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Source: Florida Entomologist, 97(4) : 1511-1528

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.097.0426

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THREE NEW SPECIES OF SUBGENUS *FRENDELIA* (DIPTERA: LAUXANIIDAE: *MINETTIA*) IN SOUTHERN CHINA, WITH A KEY TO KNOWN SPECIES WORLDWIDE

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ABSTRACT

Three new species, *Minettia* (*Frendelia*) *decussata* **sp. nov.**, *Minettia* (*F.*) *longifurcata* **sp. nov.** and *Minettia* (*F.*) *hupingshanica* **sp. nov.**, are described and illustrated from southern China. A key to separate the known species worldwide is presented, along with a taxonomic list of species. The type materials of the new species are deposited in the China Agricultural University, Beijing, China (CAUC).

Key Words: *decussata*, *hupingshanica*, *longifurcata*, Oriental region

RESUMEN

Se describen e ilustran tres especies nuevas, *Minettia* (*Frendelia*) *decussata* sp. nov., *Minettia* (*F.*) *longifurcata* sp. nov. y *Minettia* (*F.*) *hupingshanica* sp. nov., del sur de China. Se presenta una clave para separar las especies conocidas en el mundo, junto con una lista taxonómica de las especies. El material tipo de las nuevas especies esta depositado en la Universidad Agrícola de China, Beijing, China (CAUC).

Palabras Clave: *decussata, hupingshanica, longifurcata*, región Oriental

The subgenus *Frendelia* Collin, 1948 (Diptera: Lauxaniidae: *Minettia* Robineau-Desvoidy, 1830) is diagnosed as follows: body brown to black; antenna often long plumose, rarely short pubescent (in *Minettia* (*F.*) *multisetosa* (Kertész, 1915)); face with a pair of protuberances (developed in most species, but slightly swollen in *Minettia* (*F.*) *kunashirica* Shatalkin, 1992 and *Minettia* (*F.*) *martineki* Ceianu, 1991) on lower margin; mesonotum often with blackish gray pruinose stripes; scutellum often grayish white pruinosity on posterior margin; legs often black, rarely entirely yellow (in *Minettia* (*F.*) *vockerothi* Sasakawa, 1998), color of tarsi variable, hind tibia often with preapical *ad*, rarely absent (in *Minettia* (*F.*) *longipennis* (Fabricius, 1794), *Minettia* (*F.*) *quadrispinosa* Malloch, 1927 and *Minettia* (*F.*) *bistrigata* Shi, Li & Yang, 2010); wing often yellow hyaline, rarely grayish hyaline (in *Minettia* (*F.*) *obscurata* Shewell, 1977), base of wing brown to black or yellow, halter often with yellow stem and brown to black knob, rarely entirely yellow (in *Minettia* (*F.*) *rufiventris* (Macquart, 1848)); abdomen entirely glossy black or grayish black pruinosity, surstylus often separated from epandrium, rarely connected (in *Minettia* (*F.*) *philippinensis* Malloch, 1929); surstylus often broad with apical process; pregonites present, often connected partly with hypandrium, rarely absent; postgonites often with symmetrical or asymmetrical subuliform process; dorsal sclerite of phallus often membranous, if sclerotized, often reverse triangular or trapezoidal in shape; female sternite VIII varying in shape, rarely with lateral projection; distributions are limited to Palaearctic and Oriental regions so far.

The character "two distinctive protuberances on lower margin of face" is very important diagnostic character for the subgenus *Frendelia* (Malloch 1929; Collin 1948). However, Shewell (1977) wrongly placed 2 species *Minettia hoozaensis* Malloch, 1927 (Figs. 11-22) and *Minettia tubifera* Malloch, 1927 without protuberances on the lower margin of the face into the subgenus *Frendelia*. Sasakawa (1998) referred *Minettia tubifera* in Japan to the subgenus *Minettia*. Although Shatalkin (2000) had placed 3 species, *Minettia acuminata* Sasakawa, 1985, *Minettia austriaca* Hennig, 1951 (Figs. 1-5) and *Minettia eoa* Shatalkin, 1992, into the subgenus *Frendelia*, and he revised their placement as belonging to the subgenus *Scotominettia* Shatalkin, 2008.

The subgenus *Frendelia* is similar to the subgenus *Scotominettia*, but the latter has the following diagnostic characters: face having small

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or indistinctive elliptical protuberances on lower margin; arista being short plumose with longest setulae shorter than half of 1st flagellomere or pubescent with microscopic hairs; base of wing being yellow; pregonites being absent and postgonites having a pair of coniform or subuliform process; phallus being membranous or sclerotized, square or rectangular and blunt or truncated apically. Distributions are in the Palaearctic and Nearctic regions (Shatalkin 2008).

There are 21 species in the subgenus *Frendelia* in the world, 10 of which are found in China so far (Table 1).

Materials and Methods

The general terminology follows McAlpine (1981), Papp & Shatalkin (1998), Cumming & Wood (2009) and Gaimari & Silva (2010). Line diagrams were drawn by a drawing tube attached to a Nikon SMZ 1500 stereomicroscope and to a Nikon 80i compound microscope. Photographs were taken by a Nikon DS-Fi2-U3 digital camera mounted on a Nikon SMZ 1500 stereomicroscope. Genitalia preparations were made by removing and macerating the apical portion of the abdomen in cold saturated NaOH for 6 h. After examination, the genitalia were transferred to glycerin and stored in a microvial on the pin below the specimen. Specimens examined were deposited in the following Museums: Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI); China Agricultural University, Beijing, China (CAUC).

The following abbreviations are used: *a* = anterior seta(e), *acr* = acrostichal setula(e), *ad* = anterior dorsal seta(e), *app* = apical posterior seta(e), *apv* = apical ventral seta(e), *av* = anterior ventral seta(e), *dc* = dorsocentral seta(e), *oc* = ocellar, *or* = fronto-orbital seta(e), *p* = posterior seta, *pd* = posterior dorsal seta(e), *prsc* = prescutellar acrostichal seta(e), *pv* = posterior ventral seta(e).

Table 1. Current list of the 21 species in the subgenus *Frendelia* in the world including 10 in China.

- *Minettia* (*Frendelia*) *bistrigata* Shi, Li &Yang, 2010. Oriental: China (Hubei, Guizhou).
- *Minettia* (*Frendelia*) *cycliostylis* Sasakawa, 2008. Palaearctic: Japan (Tokyo).
- *Minettia* (*Frendelia*) *decussata* **sp. nov.** Oriental: China (Hainan).
- *Minettia* (*Frendelia*) *fuscofasciata* (Meijere, 1910). Palaearctic: Vietnam; Oriental: China (Taiwan), Indonesia, Malaysia.
- *Minettia* (*Frendelia*) *hupingshanica* **sp. nov.** Oriental: China (Hunan).
- *Minettia* (*Frendelia*) *kunashirica* Shatalkin, 1992. Palaearctic: Russia.
- *Minettia* (*Frendelia*) *longifurcata* **sp. nov.** Oriental: China (Hubei).
- *Minettia* (*Frendelia*) *longipennis* (Fabricius, 1794). Palaearctic: Andorra, Arabian peninsula, Armenia, Austria, Azerbaidjan, Belgium, Britain, Bulgaria, China (Ningxia), Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iran, Iraq, Ireland, Israel, Italy, Latvia, Lebanon, Lithuania, Netherlands, North Korea, Northern Ireland, Japan (Hokkaido, Rishiri Island, South Kuril Is.), Jordan, Mongolia, Norway, Poland, Romania, Russia, Sinai Peninsula (Egypt), Slovakia, Spain, Sweden, Switzerland, Syria, Turkey, Ukraine; Oriental: China (Hubei, Zhejiang, Hainan, Taiwan); Nearctic: USA.
- *Minettia* (*Frendelia*) *luteitarsis* (Meijere, 1915). Oriental: Indonesia.
- *Minettia* (*Frendelia*) *martineki* Ceianu, 1991. Palaearctic: Arabian peninsula, Armenia, Azerbaidjan, Georgia, Iran, Iraq, Israel, Italy, Jordan, Lebanon, Romania, Sinai Peninsula (Egypt), Switzerland, Syria, Turkey.
- *Minettia* (*Frendelia*) *maura* (Walker, 1852). Oriental:" East Indies."
- *Minettia* (*Frendelia*) *multisetosa* (Kertész, 1915). Oriental: China (Taiwan).
- *Minettia* (*Frendelia*) *nigritarsis* Shatalkin, 1998. Palaearctic: Russia.
- *Minettia* (*Frendelia*) *nigrohalterata* Malloch, 1927. Oriental: China (Taiwan).
- *Minettia* (*Frendelia*) *nitidiventris* Malloch, 1935. Oriental: Malaysia.
- *Minettia* (*Frendelia*) *obscurata* Shewell, 1977. Oriental: Indonesia.
- *Minettia* (*Frendelia*) *philippinensis* Malloch, 1929. Oriental: Philippines.
- *Minettia* (*Frendelia*) *quadrispinosa* Malloch, 1927. Oriental: China (Taiwan), Vietnam.
- *Minettia* (*Frendelia*) *rufiventris* (Macquart, 1848). Oriental: China (Taiwan), India, Indonesia, Laos, Malaysia, Philippines, Vietnam.
- *Minettia* (*Frendelia*) *ryukyuensis* Sasakawa, 2002. Oriental: Japan (Ryukyus).
- *Minettia* (*Frendelia*) *vockerothi* Sasakawa, 1998. Oriental: Malaysia.

