

Diagnosis and Key for the *Helina subpubiseta*-group (Diptera: Muscidae) from China, with Descriptions of Eight New Species

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ABSTRACT

Eight new species of *Helina subpubiseta*-group from China, namely *H. betula* sp. n., *H. biastocerca* sp. n., *H. ciliitruncata* sp. n., *H. compositimacula* sp. n., *H. deslargideleta* sp. n., *H. moirigkawagarboensis* sp. n., *H. subdeleta* sp. n. and *H. tigrivestigia* sp. n., are described and illustrated. Diagnosis of this group, key to the species are also given.

Key words: Diptera, Muscidae, *Helina subpubiseta*-group, new species, China.

INTRODUCTION

Helina Robineau-Desvoidy, established in 1830, is the second largest genus in the family Muscidae, distributed in all zoogeographic regions of the world, and comprises about 660 scientific names (over 540 species), the majority of which are from the Palaearctic region (Emden, 1951, 1965; Hennig, 1957-1958; Hockett, 1965; Pont 1977, 1980, 1986, 1989; Xue, 1998; de Carvalho *et al.*, 2005; Xue, Wang, 2012; Wang, 2013). The genus *Helina* was classified into seven groups by Ringdahl for the first time in 1924, and then classified into 21 groups by Ringdahl in 1949. Although Ringdahl did a tremendous amount of work on this genus, his conclusions were preliminary and need further investigation. Ringdahl (1956) did not quote these groups in his book *Svensk Insektfauna*, but Hennig (1957-1958) accepted in his monograph of *Palaearctic Muscidae*, but there was no in-depth study. Emden (1951, 1965) and Skidmore (1985) further divided this genus into subgenera according to morphological or biological characters. However, some of the groups are now redefined as genera, whilst others have been placed in synonymy. Modern taxonomists such as Pont (1977, 1980, 1986, 1989) did a large amount of analysis and research about generic synonymies and homonymies in the genus *Helina*. Some species-groups were reviewed and defined by Wang *et al.*, (2004, 2005a, b, c, 2006a, b) and Xue *et al.*, (2012).

China is located in two zoogeographic regions, namely the Palaearctic and the Oriental regions. A large number of species of *Helina* are found in China. The domestic study of *Helina* genus began in the early 1980s. From the early 1980s to 90s, the species of genus *Helina* rose from more than 10 species up to 69 species (Fan 1992). By 1998, Xue, in the book *Flies of China*, reported 96 species of genus

Helina in China. According to statistics, so far, 237 species in the genus *Helina* are known from China. This study assigns part of Palaearctic and Oriental species into a species-group, namely the *subpubiseta*-group. This paper gives the diagnosis of the *Helina subpubiseta*-group, compiles the key to 34 species of this group, and describes eight new species.

MATERIALS AND METHODS

The type specimens of eight new species are all deposited in the Institute of Entomology, Shenyang Normal University, Shenyang, China. This study was based on the research method of combining external morphology with terminalia characteristics. The terminology followed is that of McAlpine (1981). Absolute measurements were given in mm. The following abbreviations are used: IESNU (Institute of Entomology, Shenyang Normal University), *ors* (orbital setae), *fr* (frontal setae), *prst acr* (presutural acrostichal setae), *acr* (acrostichal setae), *dc* (dorsocentral setae), *psut dc* (postsutural dorsocentral setae), *ial* (intra-alar setae), *pra* (prealar setae), *av* (anteroventral setae), *a* (anterior setae), *ad* (anterodorsal setae), *pd* (posterodorsal setae), *p* (posterior setae), *pv* (posteroventral setae), *v* (ventral setae), *r-m* (radio-medial crossveins), *dm-cu* (discal medial-cubital crossvein), R_{4+5} (4th and 5th branches of radius), and *M* (media vein).

