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Two new records and one new species of the genus *Apelaunothrips* from China (Thysanoptera: Phlaeothripidae)

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Abstract

Apelaunothrips dentiellus **sp. n.** is described from China. This is characterized by all tibiae and tarsi yellow and the fore tarsus with a small tooth in both sexes. *A. indicus* (Ananthakrishnan) and *A. maculipennis* (Okajima) are newly recorded from China. A key to the *Apelaunothrips* species known from China is provided, together with new distribution information of each species.

Key words: Phlaeothripinae, fungus-feeding thrips, *Apelaunothrips*, new species

Introduction

The species of *Apelaunothrips* are characterized by having the maxillary stylets relatively broad (4–6 microns in diameter), the width of these stylets being between that of species of Idolothripinae and typical members of Phlaeothripinae (Mound 2013). Mound (2013) reviewed the species diversity, distribution, and generic relationships of this genus, and provided a key to 37 known species in the world. Recently, *Dolichothrips citricrurus* Moulton originally recorded from Ethiopia was moved to *Apelaunothrips* by Mound & Okajima (2015). Worldwide, 39 recognised species of *Apelaunothrips* are listed (ThripsWiki 2018), of which, nine species were recorded from China (Tong & Zhang 1989; Zhang & Tong 1990; Dang & Qiao 2014). The genus *Apelaunothrips* is mainly distributed in tropical and subtropical areas of the Oriental Region. Recent surveys on the Chinese thrips fauna have revealed that the species of *Apelaunothrips* have a wide geographical range in China (Table 1). It is one of most commonly encountered genera of leaf-litter thrips during sampling in China. For example, the results of quantitative sampling from five different natural reserves in China showed that the mean density (individuals/m^2) of *Apelaunothrips lieni* is 42, 19.3, 7.8, 5.5 and 1.0, respectively (Wang & Tong 2012; Wang *et al.* 2014). Furthermore, in the samples taken from recent surveys in this study, *hainanensis*, *longidens*, *luridus*, *medioflavus* and *nigripennis* are usually found co-existing in the same habitat, particularly in bamboo leaf-litter. The aim of the present study is to describe one new *Apelaunothrips* species, to record *A. indicus* (Ananthakrishnan, 1968) and *A. maculipennis* (Okajima, 1976) in China for the first time, and to provide an identification to the members of this genus recorded from China.

Materials and methods

All thrips specimens in this study were extracted by using Tullgren funnels from leaf litter, and the specimens then were sorted and preserved in 90% alcohol. Examined specimens were mounted in Canada balsam and were examined and photographed under the microscope with a digital camera attached. Some slide-mounted specimens of *Apelaunothrips,* provided by Professor Okajima of Tokyo University of Agriculture (TUA, Japan), have also been examined. The holotype of the new species is preserved in the Insect Collection, South China Agricultural University (SCAU).

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TABLE 1. Distribution of Chinese *Apelaunothrips* species.

Species	Distribution	Sources
A. bicolor Okajima	China (Yunnan, Guizhou, Hainan); Thailand	Okajima, 1979; Tong & Zhang, 1989; This study.
A. consimilis (Ananthakrishnan)	China (Yunnan, Guangdong, Taiwan); Japan, Singapore, Malaysia, Indonesia, India.	Ananthakrishnan, 1969; Okajima, 1979; Zhang & Tong, 1990; Dang & Qiao, 2014; This study.
A. dentiellus **sp. n.**	China (Yunnan).	This study.
A. hainanensis Zhang & Tong	China (Hunan, Jiangxi, Yunnan, Guangdong, Hainan).	Zhang & Tong, 1990; Dang & Qiao, 2014; This study.
A. indicus (Ananthakrishnan)	China (Guangdong); India.	Ananthakrishnan, 1968; This study.
A. lieni Okajima	China (Yunnan, Guangdong, Taiwan)	Okajima, 1979; Tong & Zhang, 1989; Zhang & Tong, 1990; This study.
A. longidens Zhang & Tong	China (Hunan, Guizhou, Guangxi, Guangdong, Hainan)	Zhang & Tong, 1990; This study.
A. luridus Okajima	China (Zhejiang, Jiangxi, Sichuan, Guizhou, Guangdong, Yunnan, Hainan); Malaysia.	Okajima, 1979; This study
A. maculipennis (Okajima)	China (Hainan); Japan.	Okajima, 1976; This study.
A. medioflavus (Karny)	China (Hunan, Sichuan, Yunnan, Guangxi, Guangdong, Fujian, Hainan, Taiwan); Japan; Thailand; Singapore; Indonesia; Philippines.	Karny, 1925; Okajima, 2006; Dang & Qiao, 2014; This study.
A. montanus Okajima	China (Yunnan); Japan.	Okajima, 1979; Dang & Qiao, 2014.
A. nigripennis Okajima	China (Henan, Guizhou, Hunna, Jiangxi, Yunnan, Guangdong, Hainan, Taiwan); Japan.	Okajima, 1979; Dang & Qiao, 2014; This study.

