

Review of the Panchaethripinae (Thysanoptera: Thripidae) of China, with two new species descriptions

Majid Mirab-balou, Zhaohong Wang, Xiaoli Tong¹

Abstract—The paper provides a review of the subfamily Panchaethripinae (Thysanoptera: Thripidae) in China, including descriptions of two new species: *Helionoethrips rugatus* Mirab-balou and Tong **new species** and *Panchaethrips bifurcus* Mirab-balou and Tong **new species**. *Rhipiphoroethrips concoloratus* Zhang and Tong, originally described in Chinese, is re-described based on type specimens. Identification keys to 13 genera and 32 species of Chinese panchaethripine are presented.

Introduction

The subfamily Panchaethripinae (Thysanoptera: Thripidae) is one of the four subfamilies recognised in the family Thripidae (Wilson 1975). Panchaethripines can be distinguished from other Thripidae by the following characters (Kudô 1992a; Mound and Marullo 1996): body surface having strong reticulate sculpture; antennomeres III and VI vasiform or globular; first vein of forewing more or less fused to costa; mesothoracic and metathoracic furcae transverse and lacking a median spinula. Worldwide, Panchaethripinae includes 141 species in 39 genera and three fossils, with more than 50% of the genera are monospecific (ThripsWiki 2016). Wilson (1975) gave a full taxonomic account of the species and genera, and Mound *et al.* (2001) provided a phylogenetic analysis based on morphological characters. Identification keys are now available for the identification of the genera of Panchaethripinae in the following parts of the world: Asia (Kudô 1979, 1992a, 1992b, 1992c, 1995; Chen 1980, 1981; Reyes 1994; Han 1997; Zhang *et al.* 1999; Mirab-balou and Chen 2012); Europe and the Mediterranean (zur Strassen 2003); Central and South America (Mound and Marullo 1996). In addition, Mound and Gillespie (1997) provided identification details for the species of the

seven panchaethripine genera found most often in Australia; and Moritz *et al.* (2001) provided a digital information and identification system on pest thrips worldwide that included details of 16 panchaethripine genera.

The members of this subfamily are all leaf feeders. Many of the most common panchaethripine species are associated with older, senescing leaves (Fig. 1), not with young, apical leaves. Despite this, some species such as members of *Caliothrips* Daniel can be pests on crop seedlings, whereas others are usually found only on grasses (Mound and Marullo 1996), and some of them are related to aquatic plants. Among Chinese panchaethripine, red-banded thrips, *Selenoethrips rubrocinctus* (Giard), are widely distributed. This species has been recorded as a pest that damages plants (Fig. 1) in Zhejiang province (Mirab-balou *et al.* 2014) and is also reported as pest on mango trees (*Mangifera indica* Linnaeus; Anacardiaceae) (Reitz *et al.* 2011).

The objective of this paper is to review the genera of Panchaethripinae in China and establish diagnostic characters by which Chinese taxa assigned to the subfamily Panchaethripinae can be recognised, particularly because published records are in the Chinese language, which is not accessible to international experts. In addition, two new species of the subfamily are described and illustrated.

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Material and methods

Examined specimens were mounted with Canada balsam. Slide-mounted specimens were examined and photographed under the microscope with a digital camera attached. All

measurements are in micrometres. The type and examined specimens are deposited in the Insect Collection of Department of Entomology, South China Agricultural University, Guangzhou, China (SCAU) unless otherwise stated.

Key to genera of Panchaethripinae from China

1. Forewings with straight cilia on the posterior margin (Fig. 18) 2
 – Forewings with wavy cilia on the posterior margin (Fig. 17) 4
 2. Antennae with seven antennomeres, antennomeres III and IV with simple sense cones; forewings without a fringe of cilia on the anterior margin (Fig. 18) *Phibalothrips* Hood
 – Antennae with eight antennomeres (Figs. 28–31), antennomeres III and IV with simple or forked sense cones; forewings with or without a fringe of cilia on the anterior margin (as in Fig. 19) 3
 3. Head with regular polygonal reticulation (Fig. 5), forewings usually with a fringe of cilia on the anterior margin (Fig. 19) *Heliothrips* Haliday
 – Head with irregular reticulation (Fig. 7), forewings without a fringe of cilia on the anterior margin *Rhipiphorotherips* Morgan
 4. Tarsi with two tarsomeres (as in Fig. 26) 5
 – Tarsi with one tarsomere (as in Fig. 27) 7
 5. Head and thorax with expanded, lanceolate setae; abdominal segment II constricted and waist-like; tergite II with strong microtrichia, tubercles, or anastomosing processes *Copidothrips* Hood
 – Head and thorax with normal setae; abdominal segment II not constricted and waist-like (as in Fig. 24); tergite II without specialised cuticular processes 6
 6. Abdominal segment X tube-like (Fig. 11); pronotum with small, inconspicuous, long setae; head covered with strong sculpture, usually reticulate (Fig. 8) *Panchaethrips* Bagnall
 – Abdominal segment X as long as other segment (as in Fig. 12); pronotum with a conspicuous, long setae at each angle; head fairly smooth except for broad, reticulate area behind postocular setae *Monilotherips* Moulton
 7. Abdominal tergite II with lateral median areas bearing specialised cuticular process (as in Fig. 23); abdominal segment II constricted and waist-like (as in Fig. 23) 8
 – Abdominal tergite II without specialised cuticular processes (as in Fig. 24); abdominal segment II not waist-like (as in Fig. 24) 11
 8. Abdominal tergite X with a pair of strong, apically expanded setae *Elixothrips* Stannard and Mitri
 – Abdominal tergite X with pointed setae 9
 9. Pronotum with three pairs of extremely long setae on posterior margin; with a similar seta on each anterior angle *Zaniothrips* Bhatti
 – Pronotum with short, inconspicuous setae 10
 10. Abdominal segments III–VII each with dorsal and ventral paired clusters of round areolae (Fig. 35); forewing with veinal microtrichia stouter and often slightly longer than interveinal microtrichia
 *Anisopilotherips* Stannard and Mitri
 – Abdominal segments lacking clusters of specialised areolae; forewing with veinal microtrichia weaker and shorter than interveinal microtrichia; head and pronotum with elaborate, raised sculpturing *Astrotherips* Karny
 11. Head with a strong, thick, transverse occipital ridge (Figs. 2–4); abdominal tergites with anterior ridge boldly crenulate *Helionotherips* Bagnall
 – Head lacking a transverse occipital ridge (as in Fig. 6); abdominal tergites without boldly crenulate, anterior ridge 12
 12. Head constricted posteriorly (Fig. 6); pronotum with transverse straight sculpture (Fig. 15); abdominal tergite X undivided *Selenothrips* Karny
 – Head without constriction posteriorly; pronotal sculptured reticles with internal markings; abdominal tergite X partially divided *Caliotherips* Daniel
-

Anisoplothrips Stannard and Mitri

The only species in this genus, *A. venustus* (Priesner), is distributed in tropic and subtropical regions; and is also recorded from China. This monotypic genus is unique in having the veinal microtrichia larger than the interveinal microtrichia and is also easily recognised by having paired clusters of round areolae on abdominal segments III–VII (Fig. 35).

Astrothrips Karny

This genus was reviewed by Stannard and Mitri (1962) and Bhatti (1968a), and a key to the species was provided by Wilson (1975). There are 12 species listed in this genus, of which three are recorded from China (Mirab-balou *et al.* 2011): *Astrothrips aucubae*, *A. chisinliaoensis*, and *A. strasseni*.

Key to *Astrothrips* species from China

1. Antennae with eight antennomeres, male with U-shape pore plate on abdominal sternites IV–VII *A. strasseni* Kudó
 - Antennae with seven antennomeres (antennomere VI closely fused with antennomere VII but with a distinct suture in *A. aucubae*) 2
 2. Antennomeres I–V yellow, male with U-shape pore plate on abdominal sternites VI–VII. *A. chisinliaoensis* Chen
 - Antennomeres yellowish brown, antennomeres I and II darker than other antennomeres; male with U-shape pore plate on abdominal sternites III–VII (Fig. 42). *A. aucubae* Kurosawa
-

Caliothrips Daniel

This worldwide genus currently includes 23 species. The members of this genus are identified by presence of wrinkled or dot-shaped markings within their reticulate sculpture; head is not constricted into a neck-like region; antennae with eight antennomeres; forewings usually with dark and light bands, and the first vein with a wide interval in the setal row; metathoracic furca similar to *Selenothrips*. In China, three species

have been recorded from this genus (Zhang 1980; Han 1997; Huang *et al.* 2011). However, Mound *et al.* (2011) confirmed that *Caliothrips fasciatus*, previously recorded from China, is misidentification of *Caliothrips tongi* Mound, Zhang, and Bei. Huang *et al.* (2011) reported *Caliothrips insularis* (Hood) from China, but judging from the description and diagnostic features provided in their paper, we consider this as a misidentification of *Caliothrips tongi*.

