



Two new species and a new record of the fungivorous genus *Terthrothrips* from China (Thysanoptera: Phlaeothripidae)

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Abstract

Two new species of *Terthrothrips*, *T. levigatus* sp. n. and *T. trigonius* sp. n., are described and illustrated from China. *T. strasseni* Dang, Mound & Qiao, 2014, originally described from Indonesia, is newly recorded in China. A key to the Chinese species of *Terthrothrips* is provided.

Key words: Fungus-feeding thrips, Phlaeothripinae, *Terthrothrips*, new species

Introduction

Terthrothrips Karny, 1925 is a small genus of fungus-feeding species in the subfamily Phlaeothripinae, with 27 species worldwide (ThripsWiki 2017). The members of this genus are mainly distributed in Neotropics (Hood 1954; 1957), but 5 species are described in Asia (Kudô 1978; Okajima 2006; Wang & Tong 2011; Dang *et al.* 2014).

Terthrothrips is closely related to *Eurythrips* Hinds which is an ill-defined group from America (Mound 1977). Stannard (1957) attempted to distinguish these two genera by the antennae length, but Mound (1976) reported that species placed in *Terthrothrips* vary in the length of their antennae. Subsequently, Mound (1977) distinguished *Terthrothrips* from *Eurythrips* in a key, by the relatively long head with curved cheeks that are incut behind large eyes, and fore tibiae frequently with a row of small tubercles along the inner margin. Although the generic relationships of the genus are not clear, Okajima (2006) retained the genus in the *Glyptothrips* lineage.

Prior to this study, four species have been reported from China: *T. ananthakrishnani* Kudô, 1978 (Cao *et al.* 2012), *T. apterus* Kudô, 1978, *T. palmatus* Wang & Tong, 2011 and *T. parvus* Okajima, 2006 (Wang & Tong 2011). The aim of the present study is to describe and illustrate two new *Terthrothrips* species, and report *T. strasseni* Dang, Mound & Qiao, 2014 for the first time from China.

Materials and methods

All thrips specimens were extracted from leaf litter by using Tullgren funnels, and then sorted and preserved in 90% alcohol. Examined specimens were mounted into Canada balsam using the method outlined by Zhang *et al.* (2006). Structural details were examined with a ZEISS Imager A1 microscope, photos were collected by a Photometrics CoolSNAP camera. Abbreviations for names of pronotal setae are as follows: am (anteromarginal), aa (anteroangular), ml (midlateral), epim (epimeral) and pa (posteroangular). All specimens in this study were collected from leaf-litter unless otherwise noted. All type specimens are deposited in the Insect Collection, South China Agricultural University (SCAU).

Key to *Terthrotrips* species from China (females)

1. Pronotal am stout and well developed, much longer and stouter than ocellar setae, expanded at apex; aa absent . . . *T. palmatus*
- Pronotal am reduced to minute and fine setae, shorter or as long as ocellar setae, pointed at apex; aa absent or present 2
2. Pronotum with 4 pairs of well developed capitate setae (aa, ml, epim and pa) (Fig. 2) 3
- Pronotum with 3 pairs of well developed capitate setae (ml, epim and pa) 4
3. Pronotal am as long as ocellar setae, fine and acute; metanotum smooth medially with polygonal reticulation laterally; pelta long hat-shaped (Fig. 7) with slender lateral lobes and distinctly sculptured *T. levigatus* **sp. n.**
- Pronotal am variable in length, but not longer than ocellar setae; metanotum sculptured with polygonal reticulation medially; pelta irregularly hat-shaped and weakly sculptured *T. parvus*
4. Fore tibiae with apparent tubercles on inner margin 5
- Fore tibiae without tubercles on inner margin 6
5. Antennal segment VIII longer than segment VI; pelta bell-shaped with short lobes laterally *T. ananthakrishnani*
- Antennal segment VIII much shorter than segment VI; pelta broadly trapezoidal, with indistinct lateral lobes *T. apterus*
6. Eyes approximately 1/3 of head length, equally developed ventrally and dorsally; antenna brown with median segments slightly pale; metanotum smooth medially with polygonal reticulation laterally; pelta irregularly hat-shaped and weakly sculptured *T. strasseni*
- Eyes slightly shorter than 1/4 of head length, smaller ventrally than dorsally; antenna uniformly brown; metanotum entirely smooth; pelta triangular and smooth without any sculpture *T. trigonius* **sp. n.**

Terthrotrips ananthakrishnani Kudô

Terthrotrips ananthakrishnani Kudô, 1978: 8.

Material examined. Not studied. The distribution information is based on Cao *et al.* (2011).

Distribution. China (Fujian); Japan; Australia.

Terthrotrips apterus Kudô

(Figs. 25, 26)

Terthrotrips apterus Kudô, 1978: 11.

Material examined. CHINA, Guangdong: 1 female and 1 male, Nanling National Nature Reserve (24°55'N, 113°00'E), 15.ix.2001, Zhiwei Li.

Distribution. China (Guangdong); Japan

Remarks. Described originally from Japan, this species has been reported from China (Wang & Tong 2011). This species is similar to *T. ananthakrishnani* Kudô with pronotal aa reduced, antennal segments III and IV each with 3 sense cones and fore tibiae with distinct tubercles on inner margin. However, antennal segment VIII is much shorter than segment VI, and the pelta trapezoidal with unobvious lobes laterally. In *ananthakrishnani*, antennal segment VIII is longer than segment VI, and the pelta hat-shaped with short lateral lobes.

