



Ant-mimicking thrips of the genus *Compsothrips* Reuter from China (Phlaeothripidae, Idolothripinae)

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Abstract

Species of *Compsothrips* are ant-mimics in body form and structure. In contrast to the predatory species of ant-mimicking Aeolothripidae, these species feed by ingesting fungal spores. Worldwide, there are 27 species listed in this genus, with three recorded here from China. *Compsothrips tenebronus* is here considered a **new synonym** of *C. sinensis*, and *C. timur* is newly recorded from China in Tibet. Furthermore, *C. reticulates* is redescribed, with details of the female given for the first time. An illustrated key is provided to the three species of *Compsothrips* from China.

Key words: Ant mimics, redescription, new synonym, new record, key

Introduction

Ant-mimicry is widespread amongst arthropods, particularly in Arachnida but also among unrelated Orders of Insecta, from Hemiptera and Orthoptera to Coleoptera and Lepidoptera. Within the Order Thysanoptera it occurs in unrelated genera of both suborders, the Terebrantia and Tubulifera. Among the Terebrantia, ant-mimicry occurs in several genera of the family Aeolothripidae (Mound & Marullo 1998; Mound & Reynaud 2005). In this family, most species of *Franklinothrips* resemble ants to some extent, the most impressive example being *F. megalops* from Africa. This species is not only ant-like in general appearance but also in behavior (Mound & Reynaud 2005). Members of this worldwide genus sometimes occur in flowers, but they are more commonly seen on leaves where they can be sufficiently effective as predators of other small insects that they are used commercially in greenhouses for biocontrol purposes (Wang *et al.* 2022). Two other Aeolothripidae genera, *Allelothrips* in Africa and *Stomatothrips* in South America, comprise species that live at ground level where their ant-like form and behaviour can be observed. A similar habit, structure and behavior occurs in just one species of two further Aeolothripidae genera: *Aeolothrips albicinctus* in Palearctic, and *Desmothrips reedi* in Australia. Amongst the other, and much more numerous, members of the Terebrantia there is no evidence of ant-mimicry. Among Tubulifera, species of two Idolothripinae genera, *Hartwigia* and *Compsothrips*, are obviously ant-mimics in body form. The monotypic genus *Hartwigia* has not been further studied since its type species was described from South Africa (Faure 1949). However, species of the genus *Compsothrips* are more concerned because they are widely found in the warmer parts of the world apart from Australia. The ant-like habits, which is typical of the ground-dwelling, wingless species of *Compsothrips*, are well reflected in two synonymic generic names that were erected for two species that are now placed in this genus, *Myrmecothrips* and *Formicothrips* (ThripsWiki 2023).

An overview of the members of *Compsothrips* was provided by Stannard (1976), but that author chose to

recognize three separate genera instead of the single genus now accepted. Stannard restricted *Compsothrips* to the single species *albosignatus*, a species that is structurally the least extreme ant-mimic in the genus. He placed a pantropical group of 16 species into the genus *Leptogastrothrips* and eight North American species into the genus *Oedaleothrips*. This arrangement failed to give enough relevance to various species that are intermediate in structure between these three generic groups (Mound & Palmer 1983). As a result, *Compsothrips* is currently accepted as a single genus of 27 species. In contrast to the ant-mimicking Aeolothripidae species, the members of *Compsothrips* are not predators; they all feed by ingesting fungal spores, as is evident from their gut contents.

The genus is a member of the Phlaeothripidae subfamily, Idolothripinae in which all species feed on spores in contrast to the phytophagous habits of many Phlaeothripinae. There are now 64 species of 19 genera in Idolothripinae recorded from China (Dang & Qiao 2013; Zhang *et al.* 2017; Dang *et al.* 2021; Li *et al.* 2022). Considering the taxonomic diversity within this subfamily, with 765 species in 83 genera worldwide (ThripsWiki 2023), the species diversity in China needs much greater exploration. As part of ongoing research on Idolothripinae from China, the objective here is to provide an account of the species of *Compsothrips* that are known from China, together with redescriptions, one new synonym and one new record.

Materials and methods

For taxonomic study, thrips must be mounted onto microscope slides. These slides are then available for study by future taxonomists, both nationally and internationally, and they should be labelled clearly with that future collaborative aspect in mind. Thrips slides usually have two labels—one giving the host plant, location, date and collectors, and the other giving the gender, Latin species name, authors, and identifier (ThripsWiki 2023). In addition, a unique code number for each specimen is strongly recommended for facilitating future studies in discussing individual variation, and in building an electronic database. All information on these labels is best printed, and in English. Hand written labels in any language can be difficult to read, and are easily erased (Figs 20, 24).