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Taxonomic Account

Key to the Known Species of the Subgenus *Frendelia*

1. Base of wing concolorous with rest of wing 2

—. Base of wing distinct darker than rest of wing 10

2. Knob of halter black or brown, darker than stem 3

—. Knob of halter yellow, concolorous with stem 5

3. Abdomen densely gray pruinosity; postgonites well sclerotized tube-like, acute apically; phallus with clustered spinulae on basal membrane in ventral view (Sasakawa 2002: Fig. 1) . . . . . *M.* (*F.*) *ryukyuensis* Sasakawa

—. Abdomen glossy black; postgonite with one or two pairs of processes; phallus not as above. 4

4. Arista with longest setulae less than half as long as width of 1st flagellomere; mesonotum with 2 black stripes (Fig. 36); postgonites in form of a pair of subuliform processes equal in length in ventral view (Fig. 42) . . . . . *M.* (*F.*) *nigrohalterata* Malloch

—. Arista with longest setulae almost as long as width of 1st flagellomere; mesonotum with 3 brown stripes; pregonites and postgonites in form of 2 pairs of asymmetrical processes (Sasakawa 2008: Fig. 2) . . . . . *M.* (*F.*) *cycliostylis* Sasakawa

5. Wing grayish hyaline; first postsutural *dc* close to suture, distance between first postsutural *dc* and suture equal to distance between 3rd postsutural *dc* and hind margin of mesonotum; postgonites in form of a pair of long processes equal in length with a pair of basal teeth (Malloch 1929: Fig. 25) . . . . . *M.* (*F.*) *obscurata* Shewell

—. Wing yellowish hyaline; first postsutural *dc* far from suture, distance between first postsutural *dc* and suture larger than distance between 3rd postsutural *dc* and hind margin of mesonotum; male genitalia not as above 6

6. Arista pubescent; abdomen moderately glossy black with gray pruinosity; male genitalia without illustrations so far . . . . . *M.* (*F.*) *multisetosa* (Kertész)

—. Arista plumose, at least as long as half of 1st flagellomere; abdomen distinctively glossy black 7

7. Legs brownish yellow; mesonotum testaceous; surstylus with an acute triangular process in lateral view; postgonites in form of a pair of long processes, crossed apically (Sasakawa, 1998: Fig. 6) . . . . . *M.* (*F.*) *vockerothi* Sasakawa

—. Legs black, rarely parts of tarsi yellow to yellowish brown and base of tibia yellow; mesonotum black or brown; surstylus and postgonites not as above 8

8. Tibiae black; fore tarsi black, mid and hind tarsi with at least basal 2 segments reddish yellow; surstylus small, incurved . . . . . *M.* (*F.*) *nitidiventris* Malloch

—. Bases of tibiae slightly yellowish and tarsi yellow; surstylus large 9

9. Surstylus articulated with epandrium, with acute inner tooth-like process subapically; postgonites in form of a pair of short processes, crossed apically (Malloch 1929: Fig. 26) . . . . . *M.* (*F.*) *luteitarsis* (Meijere)

—. Surstylus fused with epandrium by a narrow "neck", with a small apical tooth; postgonites in form of a slender S-shaped process (Malloch 1929: Fig. 27) . . . . . *M.* (*F.*) *philippinensis* Malloch

10. Abdomen yellow 11

—. Abdomen brown to black 2

11. Surstylus narrow, clavate, projected back and inward, minutely pointed on dorsal tip; postgonites in form of a pair of tooth-like distal processes and phallus with 3 pairs of central subuliform processes distally in ventral view (Sasakawa 2001: Fig. 4A) . . . . . *M.* (*F.*) *rufiventris* (Macquart)

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—. Surstylus wide rounded with an acute inner process; postgonites in form of a pair of long broad knife-like sclerites, decussate apically; phallus with a W-shaped sclerite and 2 pairs of slender subuliform processes in ventral view (Figs. 6 and 9) . . . . . *M.* (*F.*) *decussata* **sp. nov.**

12. Hind tibia without preapical *ad* 13

—. Hind tibia with preapical *ad* 15

13. Abdominal tergites III–VI each with a brownish pruinosity median band; male genitalia and female terminalia not as below 14

—. Abdomen sparse grayish pruinosity, without a median band; surstylus with a small triangular apical process; pregonites and postgonites consisting of 2 pairs of asymmetrical subuliform processes; phallus consisting of a V-shaped dorsal sclerite with a small acute apical process and indistinct membranous part (Shi et al. 2010: Figs. 2-6); female: eggs with distinct ridges, white to pale yellow; sternite VIII with undulated posterior margin (Fig. 44) . . . . . *M.* (*F.*) *bistrigata* Shi et al.

14. Mesonotum with four black pruinose stripes; surstylus consisting of 2 apical processes, variable in length, generally upper one slightly wider than lower one and broad distance between apical part of 2 processes in ventral view (Remm & Elberg 1979: Fig. 14) . . . . *M.* (*F.*) *longipennis* (Fabricius)

—. Mesonotum with 2 black pruinose stripes; surstylus with a small acute inner process (Malloch 1929: Fig. 24) . . . . . *M.* (*F.*) *quadrispinosa* Malloch

15. Fore, mid and hind tarsi entirely yellow 16

—. Fore tarsi partly or entirely black, mid and hind tarsi yellow or black 18

16. Mesonotum with a pair of black stripes right through the *dc* rows; surstylus consisting 2 apical processes, one is acute apically and another one is truncated apically in posterior view; pregonites and postgonites consisting of 2 pairs of short processes in ventral view (Malloch 1929: Fig. 23; Sasakawa 2001: Fig. 4B) . . . . . *M.* (*F.*) *fuscofasciata* (Meijere)

—. Mesonotum with a pair of black median stripes and a pair of short lateral stripes; surstylus, pregonites and postgonites not as above 17

17. Abdominal tergites II-V each with a pale brown pruinose median band; surstylus with a process on anterior ventral corner and a small acute apical process in lateral view (Fig. 23); female sternite VIII with a pair of black glossy lateral processes at middle (Figs. 46, 47) . . . . . *M.* (*F.*) *hupingshanica* **sp. nov.**

—. Abdominal tergite III only with a pale brown pruinose median band or absent from all tergites; surstylus with 2 long and furcated apical processes in ventral view (Fig. 30); female sternite VIII long trapeziform (Fig. 48). . . . . *M.* (*F.*) *longifurcata* **sp. nov.**

18. Fore tarsi entirely black 19

—. Fore tarsi mostly black except basitarsus yellow 20

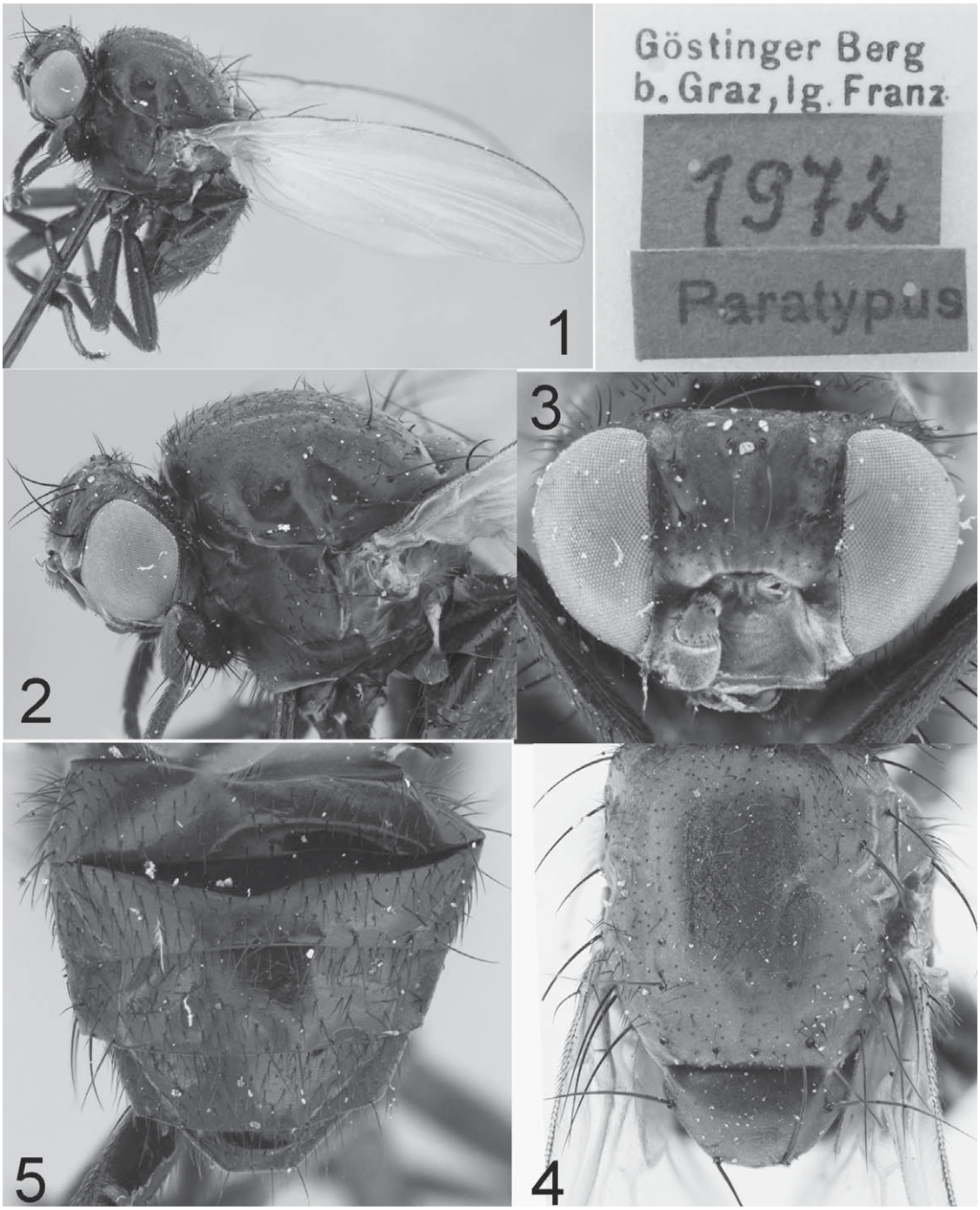
19. Mesonotum with *acr* in 6 rows; tibiae blackish; pregonites and postgonites each in form of a pair of asymmetrical subuliform processes (Shatalkin 1999: Fig. 1d; Shatalkin 2000: Fig. 85) . . . . . *M.* (*F.*) *nigritarsis* Shatalkin