Key to *Caliothrips* species from China

1. Sculpture restricted to lateral thirds of abdominal tergites III–VII, inter surface with reticles bearing numerous wrinkles; male with long, transverse, arcuate pore plates on abdominal segments III–VII. *C. indicus* (Bagnall)
 - Sculpture completely transverse the anterior third of abdominal tergites III–VII; forewing dark with two pale areas; sub-basal pale area short, apical dark area shorter than distal pale area (Fig. 46); male with slender transverse pore plate on abdominal segments III–VII *C. tongi* Mound, Zhang, and Bei
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Copidothrips Hood

Copidothrips is a monobasic genus with the type species *C. octarticulatus* (Schmutz). This genus is similar to *Noathrips* but it differs in the number of tarsomeres and shape of sense cones on

antennomeres III and IV. *Copidothrips octarticulatus* (Schmutz) is distributed widely in the southern China (Jiangxi, Hunan, Guangxi, and Guangdong) and is associated with a wide range of unrelated plants, such as *Liquidambar formosana* Hance (Hamamelidaceae), *Perilla frutescens* (Linnaeus)

Britton (Lamiaceae), *Wedelia chinensis* (Osbeck) Merrill (Asteraceae), *Eurya groffii* Merrill (Pentaphragaceae), and Poaceae grasses.

***Elixothrips* Stannard and Mitri**

This monotypic genus is unique in having the pair of setae on abdominal tergite X apically expanded. One species, *E. brevisetis* (Bagnall), was reported Guangdong, China (Han 1997).

***Helionothrips* Bagnall**

Helionothrips is the largest genus among Panchaetothripinae with 27 species in the world (ThripsWiki 2016). During recent surveys on thrips

fauna in China, 13 species of the genus (including a new species) have been recorded from China, and this genus has a wide geographical range in China from southwestern China through southern to eastern China. *Helionothrips* species are leaf feeders and one species that has been reported to be of economic significance was *H. kadaliphilus* (Ramakrishna and Margabandhu), which is an occasional pest on banana (*Musa* Linnaeus; Musaceae) (Ramakrishna and Margabandhu 1939). Below we present an updated key for Chinese species of *Helionothrips* based on the relevant identification keys (Faure 1961; Bhatti 1968b; Wilson 1975; Chen 1981; Kudô 1992b; Zhang and Tong 1993; Feng *et al.* 2007).

Key to *Helionothrips* species from China

1. Abdominal tergite VIII with complete comb on posterior margin 2
 - Abdominal tergite VIII with comb on posterior margin interrupted medially 3
 2. Metascutum triangle with posterior margin extending over metascutellum (Fig. 36); male lacking pore plate on abdominal sternites. *H. annosus* Wang
 - Metascutum triangle with posterior margin not extending over metascutellum (as in Fig. 37); male with pore plate on sternites VII–VIII *H. errans* (Williams)
 3. Both antennomeres I and II brown, II as dark as antennomere VI (Fig. 28). 4
 - Antennomere I yellow; antennomere II yellow or brown 8
 4. Forked sensory cone on antennomere IV reaching apex of antennomere VI (rarely VIII); male with pore plate on sternite VIII *H. brunneipennis* (Bagnall)
 - Forked sensory cone on antennomere IV not reaching apex of antennomere V. 5
 5. Pronotum with wrinkles in reticles; head with or without wrinkles in reticles 6
 - Head and pronotum without wrinkles in reticles; male without pore plate on abdominal sternites
. *H. unitatis* Chen
 6. Apical half of forewing white, male with pore plate on sternites VII–VIII *H. parvus* Bhatti
 - Apical half of forewing brown, male (if known) without pore plate 7
 7. Head and pronotum with wrinkles in reticles; male without pore plate on abdominal sternites
. *H. cephalicus* Hood
 - Head and anterior half of pronotum without wrinkles in reticles; male unknown *H. ponkikiri* Kudô
 8. Antennomeres I and II yellow (Figs. 29, 30), sometimes yellowish brown, never as dark as VI; male with variable pore plate on abdominal sternites VI–VIII 9
 - Antennomere I yellow, II brown (Fig. 31); male with pore plate on abdominal sternites VII–VIII (Figs. 43–44)
. 12
 9. Head and pronotum with wrinkles in reticles; male with small pore plates on sternites VII–VIII.
. *H. communis* Wang
 - Head and pronotum without wrinkles in reticles; male pore plates on sternites VI–VIII, VII–VIII, or only on VIII. 10
 10. Head yellow anterior to fore ocellus and between antennal bases, male with pore plate on abdominal sternite VIII *H. lindera* Kudô
 - Head entirely dark brown; male with pore plate on abdominal sternites VI–VIII or VII–VIII 11
-

11. Mesotibia and metatibiae yellow at extreme apex and base; male with pore plate on abdominal sternites VII–VIII; anterior, stout setae on tergite IX of males closely situated at base *H. aino* (Ishida)
- Mesotibia and metatibia yellow only at extreme apex; male with pore plate on abdominal sternites VI–VIII; anterior, stout setae on tergite IX of males widely separated at base *H. mube* Kudô
12. Head and pronotum with wrinkles in reticles (Fig. 2); abdominal segment IX longer than other segments, at least twice as long as segment VIII (Fig. 12) *H. rugatus* new species
- Head and pronotum without wrinkles in reticles (Figs. 4, 13); abdominal segment IX as long as segment VIII *H. shennongjiaensis* Feng, Yang, and Zhang

Helionothrips annosus Wang

Figures 14, 22, 29, 36.

Helionothrips annosus is easily distinguished from other *Helionothrips* by the metascutum triangle with posterior margin extending over metascutellum (Fig. 36). The specimens listed here were identified using the original description (Wang 1993). This species is widely distributed in southern

Fig. 1. *Viburnum odoratissimum* Ker Gawler (Adoxaceae) damaged by *Selenothrips rubrocinctus* (Huajiachi Campus at Zhejiang University, Hangzhou, China, 20.ix.2011).



China (Guangxi and Guangdong) and is mainly associated with older leaves of Lauraceae, for example, *Cinnamomum camphora* (Linnaeus) Presl and *C. burmannii* (Nees and Nees) Blume.

Material examined (in SCAU). **CHINA, Guangdong Province:** 6♀1♂, Arboretum (23°09'N, 113°21'E), South China Agricultural University, Guangzhou, from *Cinnamomum burmannii* (Nees and Nees) Blume (Lauraceae), 20.viii.2011, Song Tao; 1♀, Hailing Island (21°35'N, 111°50'E), Yangjiang City, from *Cinnamomum camphora* (Linnaeus) Presl, 17.iv.1976, Zhang Wei-qiu; 1♀, Shenzhen (22°34'N, 114°01'E), host plant unknown, 26.vi.1983, Wang Ye'an; 1♀8♂, Wushan (23°09'N, 113°20'E), Shipai, Guangzhou, from *Cinnamomum camphora*, 23.xii.1976, Zhang Wei-qiu; 2♀1♂, Wushan (23°09'N, 113°20'E), Shipai, from *C. camphora*, 17.xii.1976, Zhang Wei-qiu; 1♀, Wushan, Shipai, from *C. camphora*, 10.xi.1976, Zhang Wei-qiu; 2♀, Wushan, Shipai, from *C. camphora*, 14.xi.1976, Zhang Wei-qiu; 2♀, Wushan, Shipai, from *C. camphora*, 17.x.1976, Zhang Wei-qiu; 7♀1♂, Luofushan (31°35'N, 104°20'E), Huizhou City, from *Eucalyptus tereticornis* Smith (Myrtaceae), 7.xii.1976, Zhang Wei-qiu; 7♀2♂, Luofushan, Huizhou, from *C. camphora*, 14.xi.1976, Zhang Wei-qiu. **Guangxi Province:** 3♀1♂, Longzhou (22°20'N, 106°51'E), Chongzuo, from Lauraceae, 1.viii.1985, Zhang Wei-qiu; 8♀3♂, Longzhou (22°20'N, 106°51'E), Chongzuo, from Fagaceae, 27.vii.1985, Zhang Wei-qiu; 1♀, Longzhou (22°20'N, 106°51'E), Chongzuo, from *Yulania denudata* (Desrousseaux) Fu (Magnoliaceae), 28.vii.1985, Zhang Wei-qiu; 2♀, Nanning (22°48'N, 108°22'E), from *Pelargonium hortorum* Bailey (Geraniaceae), 3.viii.1985, Zhang Wei-qiu; 1♀, Nanning (22°48'N, 108°22'E), from *Jasminum sambac* (Linnaeus) Aiton (Oleaceae), 5.viii.1985, Zhang Wei-qiu.

***Helionothrips rugatus* Mirab-balou and Tong, new species**

Figures 2, 12, 21, 34, 37, 43, 45.

Material examined. Holotype (female, in SCAU), **CHINA, Guangdong Province:** Longdong (23° 14'N, 113°23'E), Guangzhou, from Poaceae, 9. v.2012, M. Mirab-balou. Paratypes (in SCAU): 6♀3♂ paratypes (in SCAU), same data as holotype; 7♀ paratypes (in SCAU), Dinghushan National Nature Reserve (23°10'N, 112°32'E), Zhaoqing, from Poaceae, 23.i.1978, Zhang Wei-qiu; 3♀ paratypes (in SCAU), **Yunnan Province:** Xishuangbannan Tropical Botanical Garden (21°55'N, 101°16'E), Menglun, from weeds, 17.iv.1987, Zhang Wei-qiu; 2♀ paratypes (in SCAU), **Guangxi Province:** Longzhou (22°20'N, 106°51'E), Chongzuo, from Poaceae, 30.vii.1987, Zhang Wei-qiu.