Key to *Apelaunothrips* species from China (female)

[* indicates included here based on published information]

1. Antennal segments III and IV each with 2 sense cones 2
-. Antennal segment III with 2–3 sense cones, IV with 3–4 (5) 3
2. Interocellar setae acute; eyes approximately 1/4 of head length; metanotum with 12–14 setae (Fig. 12) . . . . . *lieni*
-. Interocellar setae weakly capitate; eyes approximately 1/3 of head length; metanotum with 2–6 setae (Fig. 11) . . . . . *indicus*
3. Antennal segment III with 2 sense cones, IV with 3 4
-. Antennal segment III with 3 sense cones, IV with 3–4 or (2+2^{+1}) 5
4. Body brown except antennal segments III–IV, pterothorax, legs and abdominal segments V–VI yellow to yellowish brown; pelta trapezoidal . . . . . *hainanensis*
-. Body largely yellow except antennal segments I–II, head and abdominal segments VII–IX (sometimes II) and tube brown; pelta hat-shaped . . . . . *medioflavus* [in part]
5. Antennal segments III and IV each with 3 sense cones 6
-. Antennal segment III with 3 sense cones, IV with 4 or (2+2^{+1}) 7
6. Head 1.2 times as long as width; pelta trapezoidal or subtriangular; abdominal segments III–VI each with a small brown marking anteriorly . . . . . *luridus*
-. Head 1.5 times as long as width; pelta hat-shaped; abdominal segments III–VI yellow without any brown marking . . . . . *medioflavus* [in part]
7. Body bicoloured yellow and brown 8
-. Body uniformly brown 9
8. Head brown, antennal segment IV with 4 sense cones; pelta without paired campaniform sensilla; abdominal segment IX yellow; fore tarsal tooth absent . . . . . *bicolor*
-. Head yellow, antennal segment IV with (2+2^{+1}) sense cones; pelta with paired campaniform sensilla; abdominal segment IX brown; fore tarsal tooth present . . . . . *longidens*
9. Antennal segment VIII not constricted at base 10
-. Antennal segment VIII constricted to short basal neck 11
10. Dorsal surface of head entirely with reticulation or striation; pronotal anteromarginal setae usually well developed and

expanded at apex . . . . . *consimilis*

-. Dorsal surface of head smooth medially; pronotal anteromarginal setae usually reduced to small and acute setae . . *nigripennis*

11. Fore tarsus with no tooth 12

-. Fore tarsus with a small tooth (Fig. 2); all tibiae and tarsi yellow; pelta long hat-shaped (Fig. 4). . . . . *dentiellus* **sp. n.**

12. All tibiae and tarsi yellow; forewing without any speckles . . . . . *montanus**

-. All tibiae and tarsi brown; forewing with some small speckles apical third (Fig. 14) . . . . . *maculipennis*

Apelaunothrips dentiellus sp. n.

(Figs 1–4, 13, 15, 18, 19)

Female macroptera: Body largely brown with red internal pigment; all femora brown, but tibiae and tarsi yellow (Figs 18, 19); antennal segments I–II as brown as head, III mainly yellow, IV–V light brown with basal 1/3 yellow, VI light brown with extreme base yellow, VII–VIII light brown (Fig. 15); fore wing shaded light brown medially (Fig. 13).

Head approximately 1.1 times as long as wide, cheeks straight with prominent pair of setae; dorsal surface with transverse sculpture behind eyes, vertex with no sculpture between eyes (Fig. 1). Eyes approximately 2/5 of head length; ocelli well developed; postocellar setae slightly longer than an ocellus; postocular setae with capitate apex, subequal to eyes in length. Antennal segments III and IV with 3 and 4 sense cones respectively, VIII constricted to basal neck. Maxillary stylets retracted anterior to postocular setae, close together medially on posterior third of head.

Pronotum dorsal surface almost smooth with weakly sculptured posteriorly; notopleural sutures complete; 5 pairs of major setae well developed and capitate. Mesonotum with lateral setae well developed and capitate, and three pairs of short setae arising anterior to posterior margin. Metanotum with polygonal reticulation, median setae long and pointed, rather wide apart from each other (Fig. 3). Fore wing with 8–10 duplicated cilia; sub-basal S1 and S2 setae capitate, S3 longest and blunt at apex. Fore tarsus with a small tooth (Fig. 2).

Pelta hat-shaped with irregular reticulation medially, a pair of campaniform sensilla present (Fig. 4); abdominal tergites II–VII each with 2 pairs of sigmoid wing-retaining setae, posterior pair of wing-retaining setae on tergite II with apex uncinate; tergite IX setae S1 slightly longer than S2, but all shorter than tube, both blunt apically; intermediate setae (iS) pointed, approximately 0.6 times as long as S1; tube length approximately 2.3 times basal width, 0.7 times as long as head; anal setae slightly shorter than tube.