—. Mesonotum with *acr* in 8 rows; tibiae yellow; pregonites in form of a pair of long symmetrical subuliform processes; pregonites in form of a pair of asymmetrical processes in ventral view (Ceianu, 1991: Fig. 2C; Shatalkin, 2000: Fig. 84) . . . . . *M.* (*F.*) *martineki* Ceianu

20. Arista long plumose, longest setulae about 3 times as long as height of 1st flagellomere; surstylus, pregonites and postgonites unknown . . . . . *M.* (*F.*) *maura* (Walker)

—. Arista plumose, longest setulae less than 3 times as long as height of 1st flagellomere; surstylus with a pair of acute apical processes; pregonites consisting of a pair of short asymmetrical processes and postgonites in form of a pair of long asymmetrical processes (Shatalkin 2000: Fig. 86) . . . . . *M.* (*F.*) *kunashirica* Shatalkin

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Figs. 1-5. *Minettia* (*Scotominettia*) *austriaca* Hennig, 1951. Male (specimens from SDEI). (1 and 2) body, lateral view; (3) head, anterior view; (4) thorax, dorsal view; (5) abdomen, dorsal view.

Species Descriptions

Unless otherwise specified, all species described below are characterized as follows: Frons wider than long; ocellar triangle black; *oc* developed, longer than anterior *or*, anterior *or* reclinate, shorter than the posterior. A blackish brown spot present between eye and base of antenna.

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Gena about 1/5 height of eye. Proboscis and palpus black. Mesonotum with *prsc* longer than 1st post-sutural *dc*; 1 *anepst*, 2 *kepst*. Wing slightly yellow, hyaline, pale brown at base. Halter pale yellow except grayish black knob. Surstylus separated from epandrium. Three spermathecae, round.

MINETTIA (*FRENDELIA*) *DECUSSATA* **SP. NOV.** (Figs. 6-10, 45, 52)

Description

Male

Body length 3.6-4.1 mm, wing length 3.6-4.0 mm.

Head black. Frons brown (slightly yellowish brown on anterior margin in a few specimens) except orbital plate black. Parafacial grayish yellow with a black stripe-like median spot, a black round spot on ventral corner and inner margin glossy black. Antennal scape blackish brown; pedicel brownish yellow to pale brown; 1st flagellomere brownish yellow to pale brown, nearly 1.7 times longer than high; arista black, long plumose, with longest setulae more than height of 1st flagellomere.

Thorax brown to black with brownish gray pruinosity. Mesonotum with four black stripes; 0+3 *dc* (anterior *dc* far behind transverse scutal suture), *acr* in 8 rows. Scutellum brown, with a silver white pruinosity band on apical margin. Legs mostly blackish brown except all tarsi pale yellow (tarsomeres 3-5 slightly reddish yellow in a few of specimens); all femora black; fore tibia black, mid and hind tibiae brown. Fore femur with 6 *pv*, 10 *pd*, fore tibia with 1 long preapical *ad* and 1 short *apv*. Mid femur with 6 *a* and 1 *app*; mid tibia with 1 strong preapical *ad*, 1 strong *apv*. Hind femur with 1 weak preapical *ad*; hind tibia with 1 weak preapical *ad* and 1 short *apv*. Wing with costa with 2nd (between R_1 and R_{2+3}), 3rd (between R_{2+3} and R_{4+5}) and 4th (between R_{4+5} and M_1) sections in proportion of 6.3:1.7:1; *r-m* before middle of discal cell; ultimate and penultimate sections of M_1 in proportion of 1:1.2; ultimate section of CuA_1 about 1/6 of penultimate.

Abdomen yellow (reddish yellow in a few specimens) with sparse grayish white pruinosity. Male genitalia (Figs. 6-10): syntergosternite slender, semicircular, epandrium wide; surstylus wide rounded with a triangular inner process; hypandrium narrow; pregonites short narrow subuliform and postgonites in form of a pair of long broad knife-like sclerites, decussate apically; phallus with a W-shaped sclerite and 2 pairs of slender subuliform processes in ventral view; phallapodeme short claviform and oblique backwards.

Female

Body length 3.9-4.4 mm, wing length 3.7-4.1 mm.

Sternite VIII wider than long with long setae on lateral margin (Fig. 45), spermathecae elliptical, slightly narrow at tip (Fig. 52).

Type Material

HOLOTYPE: ♂, CHINA, Hainan Province, Changjiang, Bawangling National Natural Reserve, Dong'er station, 1000 m, 24-V-2007, Kuiyan Zhang (CAUC). PARATYPES: CHINA, Hainan Province: 6 ♂♂, 8 ♀♀, Changjiang, Bawangling National Natural Reserve, Dong'er station, 1000 m, 24-V-2007, Kuiyan Zhang (CAUC); 9 ♂♂, 4 ♀♀, Changjiang, Bawangling National Natural Reserve, Dong'er station, 1000 m, 24-V-2007, Junhua Zhang (CAUC); 1 ♂, 1 ♀, Changjiang, Bawangling National Natural Reserve, Dong'er station, 1000 m, 25-V-2007, Junhua Zhang (CAUC).

Distribution

China (Hainan).

Etymology

Latin, *decussata*, meaning crossed; referring to the postgonites having a pair of broad knife-like sclerites, crossed apically in ventral view; a feminine adjective.

Remarks

The new species is distinctly different from other species of the subgenus by the pregonites having a pair of short narrow subuliform processes and the postgonites having a pair of long broad knife-like processes, decussate apically; the phallus being consisting of a W-shaped sclerite and 2 pairs of slender subuliform processes in ventral view.

MINETTIA (*FRENDELIA*) *HUPINGSHANICA* **SP. NOV.** (Figs. 23-27, 46, 47, 50, 53)