The descriptions and images were produced from slide-mounted specimens with Nikon Eclipse 80i microscopes and Leica DM2500 using DIC illumination, and processed with Automontage and Photoshop v.7.0. The abbreviations used for the pronotal setae are as follows: am—anteromarginal, aa—anteroangular, ml—midlateral, epim—epimeral, pa—posteroangular. The unit of measurement in this study is the micrometre. All specimens are available in the School of Bioscience and Engineering, Shaanxi University of Technology (SNUT), Hanzhong, China, the collection of the Entomological Museum, Northwest A & F University, China (NWAUFU), the Australian National Insect Collection (ANIC), Canberra, Australia, and the National Zoological Museum of China (NZMC), Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

Compsothrips Reuter

Compsothrips Reuter, 1901: 214. Type species: *Phloeothrips albosignata* Reuter, by monotypy.

Of the 27 species listed in this genus (ThripsWiki 2023), only seven are known from Asia. Of these seven, four are dealt with below in this paper: *reticulates*, *sinensis*, *tenebronus* and *timur*. Of the remaining three, *C. ramamurthii* (Ananthakrishnan 1964) from India, is distinguished from all other Asian species in having the body and legs predominantly yellow in colour. *C. sumatranus* Priesner (1928) was based on a single female from Sumatra, and this is discussed further below under *C. timur*. The last one, *C. albosignatus* was recorded from Iran (Hakimara *et al.* 2019), which seems widespread in the Mediterranean area (ThripsWiki 2023).

All species of *Compsothrips* are ant mimics with the legs and slender thorax giving the impression of a slender waist, this being emphasized in several species by the contrasting pale colour of the metanotum and first abdominal tergite. The head varies between two extremes amongst species, with some North American species having the head broadly rounded posterior to the compound eyes, but other species, as in the three considered here from China, having the head more elongate and broadest across or just behind the eyes. The body colour is usually dark brown, but one or more of the basal antennal segments may be pale, the metanotum and pelta are often pale, there is a pair of pale spots laterally on the abdomen, and the tenth abdominal segment is bicoloured in one species considered here.

Generic diagnosis. Apterous ant mimics. Head elongate or rounded, usually contracted at base, projecting in front of eyes, or scarcely projecting; eyes strongly prolonged ventrally; interocellar and postocellar setae usually well developed (Figs 1, 27); postocular setae usually small and acute, or developed and blunt to expanded; one pair of postocular cheek setae usually developed (Fig. 27), sometimes reduced (Fig. 1); stylets V-shaped; antennae 8-segmented, sense cones on and IV small, III with 1 or 2, IV with 2; segment VI usually protruding on outer apex (Figs 6, 15, 16); pronotal major setae short, blunt or expanded, notopleural sutures complete (Fig. 1); basantra present; mesopresternum broad (Fig. 3); metathoracic sternopleural sutures usually complete and long (Fig. 5); fore tarsal tooth present in both sexes (Figs 1, 2, 27, 28); pelta white and broad, rounded triangular (Fig. 4); abdominal tergites usually without sigmoid wing-retaining setae; tergite II with white spots anterolaterally, V usually with white spots laterally (Figs 9–11, 17); tube surface smooth, without prominent setae (Figs 7, 8, 14); anal setae shorter or a little longer than tube.

Key to species of *Compsothrips* from China

1. Tergite IX setae S1–S3 longer than tube, acute at apex; antennae uniformly brown (Fig. 19) *sinensis*
- Tergite IX setae S1–S3 shorter than tube, expanded at apex (Figs 7, 8, 14); at least antennal segment III yellow (Figs 15, 21, 25, 26). 2
2. Metanotum reticulation mainly transverse (Figs 29, 30); pelta and much of metanotum white (Figs 29, 30); antennal segment I–II black *timur*
- Metanotum reticulation medially mainly concentric (Fig. 13); pelta white but metanotum largely dark (Fig. 13); antennal segments I–IV yellow (Figs 9, 15, 21) *reticulates*

Compsothrips reticulates Guo & Feng

(Figs 1–17, 21–24)

Compsothrips reticulates Guo & Feng, 2006: 843.