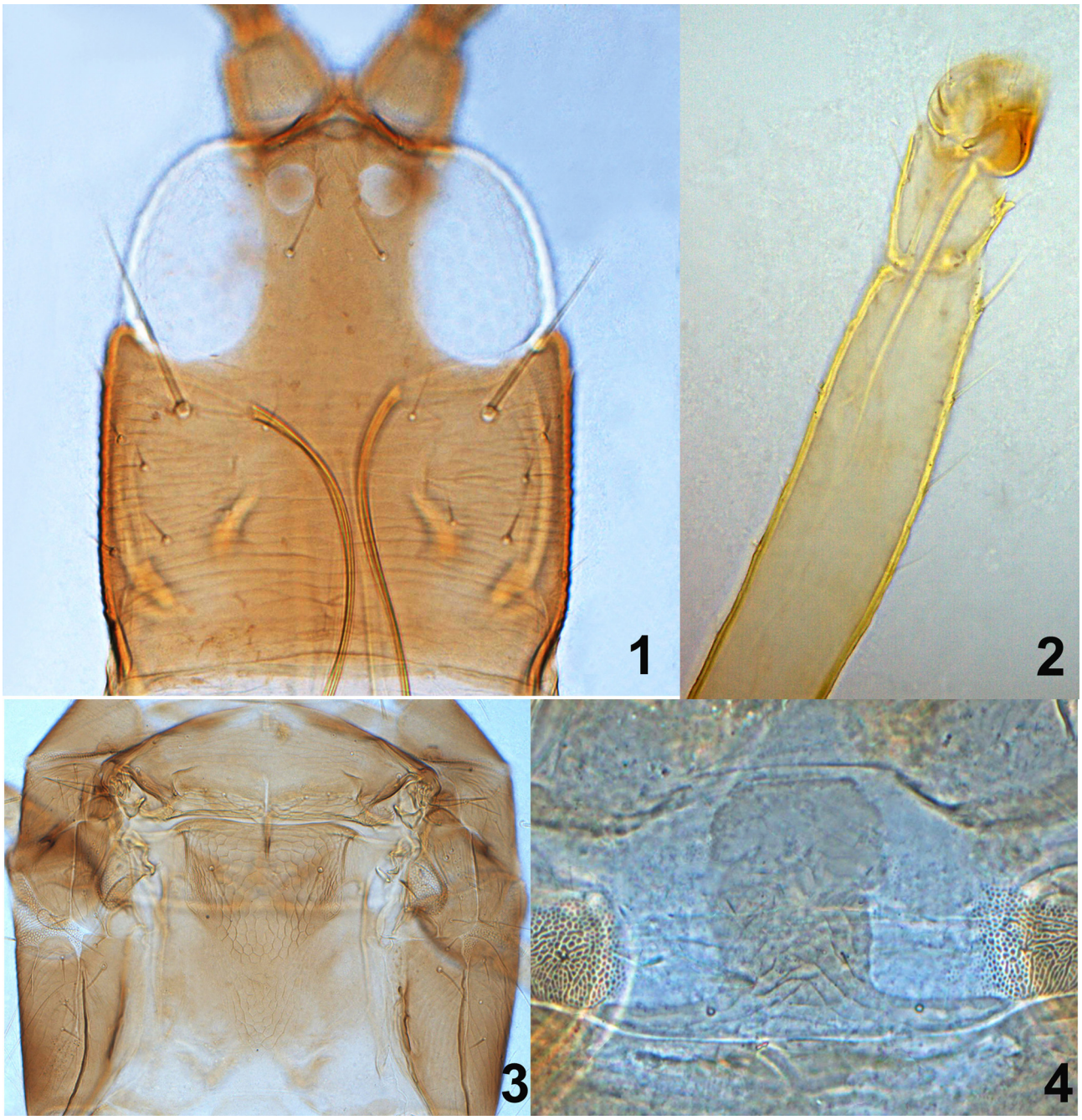
Measurements (holotype female in microns). Distended body length 2420. Head length 255, width 230; eyes length 95; postocular setae length 90; diameter of anterior (posterior) ocelli 23; postocellar setae length 19. Antennae length 530, segments I–VIII length (width) as follows: 45 (42); 56 (32); 90 (33); 85 (32); 80 (29); 69 (25); 59 (20); 45 (12). Pronotum median length 125, width across median part 290; length of major setae: am 50, aa 55, ml 65, pa 70, epim 90. Mesonotum lateral setae 40. Fore wing length 950, subbasal setae S1–S3 length: 60, 65, 80. Metanotum median setae 65. Abdominal tergite IX S1 length 132, iS length 84, S2 length 112. Tube length 185, width at base 85, at apex 50; anal setae length 180.