Description. Female macropterous. Body brown to dark brown; abdominal segments II–VII darkest; head yellow at anterior margin; prothoracic leg pale yellow (Fig. 34); mesofemora brown, paler basally; metafemora brown; mesotibiae brown, pale yellow in apical half and basally; metatibiae brown in basal half, remainder pale yellow; tarsi yellow; antennomere I, III–V yellow, other antennomeres brown; forewing colour as in *H. shennongjiaensis* but darker at apex (Fig. 21). **Head.** Head wider than long; transversely covered with sculpturing; eyes large, occupying over half the width of the head; three ocelli present; head sculptured strongly with wrinkles in reticles but posterior sculpture with some internal dots (Fig. 2). Antennae with eight antennomeres, antennomeres III and IV with short, forked sensory cones; forked sensory cone on IV reaching the apical half of V. Mouth cone short and rounded. Maxillary palps each with two palpo-meres. **Thorax.** Pronotum covered with polygonal reticles, with wrinkles in reticles (Fig. 2). Mesonotum with median setae in centre of sclerite, sculpture same as pronotum with wrinkles in reticles. Metanotum with reticulation same as pronotum and with wrinkles in reticles; median, metanotal setae situated far from anterior margin (Fig. 37). Forewing first vein with six to seven setae basally and two setae in distal half; second vein with six to seven setae; posterior margin with wavy fringe cilia (Fig. 21). Tarsi with one tarsomere (Fig. 34). **Abdomen.** Abdominal

tergites I and II strongly reticulate, other tergites with strong reticulation laterally, and with wrinkles in reticles; abdominal tergite VIII with interrupted comb medially, laterally with a few long microtrichial comb on posterior margin. Abdominal segment IX longer than other segments, at least, twice as long as X (Fig. 12). Abdominal tergite X with a complete dorsal split. Abdominal sternites completely reticulate; sternites II–VIII with three pairs of long centrally located setae, sternite VIII with more additional setae. Ovipositor long and well developed.

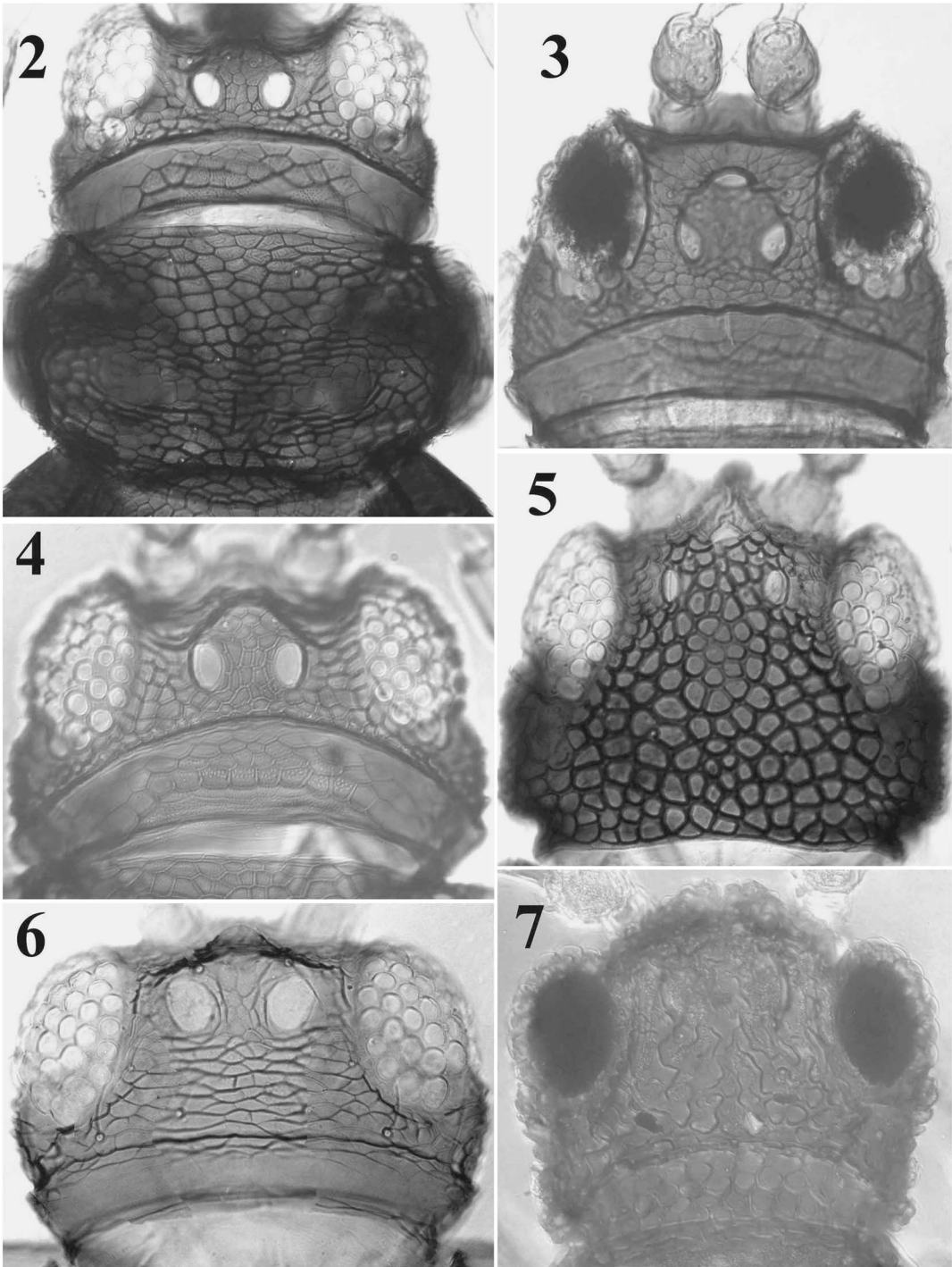
Measurements (holotype in microns). Distended body length 1300. Head length 105, width 190. Pronotum median length 139, median width 240. Forewing length 920. Abdominal segment VIII median length 109, width 250; segment IX median length 160, width 167; segment X median length 57, width 52. Antennomeres I–VIII length (width) as follows: 25 (25), 46 (30), 51 (20), 51 (22), 43 (18), 31 (17), 10 (7), and 14 (4).

Male. Distended body length 1100 microns. Similar to female but smaller; abdominal tergite IX with two pairs of thorn-like setae, their bases nearly contiguous, with four to five chitinous wartlets on posteromedian area (Fig. 45); sternites VII–VIII each with small, round pore plate (Fig. 43).

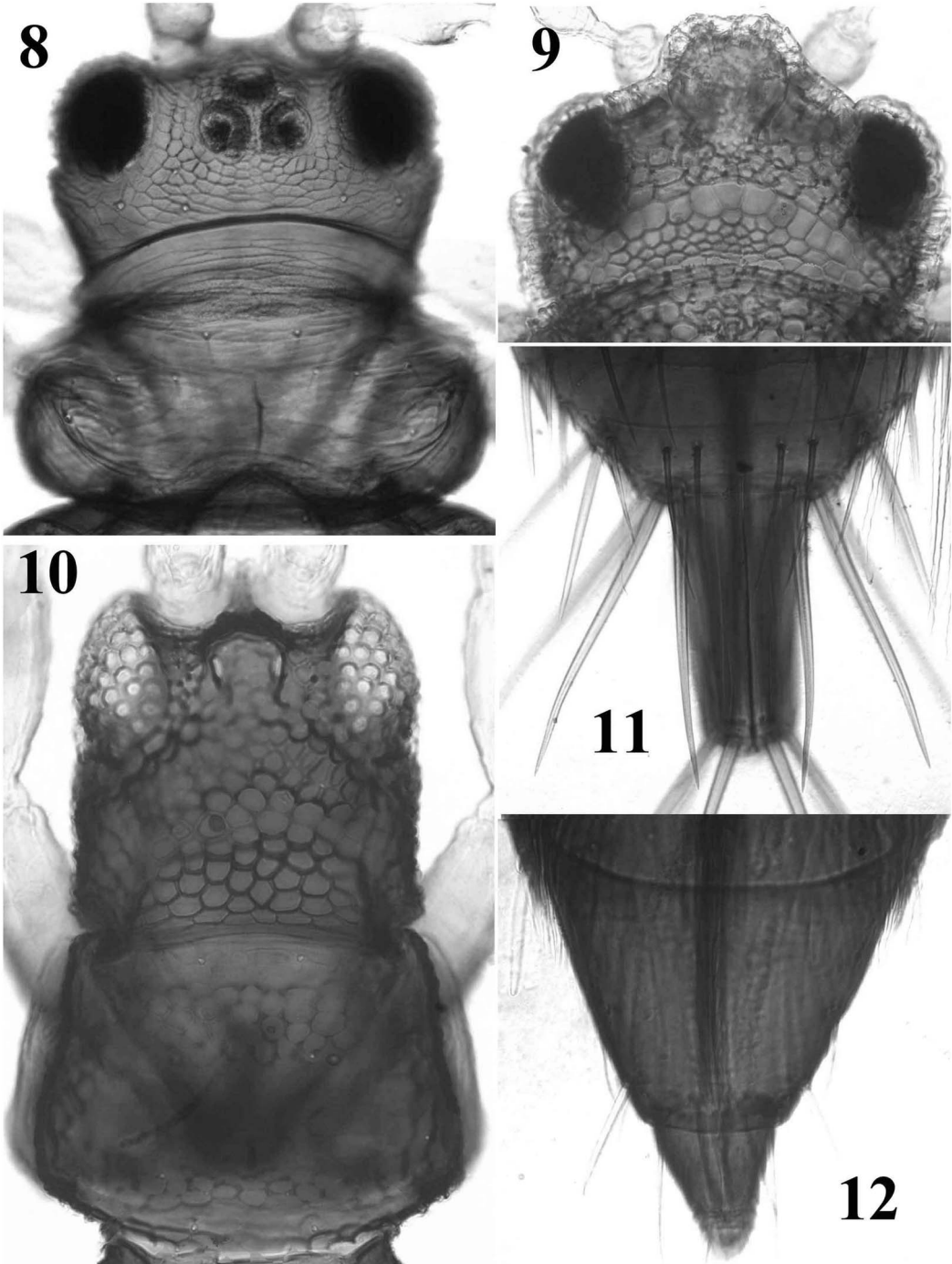
Etymology. Specific epithet from Latin “*rugatus*” which means wrinkle, and refers to the head, thorax, and lateral of abdominal tergites with wrinkles in reticles. This name is an adjective in the nominative singular.

