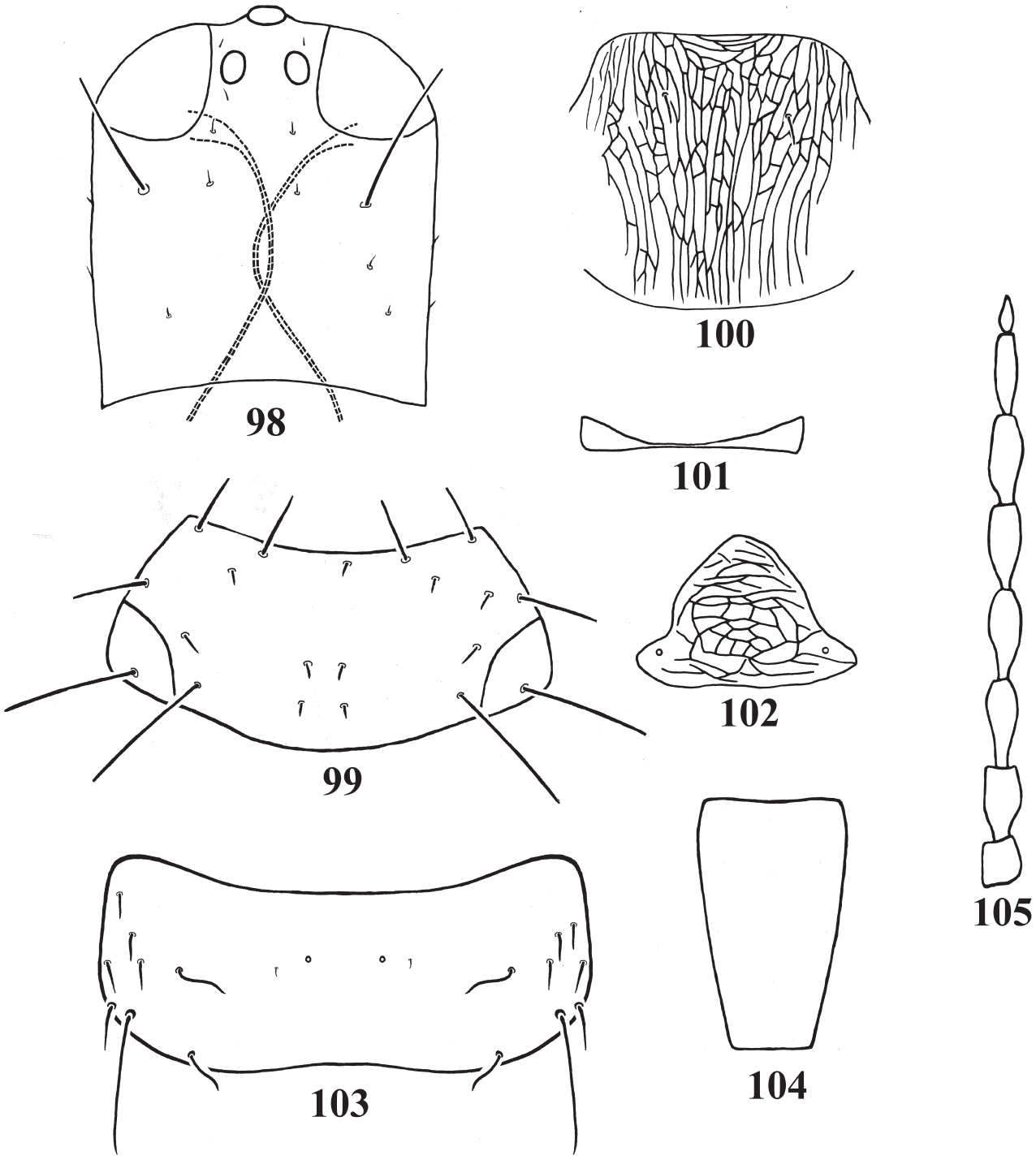
Specimens examined. Taiwan, Puli (Nantou), holotype female from flower of *Cymbidium*, 17.iii.2000; paratypes 5 females, 3 males with same data as holotype.

Etymology. In reference to *Cymbidium* on which it was collected.

Comments. This species is similar to *strasseni* in having setae S1 on tergite IX almost as long the as tube, and the pronotal aa and am setae about equal in length. However, the colour is distinctive, with the fore and mid tibiae yellow and the fore wings pale brown distinguishing this species from *strasseni* and the other species.



FIGURES 90–97. *Psephenothrips baiheensis* **sp.n.**: (90) head; (91) pronotum; (92) metanotum; (93) tergites II-III; (94) mesopresternum; (95) pelta; (96) tube; (97) shape of antenna.



FIGURES 98–105. *Psephenothrips cymbidas* **sp.n.**: (98) head; (99) pronotum; (100) metanotum; (101) mesopresternum; (102) pelta; (103) tergite II; (104) tube; (105) shape of antenna.

Psephenothrips leptoceras Okajima

Psephenothrips leptoceras Okajima, 2006: 554.

Previously known only from the type series in Honshu, Japan, this species is here newly recorded from Taiwan based on the specimens listed below that were identified from the original description.

Specimens examined. Taiwan, Renai (Nantou), 3 females from *Rhus semialata*, 8.xi.2001.

Psephenothrips machili (Moulton)

Rhynchothrips machili Moulton 1928a: 313–315.

Described from Taiwan on two specimens taken on *Machilus* [Lauraceae] by Takahashi, 18.v.1924, this species has not been examined during the present study. However, it was recorded and redescribed by Okajima (2006) from the Ryukyu, Izu and Ogasawara Islands of Japan, also taken from *Machilus*.

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