Male macroptera. Very similar to female, but smaller and more slender. Fore tarsus with a small tooth; tergite IX setae S2 approximately 1/3 length of S1, iS approximately 0.7 times as long as S1.

Measurements (paratype male in microns). Distended body length 1780.Head length 225, width 205; eyes length 85; postocular setae length 83; diameter of anterior (posterior) ocelli 16; postocellar setae length 15. Antennae length 495, segments I–VIII length (width) as follows: 35 (42); 47 (30); 77 (29); 81 (26); 82 (24); 74 (20); 54 (19); 44 (11). Pronotum median length 110, width across median part 256; length of major setae: am 41, aa 53, ml 64, pa 66, epim 69. Mesonotum lateral setae 24. Fore wing length 780, subbasal setae S1–S3 length: 47, 53, 59. Metanotum median setae 42. Abdominal tergite IX S1length 118, iS length 86, S2 length 32. Tube length 155, width at base 80, at apex 40; anal setae length 170.

Material examined. Holotype female, **CHINA, Yunnan:** Pu'er City, Lancang County, Nuozhadu Nature Reseve (22°30'N, 100°34'E, alt. 1840m), from leaf litter of *Tectona grandis*, 5.xi.2016, Chao Zhao.

Paratypes. 1 female, collected with holotype. **CHINA, Yunnan:** 2 females and 1 male, Xishuangbanna, Menglun, Tropical Botanical Garden (21°55'N, 101°16'E), from leaf litter, 8.iv.1987, Xiaoli Tong; 1 female, Pu'er City, Lancang County (22°30'N, 100°21'E, alt. 1070m), from leaf litter, 28.x.2016, Chao Zhao.