Remarks. This new species is readily distinguished from *H. errans* (Williams) by antennomere I completely yellow (versus brown in *H. errans*); abdominal tergite VIII with interrupted comb medially (versus with complete comb in *H. errans*); head, thorax, and lateral of abdominal tergites with wrinkles in reticles (versus without wrinkles in *H. errans*). The yellow colour of antennomere I is unique in this species, however, *H. shennongjiaensis* has antennomere I yellowish brown but this new species can be distinguished from it by the presence of wrinkles in reticles on the body, the forked sensory cone on antennomere IV reaching half of V, abdominal tergite VIII with broad interrupted comb medially, and tergite IX twice as long as X. This new species is also easily distinguished from *H. communis* by

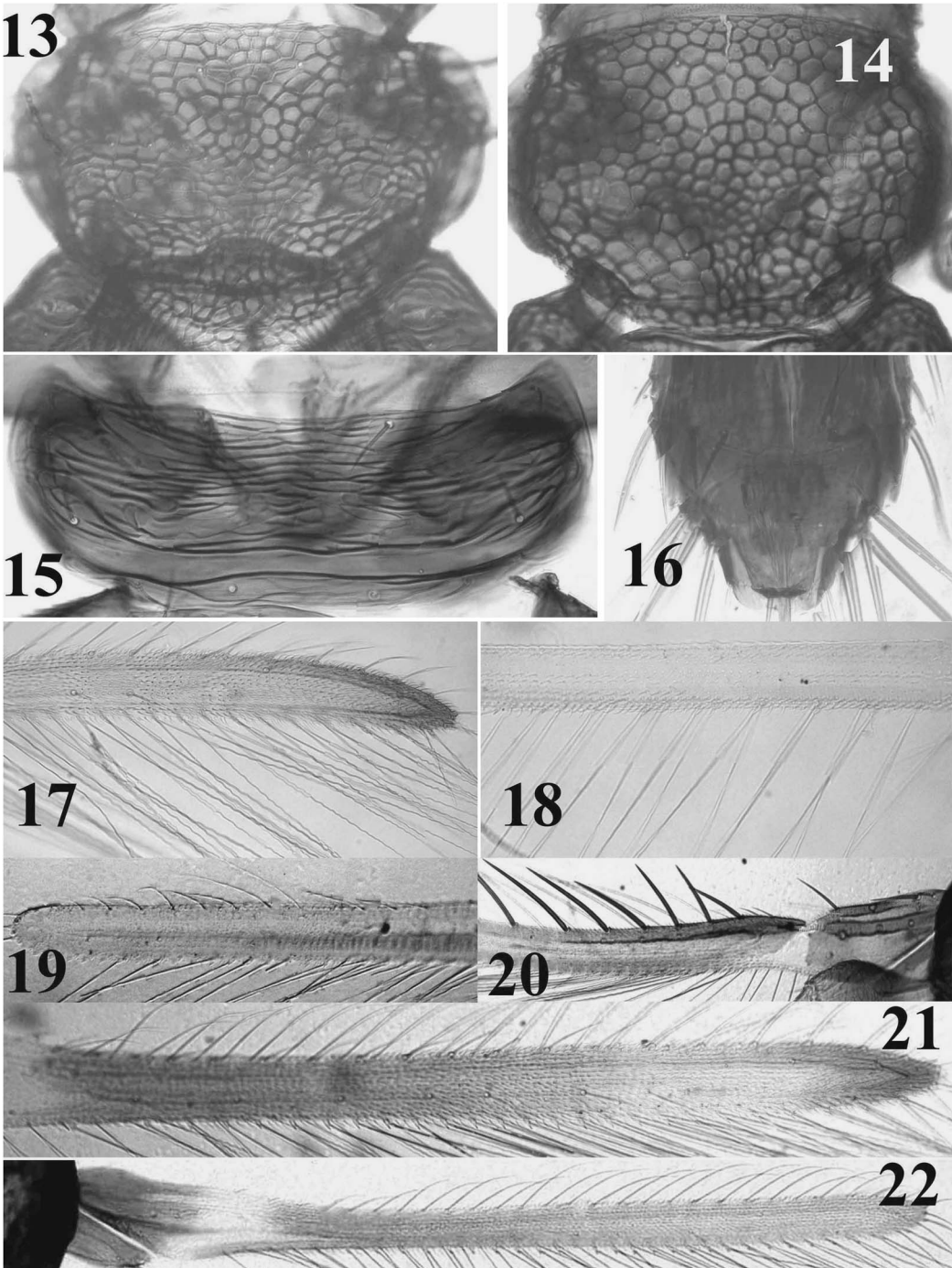
Figs. 2–7. Panchaethripine species from China. **2.** *Helionothrips rugatus*, head and pronotum. **3.** *Helionothrips parvus*, head. **4.** *Helionothrips shennongjiaensis*, head. **5.** *Heliothrips haemorrhoidalis*, head. **6.** *Selenothrips rubrocinctus*, head. **7.** *Rhipiphorothrips concoloratus*, head.



Figs. 8–12. Panchaetothripine species from China. **8.** *Panchaetothrips bifurcus*, head and pronotum. **9.** *Astrothrips aucubae*, head. **10.** *Phibalothrips peringueyi*, head and pronotum. **11.** *Panchaetothrips bifurcus*, abdominal segment X. **12.** *Helionothrips rugatus*, abdominal segments IX–X.



Figs. 13–22. Panchaethripine species from China. **13.** *Helionothrips shennongjiaensis*, pronotum. **14.** *Helionothrips annosus*, pronotum. **15.** *Selenothrips rubrocinctus*, pronotum. **16.** *Panchaethrips bifurcus*, abdominal segments IX–X, male. **17.** *Helionothrips shennongjiaensis*, forewing. **18.** *Phibalothrips peringueyi*, forewing. **19.** *Helionothrips haemorrhoidalis*, forewing. **20.** *Panchaethrips bifurcus*, forewing. **21.** *Helionothrips rugatus*, forewing. **22.** *Helionothrips annosus*, forewing.



the pronotum entirely covered with wrinkles in reticles and with abdominal segment IX twice as long as segment X.

***Helionothrips shennongjiaensis* Feng,
Yang, and Zhang**

Figures 4, 13, 17, 31, 44.

Redescription. Female macropterous. Body brown to dark brown; head and abdominal segments VIII–X paler in colour; head yellow at anterior; profemur yellowish brown, shaded laterally; mesofemur and metafemur brown, paler basally; protibia yellow, shaded laterally; mesotibia and metatibia brown, yellow in apical half; tarsi yellow; antennomere I yellowish brown to brown, antennomeres II and VI–VIII brown, the remaining antennomeres yellow (Fig. 31); forewing with pale band basally, darker at apex (Fig. 17). **Head.** Head more than twice as wide as long; transversely covered with sculpturing (Fig. 4); eyes large, occupying over half the width of the head; three ocelli present; head sculpture without wrinkles in reticles but posterior sculpture with some internal dots; mouth cone short, not reaching to posterior margin of prosternum. Maxillary palps each with two palpomeres. Antennae with eight antennomeres; antennomeres III and IV with long, forked sense cones; forked sense cone on antennomere IV reaching half of antennomere VI. **Thorax.** Pronotum covered by polygonal reticles of rather uniform size, without wrinkles in reticles (Fig. 13). Mesonotum with median setae in centre of sclerite, sculptured same as pronotum, without wrinkles in reticles. Metanotum with reticulation, same as pronotum, and without wrinkles in reticles, sometimes with an irregular wrinkles in anterior margin; median metanotal setae situated far from anterior margin. Forewing first vein with five to seven setae basally and two setae in distal half; second vein with seven to eight setae; posterior margin with wavy fringe cilia. Tarsi with one tarsomere. **Abdomen.** Abdominal tergites I and II strongly reticulate, other tergites with strong reticulation laterally, without wrinkles in reticles, sometimes tergal sculptures with internal linear lines; abdominal tergite VIII with comb on posterior margin but interrupted medially. Abdominal tergite X with a complete dorsal split. Abdominal sternites completely reticulate; sternites II–VIII with three pairs

of long, centrally located setae; sternite VIII with more additional setae. Ovipositor long and well developed.