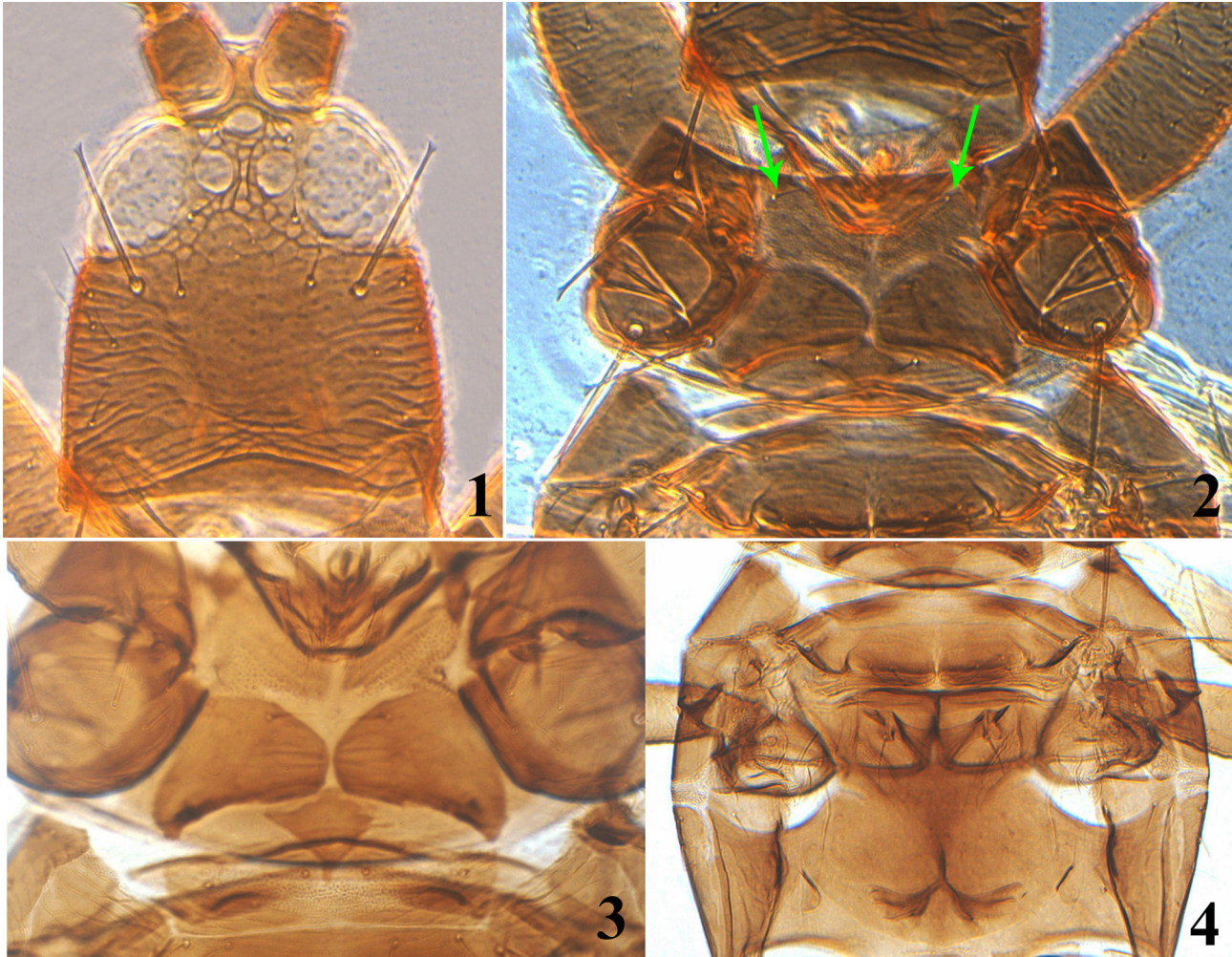
Terthrotrips levigatus sp. n.

(Figs. 1–9, 21, 22)

Female. Macroptera (Fig. 21). Body and legs entirely brown except tarsi yellow; antennal segments I–II brown, III yellowish brown, IV–VIII light brown; wings weakly shaded light brown except pale medially; major setae weakly shaded.

Head (Fig. 1) approximately 1.2 times as long as wide; dorsal surface sculptured laterally and posteriorly, with polygonal reticulation between eyes; cheeks nearly straight, slightly constricted behind eyes. Eyes approximately one-third of head length, equally developed ventrally and dorsally; ocelli well developed; postocellar setae pointed and as long as hind ocellus; postocular setae stout, longer than eyes with expanded apex. Antennae (Fig. 9) approximately 2 times as long as head length; segments III and IV each with three (2+1) sense cones; segment VI longer than segment VIII; terminal setae slightly longer than segment VIII. Maxillary stylets wide apart, retracted slightly into head capsule. Mouth-cone short and rounded.

Pronotum (Fig. 2) smooth, transverse with anterior margin concave, notopleural sutures complete; pronotal aa well developed, as long as ml, epim and pa, expanded apically, pronotal am fine, as long as postocellar setae, pointed apically; basantra present, but membranous, paired ferna well-developed. Mesonotum with pair of long lateral setae, slightly shorter than pronotal aa and expanded at apex; mesopresternum eroded medially, divided into two triangular lateral plates (Fig. 3), with prospinasternum developed. Metanotum (Fig. 4) smooth medially with polygonal reticulation laterally, median pair of setae long and pointed; metathoracic sternopleural sutures absent. Fore tibiae without tubercles on inner margin; fore tarsal tooth present. Fore wing almost parallel-sided without duplicated cilia; three pairs of sub-basal setae present and expanded at apex.