Diagnosis of *Helina subpubiseta*-group (males)

Cercus broad and usually with both outer and inner protuberances, the lateral of free part without deep gap; posteroventral surface of hind tibia without long setulae row, otherwise the legs complete black; hind tibia usually without *pd* in sub-basal part, *pra* strong, most of them at least equal to or slightly shorter than the length of posterior notopleural seta (several species hair-like); centre of proepisternum and basisternum of prosternum, hollow, notopleuron, lateral surface and ventral lateral margin of scutellum and anepimeron all bare; sternite 1 bare.

Key to species of *Helina subpubiseta*-group (males)

1. *pra* at least equal to or slightly shorter than the length of posterior notopleural seta2
 - *pra* absent or hair-like, at most about a half of the length of posterior notopleural seta30
2. *dc* 2+3.....3
 - *dc* 2+4.....8
3. Katepisternal setae 1+24
 - Katepisternal setae 2+25
4. Femora and tibiae yellow*Helina dicrocercacma* Feng, 2004
 - Legs complete black.....*Helina compositimacula* Xue, sp. n.
5. Fore tibia without median *p*.....*Helina altica* Wang, Xue and Wang, 2005
 - Fore tibia with 1 median *p*.....6

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6. Mid femur with complete *pv* row, 3 of them strong in super-medial part
*Helina harbinensis* Zhang and Ma, 1997
 - Mid femur only with 2-3 *pv* in basal one-third to one-fourth.....7
7. Hind femur without *pv*.....*Helina betula* Xue, sp. n.
 - Hind femur only with thin and long *pv* in distal one-third, others indistinct
*Helina qilianshanensis* Wu, 1989
8. Arista short plumose or with pubescences, the longest hairs at most about two-thirds of the width of postpedicel.....9
 - Arista long plumose, the longest hairs longer than the width of postpedicel.....18
9. Mid femur without *av*.....10
 - Mid femur with *av*.....15
10. Eyes bare or with sparse and short ciliae; fore tibia with 1-2 median *p*.....11
 - Eyes with dense and long ciliae; fore tibia without median *p*.....14
11. Mid tibia with 1 *ad*.....*Helina tigrivestigia* Xue, sp. n.
 - Mid tibia without *ad*.....12
12. Anterodorsal and posteroventral surfaces of hind tibia with thin and long hair-like row*Helina angulisternita* Xue and Feng, 1988
 - Anterodorsal and posteroventral surfaces of hind tibia without thin and long hair-like row13
13. Frons subequal to the width of the anterior ocellus, arista with pubescences
*Helina platycerca* Feng, 2000
 - Frons about 1.5 times as broad as anterior ocellus, arista short plumose, the longest hairs about a half of the width of postpedicel...*Helina solata* Xue and Feng, 2002
14. Mid tibia without *ad*, 6-7 *p*; hind tibia with 6-8 pectinate *av* in distal three-fifths.....*Helina deslargideleta* Xue, sp. n.
 - Mid tibia with 1 *ad* in submedial part, 3 *p*; hind tibia with complete *av* row
*Helina xianggelilaensis* Xue, Feng and Tong, 2005
15. Katepisternal setae 1+2.....*Helina subpubiseta* Xue, 1986
 - Katepisternal setae 2+2.....16
16. Arista with pubescences.....*Helina phantodonta* Feng, 2004
 - Arista short plumose, the longest hairs about a half to two-thirds of the width of postpedicel17
17. Middle part of hind tibia with 2 *av*, *ad* 2; hind femur with complete *av* row, *pra* shorter than the length of posterior notopleural seta.....
*Helina conicocerca* Feng and Xu, 2008
 - Middle part of hind tibia with 4 *av*, *ad* 1; hind femur with 4-5 *av* in distal two-fifths, *pra* longer than the length of posterior notopleural seta
*Helina spilopardalis* Xue and Zhang, 2005