Male. Macropterous. Similar to female in colour and structure, but smaller; abdominal tergite IX with two pairs of thorn-like setae, their bases nearly contiguous, with eight to nine chitinous wartlets on posteromedian area; sternites VII–VIII each with small, round pore plate (Fig. 44).

Material examined. **CHINA, Yunnan Province** (in SCAU): 37♀9♂, Xishuangbanna Tropical Botanical Garden (21°55'N, 101°16'E), Menglun, from *Cinnamomum camphora*, 10.iv.1987 (1♀ also collected in 15.iv.1987), Zhang Wei-qiu; 5♀4♂, **Guangdong Province** (in SCAU): Xiangtoushan National Nature Reserve (23°14'N, 114°23'E), Huizhou, from Lauraceae, 20.iv.2012, Yang Shu-lan; 1♀, Dinghushan National Nature Reserve (23°10'N, 112°32'E), from Poaceae, 10.i.1978, Zhang Wei-qiu; 2♀1♂, **Hainan Province** (in SCAU): Danzhou (19°30'N, 109°29'E), from Lauraceae, 2.iv.1980, Zhang Wei-qiu.

Remarks. The diagnosis above was partially based on the original description of the species (Feng *et al.* 2007).

***Heliothrips* Haliday**

Members of *Heliothrips* are polyphagous and common in the tropics and in greenhouses (Kudô 1995). In this genus, the head is strongly reticulate with a constricted neck, and the terminal antennomere is long and slender; the forewing has a distinctive rounded apex, the veinal setae are small, and the posteromarginal cilia are straight. This genus includes five species worldwide, of which *H. haemorrhoidalis* (Bouché) has been recorded from China (Mirab-balou *et al.* 2011). *Heliothrips haemorrhoidalis*, is a highly polyphagous species and its host range includes citrus, grape, and many ornamental plants.

***Monilothrips* Moulton**

This genus is similar to *Zaniothrips* but it can be distinguished from latter in having tarsi with two tarsomeres, the presence of four pairs of postocular setae, and the absence of lateral microtrichia on abdominal tergite II. Only one species of this genus, *M. kempii* Moulton, has

been recorded from China (Han 1997). This species shows a remarkable discontinuously distributed pattern: Asia, Africa, and North America, and it is only associated with fern (Wilson 1975).

***Panchaetothrips* Bagnall**

Species of this genus are leaf feeders and they inhabit the Old World tropics. *Panchaetothrips*

noxius Priesner breeds on coffee leaves in Tanzania, Uganda, and Zaire, and *P. indicus* Bagnall was recorded damaging the leaves of turmeric (*Curcuma longa* Linnaeus; Zingiberaceae), arrowroot (*Maranta arundinacea* Linnaeus; Marantaceae), and bananas in India (Wilson 1975; Mound and Postle 2004). This genus is unique in having a tube-like abdominal tergite X, and the conspicuous array of stout spines on the terminal abdominal segments.

Key to *Panchaetothrips* species from China

1. Antennomeres III and IV with sensory cone short and simple (Fig. 33); abdominal tergite II with setal pair S1 about 0.5 times length of setae S2 (Fig. 38) *P. indicus* Bagnall
 - Antennomeres III and IV with sensory cone long and forked (Fig. 32); abdominal tergite II with setal pair S1 at least 0.75 as long as setae S2 (Fig. 39) *P. bifurcus* new species
-

***Panchaetothrips bifurcus* Mirab-balou and Tong, new species**

Figures 8, 11, 16, 20, 26, 32, 39.

Material examined. Holotype (female, in SCAU), **CHINA, Guangdong Province:** Dinghushan Natural Nature Reserve (23°10'N, 112°32'E), Zhaoqing, from Poaceae, 9.i.1978, Zhang Wei-qiu. Paratypes (in SCAU): 2♀5♂ paratypes (in SCAU), the same data as holotype; 5♀3♂ paratypes (in SCAU), **Hainan Province:** Jingfengling National Nature Reserve (18°44'N, 108°51'E), from grasses, 5.iv.1980, Zhang Wei-qiu; 2♀ paratypes (in SCAU), **Jiangxi Province:** Chongyi County, Yangling National Forest Park (25°39'N, 114°18'E), collected from an unidentified dicotyledonous shrub, 22.viii.2015, Zhaohong Wang.

Description. Female macropterous. Body brown to dark brown, abdominal segments IV–X darkest; femora brown, paler apically and basally; tibiae brown, shaded laterally, paler apically; all tarsi yellowish brown; forewing brown, with triangular pale area in basal third (Fig. 20); antennomeres I–II and VI–VIII brown, III–V yellow with apical third shaded brown (Fig. 32). **Head.** Head reticulate (Fig. 8), ocellar region slightly elevated, postoccipital apodeme strong in front of constricted reticulate neck region; sculptured reticles posterior to hind ocelli with irregular linear markings internally. Antennae with eight

antennomeres; antennomeres III–V with slender basal third; antennomere III with long, forked sensory cone; antennomere IV with long forked sensory cone reaching to apex of VI (Fig. 32). **Thorax.** Pronotum transverse, with short and pointed setae (Fig. 8). Mesonotum sculpture evenly; metanotum with a bold, triangular, sculptured area delimited by a slight ridge; metanotal median setae far from anterior margin. Forewing with longest costal setae about three times as long as wing width, first vein with about five setae distal to pale area, then a single seta on apical half of wing (Fig. 20). Tarsi with two tarsomeres (Fig. 26). **Abdomen.** Abdomen swollen and pyriform, tergite II with S1 setae almost at least 0.75 as long as setae S2, tergite III with S1 as long as or longer than S2 (Fig. 39); tergite IX with stout setae; tergite X elongate, fully divided in mid-line with six stout, terminal setae (Fig. 11).

Measurements (holotype in microns): Distended body length 1600. Head length 136, width 228. Pronotum median length 130, median width 270. Forewing length 990. Abdominal segment II median length 96, width 350; median setae (S1) 66, S2 90; segment IX, median length 68, width 266; segment X, median length 270, width 115; setae on tergite X, length 250. Antennomeres I–VIII length (width) as follows: 19 (30), 25 (38), 97 (30), 126 (27), 80 (23), 34 (19), 15 (9), and 66 (6).

Male. Distended body length 1300 microns. Similar to female in colour and structure, but

abdomen more slender, segments VII and VIII robustly sculptured and elongate; tergite IX with three pairs of stout and long posterolateral setae (Fig. 16); sternites III–VI with slender, transverse glandular area.

Etymology. Specific epithet from Latin “*bifurcus*”, meaning forked and referring to antennomeres III and IV each with a long and forked sensory cone. This name is an adjective in the nominative singular.

Remarks. This new species is similar to *P. indicus* Bagnall but it can be distinguished from this species using the characters states in the above key. The new species is distinguished from *R. noxius* Priesner in having a very slender and straight transverse pore plate on male sternites III–VI, although Wilson (1975) indicates that *P. noxius* has such areas on sternites III–VII; ocellar setae pair III closer together than width of fore ocellus in *P. noxius*, while in the new species is situated further apart than width of fore ocellus; and the new species has internal markings on the reticulation of the head with the presence of only one seta on the distal half of forewing, which easily distinguishes it from *P. noxius*. According to the key and descriptions in Mound and Postle (2004), this new species is similar to *P. timonii* Mound and Postle, but is distinguished from the latter by the following character states: colouration of body, that both of them are brown with abdominal segments IV–X dark brown (versus abdomen almost yellow, darkest in segment X in *P. timonii*); tibiae brown, shaded laterally, pale yellow at apex, tarsi yellowish brown (versus tibiae and tarsi yellow in *P. timonii*); antennomeres I–II and VI–VIII brown (versus I yellow in *P. timonii*); reticulation posterior to hind ocelli with no internal markings (versus with irregular

linear internal markings in *P. timonii*); tergite II with S1 setae shorter than S2 (versus S1 setae almost as long as S2 setae in *P. timonii*).

***Phibalothrips* Hood**

This genus includes four species worldwide, of which only *P. peringueyi* (Faure) has been recorded from China (Mirab-balou *et al.* 2011). We observed this species in abundance on grasses in Guangdong Province. Among male specimens, we found different shape of pore plates on abdominal sternites III–VII: most of them with broad pore plates (Fig. 41) and few specimens with small and round pore plates (Fig. 40). Females are macropterous; strongly bicoloured with head and thorax dark brown (Fig. 10) and abdomen, legs, and antennomeres III–V yellow; forewing slender, uniformly pale yellow.

Material examined. 18♀2♂ (in SCAU), CHINA, Guangdong Province: Campus of South China Agricultural University (23°09'N, 113°21'E), from Poaceae, 10.v.2012, M. Mirab-balou; 14♀4♂ (in SCAU), with same data, 20.vi.2012.