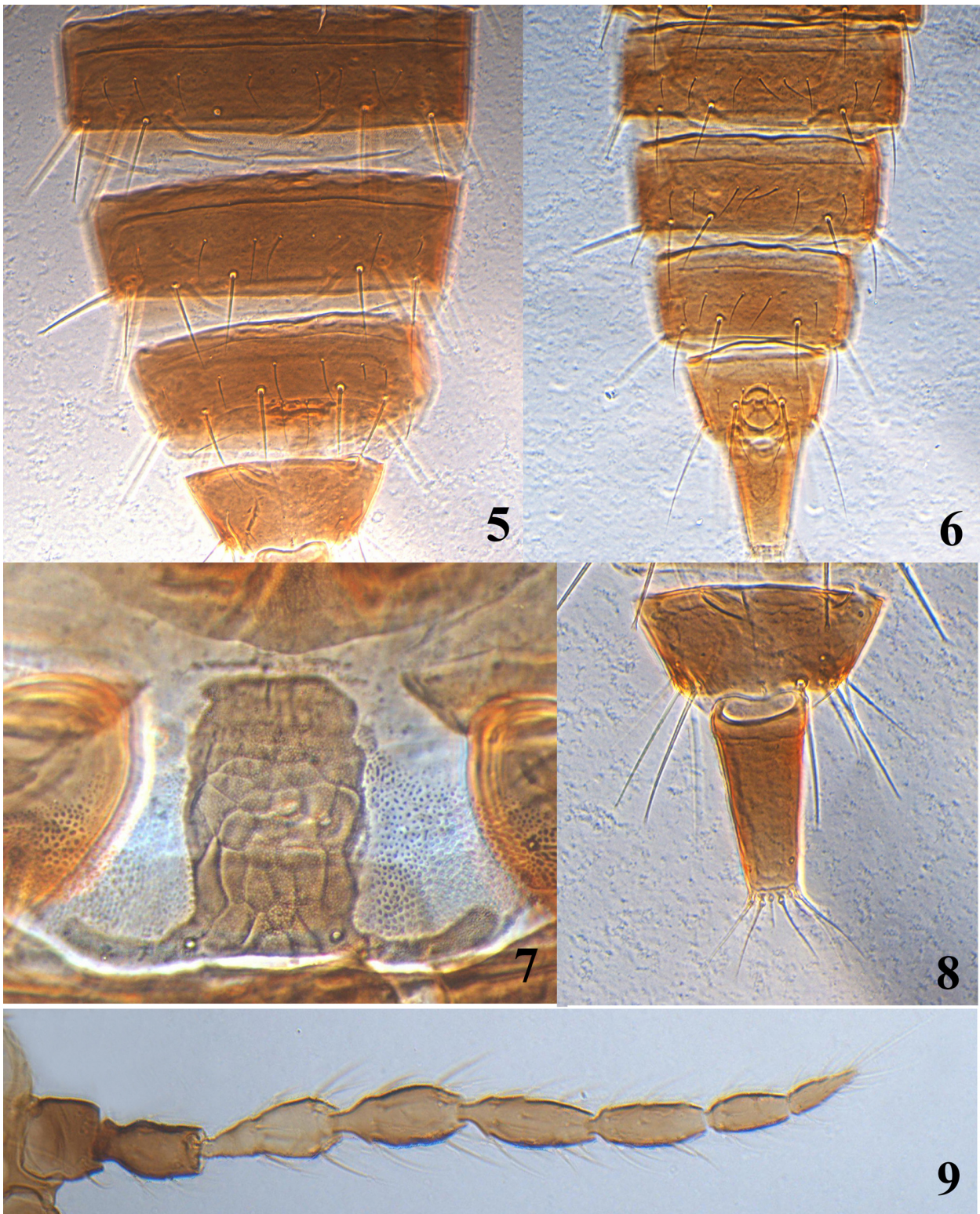


FIGURES 1–4. *Terthrotrips levigatus* sp. n. (1) dorsal view of head; (2) pronotum (arrows indicate the anteromarginal setae); (3) ventral view of prothorax; (4) dorsal view of pterothorax.

Pelta (Fig. 7) long hat-shaped with flat anterior margin, nearly 2 times as long as apical width, with slender lateral lobes and dorsal surface sculptured with irregular reticulation, and a pair of campaniform sensilla present; abdominal tergites II–VII each with 2 pairs of sigmoid wing retaining setae, anterior pair weaker than posterior pair; tergite VIII without wing-retaining setae; sternites II–VIII with transverse row of 6–18 discal setae medially, each with 2 pairs of equally developed long and stout setae arising in front of posterior margin, but VIII with an additional pair of short and fine setae situated at posterior margin (Fig. 5); tergite IX setae S1 as long as S2, both shorter than tube and blunt or expanded at apex, intermediate setae (iS) longer than half of S1 (Fig. 8); tube almost 0.7 times as long as head; anal setae shorter than tube.

Measurements (holotype female in microns). Distended body length 1725. Head length 220, width 185; eyes length 70; postocular setae length 75; diameter of anterior (posterior) ocelli 19; postocellar setae length 16. Antennae length 440, segments I–VIII length (width) as follows: 37(41); 53(29); 74(28); 66(28); 66(24); 60(21); 42(21); 41(13); terminal setae length 60. Pronotum median length 125, width across median part 290; length of

major setae: am 15, aa 60, ml 75, pa 80, epim 72. Fore wing length 700, subbasal setae S1–S3 length: 60, 65, 65. Metanotum median setae 33. Pelta length 84, width with lateral lobes 125, width at apex 43; abdominal tergite IX S1 setae length 108, intermediate setae (iS) length 90, S2 setae length 108. Tube length 135, width at base 85, at apex 43; anal setae length 55.



FIGURES 5–9. *Terthrothrips levigatus* sp. n. (5) abdominal sternites VI–IX of female (6) abdominal sternites VI–IX of male; (7) pelta; (8) tube; (9) antenna.