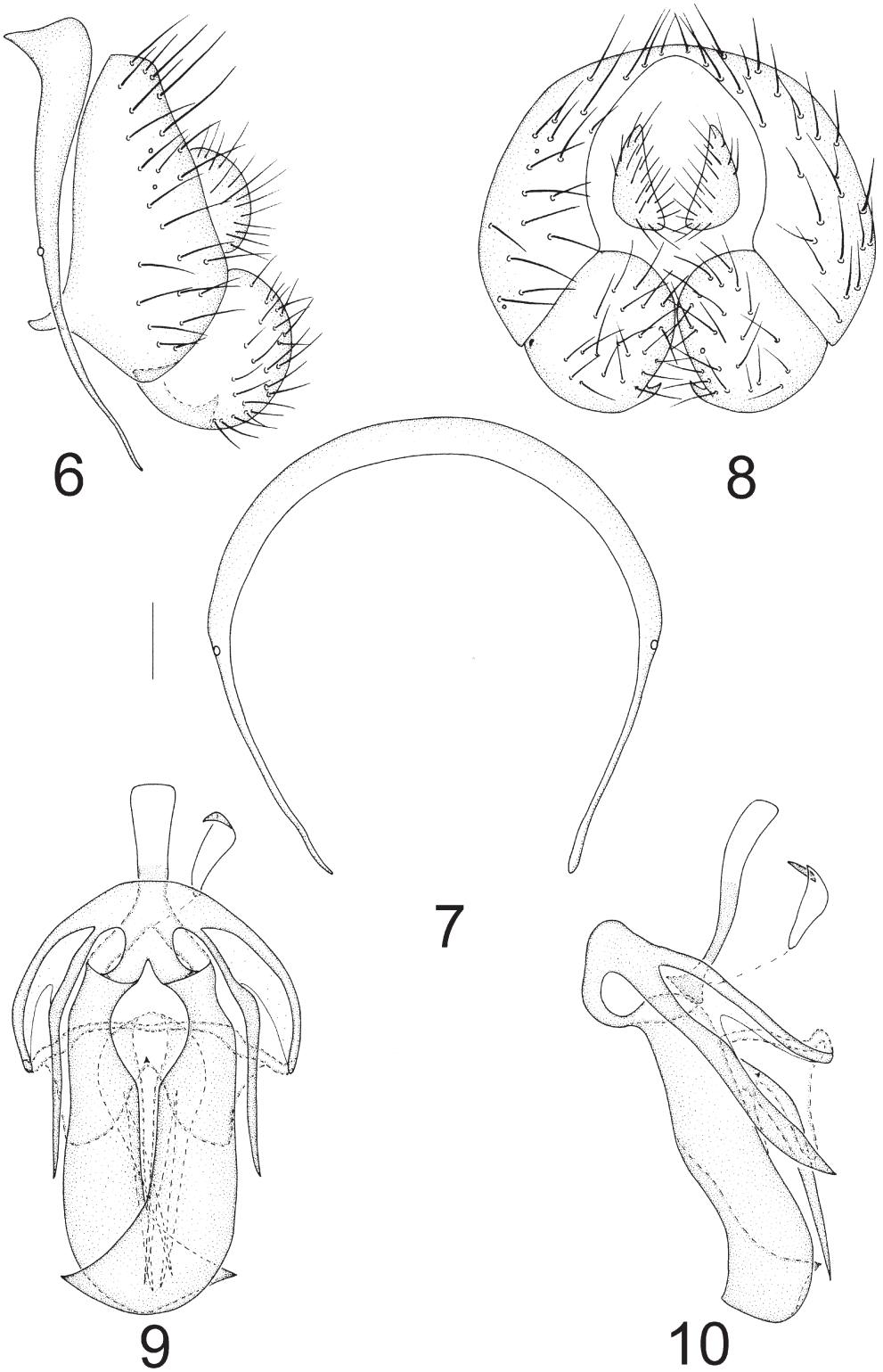
Description

Male

Body length 3.9-5.0 mm, wing length 4.0-4.5 mm.

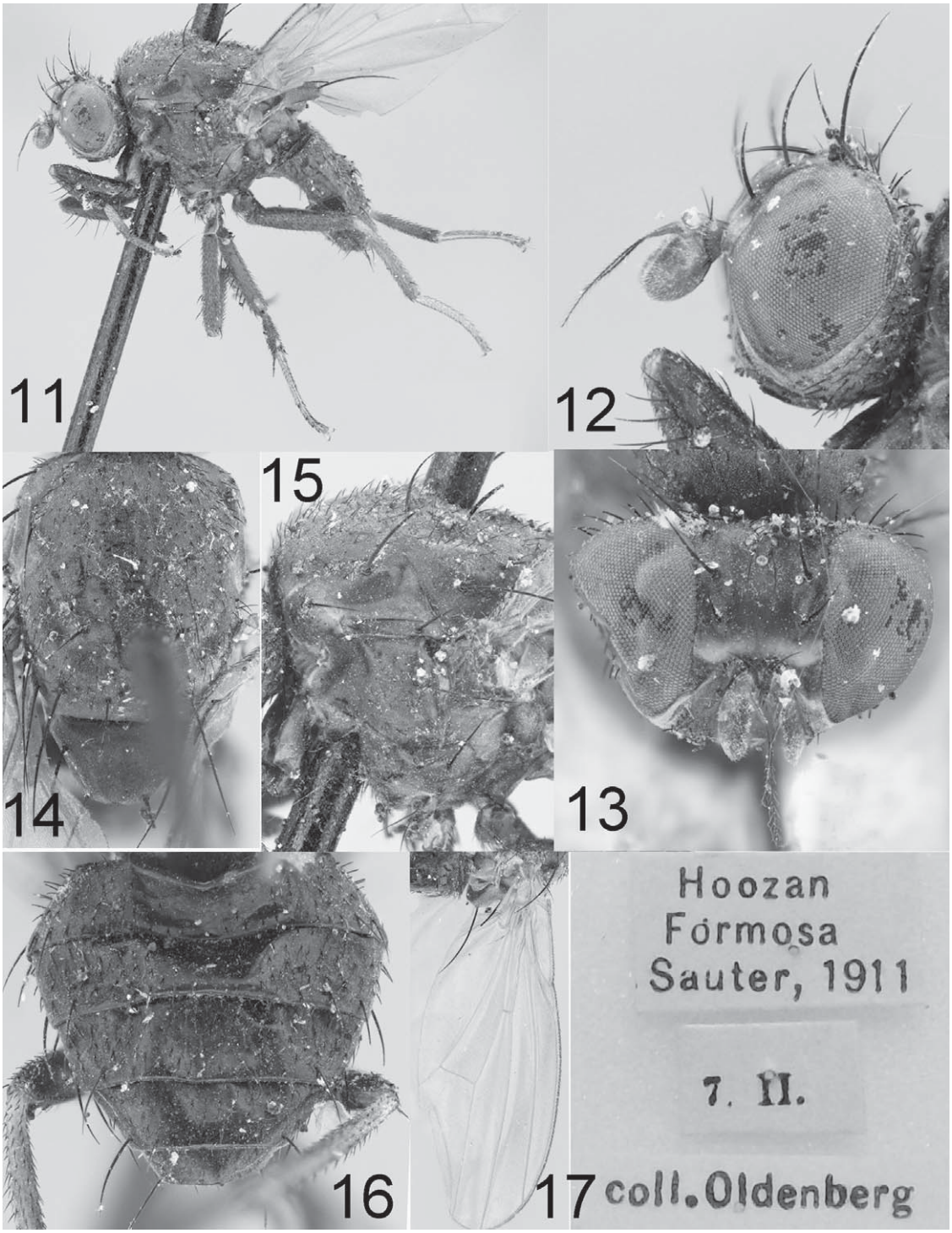
Head mostly black. Frons grayish black with a pair of black stripes extending to ocellar triangle. Parafacial grayish white pruinosity with a narrow black median stripe. Antennal scape blackish brown; pedicel yellow; 1st flagellomere pale brown except yellow at base, nearly 1.9 times lon-

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Figs. 6-10. *Minettia* (*Frendelia*) *decussata* **sp. nov.** Male. (6) syntergosternite and epandrium, lateral view; (7) syntergosternite, anterior view; (8) epandrial complex, posterior view; (9) aedeagal complex, ventral view; (10) aedeagal complex, lateral view. Scale bar = 0.1mm.

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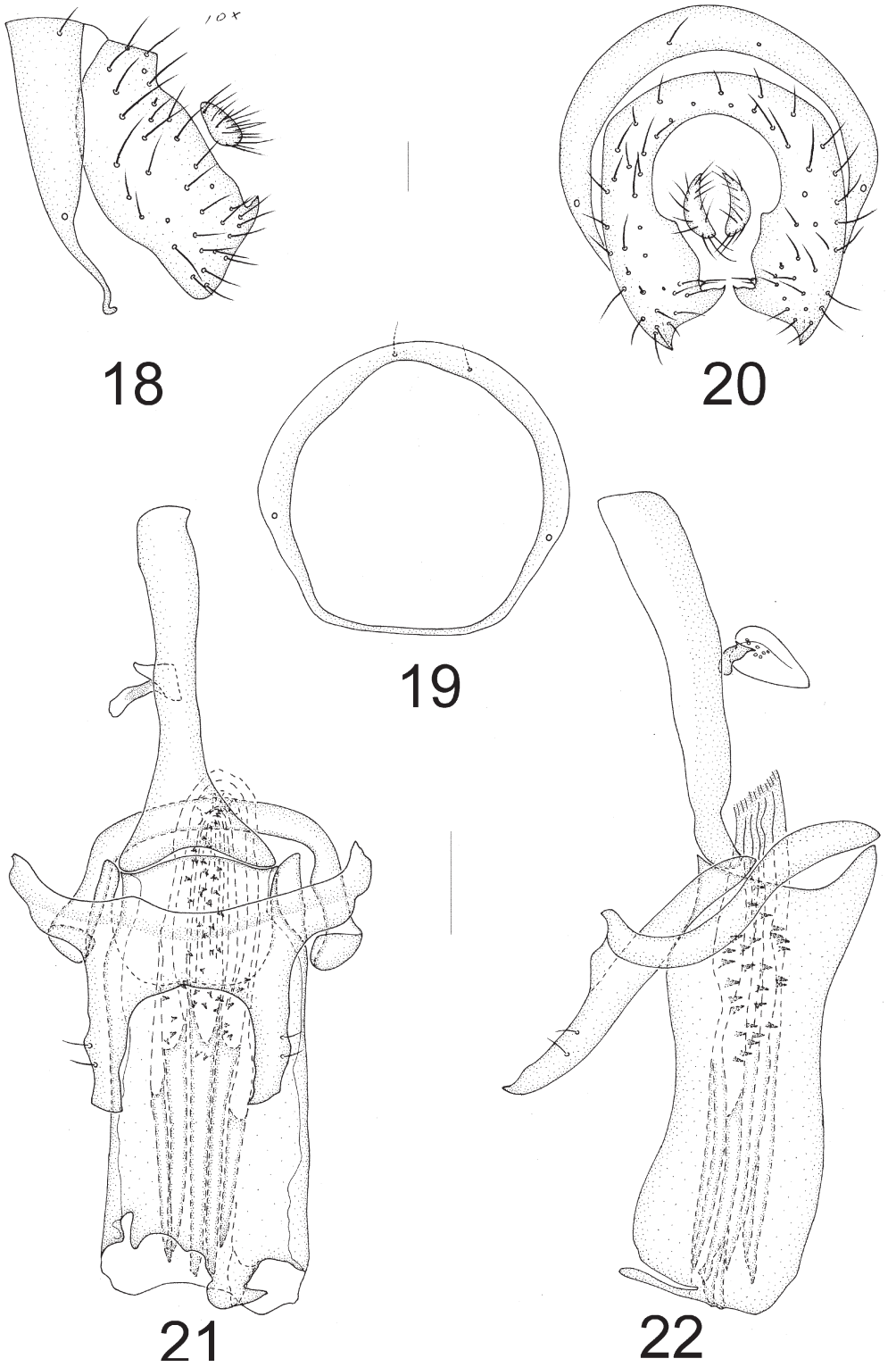