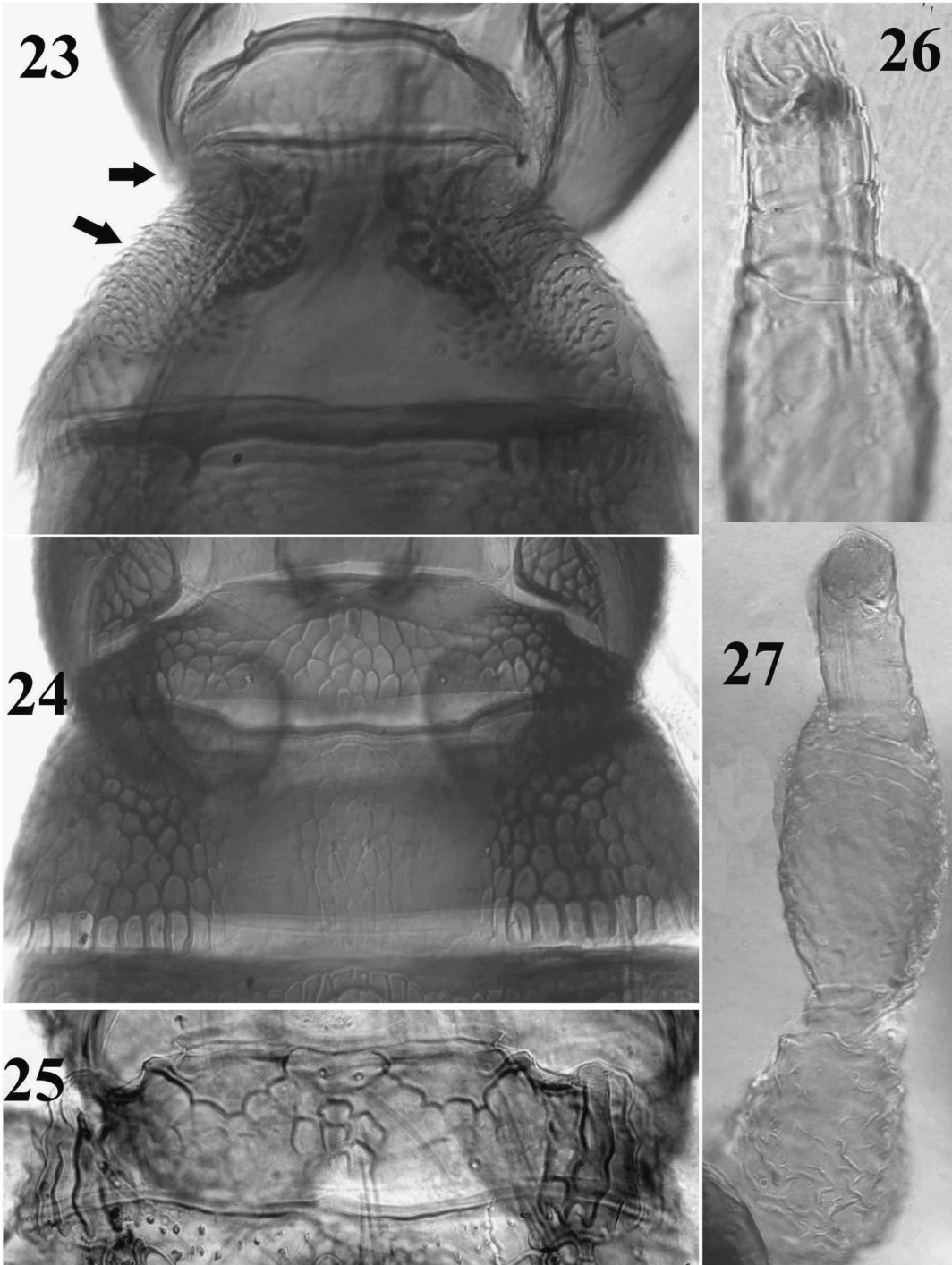
***Rhipiphorothrips* Morgan**

This genus is distinct, being the only panchaetothripine with rugose sculpturing on the head and body. *Rhipiphorothrips* includes five species, of which four species have been recorded from China (Mirab-balou *et al.* 2011). Since the original description of *R. concoloratus* was in Chinese (Zhang and Tong 1993), a redescription is here provided based on the type specimens deposited in SCAU.

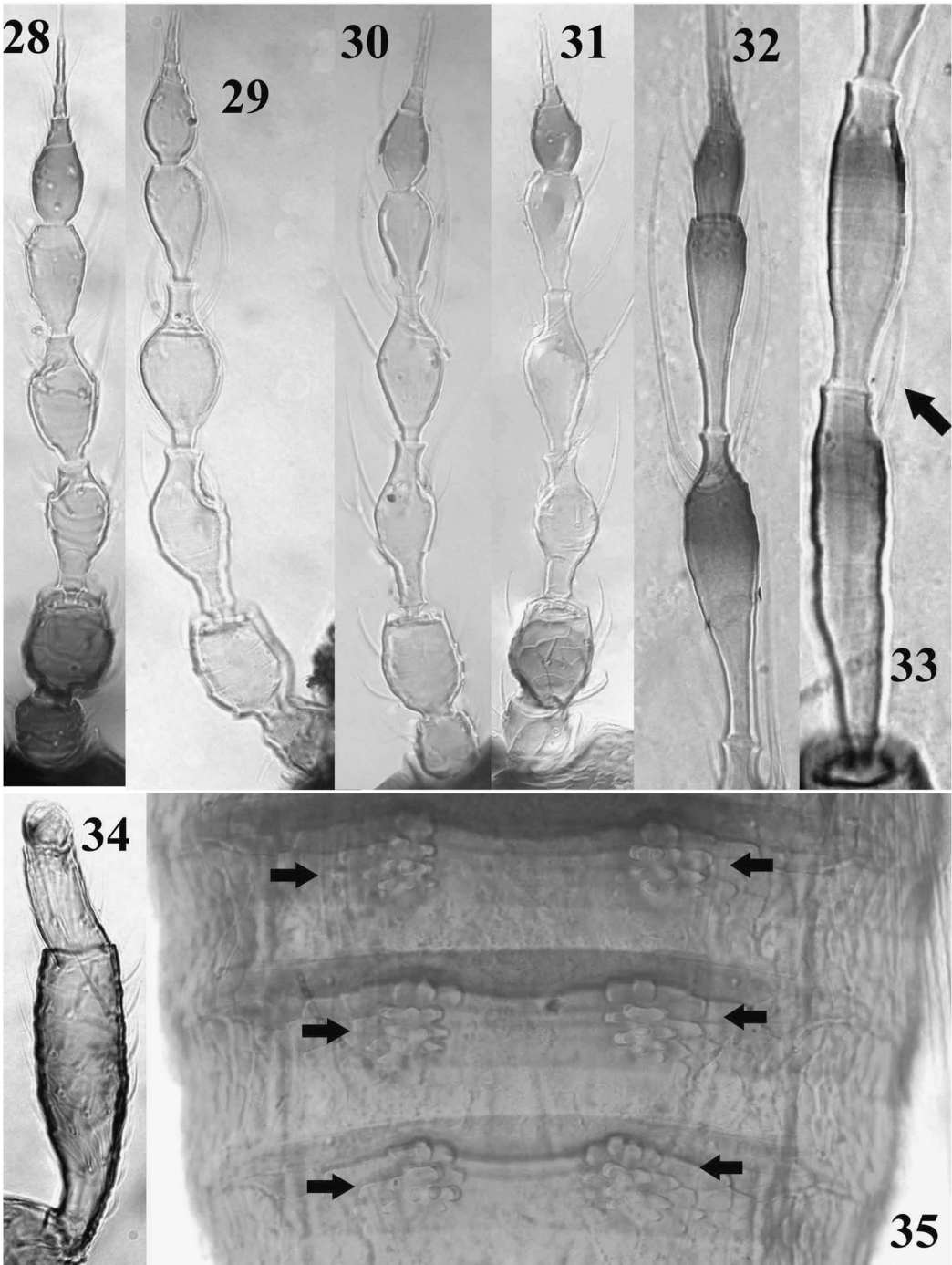
Key to *Rhipiphorothrips* species from China

1. Antennomeres III and IV with sensory cone simple 2
– Antennomeres III and IV with sensory cone forked 3
 2. Body dark brown, male with a tooth-like process on sides of abdominal segment IV *R. cruentatus* Hood
– Body yellow, male lacking a process on sides of abdominal segment *R. pulchellus* Morgan
 3. Body brown; abdominal tergite I nearly completely sculptured except near middle, where the sculpturing is indistinct (Fig. 25) *R. concoloratus* Zhang and Tong
– Body dark brown, abdominal tergite I completely covered by polygonal reticulations *R. africanus* Wilson
-