18. Katepisternal setae 1+2.....19
 - Katepisternal setae 2+2.....20
19. Mid femur without distinct *av*, hind femur with complete *av* row, hind tibia with a row of posterior setulae in middle part.....*Helina subdeleta* Xue, sp. n.
 - Mid femur with complete *av* row, hind femur only with *av* in distal three-fifths, hind tibia with a row of posterior setulae in distal half part.....
*Helina moirigkawagarboensis* Xue, sp. n.
20. Length of postpedicel about 1.3 times as long as its width.....
*Helina guizhenae* Feng, 1999
 - Length of postpedicel about 2.5-3.5 times as long as its width.....21
21. Hind femur with complete *av* row, short and setiform in basal half part, strong in distal half part.....22
 - Hind femur with *av* only in distal half part.....25
22. Mid femur with *pv* only in basal part.....23
 - Mid femur with complete *pv* row.....24
23. *pra* subequal to the length of posterior notopleural seta, mid tibia with 1*p*
*Helina minutideleta*, Xue, 2002
 - *pra* subequal about 1.5 times as long as the length of posterior notopleural seta, mid tibia with 3 *p*.....*Helina callia* Feng, 2004
24. Inner vitta not reaching the scutoscutellar suture, surstylus slightly longer than the circus.....*Helina hyeta* Feng and Xue, 2002
 - Inner vitta reaching the scutoscutellar suture, surstylus distinctly shorter than the circus.....*Helina yaanensis* Feng and Xue, 2003
25. Legs black, except each tibia slightly orange to yellow in part of distal half
*Helina alea* Feng and Xue, 2004
 - Legs complete black.....26
26. Fore tibia without median *p*.....27
 - Fore tibia with 1 median *p*.....28
27. Bilateral parts of tergites 3-5 with distinct shifting patches, dark patches on tergites 3 and 4 large and squarish.....*Helina largideleta* Xue, Wang and Tong, 2003
 - Bilateral parts of tergites 3-5 without distinct shifting patches, patches on tergites 3 and 4 indistinct, shape of traces.....*Helina deleta* (Stein, 1914)
28. Inner vitta reaching the scutoscutellar suture.....*Helina meiguica* Qian and Feng, 2005
 - Inner vitta not reaching the scutoscutellar suture.....29
29. Tergites 3 and 4 without distinct patches, tergite 5 with a pair of small patches.....*Helina ampyxocerca* Xue, 2001

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- Middle parts of tergites 3 and 4 each with a pair of brown patches.....
.....*Helina paomashana* Feng, 2000
- 30. Katepisternal setae 1+2.....31
- Katepisternal setae 2+2.....32
- 31. Eyes bare, arista short plumose, the longest hairs about two-fifths of the width of postpedicel, legs complete black.....*Helina flavipulchella* Xue and Du, 2008
- Eyes with sparse and long ciliae, arista long plumose, the longest hairs about 1.3-1.5 times as long as the width of postpedicel, each femur in distal part and hind tibia in distal four-fifths yellow, other parts black.....*Helina biastocerca* Xue, sp. n.
- 32. Fore tibia with 1 median *p*.....*Helina raoheensis* Liu, Cui and Ma, 2000
- Fore tibia without median *p*.....33
- 33. Eyes bare, mid and hind tibiae yellow, *psut dc* 3.....*Helina cilitruncata* Xue, sp. n.
- Eyes with sparse and short ciliae, legs complete black, *psut dc* 4.....
.....*Helina xingkaiensis* Xue and Zhang, 2008

Descriptions of new species

***Helina betula* Xue, sp. n. (Figs. 1-4)**

Male. Body length 7.5-8.5 mm.

Head: Eyes with medium long ciliae; the narrowest point of frons narrower than or equal to the distance between the posterior ocelli, frontal vitta black, subequal to or narrower than the width of frons, 7-8 pairs of *fr* on lower three-fifths of frons, fronto-orbital plate and parafacial with a black ground colour and grey white pruinosity, parafacial about 1.5 times broader than the width of postpedicel; antenna black; length of postpedicel about 2.5-3.0 times as long as its width; arista plumose, the longest hairs equal to or shorter than the width of postpedicel; anterior margin of gena with 2 rows of upcurved setae; genal height slightly shorter than one-third of eye height; genal and postgena setulae all black; proboscis short, length of prementum about 2.0 times as long as its height; palpus black, slightly longer than the length of haustellum.