Figs. 11-17. *Minettia* (*Minettia*) *hoozanensis* Malloch, 1927. Male (specimens from SDEI). (11) body, lateral view; (12 and 13) head, lateral and anterior view; (14 and 15) thorax, dorsal and lateral view; (16) abdomen, dorsal view; (17) wing.

ger than high; arista black, plumose, with longest setulae as long as height of 1st flagellomere.

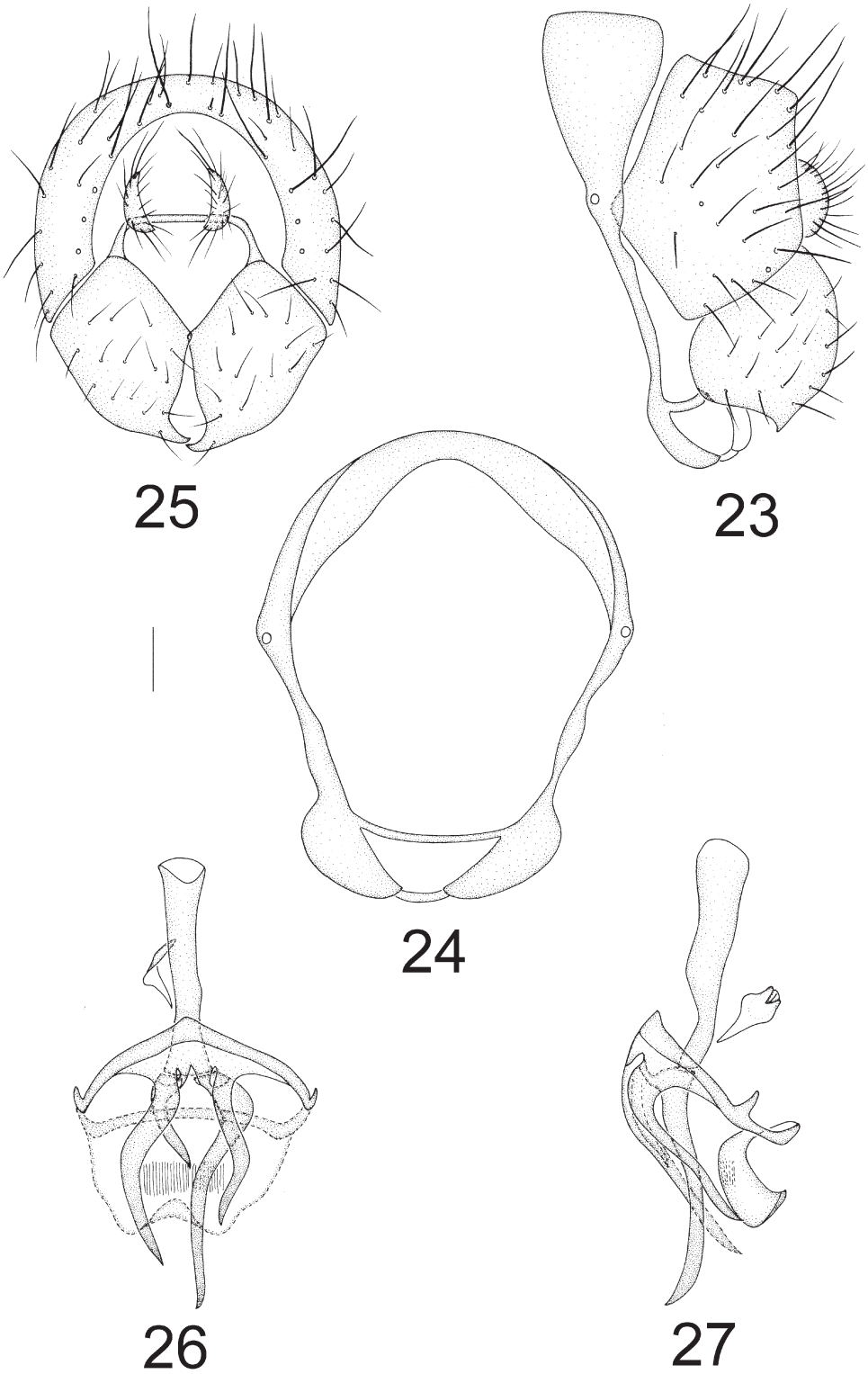
Thorax black with brownish gray pruinosity. Mesonotum with a pair of black median stripes

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Figs. 18-22. *Minettia* (*Minettia*) *hoozanensis* Malloch, 1927. Male (specimens from SDEI). (18) syntergosternite and epandrium, lateral view; (19) syntergosternite, anterior view; (20) epandrial complex, posterior view; (21) aedeagal complex, ventral view; (22) aedeagal complex, lateral view. Scale bar = 0.1mm.

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Figs. 23-27. *Minettia* (*Frendelia*) *hupingshanica* **sp. nov.** Male. (23) syntergosternite and epandrium, lateral view; (24) syntergosternite, anterior view; (25) epandrial complex, posterior view; (26) aedeagal complex, ventral view; (27) aedeagal complex, lateral view. Scale bar = 0.1mm.

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and a pair of short lateral stripes; 0+3 *dc*, *acr* in 8 rows. Scutellum black, with a U-shaped grayish white pruinosity band along apical and lateral margin. Legs black except tarsi dark yellow. Fore femur with 5-6 *pv*, 8 *pd*, fore tibia with 1 preapical *ad* and 1 short *apv*. Mid femur with 6 *a* and 1 *app*; mid tibia with 1 strong preapical *ad*, 1 strong *apv*. Hind femur with 1 weak preapical *ad*; hind tibia with 1 weak preapical *ad* and 1 short *apv*. Wing with costa with 2nd (between R_1 and R_{2+3}), 3rd (between R_{2+3} and R_{4+5}) and 4th (between R_{4+5} and M_1) sections in proportion of 6:1.3:1; *r-m* at middle of discal cell; ultimate and penultimate sections of M_1 in proportion of 1:1.1; ultimate section of CuA_1 about 1/6 of penultimate.

Abdomen black with sparsely grayish pruinosity, tergites II-V each with a pale brown pruinosity median band. Male genitalia (Figs. 23-27): syntergosternite with 2 ventral bridges and a pair of broad apical processes; epandrium broad; surstylus with an tiny process on anterior ventral corner and a small acute apical process in lateral view; hypandrium narrow V-shaped; pregonites and postgonites with a pair of asymmetrical processes; phallus consisting of a trapeziform sclerite and a brown membranous brush-like central area; phallapodeme long.

Female

Body length 3.7-5.0 mm, wing length 3.9-4.9 mm.

Sternite VIII with a pair of black glossy lateral processes at middle and long setulae at ventral half in ventral view (Figs. 46, 47, 50, 53).

Type Material

HOLOTYPE: ♂, CHINA, Hunan Province, Changde, Shimen, Hupingshan National Natural Reserve, Zhipeng River, 450 m, 6-VI-2008, Kuiyan Zhang (CAUC). PARATYPES: CHINA, Hunan Province: 5 ♂♂, 4 ♀♀, data same as holotype (CAUC); 3 ♂♂, 4 ♀♀, Changde, Shimen, Hupingshan National Natural Reserve, Zhipeng River, 450 m, 6-VI-2008, Li Shi (CAUC).

Distribution

China (Hunan).