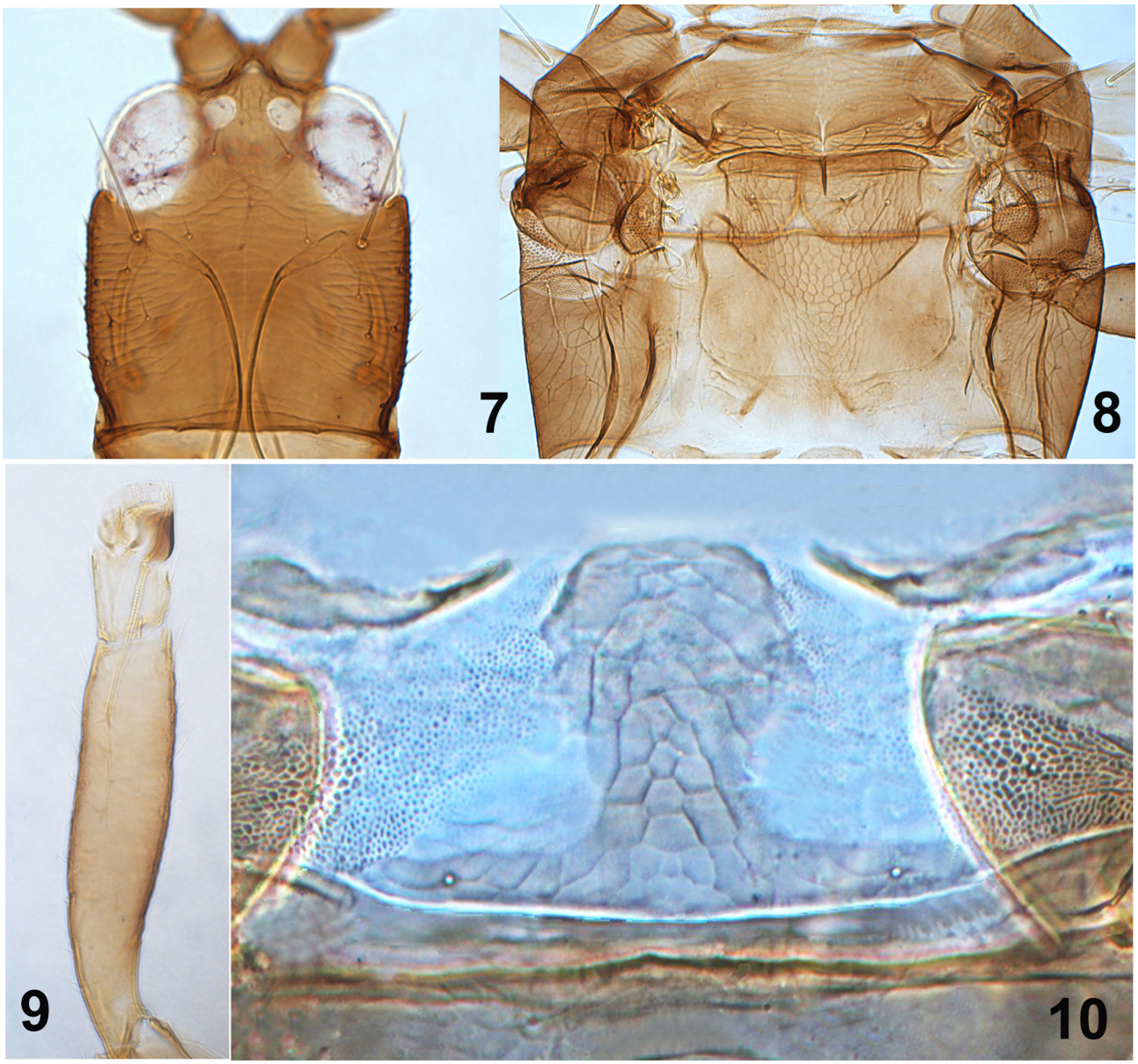


FIGURES 1–4. *Apelaunothrips dentiellus* **sp. n. (1)** head; **(2)** fore tibia and tarsus; **(3)** meso- & metanotum; **(4)** pelta.

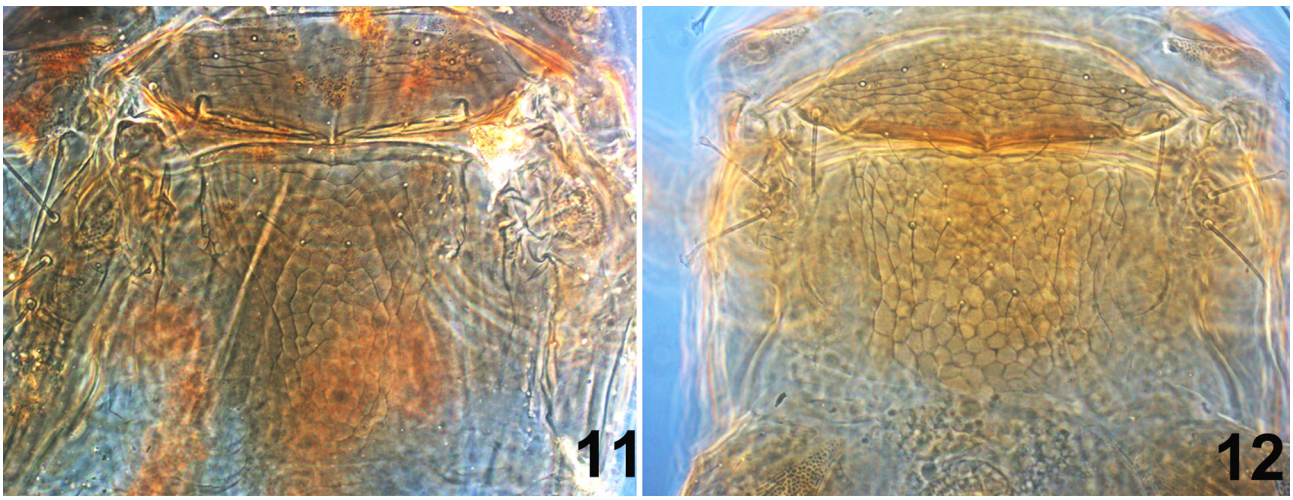
Etymology. The specific epithet, *dentiellus*, is from the Latin adjective, meaning "small tooth", in reference to the fore tarsus with a small tooth in both sexes.

Distribution. China (Yunnan).

Comments. This new species appears to be closely related to *Apelaunothrips maculipennis* in coloration and structure. However, it differs from the latter mainly by the following characteristics: (1) fore wing without small speckles on apical third (Fig. 13), while *maculipennis* has some small speckles on fore wing (Fig. 14); (2) all tibiae and tarsi yellow (Figs 18, 19), while those in *maculipennis* are brown (Figs 22, 23); (3) fore tarsus armed with a small tooth in both sexes (Fig. 2), while the fore tarsus has no tooth in *maculipennis* (Fig. 9); (4) pelta hat-shaped (Fig. 4), but it is eroded laterally in *maculipennis* (Fig. 10).



FIGURES 7–10. *Apelaunothrips maculipennis* (Okajima): **(7)** head; **(8)** meso- and metanotum; **(9)** fore tibia and tarsus; **(10)** pelta.



FIGURES 11–12. Meso- and metanotum: **(11)** *A. indicus*; **(12)** *A. lieni*.