Male. Macroptera (Fig. 22). Similar in colour and structure to female, but smaller. Abdominal sternites II–VIII with 4–12 discal setae medially; sternite VIII with only 2 pairs of posteromarginal setae arising in front of posterior margin; sternite IX with a pair of prominent setae medially (Fig. 6); tergite IX setae S2 acute and approximately one-third as long as S1.

Measurements (paratype male in microns). Distended body length 1300. Head length 220, width 160; eyes length 60; postocular setae length 60; diameter of anterior (posterior) ocelli 18; postocellar setae length 12. Antennae length 420, segments I–VIII length (width) as follows: 37(35); 42(29); 76(25); 65(26); 68(23); 56(20); 38(19); 38(13); terminal setae length 40. Pronotum median length 110, width across median part 260; length of major setae: am 14, aa 60, ml 54, pa 55, epim 60. Fore wing length 640, subbasal setae S1–S3 length: 50, 60, 50. Metanotum median setae 25. Pelta length 70, width at base 90, width at apex 37; abdominal tergite IX S1 setae length 110, intermediate setae (iS) length 80, S2 setae length 38. Tube length 110, width at base 75, at apex 30; anal setae length 55.

Material examined. Holotype. Female macroptera, **CHINA, Guangdong:** Conghua, Guangzhou City, Shimen National Forest Park (23°32'N, 113°32'E), 19.ix.2004, Jun Wang.

Paratypes. 1 female and 1 male, collected with holotype. **CHINA, Guangdong:** 1 female and 1 male, Zhaoqing City, Dinghushan National Nature Reserve (23°10'N, 112°32'E), 14.vi.1987, Xiaoli Tong.

Etymology. The Latin word *levigatus* means smooth, referring to the metanotum without sculpture medially.

Distribution. China (Guangdong).

Remarks. This new species resembles *T. parvus* in sharing 4 pairs of well-developed setae on the pronotum, and fore tibiae without tubercles on inner margin, but it can be readily distinguished from the latter by the following diagnostic characters: (1) Metanotum smooth medially (metanotum sculptured with polygonal reticulation in *T. parvus*); (2) pelta long hat-shaped with flat anterior margin, nearly 2 times as long as apical width, with distinctly reticulate sculpture (pelta irregularly hat-shaped and surface weakly reticulate in *T. parvus*); (3) female sternite VIII with pair of setae submedially in front of posterior margin, which are equally developed as those on sternites II–VII (paired setae on VIII in *parvus* somewhat leaf-like, much stouter than those on sternites II–VII).

***Terthrotrips palmatus* Wang & Tong**

(Figs. 27, 28)

Terthrotrips palmatus Wang & Tong, 2011: 64.

Material examined. Holotype (in SCAU). Female macroptera, **CHINA, Hainan:** Ledong, Jianfengling National Nature Reserve (18°44'24"N, 108°51'48"E), 31.x.1986, Xiaoli Tong. **Paratypes** (in SCAU). **CHINA, Hainan:** 2 males, Wuzhishan National Nature Reserve (18°54'N, 109°40'E), 7.xii.2008, Jun Wang. 1 female and 1 male, Diaoluoshan Nature Reserve (18°43'N, 109°52'E), 5.xii.2008, Wang Jun.

Distribution. China (Hainan).

Remarks. This species apparently remains known only from the type material taken from leaf-litter in Hainan, a tropical island of China (Wang & Tong, 2011). This species is easily separated from other members of the genus by the long and stout pronotal am setae with expanded apex.

***Terthrotrips parvus* Okajima**

(Figs. 29, 30)

Terthrotrips parvus Okajima, 2006: 616.

Material examined. Female macroptera, **CHINA, Guizhou:** 4 females and 1 male, Jiangkou County, Fanjingshan National Nature Reserve, Heiwanhe (27°46'N, 108°48'E), 3.viii.2014, Guoru Ren; 4 females and 4 males, Libo County, Weng'ang (25°25'N, 107°91'E), 21.vii.2015, Zhaohong Wang. **Guangdong:** 1 female and 1 male, Yingde City, Shimentai Nature Reserve (24°41'N, 113°31'E), 10.iv.2002, Zhiwei Li; 1 female 1 male, Conghua City,

Shimen National Forest Park (23°32'N, 113°32'E), 19.ix.2004, Jun Wang. **Yunnan:** 1 female Xishuangbanna, Mengla, Tropical Botanical Garden (21°27'N, 101°34'E), 22.xi.1993, Weiqiu Zhang. **Hainan:** 1 female and 4 males, Ledong County, Jianfengling National Nature Reserve (18°44'N, 108°51'E), 31.x.1986, Xiaoli Tong; 1 female, Diaoluoshan National Natrue Reserve (18°43'N, 109°52'E), 5.xii.2008, Jun Wang.

Distribution. China (Yunnan, Guizhou, Guangdong, Hainan, Taiwan); Japan.

Remarks. Although described from Japan (Okajima 2006), this species has been found widely in China (Wang & Tong 2011; Dang & Qiao 2014). According to the original description, this species has 2 sense cones on antennal segment III (Okajima 2006). However, Dang & Qiao (2014) indicated that this species has 3 sense cones on antennal segment III based on examination of two paratypes and Taiwan specimens. In this study, we also found that there are 3 sense cones on antennal segment III in the specimens collected from mainland China. However, on these specimens some characters are slightly different from the original description of *T. parvus*. For example, the eyes are slightly longer (approximately one-third of head length in original description), pronotal am variable in length but not longer than ocellar setae, which is similar to the diagram by Dang & Qiao (cf. Dang & Qiao 2014: fig 50) but almost invisible in original description.