Remarks

The new species is very similar to *Minettia* (*Frendelia*) *quadrispinosa* from China (Taiwan) in the following characters: color and stripes of head, thorax and abdomen; wing brown at base; pregonites and postgonites with a pair of asymmetrical processes. But it can be separated from the latter by the surstylus having an indistinct process on anterior ventral corner and a small acute apical process in lateral view and the hind tibia having a weak preapical *ad*. In *Minettia* (*Frendelia*) *quadrispinosa*, the surstylus has an apical process and the hind tibia has no preapical *ad* (Malloch, 1929).

Etymology

The new species is named after the type locality Hupingshan National Nature Reserve, Hunan Province.

MINETTIA (*FRENDELIA*) *LONGIFURCATA* **SP. NOV.**
(Figs. 28-32, 48, 54)

Description

Male

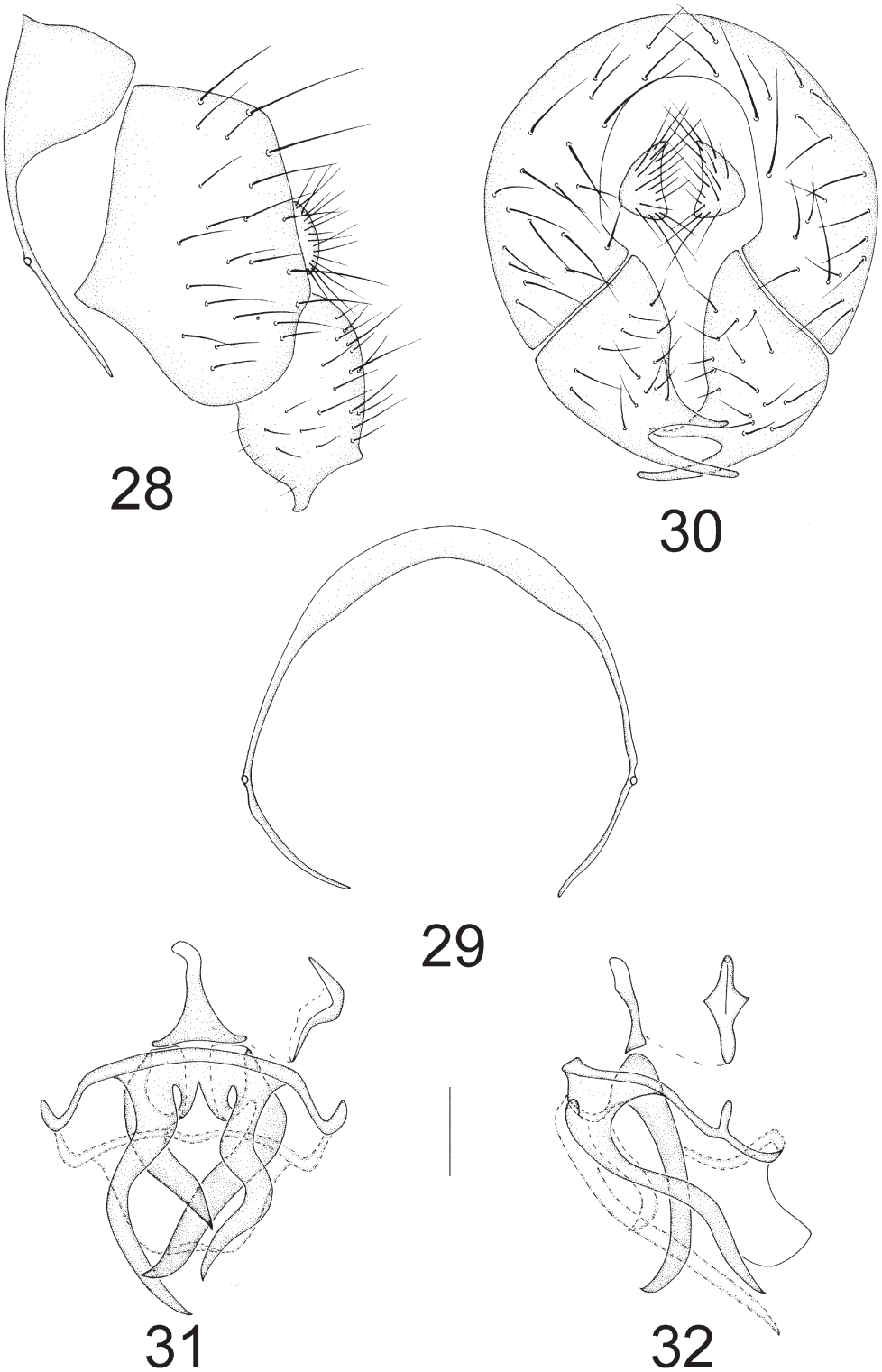
Body length 3.5-4.5 mm, wing length 4.0-4.5 mm.

Head mostly black. Frons brown (slightly yellowish brown on anterior margin in a few specimens) except orbital plate black. Parafacial grayish white pruinosity, with a narrow black median stripe and inner margin glossy black. Antennal scape blackish brown; pedicel yellow to brownish yellow; 1st flagellomere pale brown except yellow at base, about 2.0 times longer than high; arista black, long plumose, with longest setulae more than height of 1st flagellomere.

Thorax brown to black with brownish gray pruinosity. Mesonotum with a pair of median black stripes and a pair of lateral black stripes; 0+3 *dc* (anterior *dc* weak, far behind transverse scutal suture), *acr* in 8 rows. Scutellum black, with a wide grayish white U-shaped pruinose band. Legs mostly blackish brown except tarsi brownish yellow, and mid and hind tarsi pale yellow. Fore femur with 6 *pv* and 8 *pd*, fore tibia with 1 preapical *ad* and 1 short *apv*. Mid femur with 6 *a* and 1 *app*; mid tibia with 1 strong preapical *ad* and 1 strong *apv*. Hind femur with 1 weak preapical *ad*; hind tibia with 1 weak preapical *ad* and 1 short *apv*. Wing with costa with 2nd (between R_1 and R_{2+3}), 3rd (between R_{2+3} and R_{4+5}) and 4th (between R_{4+5} and M_1) sections in proportion of 5.2:1.5:1; *r-m* before middle of discal cell; ultimate and penultimate sections of M_1 in proportion of 1:1.3; ultimate section of CuA_1 about 1/8 of penultimate.

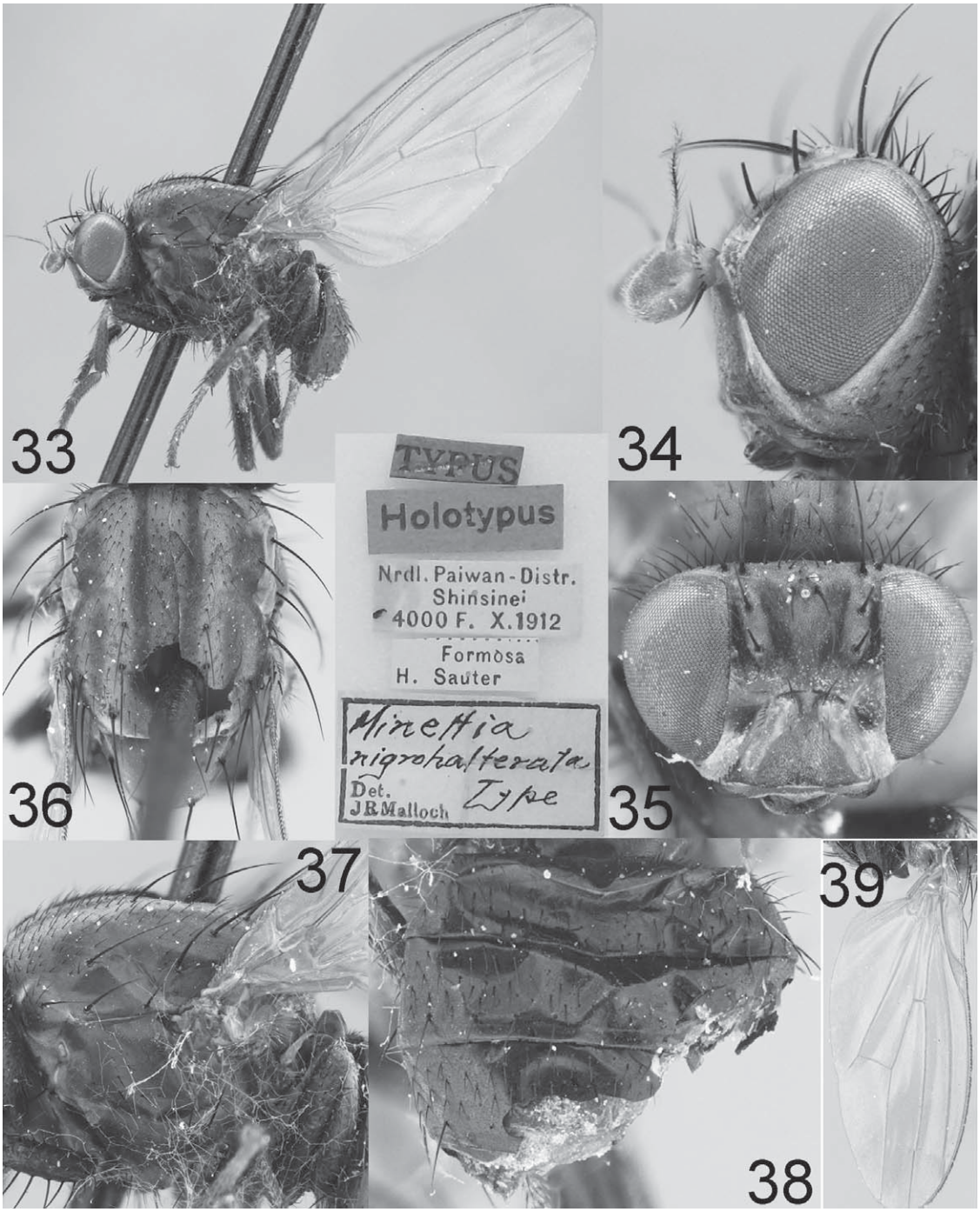
Abdomen black with whitish gray pruinosity (tergite III with pale brown pruinose median band in a few specimens). Male genitalia (Figs. 28-32): syntergosternite semicircular, epandrium broad; surstylus with 2 long and furcated apical processes (the lower one slightly wider than the upper one) and narrow distance between apical part of 2 processes in ventral view; hypandrium with narrow lateral arms in lateral view; pregonites and postgonites each in form of a pair of