This species was described only from two males taken in Hebei, China (Fig. 24). In naming the species *reticulates* the description referred to sculptured reticulation on the abdominal tergites. However, re-examination of the types, also specimens from Shanxi and Inner Mongolia listed below, indicate that weak reticulation is present only on the posterior part of the pelta and anterior part of tergite II, with the other tergites and tube smooth. The following redescription includes females for the first time.

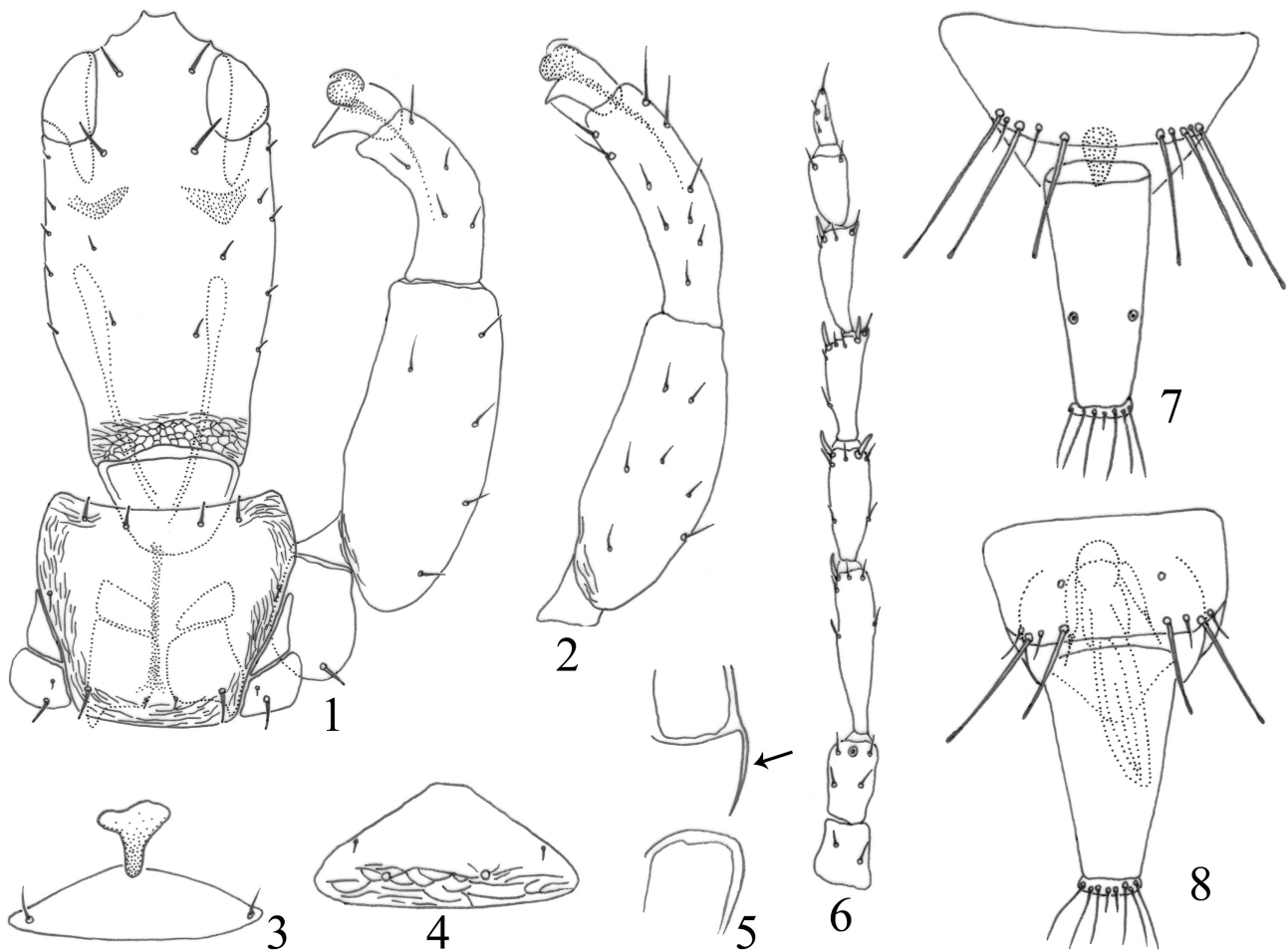
Female aptera. Body largely dark brown; antennal segments I–IV uniformly yellow, V–VIII dark brown, V slightly pale at extreme base (Figs 15, 16); all femora and tibiae yellowish brown with dark on outer margins, all tarsi yellow (Fig. 10); metanotum brown with posterior 1/3 yellow (Fig. 13); pelta white, tergite II with white spots anterolaterally, V with white spots posterolaterally (Figs 10, 11), tube yellow on basal 3/4, the rest of abdomen dark brown (Fig. 14); major setae colourless.