***Terthrotrips strasseni* Dang, Mound & Qiao**

(Figs. 31, 32)

Terthrotrips strasseni Dang, Mound & Qiao, 2014: 73.

Material examined. **CHINA, Yunnan:** 1 female, Xishuangbanna, Mengla, Tropical Botanical Garden (21°27'N, 101°34'E), 22.xi.1993, Weiqiu Zhang. **Guizhou:** 1 female, Libo County, Weng'ang (25°25'N, 107°91'E), 21.vii.2015, Zhaohong Wang. **Guangdong:** 1 male, Shixing County, Chebaling National Nature Reserve (24°42'N, 114°11'E), 5.viii.1988, Weiqiu Zhang, 1 male, same locality, 1.x.2002, Zhiwei Li; Yingde City, Shimentai Nature Reserve (24°41'N, 113°31'E), 10.iv.2002, Zhiwei Li; 1 female, Conghua, Shimen National Forest Park (23°32'N, 113°32'E), 19.ix.2004, Jun Wang. **Hainan:** 1 female and 1 male, Ledong County, Jianfengling National Nature Reserve (18°44'N, 108°51'E), 31.x.1986, Xiaoli Tong & Jian Zhang; 1 female, Diaoluoshan National Natrue Reserve (18°43'N, 109°52'E), 5.xii.2008, Jun Wang.

Distribution. China (Yunnan, Guizhou, Guangdong, Hainan); Indonesia.

Remarks. Although originally described from Indonesia (Dang *et al.* 2014), this species is here newly recored from China where it appears to be widespread from southwestern China to southern China. It is similar in shape and structure to the new species described below, but can be distinguish from them by the above key.

***Terthrotrips trigonius* sp. n.**

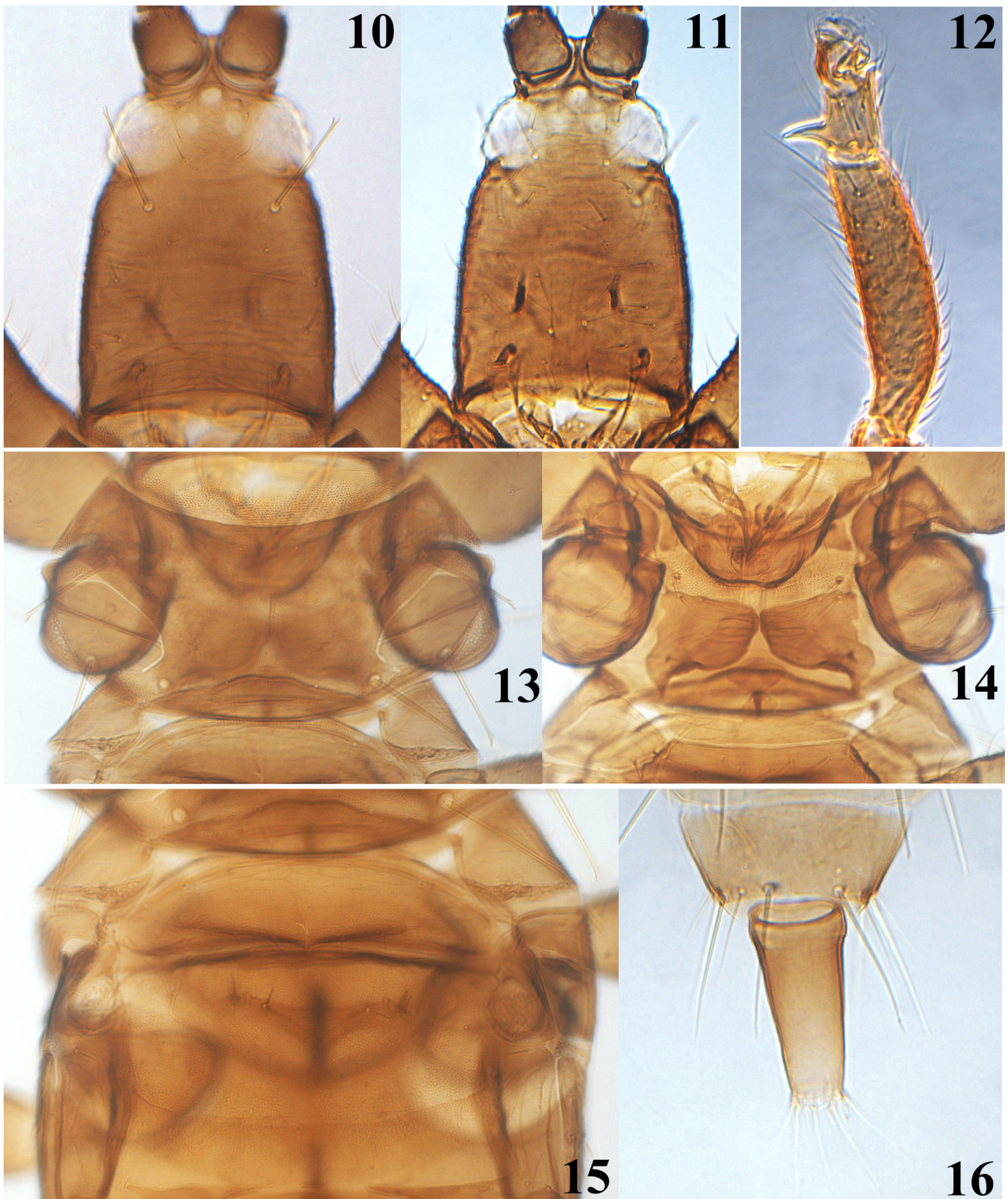
(Figs. 10–20, 23, 24)

Female. Aptera (Fig. 23). Body, legs and antennae mainly brown except for all tarsi, abdominal tergite IX and apex of tube light brown; major setae colourless to weakly shaded.