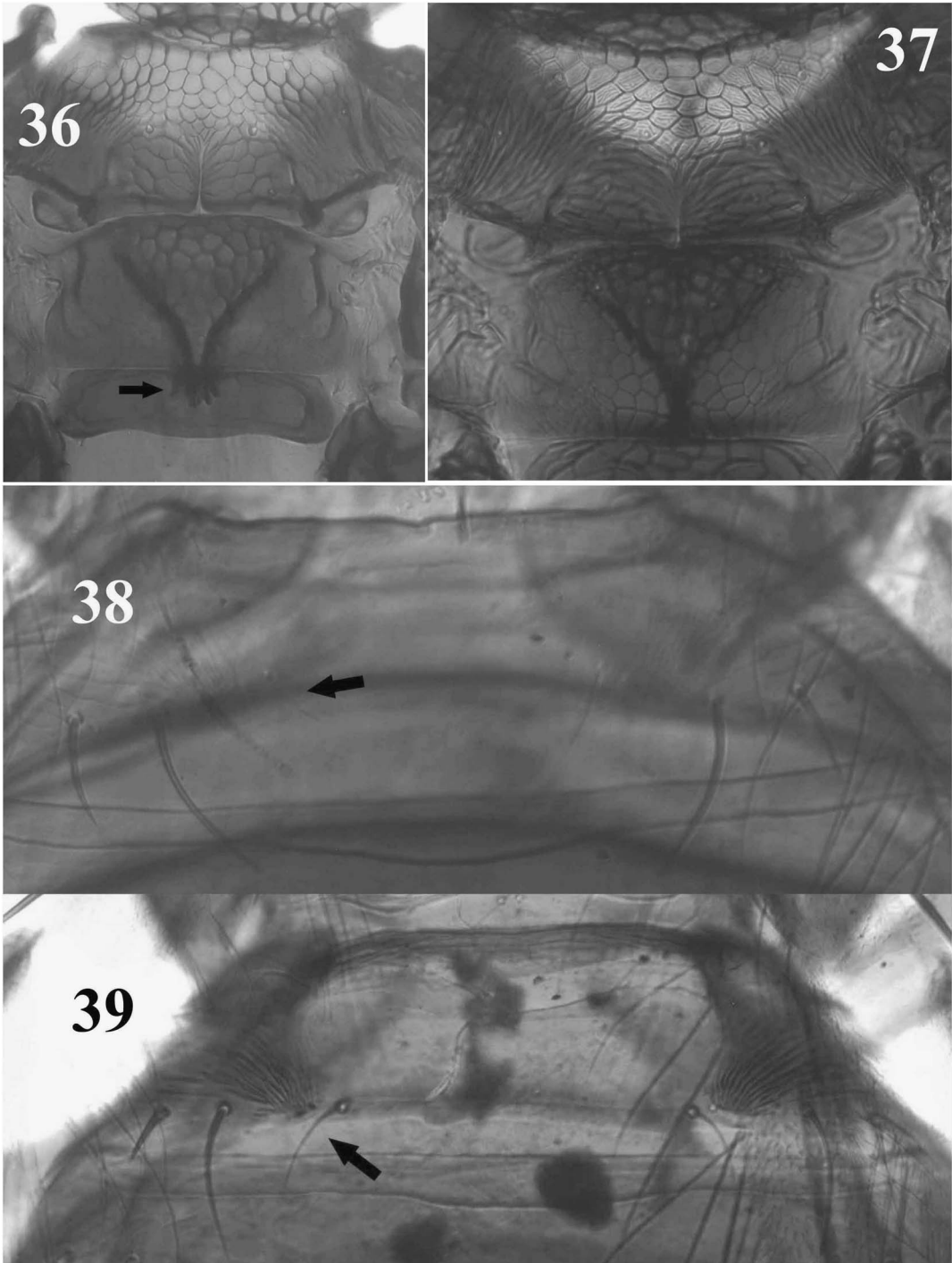
Figs. 23–27. Panchaethrothripine species from China. **23.** *Astrothrips aucubae*, abdominal tergites I and II. **24.** *Helionothrips haemorrhoidalis*, abdominal tergites I and II. **25.** *Rhipiphorotheirus concoloratus*, abdominal tergite I. **26.** *Panchaethrothrips bifurcus*, prothoracic leg. **27.** *Rhipiphorotheirus concoloratus*, prothoracic leg.



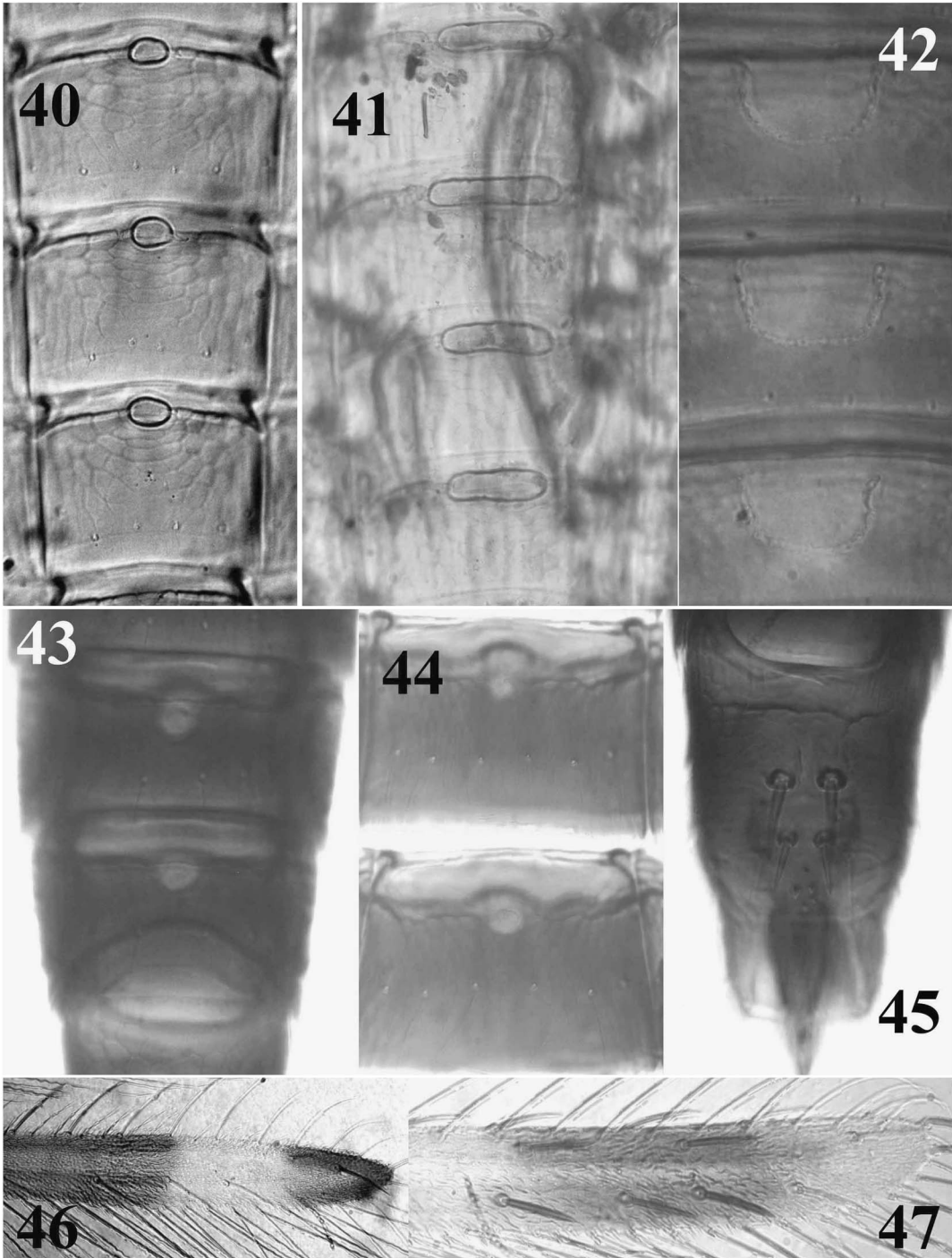
Figs. 28–35. Panchaethripine species from China. **28.** *Helionothrips cephalicus*, antenna. **29.** *Helionothrips annosus*, antenna. **30.** *Helionothrips aino*, antenna. **31.** *Helionothrips shennongjiaensis*, antenna. **32.** *Panchaethrips bifurcus*, antennomeres IV–VIII. **33.** *Panchaethrips indicus*, antennomeres III and IV. **34.** *Helionothrips rugatus*, prothoracic leg. **35.** *Anisopilothers venustus*, abdominal tergites V–VII.



Figs. 36–39. Panchaetothripine species from China. **36.** *Helionothrips annosus*, mesonotum and metanotum. **37.** *Helionothrips rugatus*, mesonotum and metanotum. **38.** *Panchaetothrips indicus*, abdominal tergites I–II. **39.** *Panchaetothrips bifurcus*, abdominal tergites I–II.



Figs. 40–47. Panchaethrotriptine species from China. **40.** *Phibalothrips peringueyi*, different shape of pore plates on abdominal sternites (male), sternites V–VII. **41.** *Phibalothrips peringueyi*, different shape of pore plates on abdominal sternites (male), sternites IV–VII. **42.** *Astrothrips aucubae*, pore plates on sternites IV–VI. **43.** *Helionothrips rugatus*, pore plates on sternites VII–VIII. **44.** *Helionothrips shennongjiaensis*, pore plates on sternites VII–VIII. **45.** *Helionothrips rugatus*, tergite IX. **46.** *Caliothrips tongi*, forewing. **47.** *Astrothrips aucubae*, forewing.