Thorax: Ground-colour black, with grey pruinosity; scutum with four black vittae, inner vitta reaching the scutoscutellar suture; *acr* 0+1, *dc* 2+3, *pra* about three-fifths to two-thirds of the posterior notopleural seta; notopleuron, lateral surface and ventral lateral margin of scutellum, basisternum of prosternum, anepimeron, meron and katepimeron all bare; katepisternal setae 2+2.

Wing: Transparent, veins orange, basicosta orange yellow, costal spine subequal to the length of r-m vein, radial node bare, R_{4+5} and M parallel, calypters yellowish, haltere yellow.

Legs: Complete black; fore tibia with 1 median *p*; mid femur with 2-3 strong *pv* in basal one-fourth, without distinct *av*; mid tibia with 3-4 *p*; hind femur with *av* row in distal two-fifths, without *pv*; hind tibia with 2-6 *av*, 2 *ad*, a row of posterior setulae in middle part; tarsi longer than tibiae, claws and pulvilli long and large.

Abdomen: Ground-colour black, oval in dorsal view, with dense and grey pruinosity;

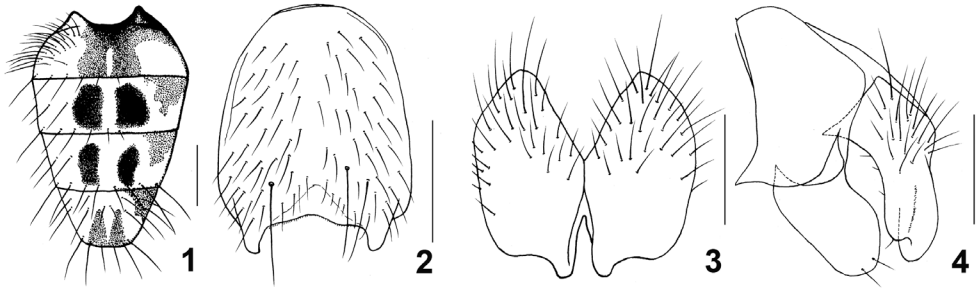
bilateral parts with indistinct shifting patches; tergites 3 and 4 each with a pair of dark brown patches, posterior margin of tergite 5 with a pair of indistinct and brown patches; sternite 1 bare.

Female. Unknown.

Etymology. The specific name is based on the locality of the new species.

Comments. This new species is similar to *Helina qilianshanensis* Wu, 1989, but differs from it as follows: 7-8 pairs of *fr* on lower three-fifths of frons, crossvein dm-cu not clouded, mid femur without distinct *av*, hind femur without *pv*.

Type material: *Holotype*. One male (IESNU), China, Yuehualin, Mount Paekdu (42°01'2.75"N, 128°04'1.31"E), Jilin, 1600 m, 13.vii.1992, Zhang Chuntian. *Paratypes*. 10 males (IESNU), same data as holotype.



Figs. 1-4. *Helina betula* Xue, sp. n. (holotype). 1. Male abdomen (dorsal view). 2. Male sternite 5 (ventral view). 3. Male cerci (posterior view). 4. Male terminalia (profile view). Scales: 1, 1.0 mm; 2, 0.5 mm; 3, 0.25 mm; 4, 0.25 mm.

***Helina biastocerca* Xue, sp. n. (Figs. 5-8)**

Male. Body length 6.4-6.6 mm.