Head about 2.0 times as long as wide (Figs 1, 10); dorsal surface smooth with reticulation posteriorly (Fig. 1); preocular projection inconspicuous; cheeks constricted at base (Fig. 1); ocelli absent, interocellar setae about as long as postocellar setae, slightly blunt at apex (Fig. 1); eye small, about 0.2 times as long as head on dorsal surface, about 0.3 times on ventral surface; postocular setae distant from eyes, minute, as long as other discal and cheek setae (Fig. 1). Antennal segment III the longest, III–IV with one and two sense cones respectively (Fig. 6), V–VI with outer apex protruding and bearing a seta (Figs 6, 15, 16). Mouth-cone rounded; maxillary stylets retracted to just behind postocular setae.

Pronotum sculptured with irregular striae around margins, notopleural sutures complete (Fig. 1); pronotal major setae small, am similar to aa and blunt, ml reduced and acute, epim the longest and expanded at apex, pa expanded but smaller (Fig. 1); mesonotum sculptured with transverse reticulation; metanotum sculptured with reticulation medially mainly concentric (Fig. 13), median pair of setae developed, slightly blunt at apex; mesopresternum broad (Fig. 3); metathoracic sternopleural sutures long (Fig. 5). Legs slender, fore tarsal tooth triangular (Figs 2, 10).

Pelta triangular and smooth, reticulate posteriorly, with pair of campaniform sensilla (Figs 4, 13); abdominal tergites II–VII smooth with few transverse reticulations or lines anteriorly (Figs 4, 11), without wing-retaining setae, with pair of small median setae, acute; posteroangular setae on tergites VI–VIII expanded at apex; tergite IX setae

S1–S3 short and blunt or expanded, about 0.7 times as long as tube (Figs 7, 14); tube almost smooth, without setae on surface (Figs 7, 14), much shorter than head, anal setae much shorter than tube (Figs 7, 14); sternites II–VIII with some small setae on anterior half.