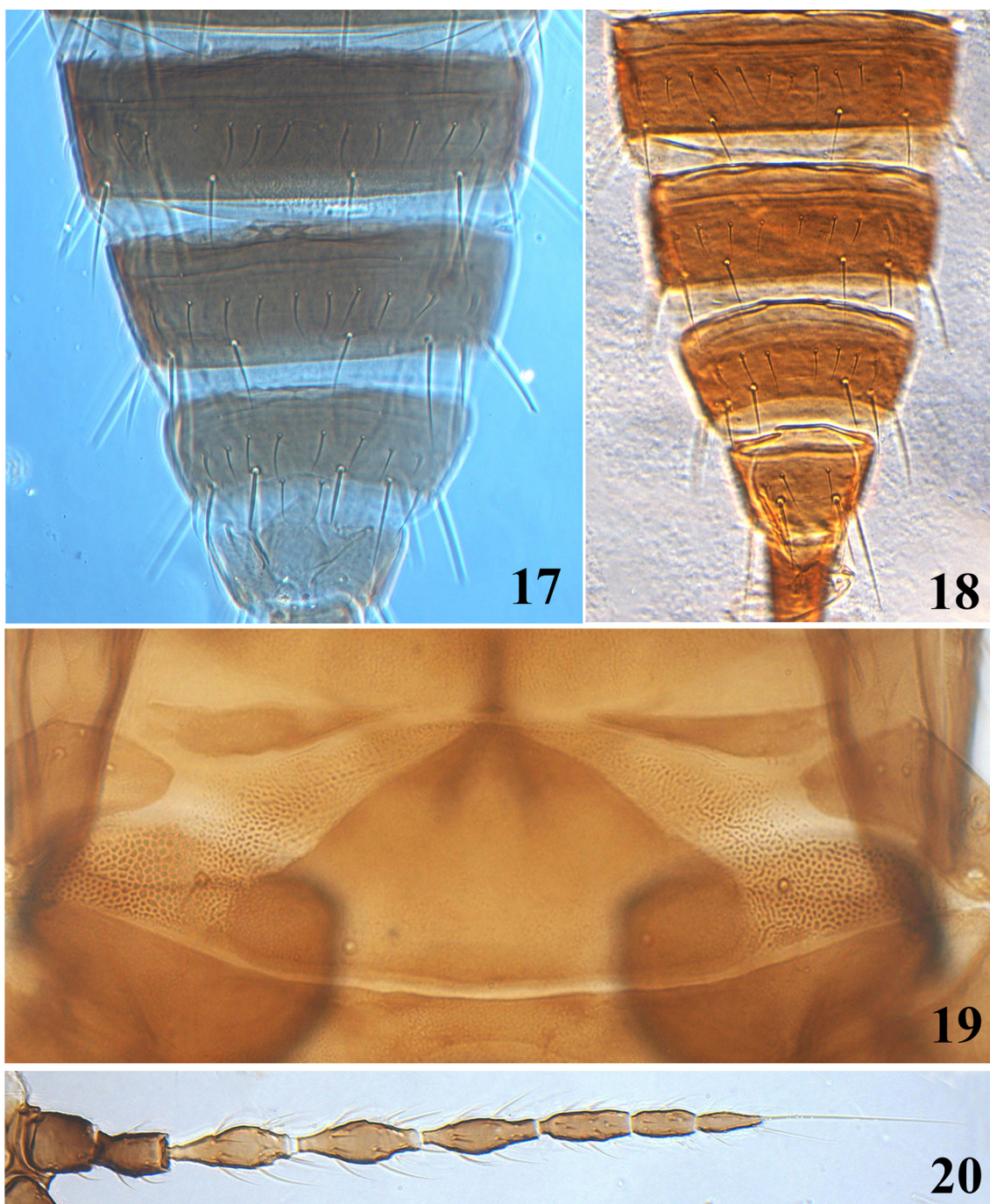
Head (Fig. 10) approximately 1.3 times as long as wide, broadest across cheeks near base, slightly projecting in front of eyes; dorsal surface with striate sculpture but weak medially; cheeks slightly rounded and incut behind eyes. Eyes slightly shorter than 1/4 of head length, smaller ventrally than dorsally (Fig. 11); postocular setae capitate and approximately 1.5 times as long as eye length; ocelli present; postocellar setae pointed and as long as diameter of posterior ocelli. Antennae (Fig.20) approximately 2.1 times as long as head length; segments III and IV each with 3 sense cones; segment VI longer than VIII; terminal setae much longer than the combined length of segments VII and VIII. Maxillary stylets retracted slightly into head capsule, approximately half of head width apart. Mouth-cone short and rounded.

Pronotum (Fig. 13) smooth, with a reduced median longitudinal line; notopleural sutures almost complete; pronotal aa and am reduced, almost invisible, pronotum with only 3 pairs of well developed capitate setae (ml, epim and pa); basantra present, but membranous, paired ferna well-developed with two pairs of setae situated at anterior margin. Mesonotum with pair of short and fine lateral setae; mesopresternum boat-shaped with a

projection medially (Fig. 14), with prospinasternum developed. Metanotum entirely smooth, median setae small and acute (Fig. 15); metathoracic sternopleural sutures absent. Fore tibiae without tubercles on inner margin; fore tarsal tooth distinct (Fig. 12).



FIGURES 10–16. *Terthrothrips trigonius* sp. n. (10) dorsal view of head; (11) ventral view of head; (12) fore tibia; (13) pronotum; (14) ventral view of prothorax; (15) dorsal view of pterothorax; (16) tube.