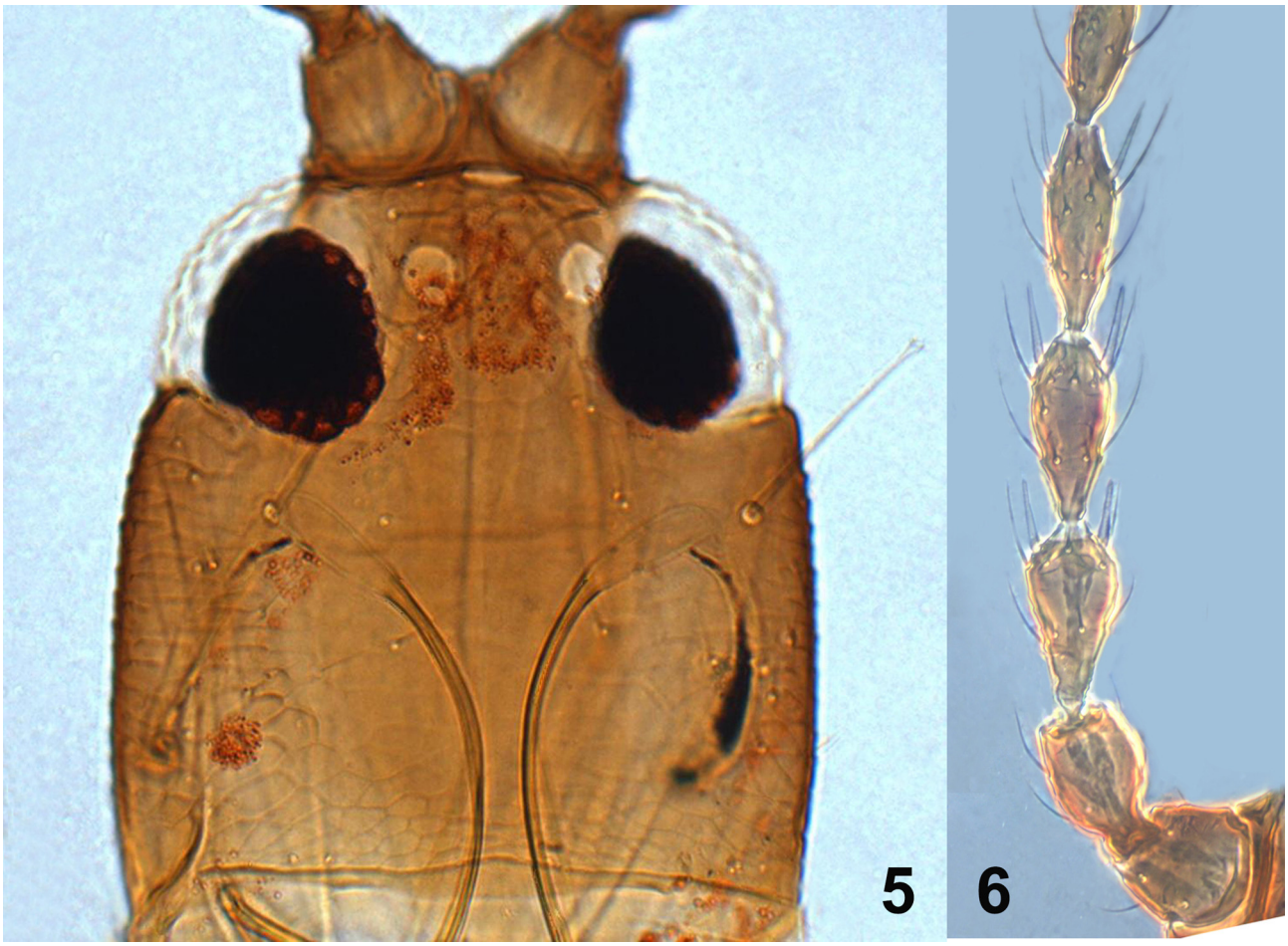
***Apelaunothrips indicus* (Ananthakrishnan, 1968)**
(Figs 5, 6, 11, 16, 20, 21)

Philothrips indicus Ananthakrishnan, 1968: 125.
Apelaunothrips indicus (Ananthakrishnan): Mound, 1974: 17.

Material examined. CHINA, Guangdong: 1 female and 2 males, Guangzhou City, Arboretum of South China Agricultural University (23°09'N, 113°21'E), from leaf litter, 18.vii.2004, Jun Wang; 1 female and 4 males, the same locality, 13.viii.2004, Jun Wang; 1 male, the same locality, 1.vii.2014, Chao Zhao.

Distribution: India, China (Guangdong).

Comments. Described in the genus *Philothrips* from southern India (Ananthakrishnan 1968), this species was transferred to *Apelaunothrips* by Mound (1974). The 9 specimens (including 7 males) listed above are here identified from the original description (Ananthakrishnan 1968). This species is very similar to *A. lieni* Okajima from Taiwan (Okajima 1979) in sharing the coloration and the antennal segments III and IV each having 2 sense cones (Figs 6, 16). However, the numbers of setae on the metanotum could be easily separated from each other (Figs 11–12). It is worth mentioning here, there are 12–14 setae (Fig. 12) on the metanotum of *A. lieni* after examining Taiwanese specimens of *lieni* (female and male) provided by Okajima, therefore, at couplet 15 of the key to the world species of *Apelaunothrips* by Okajima (1979), the word "mesonotum" of *lieni* and *indicus* is obviously a misspelling of "metanotum" (see also Okajima 1979 on page 50).