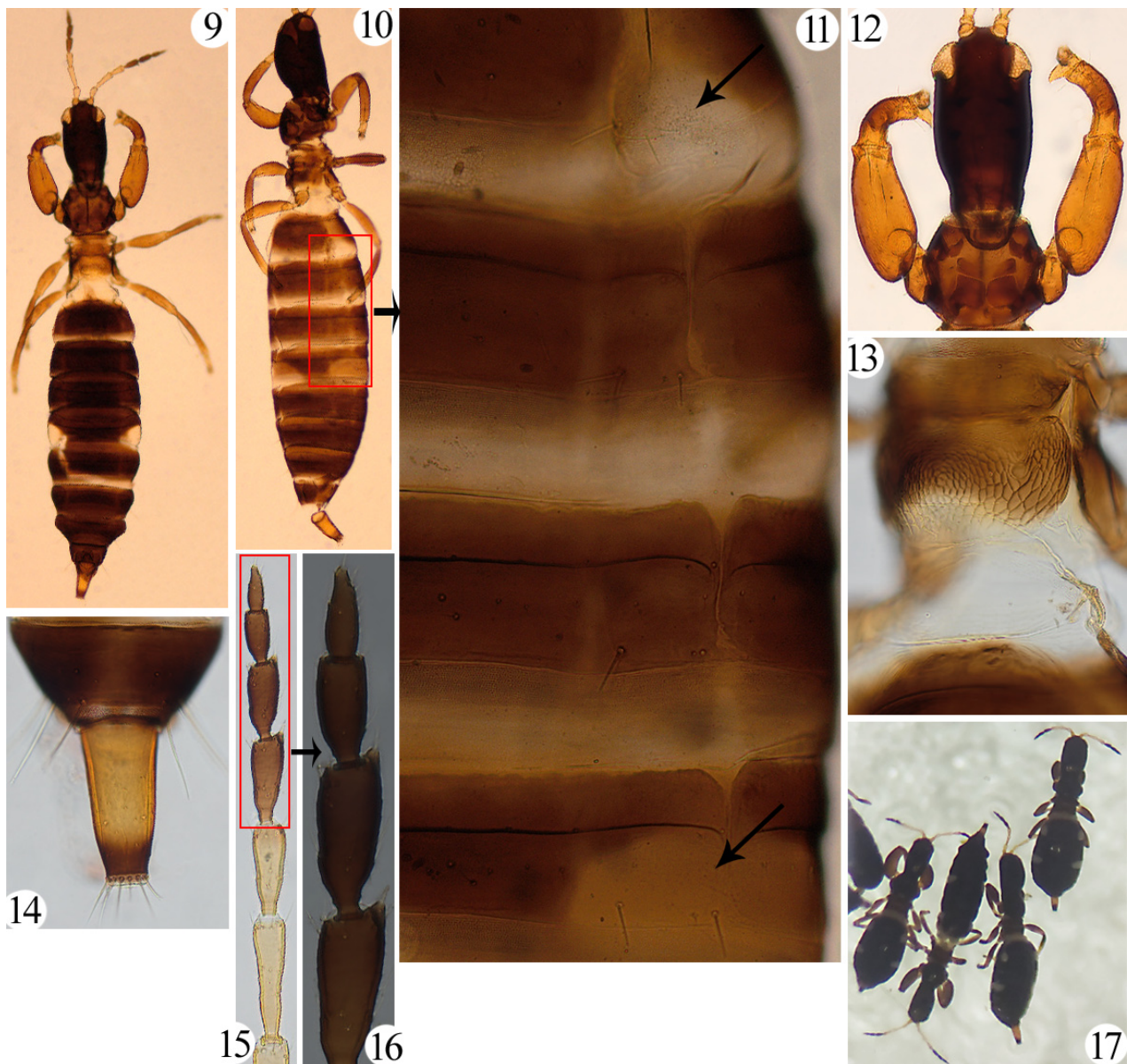


FIGURES 1–8. *Compsothrips reticulates*. (1) head, pronotum and foreleg, male; (2) foreleg, female; (3) mesopresternum; (4) pelta; (5) metathoracic sternopleural sutures (pointed by black arrow); (6) antennae; (7) tergites IX–X, female; (8) tergites IX–X, male.

Measurements (female from Shanxi in μm). Body length 3100. Head length 490, width across eyes 230, the widest across basal third 280, the least width across sub-basal constricted part 210; projection before eyes length (width) 30 (65); interocellar setae length 40, postocellar setae length 35; eye dorsal length 80, ventral length 130; postocular setae length 20, median dorsal setae 20. Antenna length 655, segments I–VIII length (widest) 60(40), 75(45), 135(35), 95(40), 90(40), 85(35), 60(30) and 55(20), sensoria on segment III length 15. Pronotum length 200, width 255, length of pronotal setae, am 15, aa 15, ml 10, epim 25, pa 35. Metanotal median setae length 25. Pelta length 110, basal width 250; tergite IX posteromarginal setae S1–S3, 115, 130, 120; tube length 160, basal width 95, apical width 50; anal setae length 70.

Male aptera. Similar to female; but larger (Fig. 9), fore femora expanded, tarsal tooth large (Figs 1, 12, 22); tergite VIII broad on anterior but posterior half suddenly constricted (Fig. 9); sternites without pore plate.

Measurements (male from Shanxi in μm). Body length 2890. Head length 470, width across eyes 255, the widest across basal third 250, the least width across sub-basal constricted part 185; projection before eyes length (width) 15 (125); interocellar setae length 25, postocellar setae length 40; eye dorsal length 90, ventral length 130; postocular setae length 10, median dorsal setae 10. Antenna length 560, segments I–VIII length (widest) 45(40), 65(40), 125(35), 80(40), 80(40), 70(35), 50(30) and 50(20), sensoria on segment III length 15. Pronotum length 255, width 290, length of pronotal setae, am 20, aa 20, ml 10, epim 15, pa 30. Metanotal median setae length 15. Pelta length 80, basal width 270; tergite IX posteromarginal setae S1–S3, 100, 95, 105; tube length 200, basal width 102, apical width 50; anal setae length 65.



FIGURES 9–17. *Compsothrips reticulates*. (9) male; (10) female; (11) lateral dorsal view of abdominal segments II–V, showing white spots on II and V (pointed by black arrows); (12) head, pronotum and forelegs, male; (13) metanotum and pelta; (14) tergites IX–X, female; (15) antennae; (16) antennal segments V–VIII, showing protruding on V–VI; (17) specimens before maceration.