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Figs. 28-32. *Minettia* (*Frendelia*) *longifurcata* **sp. nov.** Male. (28) syntergosternite and epandrium, lateral view; (29) syntergosternite, anterior view; (30) epandrial complex, posterior view; (31) aedeagal complex, ventral view; (32) aedeagal complex, lateral view. Scale bar = 0.1mm.

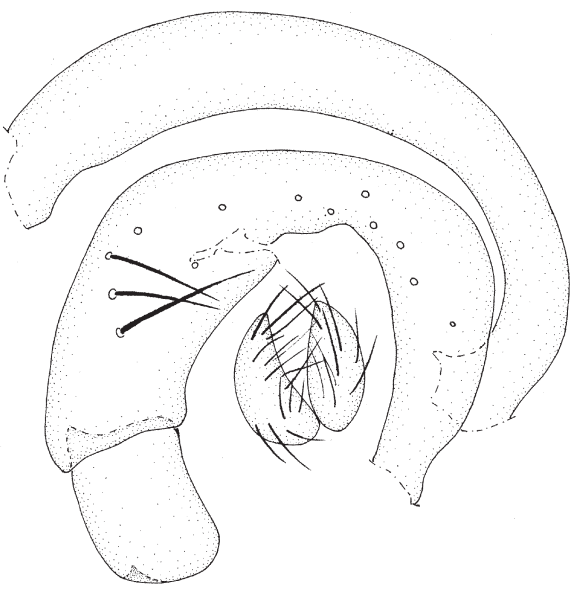
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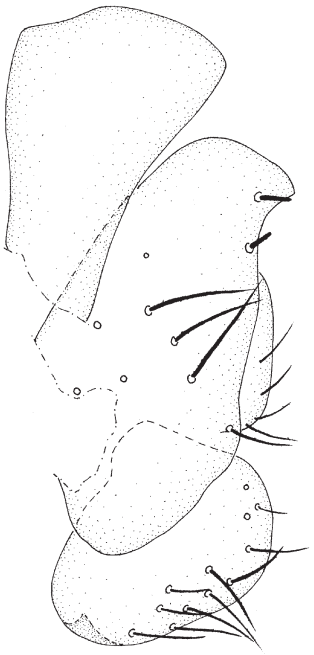
Figs. 33-39. *Minettia* (*Frendelia*) *nigrohalterata* Malloch, 1927. Male (specimens from SDEI). (33) body, lateral view; (34 and 35) head, lateral and anterior view; (36 and 37) thorax, dorsal and lateral view; (38) abdomen, dorsal view; (39) wing.

asymmetrical subuliform processes; phallus with a trapeziform sclerite, round apically in ventral view; phallapodeme shorter than phallus, curved basally in ventral view (there are slight differences in angle of pregonites versus postgonites, and length of phallapodeme among specimens).

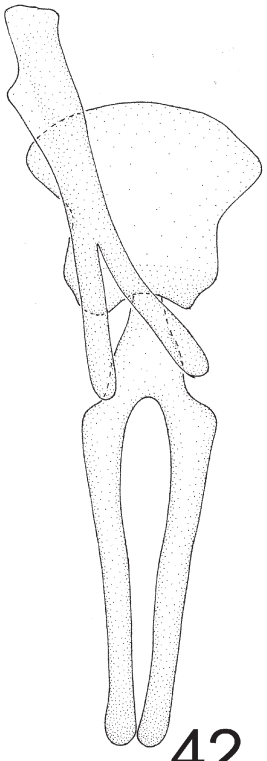
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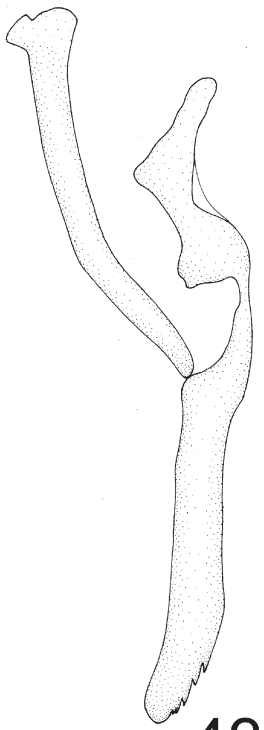
41



40



42



43

Figs. 40-43. *Minettia* (*Frendelia*) *nigrohalterata* Malloch, 1927. Male (specimens from SDEI). (40) syntergosternite and epandrium, lateral view; (41) epandrial complex, posterior view; (42) aedeagal complex, ventral view; (43) aedeagal complex, lateral view. Scale bar = 0.1mm.

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Female

Body length 3.6-4.1 mm, wing length 3.6-4.1 mm.

Sternite VIII trapeziform, sternite IX narrow and concaved on anterior margin (Figs. 48, 54).

Type Material

HOLOTYPE: ♂, CHINA, Hubei Province, Shennongjia National Natural Reserve, Laojunshan, 714 m, 4-VIII-2007, Qifei Lui (CAUC). PARATYPES: 4 ♂♂, 5 ♂♂, CHINA, Hubei Province, Shennongjia National Natural Reserve, Laojunshan, 714 m, 3-5-VIII-2007, Qifei Lui (CAUC).

Distribution

China (Hubei).

Remarks

The new species is very similar to *Minettia* (*Frendelia*) *fuscofasciata* from the Oriental Region in the following characters: mesonotum with a pair of black stripes between *dc* rows, hind tibia with 1 weak preapical *ad*, wing brown at base and abdomen whitish gray pruinosity, but it can be separated from the latter by the surstylus having 2 long and furcated apical processes and the phallus with a trapeziform sclerite, round apically in ventral view. In *Minettia fuscofasciata*, the surstylus has 2 short and furcated apical processes and the phallus has a pair of bifurcated horns (Sasakawa, 2001).

Etymology

Latin, *longa*, meaning long, + *furcata*, meaning forked; referring to the surstylus having 2 long forked apical processes; a feminine adjective.

Minettia (*Frendelia*) *longipennis* (Fabricius, 1794)

Musca longipennis Fabricius, 1794: 323.

Minettia (*Frendelia*) *longipennis*: Collin, 1948: 228. Remm & Elberg, 1979: 85. Sasakawa, 2005: 301; Sasakawa & Kozánek, 1995: 323.

Description

Male

Body length 3.9-5.0 mm, wing length 4.0-5.3 mm.

Head mostly black. Frons brown (slightly yellowish brown on anterior margin in some specimens) except orbital plate black. Parafacial yellowish gray with a narrow black median stripe and inner margin glossy black. Gena about 1/6 height of eye. Antennal scape blackish brown; pedicel yellow to brownish yellow; 1st flagellomere yellowish brown to pale brown, nearly 2.0 times longer than high; arista black, long plumose, with longest setulae longer than height of 1st flagellomere.

Thorax brown to black with brownish gray pruinosity. Mesonotum with a pair of median black stripes and a pair of lateral black stripes; 0+3 *dc* (anterior *dc* far behind transverse scutal suture), *acr* in 8-10 rows. Scutellum brown, with a wide silver white pruinosity band on apical 1/3. Legs mostly blackish brown except tarsi pale yellow; femora black; fore tibia black, mid and hind tibiae brown. Fore femur with 8 *pv* and 10 *pd*, fore tibia with 1 long preapical *ad* and 1 short *apv*. Mid femur with 8 *a* and 1 *app*, mid tibia with 1 strong preapical *ad* and 1 strong *apv*. Hind femur with 1 weak preapical *ad*; hind tibia with 1 short *apv*, but no preapical *ad*. Wing with costa with 2nd (between R_1 and R_{2+3}), 3rd (between R_{2+3} and R_{4+5}) and 4th (between R_{4+5} and M_1) sections in proportion of 6.2:1.5:1; *r-m* before middle of discal cell; ultimate and penultimate sections of M_1 in proportion of 1:1.5; ultimate section of CuA_1 about 1/8 of penultimate.