FIGURES 5–6. *Apelaunothrips indicus* (Ananthakrishnan): **(5)** head; **(6)** antenna.

***Apelaunothrips maculipennis* (Okajima, 1976)**
(Figs 7–10, 14, 17, 22, 23)

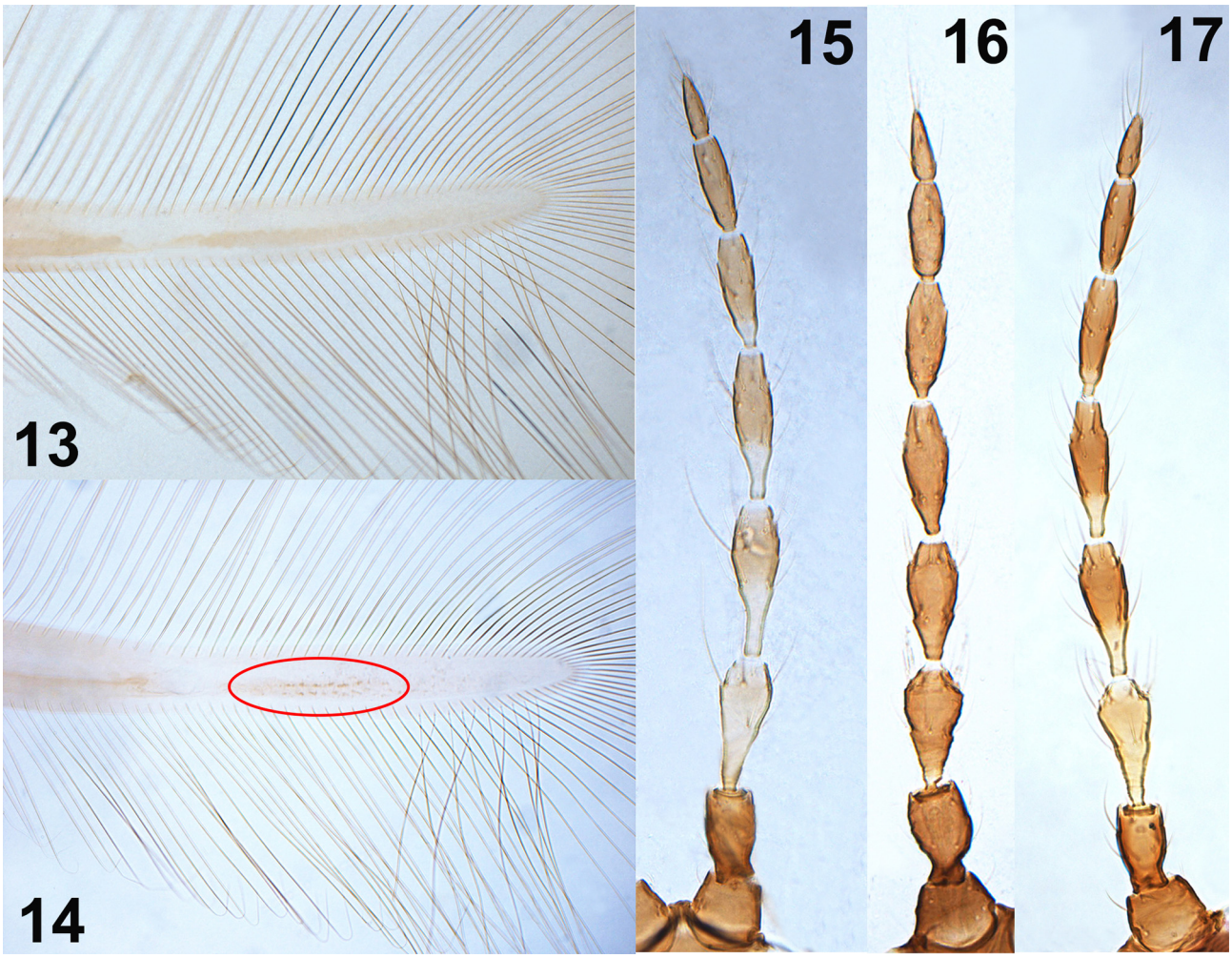
Stigmothrips maculipennis Okajima, 1976, 125.

Apelaunothrips maculipennis (Okajima): Okajima, 1979: 53.

Material examined. **CHINA, Hainan**: 2 females and 2 males, Wuzhishan National Nature Reserve (18°54'N, 109°40'E), from leaf litter, 7.xii.2008, Jun Wang; 11 females and 11males, Baisha County, Yinggeling National Nature Reserve, Yinggezui Protection Station (19°02'N, 109°33'E), from leaf litter, 29.iv.2011, Tao Song.

Distribution: Japan, China (Hainan).