Specimens studied. Holotype male and paratype male, China, Hebei, Xiaowutai Natural Reserve, 21.viii.2005 (Fuzhen Guo) (NWFU); China, Shanxi, Lishan National Nature Reserve, 2 females and 2 males on base of dry grasses, 28.vii.2021 (Yanqiao Li) (SNUT), 2 males on grasses, 17.vii.2006 (Fuzhen Guo) (NWFU); Inner Mongolia, Helan Mountains, 5 females and 2 males, 29.vii–9.viii.2010 (Qingling Hu) (NWFU).

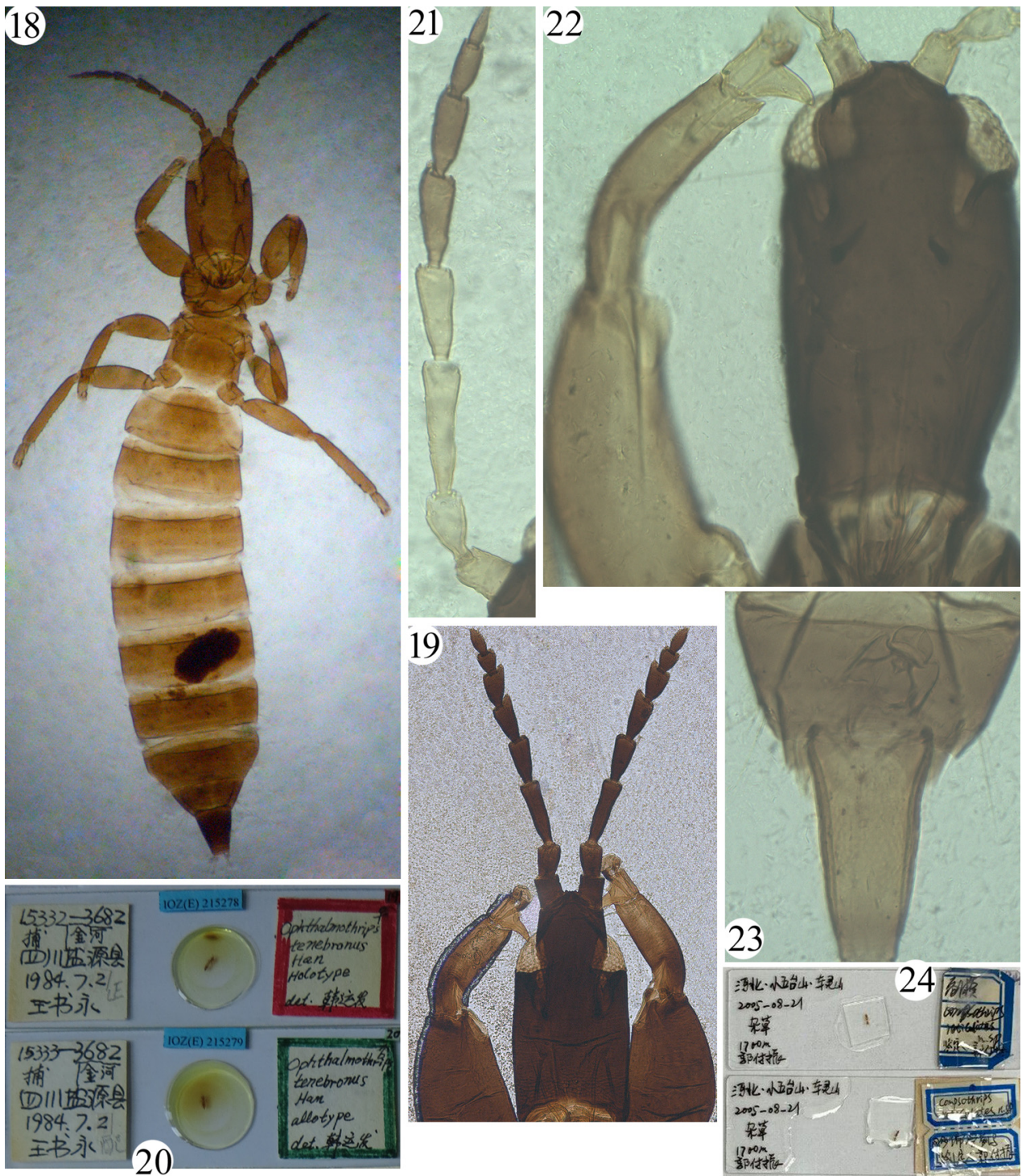
Comments. This species can be distinguished from the other two species known from China by antennal segments I–IV yellow against dark brown of V–VIII (Figs 9, 15, 21) and the tube largely yellow with distal quarter brown (Figs 14, 23). In *sinensis* and *timur* the tube is dark brown and concolorous with the other tergites (Fig. 18). The antennae are uniformly brown in *sinensis* (Figs 18, 19) and in *timur* at least segment III is largely yellow. Species of *Compsothrips* usually have a pair of stout and expanded postocular cheek setae and expanded postocular setae (Fig. 27), but these setae in *reticulates* are reduced and acute, and similar to discal setae on the head (Fig. 1). In North America, *C. yosemitae* has similar colour of the antennae and tube. However, the head shape and metanotal sculpture is different, based on six females and three males from Washington state, USA studied in ANIC.