Rhiphorothis concoloratus
Zhang and Tong

Figures 7, 25, 27.

Redescription. Female macropterous. Body brown, abdomen slightly paler, forewing with scales brown. Prothoracic and mesothoracic legs brown, metathoracic leg yellow with apical half of tibia brown. Antennomeres I–VI yellow with apex brown on VI, antennomeres VII–VIII brown. Body completely covered by strong, rugose sculpturing. Head quadrate, sculpturing of head anterior of ocellar strongly rugose (Fig. 7). Antennae with eight antennomeres, antennomeres III and IV each with small forked sensory cone with stalked base short and indistinct. Maxillary palps each with two palpomeres. Pronotum broadly rounded, strongly rugose, with minute setae. Mesoscutum completely divided longitudinally; metascutal triangle boldly sculptured with a thick lateral margin. Forewing rounded on apex, posterior fringe cilia straight. Legs stout; tarsi with one tarsomere (Fig. 27). Abdomen covered by strong, rugose sculpture except for median part; tergite I nearly completely sculptured but indistinctly sculptured near middle (Fig. 25); tergite X completely divided, with a pair of small, fan-shaped setae.

Male. Macropterous. Similar to female in sculpturing but smaller and paler in colour. Abdominal sternites III–VII each with small, anteromedian, circular pore plate.

Material examined Holotype (in SCAU): 1♀, **CHINA, Yunnan Province:** Xishuangbanna Tropical Botanical Garden (22°00'N, 100°47'E), Jinghong, from *Hibiscus syriacus* Linnaeus (Malvaceae), 11.iv.1987, Zhang Wei-qiu. Paratypes: 3♀3♂, same data as holotype. Non-type specimen: 1♀, **CHINA, Hainan Province:** Lingshui (18°29'N, 110°02'E), from *Anacardium occidentale* Linnaeus (Anacardiaceae), xi.1979, Zhuo Shaoming.

Selenothrips Karny

This genus is monotypic, containing *S. rubrocinctus*. The shape of the head, legs, and antennae gives indications of a similarity with *Caliothrips* but the transverse pronotum, abdominal microtrichia, and complete comb on abdominal tergite X places it closer to *Brachyurothrips*.

Zaniothrips Bhatti

This monotypic genus is similar to *Monilothrips* in having long setae on the head and pronotum. The only species in this genus, *Z. ricini* Bhatti, was recorded from China (Han 1997).

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References

- Bhatti, J.S. 1968a. The *Trypactothrips* complex in India, with a key to the world genera. *Oriental Insects*, **1**: 139–190.
- Bhatti, J.S. 1968b. The genus *Helionothrips* in India (Thysanoptera). *Oriental Insects*, **2**: 35–39.
- Chen, L.S. 1980. Thrips associated with mulberry plant (*Morus* sp.) in Taiwan. *Proceedings of the National Science Council (Taiwan)*, **4**: 169–182.
- Chen, L.S. 1981. Studies on the Panchaetothripinae (Thysanoptera: Thripidae) in Taiwan. *Plant Protection Bulletin (Taiwan)*, **23**: 117–130.
- Faure, J.C. 1961. Thysanoptera of Africa–5. *Journal of the Entomological Society of Southern Africa*, **24**: 133–153.
- Feng, J.N., Yang, X.N., and Zhang, G.L. 2007. Taxonomic study of the genus *Helionothrips* from China (Thysanoptera, Thripidae). *Acta Zootaxonomica Sinica*, **32**: 451–454.
- Han, Y.F. 1997. Economic insect fauna of China, FASC. 55 (Thysanoptera). Science Press, Beijing, China (in Chinese).
- Huang, L.N., Qiao, G.X., and Lian, Z.M. 2011. Chinese *Caliothrips* Daniel (Thysanoptera, Thripidae). *Acta Zootaxonomica Sinica*, **36**: 165–169.
- Kudô, I. 1979. Some panchaetothripine Thysanoptera from southeast Asia. *Oriental Insects*, **13**: 345–355.
- Kudô, I. 1992a. Panchaetothripinae in Japan (Thysanoptera: Thripidae). 1. Panchaetothripini, the genera other than *Helionothrips*. *Japanese Journal of Entomology*, **60**: 109–125.
- Kudô, I. 1992b. Panchaetothripinae in Japan (Thysanoptera, Thripidae) 2. Panchaetothripini, the genus *Helionothrips*. *Japanese Journal of Entomology*, **60**: 271–289.

- Kudô, I. 1992c. Panchaethripinae in Japan (Thysanoptera, Thripidae) 3. Monilothripini and Tryphactothripini. Japanese Journal of Entomology, **60**: 467–482.
- Kudô, I. 1995. Some Panchaethripinae from Nepal, Malaysia and the Philippines [Thysanoptera: Terebrantia: Thripidae]. Insecta Matsumurana, **52**: 81–103.
- Mirab-balou, M. and Chen, X.X. 2012. Subfamily Panchaethripinae Bagnall (Thysanoptera: Thripidae) in Iran, with first report of the genus *Selenothrips* Karny. Entomotaxonomia, **34**: 22–29.
- Mirab-balou, M., Tong, X.L., and Chen, X.X. 2014. Thrips species diversity in urban green spaces of Hangzhou (Zhejiang Province), China. Journal of Entomological and Acarological Research, **46**: 85–89.
- Mirab-balou, M., Tong, X.L., Feng, J.N., and Chen, X. X. 2011. Thrips (Insecta: Thysanoptera) of China. Check List: Journal of Species Lists and Distribution, **7**: 720–744.
- Moritz, G., Morris, D.C., and Mound, L.A. 2001. Thripsid – pest thrips of the world. An interactive identification and information system. CDROM published for ACIAR by Commonwealth Scientific and Industrial Research Organisation Publishing, Melbourne, Australia.
- Mound, L.A. and Gillespie, P.S. 1997. Identification guide to thrips associated with crops in Australia. New South Wales Agriculture, Orange and Commonwealth Scientific and Industrial Research Organisation Entomology, Canberra, Australia.
- Mound, L.A. and Marullo, R. 1996. The thrips of Central and South America: an introduction. Memoirs on Entomology, International, **6**: 1–488.
- Mound, L.A., Marullo, R., and Trueman, J.W.H. 2001. The greenhouse thrips, *Heliethrips haemorrhoidalis*, and its generic relationships within the subfamily Panchaethripinae (Thysanoptera: Thripidae). Insect Systematics & Evolution, **32**: 205–216.
- Mound, L.A. and Postle, A.C. 2004. *Panchaethrips timonii* sp. n. (Thysanoptera, Thripidae); first Australian record of this Old World tropical genus. Australian Journal of Entomology, **43**: 133–137.
- Mound, L.A., Zhang, H.R., and Bei, Y.W. 2011. *Caliothrips tongi* sp.n. (Thysanoptera, Thripidae) from China, and a dubious record of North American bean thrips. Zootaxa, **2736**: 57–62.
- Ramakrishna, A.T.V. and Margabandhu, V. 1939. Notes on new and known Indian Thysanoptera. Records of the Indian Museum, **41**: 21–33.
- Reitz, S.R., Gao, Y.L., and Lei, Z.R. 2011. Thrips: pests of concern to China and the United States. Agricultural Sciences in China, **10**: 867–892.
- Reyes, C.P. 1994. Thysanoptera (Hexapoda) of the Philippine Islands. Raffles Bulletin of Zoology, **42**: 107–507.
- Stannard, L.J. and Mitri, T.J. 1962. Preliminary studies on the *Tryphactothrips* complex in which *Anisopilothers*, *Mesostenothrips* and *Elixothrips* are erected as new genera (Thripidae: Heliethripinae). Transactions of the American Entomological Society, **88**: 183–224.
- ThripsWiki. 2016. ThripsWiki – providing information on the World's thrips [online]. Available from <http://thrips.info/wiki> [accessed 21 February 2016].
- Wang, C.L. 1993. The *Helionothrips* species of Taiwan (Thysanoptera, Thripidae, Panchaethripinae). Zoology (Journal of Pure and Applied Zoology), **4**: 389–398.
- Wilson, T.H. 1975. A monograph of the subfamily Panchaethripinae (Thysanoptera: Thripidae). Memoirs of the American Entomological Institute, **23**: 1–354.
- Zhang, W.Q. 1980. A report on the species of the Panchaethripinae (Thysanoptera, Thripidae) from China. Journal of South China Agricultural University, **1**: 43–53.
- Zhang, W.Q. and Tong, X.L. 1993. Notes on some Panchaethripinae species from Xishuangbanna, with description of a new species (Thripidae, Thysanoptera). Journal of the South China Agricultural University, **14**: 51–54.
- Zhang, W.Q., Tong, X.L., Luo, X.N., and Zhuo, W.X. 1999. Thysanoptera. In Fauna of insects: Fujian province of China. Volume 1, Edited by B.K. Huang. Science Technology of Fujian, Fuzhou, China. Pp. 347–395.
- zur Strassen, R. 2003. Die terebranten thysanopteren Europas und des mittelmeer-gebietes. Die Tierwelt Deutschlands, **74**: 1–271.