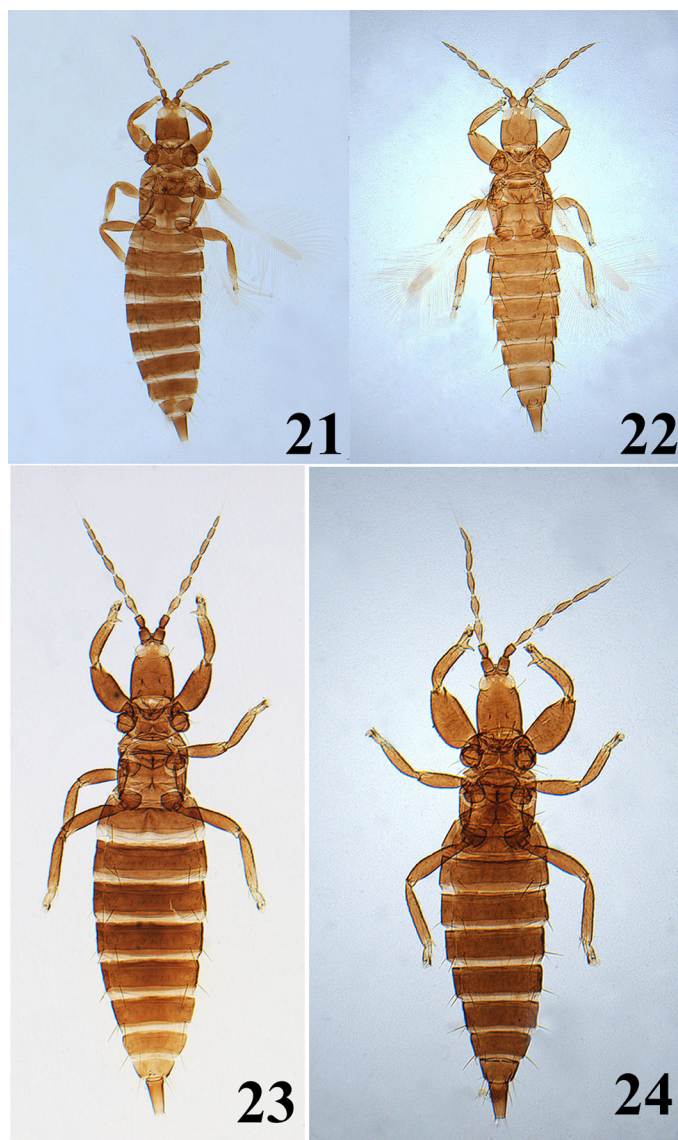


FIGURES 17–20. *Terthrothrips irgonius* sp. n. (17) abdominal sternites VI–IX of female; (18) abdominal sternites VI–IX of male; (19) pelta; (20) antenna.

Pelta (Fig. 19) almost triangular, dorsal surface smooth, a pair of campaniform sensilla present; abdominal tergites without wing retaining setae; sternites II–VIII with transverse row of 6–18 discal setae medially, each with 2 pairs of long and stout setae arising in front of posterior margin, but VIII with an additional pair of short and fine setae situated at posterior margin (Fig. 17); tergite IX setae S1 and S2 subequal in length but distinctly shorter than tube, both expanded at apex; intermediate setae (iS) pointed, approximately 0.6 times as long as S1 setae (Fig. 16); tube length approximately 2 times basal width, 0.6 times as long as head; anal setae half the length of tube.

Measurements (holotype female in microns). Distended body length 1720. Head length 250, width 175; eyes length 50; postocular setae length 75; diameter of anterior (posterior) ocelli 18; postocellar setae length 16. Antennae length 530, segments I–VIII length (width) as follows: 52(45); 51(34); 89(30); 90(33); 86(26); 66(18); 47(18); 47(15); terminal setae length 140. Pronotum median length 125, width across median part 280; length of

major setae: midlateral setae 65, posteroangular setae 75, epimeral setae 65. Metanotum median setae 30. Pelta length 70, width at base 140; abdominal tergite IX setae S1 length 108, intermediate setae length 67, S2 length 108. Tube length 140, width at base 65, at apex 35; anal setae length 70.



FIGURES 21–24. *Terthrothrips* species. (21) *T. levigatus* sp. n. (female), (22) *T. levigatus* sp. n. (male); (23) *T. trigonius* sp. n. (female), (24) *T. trigonius* sp. n. (male).

Male. Aptera (Fig. 24). Color and structure similar to apterous female except for fore femora somewhat enlarged; abdominal sternite VIII without pair of setae situated at posterior margin (Fig. 18); sternite IX with a pair of prominent setae medially; tergite IX setae S2 acute and much short than S1.

Measurements (paratype male in microns). Distended body length 1470. Head length 240, width 160; eyes length 55; postocular setae length 72; diameter of anterior (posterior) ocelli 17; postocellar setae length 15. Antennae length 490, segments I–VIII length (width) as follows: 44(31); 44(26); 84(25); 85(25); 83(23); 63(18); 40(18); 46(11); terminal setae length 125. Pronotum median length 135, width across median part 255; length of major setae: midlateral setae 82, posteroangular setae 70, epimeral setae 70. Metanotum median setae 25. Pelta length 65, width at base 120; abdominal tergite IX S1 setae length 103, intermediate setae length 65, S2 setae length 17. Tube length 120, width at base 70, at apex 35; anal setae length 65.

Material examined. Holotype. Female aptera, **CHINA, Guangdong**, Lianxian County, Mt. Dadongshan (24°55'N, 112°42'E), 28.ix.2010, Tao Song.