Compothrips sinensis (Pelikan)

(Figs 18–20)

Oedaleothrips sinensis Pelikan, 1961: 306.

Ophthalmothrips tenebronus Han & Cui, 1991. *Syn.n.*

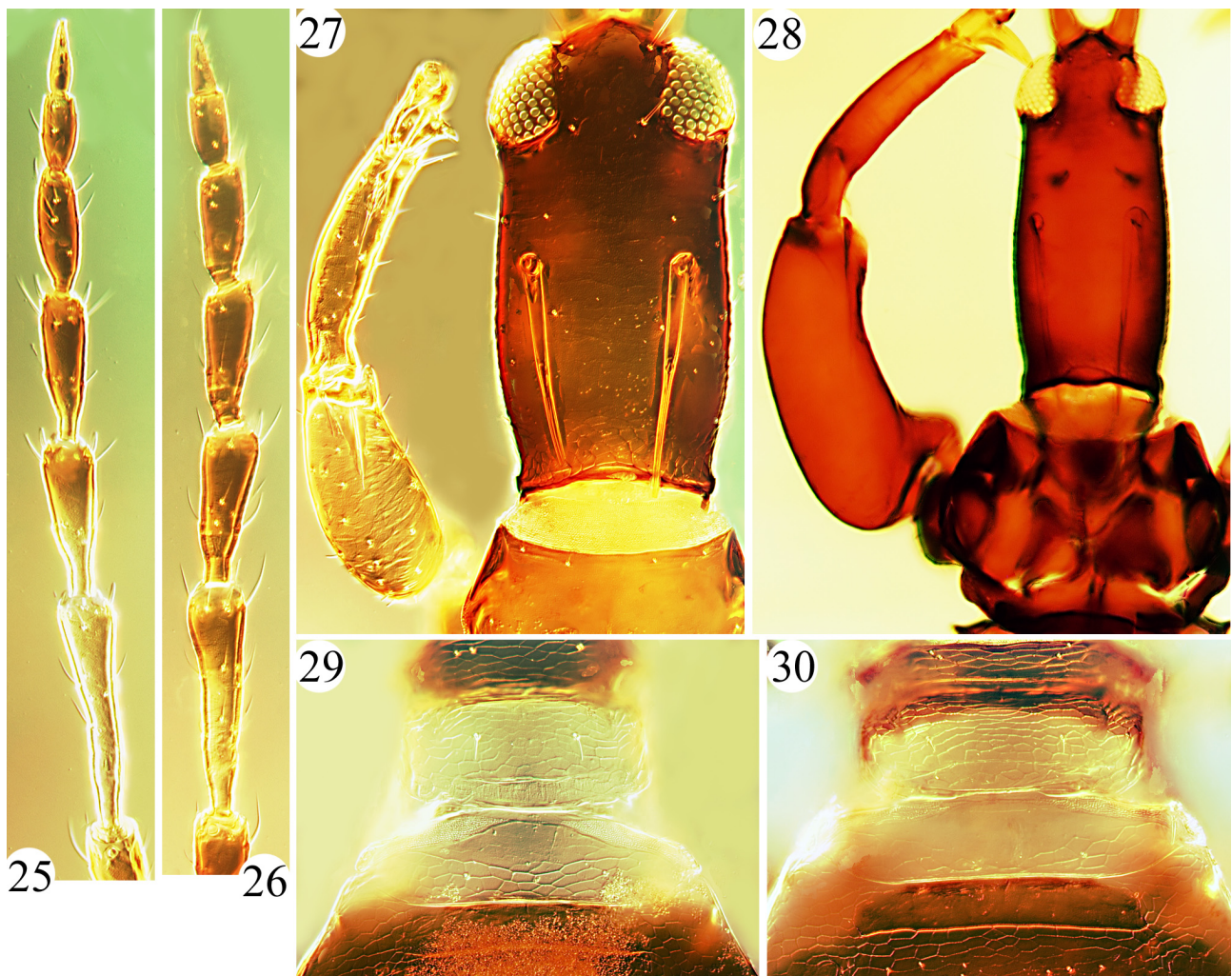


FIGURES 18–24. Type specimens. ‘*C. tenebronus*’ 18–20: (18) holotype female; (19) head, antennae and forelegs, allotype male; (20) holotype and allotype slides. *C. reticulatus* 21–24: (21) antennae, holotype; (22) head and foreleg, holotype; (23) tergites IX–X, paratype male; (24) holotype and paratype slides.

Pelikan described *sinensis* from Guangdong, China, based on a single female. Unfortunately, this specimen has been lost (Dang & Qiao 2013), and the identity of the species interpreted here is based on the detailed original description

and illustrations. Based on that description, *tenebronus* cannot be distinguished from *sinensis*, as also mentioned by Dang and Qiao (2013), and is here placed as a new synonym. This species has the typical white colour on pelta and anterolateral tergite II but no lateral white spots on tergite V (Fig. 18). Furthermore, it can be distinguished from other species of *Compsothrips* from China by the character combination: antennal segment III with 2 sense cones, the uniformly dark brown antennae and legs (Figs 18, 19), metanotum sculptured with longitudinal lines (see Dang *et al.* 2013: 658, fig. 2), tergite IX setae S1–S3 acute at apex and longer than tube, and anal setae about as long as the tube. This species has similar metanotum sculpture with *C. reuteri* from South Africa and *C. graminis* from Trinidad. Fortunately, there are some specimens labelled these two species available in ANIC. By checking the three females and three males of *reuteri* taken from its original place, this species can be easily distinguished from *sinensis* by antennal segment III clear yellow at least, abdominal segment V with a large white spot on each side, S1–S3 on tergite IX much shorter than tube with expanded at apex, anal setae much shorter than tube, and all tarsi clear yellow. In addition, one female and two males of *graminis* from Brazil also have obvious differences in paler colour at thorax and all femora in contrast to dark head and abdomen, expanded S1–S3 on tergite IX but slightly shorter than tube, abdominal segment V also with large pair of white spots, and antennal segment III with only one small sense cone.