Abdomen black with whitish gray pruinosity, tergites III-VI each with a brownish pruinose median band. Male genitalia: syntergosternite slender, semicircular, epandrium wide; surstylus round, with 2 apical processes (generally upper one slightly wider than lower one and broad distance between apical part of 2 processes in ventral view, which differs from *M. longifurcata*); hypandrium narrow; pregonites and postgonites each in form of a pair of asymmetrical subuliform processes; phallus with a trapeziform sclerite in ventral view; phallapodeme claviform, slightly broad.

Female

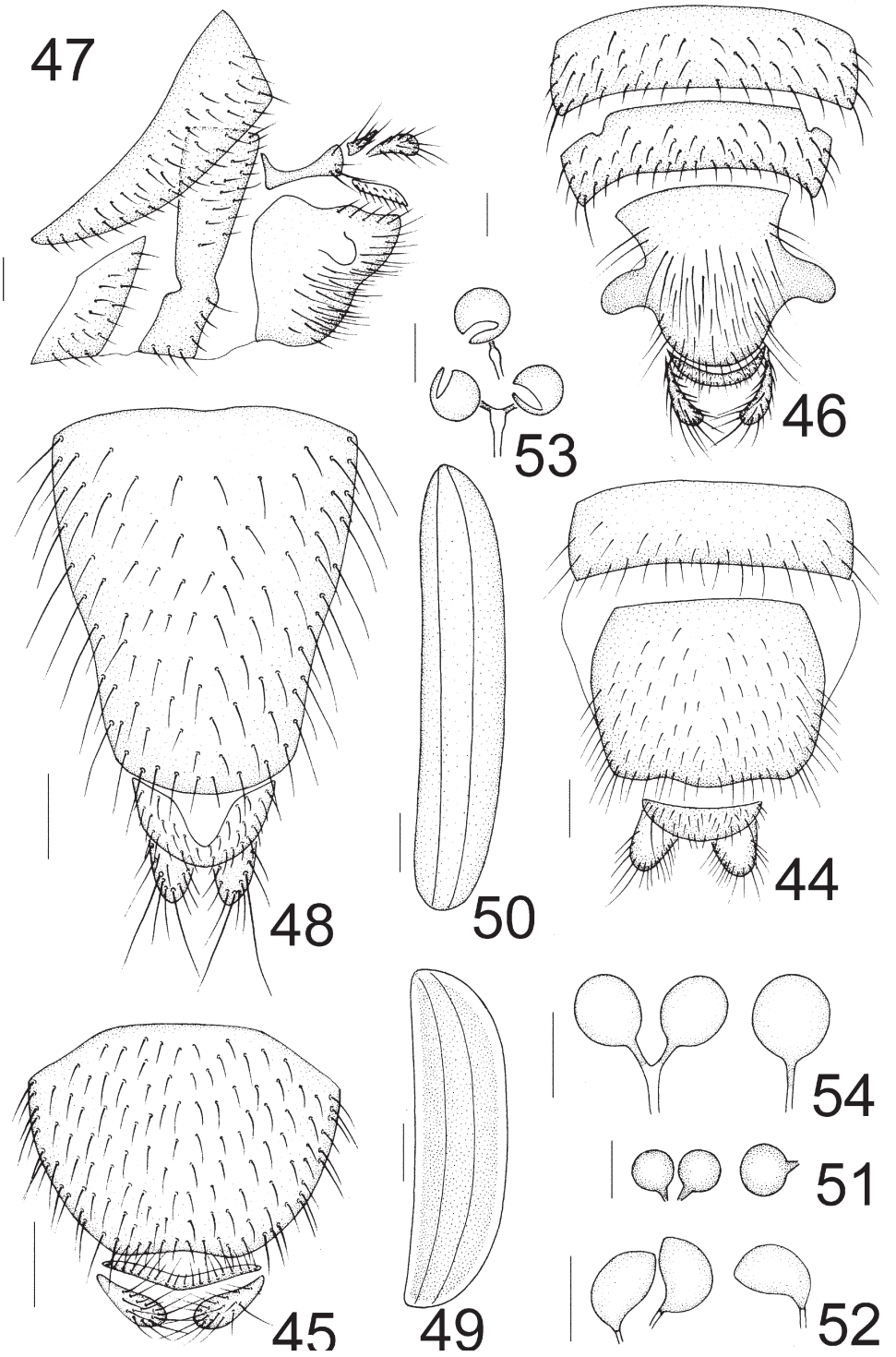
Body length 4.3-4.9 mm, wing length 4.2-5.0 mm.

Sternite VIII broad, slightly projecting subapically (Remm & Elberg, 1979).

Specimens Examined

CHINA, Ningxia Province: 4 ♂♂, 5 ♀♀, Jingyuan, Longtan, 1880 m, 6-VII-2008, Tingting Zhang (CAUC); 2 ♂♂, 1 ♀, Jingyuan, Longtan, 1880 m, 6-VII-2008, Gang Yao (CAUC); 2 ♀♀, Longde, Sutai, 2100 m, 24-VI-2008, Gang Yao (CAUC); 3 ♂♂, Jingyuan, Xiaonanchuan, 1900 m, 3-VII-2008, Tingting Zhang (CAUC); CHINA, Zhejing Province: 16 ♂♂, 18 ♀♀, Lin'an, Tianmu Mountain, 18-19-VII-2007, Yajun Zhu (CAUC); CHINA, Hainan Province: 1 ♂, Baisha, Yinggeling National Natu-

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Figs. 44-54. Female terminalia. *Minettia* (*Frendelia*) *bistrigata* Shi, Li and Yang, 2010. (44) sternites VII-IX, ventral view; (49) egg; (51) spermathecae. *Minettia* (*Frendelia*) *decussata* **sp. nov.** (45) sternites VIII-IX, ventral view; (52) spermathecae. *Minettia* (*Frendelia*) *hupingshanica* **sp. nov.** (46 and 47). sternites VI-IX, ventral view; (50) egg; (53) spermathecae. *Minettia* (*Frendelia*) *longifurcata* **sp. nov.** (48) sternites VII-IX, ventral view; (54) spermathecae. Scale bar = 0.1mm.

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ral Reserve, 2-VI-2006, Hui Dong (CAUC); 1 ♂, Ledong, Jianfengling National Natural Reserve, Protection station, 13-V-2007, Kuiyan Zhang (CAUC); 4 ♂♂, 1 ♀, Ledong, Jianfengling National Natural Reserve, Tianchi, 18-V-2006, Gang Yao (CAUC); 1 ♂, Ledong, Jianfengling National Natural Reserve, Nantianchi, 19-V-2006, Gang Yao (CAUC); 1 ♂, Ledong, Jianfeng town, 22-V-2006, Hui Dong (CAUC); 1 ♂, 3 ♀♀, Ledong, Jianfengling National Natural Reserve, Tianchi, 18-V-2006, Hui Dong (CAUC); 1 ♂, 1 ♀, Ledong, Jianfengling National Natural Reserve, Sanfenqu, 800 m, 8-V-2008, Qifei Liu (CAUC); 2 ♂♂, Ledong, Jianfengling National Natural Reserve, Plant Garden, 800 m, 9-V-2008, Qifei Liu (CAUC); 1 ♀, Changjiang, Bawangling National Natural Reserve, Linchang Hotel, 26-V-2007, Junhua Zhang (CAUC); 6 ♂♂, 1 ♀, Changjiang, Bawangling National Natural Reserve, Dong'er station, 1000 m, 24-25-V-2007, Junhua Zhang (CAUC); CHINA, Hubei Province: 1 ♂, 2 ♀♀, Shennongjia National Natural Reserve, Banqiao, 1170 m, 23-24-VII-2007, Qifei Liu (CAUC); 1 ♂, 1 ♀, Shennongjia National Natural Reserve, Pingqian, 1650 m, 25-26-VII-2007, Qifei Liu (CAUC).

Distribution

Palaearctic: Andorra, Arabian peninsula, Armenia, Austria, Azerbaidjan, Belgium, Britain, Bulgaria, China (Ningxia), Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iran, Iraq, Ireland, Israel, Italy, Latvia, Lebanon, Lithuania, Netherlands, North Korea, Northern Ireland, Japan (Hokkaido, Rishiri Island, South Kuril Is.), Jordan, Mongolia, Norway, Poland, Romania, Russia, Sinai Peninsula (Egypt), Slovakia, Spain, Sweden, Switzerland, Syria, Turkey, Ukraine; Oriental: China (Hubei, Zhejiang, Hainan, Taiwan); Nearctic: USA.

ENDNOTES

Author Li Shi gives sincere thanks to Stephen D. Gaimari (California Dept. of Food and Agriculture, Sacramento) for checking a few of specimens in USNM and reviewing the manuscript; to Anatole I. Shatalkin (Moscow, Russia) for providing literature and translating Russian literature; to Frank Menzel [Senckenberg Deutsches Entomologisches Institut (SDEI), Müncheberg] for making loans of the type specimens; and to 2 reviewers for giving kind suggestions. Li Shi visited the Zoological Museum of the Moscow State University under the grant's support, and Dr. Shatalkin was very kind and most helpful. This study was supported by a grant (No. 31260525) from the National Natural Science Foundation of China.

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