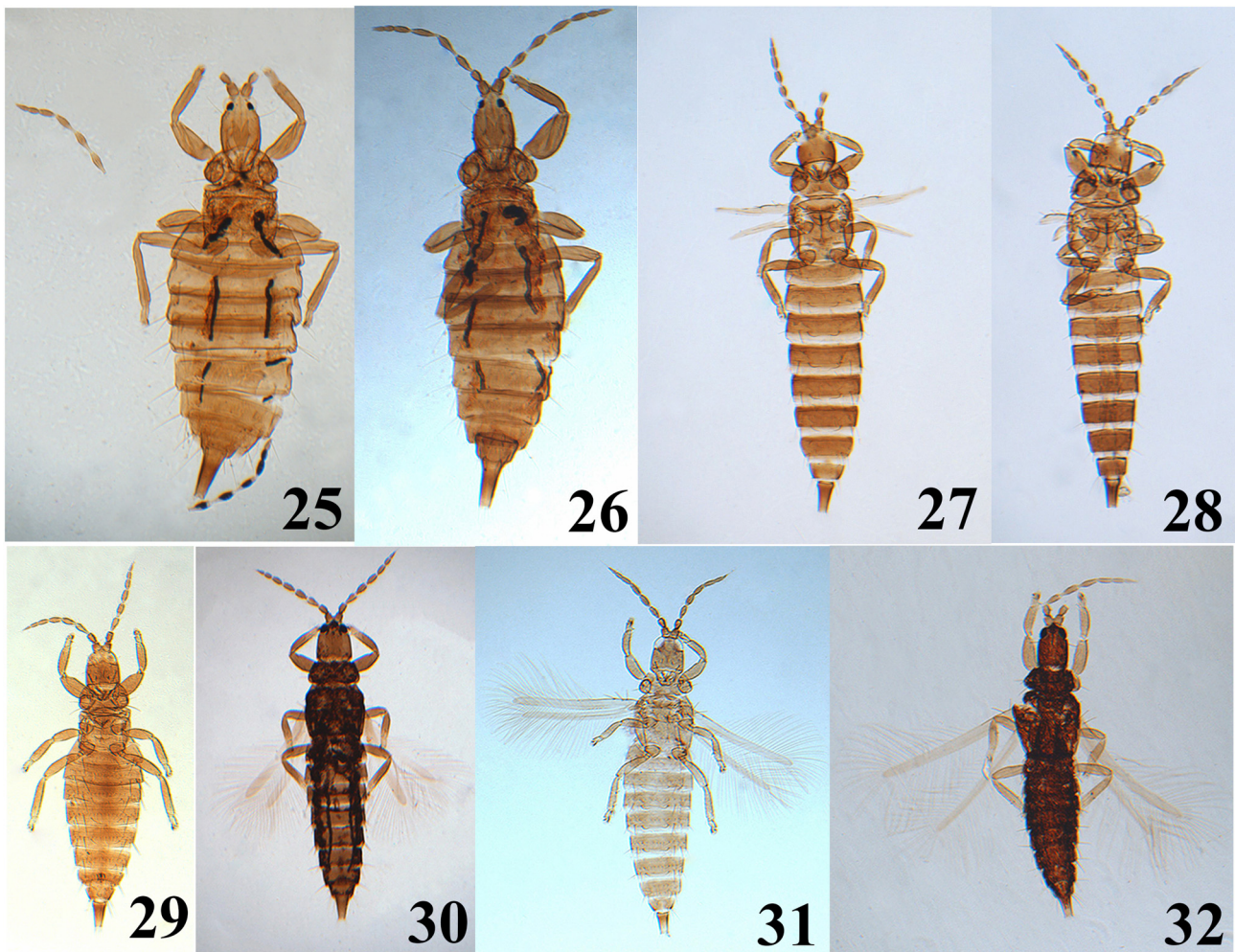
Paratypes. CHINA, Guizhou: 2 males, Jiangkou County, Fanjingshan National Nature Reserve (27°53'27"N,

108°46'45"E), 10.viii.1987, Xiaoli Tong. **Hunan:** 1 male, Zhangjiajie National Forest Park (29°22'26"N, 110°28'16"E), 11.viii.1987, Xiaoli Tong; 1 female, Yanling County, Shennong Valley (26°29'N, 114°01'E), 24. viii. 2015, Chao Zhao. **Guangdong:** 1 male, Meizhou City, Mt. Yinnashan (24°26'N, 116°09'E), 15.xi.2014, Chao Zhao.

Etymology. Specific epithet from Latin “*trigonius*” which means triangular, and refers to the almost triangular pelta of this new species .

Distribution. China (Guizhou, Hunan, Guangdong).

Remarks. The new species appears to be most similar in appearance to *T. strasseni* by sharing with dorsal surface almost smooth and fore tibiae without tubercles on inner margin, but it can be readily distinguished by the smaller eyes, approximately one-fifth of head length, which are smaller ventrally than dorsally; antennae uniformly brown; postocular setae distinctly longer than eye length; metanotum entirely smooth; pelta almost triangular and surface smooth.



FIGURES 25–32. *Terthrothrips* species. (25) *T. apterus* (female), (26) *T. apterus* (male); (27) *T. palmatus* (female), (28) *T. palmatus* (male); (29) *T. parvus* (female), (30) *T. parvus* (male); (31) *T. strasseni* (female), (32) *T. strasseni* (male).

Acknowledgements

We would like to thank Prof. Weiqiu Zhang of South China Agricultural University for his useful advices. Many thanks to Dr. Lihong Dang (School of Biological Sciences & Engineering, Shaanxi University of Technology, Shaanxi, China) for confirming the identification of *Terthrothrips strasseni*, and Guoru Ren (Guizhou University, Guizhou, China) for providing some specimens. This study was supported by the National Natural Science Foundation of China (31372236). The authors are grateful to referees for their advice and comments.

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