Specimens studied. Holotype female of *tenebronus*, with 7 females and 6 males paratypes, China, Sichuan, 2.vii.1984 (Shuyong Wang) (NZMC).



FIGURES 25–30. *C. timur*. (25) antennae, Tashkent specimen; (26) antennae, Tibet specimen; (27) head and foreleg, female from Tibet; (28) head, pronotum and foreleg, male from Tibet; (29) mesonotum, metanotum, pelta and tergite II, Tashkent specimen; (30) mesonotum, metanotum, pelta and tergite II, Tibet specimen.

***Compsothrips timur* (Pelikan)**

(Figs 25–30)

Oedaleothrips timur Pelikan, 1961: 302.

This species was described from a single female taken in Tashkent, Uzbekistan. Based on that detailed description and illustrations, the specimens listed below from Tashkent are here also identified as this species. Furthermore, two females and two males from Tibet, China are similar to the specimens from Tashkent except as follows: antennae brown with segment III yellow on basal 2/3 (Fig. 26), legs dark brown (Figs 27, 28), and metanotum brown on anterior 1/4 (Fig. 19). In contrast, the specimens from Tashkent have antennal segment III all yellow also basal half of IV (Fig. 25), the femora and tibiae are extensively yellow, and the whole of the metanotum is white (Fig. 29). Furthermore, the males from Tibet are larger with broad body and fore legs expanded (Fig. 28). However, no structural differences were observed, and the differences in body coloration are here interpreted as intraspecific variation. This species appears to be similar to *C. sumatranus* Priesner (1928) in having the major setae on tergite IX capitate and shorter than the tube, but the description of that species states that the antennal segments are dark brown with only segment III yellow. It is possible that *sumatranus* may be the same species as *timur*, but the unique holotype from Sumatra was destroyed in 1943 during the partial destruction of the Hamburg Museum.

Specimens studied. China, Tibet, Chayu, 2 females and 2 males on grasses, 12.vii.2022 (Yanqiao Li) (SNUT); Uzbekistan, Tashkent, Ohangaron, 2 females and 1 male, 24.ix.2018 (Jun Chen) (SNUT).

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