Comments. Originally described from Ryukyu Islands, Japan, the specimens listed above from Hainan Island, China are here identified from original description (Okajima 1976, 1979). This species appears to be most similar in appearance to *A. dentiellus* **sp. n.**, but they can be readily distinguished from each other by the above comments of the new species.



FIGURES 13–17. **(13)** fore wing of *A. dentiellus* **sp. n.**; **(14)** fore wing of *A. maculipennis* (circle indicates small speckles). Antenna: **(15)** *A. dentiellus* **sp. n.**; **(16)** *A. indicus*; **(17)** *A. maculipennis*.

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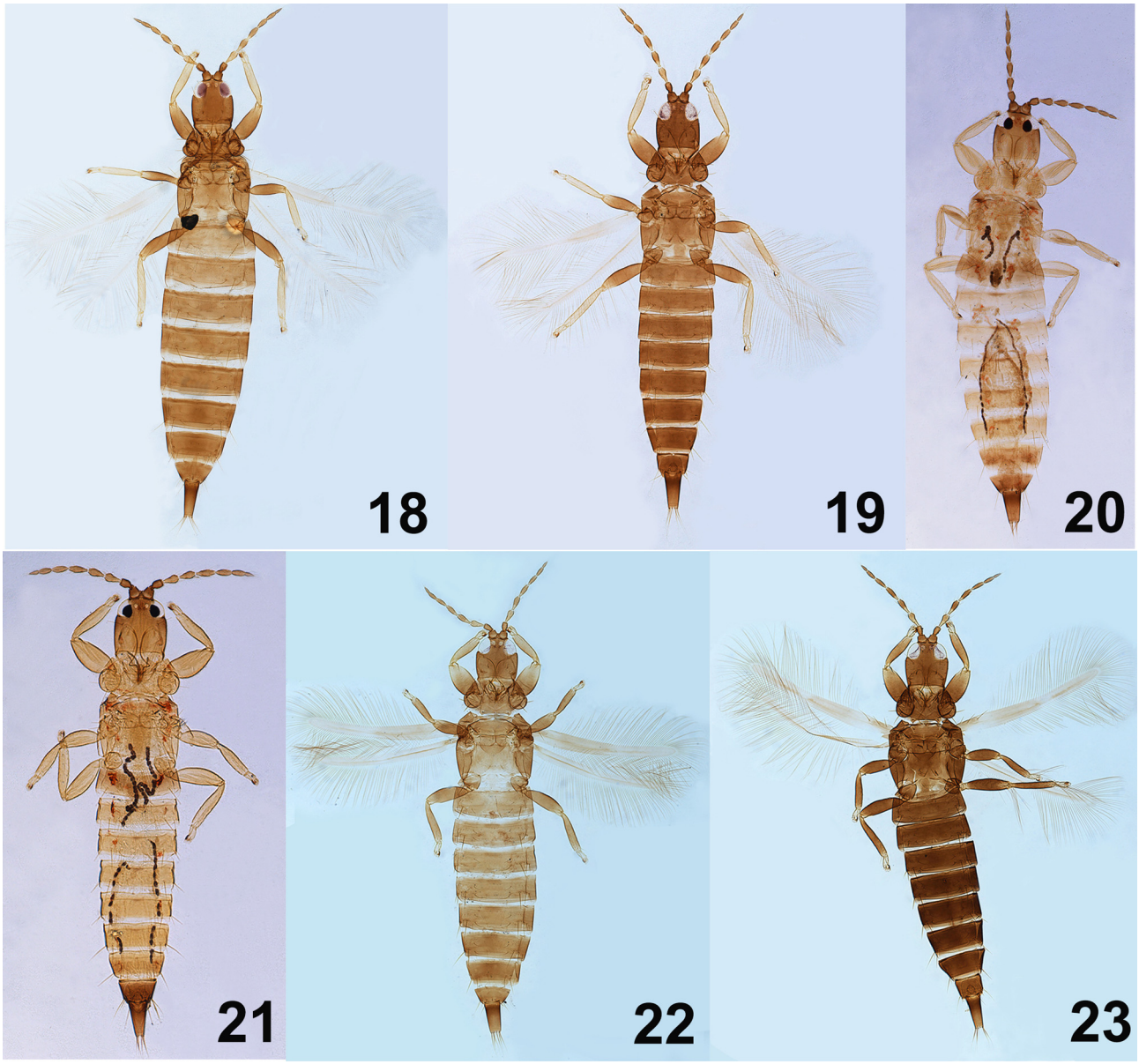

FIGURES 18–23. *Apelaunothrips* species. **(18)** *A. dentiellus* **sp. n.** (female); **(19)** *A. dentiellus* **sp. n.** (male); **(20)** *A. indicus* (female); **(21)** *A. indicus* (male); **(22)** *A. maculipennis* (female); **(23)** *A. maculipennis* (male).

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