Head: Eyes with sparse and long ciliae; frons distinctly broader than the distance between the posterior ocelli, about 1.5 times as broad as the postpedicel, frontal vitta black, broaden at lower part, nearly ampuliform, at the narrowest point slightly broader than the frons, 6-7 pairs of *fr* on lower three-fifths of frons and with long hairs around their base, ocellar seta strong, longer than the length of the coupled frontal seta below, inner vertical seta thin and short, longer than the outer vertical seta, without *ors*, fronto-orbital plate and parafacial with dark grey pruinosity, middle part of parafacial about 1.5-1.8 times broader than the width of postpedicel; antenna black; length of postpedicel about 3.0-3.2 times as long as its width; arista long plumose, the longest hairs about 1.3-1.5 times as long as the width of postpedicel; lunule brown, vibrissal angle situated behind frontal angle, anterior margin of gena with 2-3 rows of irregular upcurved setae; genal height about two-fifths of eye height, epicephalon with hairs; genal and postgena setulae all black; prementum with pruinosity, length of prementum about 2.0 times as long as its height; palpus black, about 1.3 times as long as the prementum, labellum large, bilateral parts of labellum with 3-4 pairs of small prestomal teeth.

Diagnosis and Key for the Helina subpubiseta-group

Thorax: Ground-colour black, with grey pruinosity; scutum with four black vittae, inner vitta distinctly narrower than the median and pale pruinose vitta, not reaching the scutoscutellar suture; *prst acr* hair-like, about 2 rows, only a pair of *acr* strong near scutoscutellar suture, *acr* 0+1, *dc* 2+4, *ial* 0+2, *pra* absent or hair-like, postpronotal setae 2, posthumeral seta 1+0; notopleuron, lateral surface and ventral lateral margin of scutellum, basisternum of prosternum, anepimeron, meron and katepimeron all bare; anterior anepisternal seta 1, katepisternal setae 1+2.

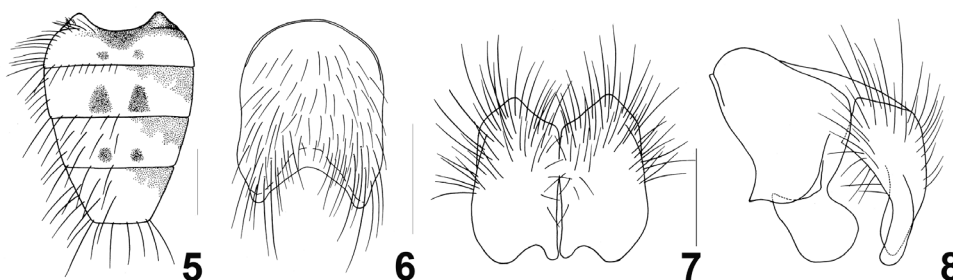
Wing: With a light orange colour, wing-base and veins brown, basicosta orange yellow, costal spine distinct, slightly shorter than the length of r-m, crossveins r-m and dm-cu indistinctly clouded, Sc bow-shaped, radial node bare; calypters orange yellow, haltere yellow.

Legs: Black, except hind tibia in distal four-fifths and each femur in distal part orange yellow; fore tibia with 1 median *p*; mid legs missing (perhaps the characteristics as follows: mid femur without distinct *av*, with distinct *pv* in basal half part; mid tibia perhaps with a yellow colour in distal one-third to a half, without *ad* and *pv*, *p* 2 or 3); hind femur with 5-6 strong *av* row in distal half, all of them longer than the width of this femur, with 5-6 thin and long *pv* in basal half, most of them about 1.8 times as long as the width of this femur, with thin setulae in distal half, becoming longer towards apex, most of them shorter than the width of this femur; hind tibia with 2 *av*, 2 *ad*, without fine *pd* in sub-basal part, middle part with 2-3 *p* (one of them deflects posteroventral surface), *pv* in apical part short, 1 *d* in pre-apical; tarsi longer than tibiae, claws and pulvilli long and large, subequal to or shorter than the length of tarsomere 5.

Abdomen: Ground-colour black, subuliform in dorsal view, with dense and greyish pruinosity, posterior part of dorsal surface with orange grey pruinosity; lateral parts of tergites 3-5 with shifting patches, tergites 4 and 5 with complete posterior marginal seta row and 2 rows of discal setae, base of seta with brown pruinosity, tergites 2-5 without median vittae, body hairs sparse and short, tergite 6 with 1-2 hairs; sternite 1 bare, outer protuberance of cercus broad and large.

Female. Unknown.

Etymology. The specific name is based on the broad and large outer protuberance of male cercus.



Figs. 5-8. *Helina biastocerca* Xue, sp. n. (holotype). 5. Male abdomen (dorsal view). 6. Male sternite 5 (ventral view). 7. Male cerci (posterior view). 8. Male terminalia (profile view). Scales: 5, 1.0 mm; 6,

0.5 mm; 7, 0.25 mm; 8, 0.25 mm.

Comments. This new species is similar to *Helina raoheensis* Liu, Cui and Ma, 2000, but differs from it as follows: *pra* absent or hair-like, katepisternal setae 1+2, hind tibia with 2 *av*, without fine *pd* in sub-basal part, lateral parts of tergites 3-5 with shifting patches, tergite 4 with round patches, outer protuberance of cercus longer than the inner protuberance.

Type material: *Holotype*. One male (IESNU), China, Yanzigou (29°37'59.29"N, 102°04'48.66"E), Sichuan, 3800 m, 6.viii.2005, Chang Liang. *Paratypes*. One male (IESNU), same data as holotype.

***Helina cilitruncata* Xue, sp. n. (Figs. 9-13)**

Male. Body length 6.5 mm.

Head: Eyes bare; frons about 1.2 times as broad as the distance between the posterior ocelli, frontal vitta dark brown, subequal to the width of frons, 6-7 pairs of *fr* on lower two-thirds of frons, fronto-orbital plate and parafacial with grey white pruinosity, parafacial becoming cuniform towards basal part, middle part of parafacial about 1.2 times broader than the width of postpedicel; antenna black; length of postpedicel about 2.5 times as long as its width; arista short plumose, the longest hairs about four-fifths of the width of postpedicel; anterior margin of gena with 2 rows of upcurved setae; genal height about one-fifth of eye height, epicephalon with hairs; genal and postgena setulae all black; proboscis short, length of prementum about 2.0 times as long as its height; palpus black, longer than the prementum.

Thorax: Ground-colour black; scutum with four black vittae and grey pruinosity, inner vitta of presutural area of scutum as broad as the median and pale pruinose vitta, inner vitta of postsutural area of scutum distinctly becoming narrow, reaching a half of the middle of postsutural area of scutum; *prst acr* hair-like, about 2 rows, *dc* 2+3, *ial* 0+2, *pra* hair-like, about two-fifths of the posterior notopleural seta; notopleuron, lateral surface and ventral lateral margin of scutellum, basisternum of prosternum, anepimeron, meron and katepimeron all bare; katepisternal setae 2+2.

Wing: Slightly transparent, veins yellow, basicosta yellow, costal spine subequal to the length of r-m, radial node bare, R₄₊₅ and M slightly diverging in distal part; calypters yellowish, haltere yellow.

Legs: Coxae, fore femur, each tarsus dark brown, fore tibia, mid femur and hind femur brown, mid and hind tibiae yellow; fore tibia without median *p*; mid femur with 3 strong *pv* in basal part; mid tibia with 2 *p*; hind femur with complete *av* row, strong in distal half, without *pv*; hind tibia with 2 *av*, 3 *ad*, posterior surface with 3-4 long setulae.

Abdomen: Ground-colour black, long and coniform in dorsal view, with dense and grey pruinosity, without shifting patches, because of the tergites stains pollution, patches invisible, distal part of abdomen with marginal and discal setae; sternite exerted; sternites 2-4 squarish, sternite 2 with dense and long fringes, margin of sternites 3 and 4 and lateral lobe of sternite 5 with long setae.

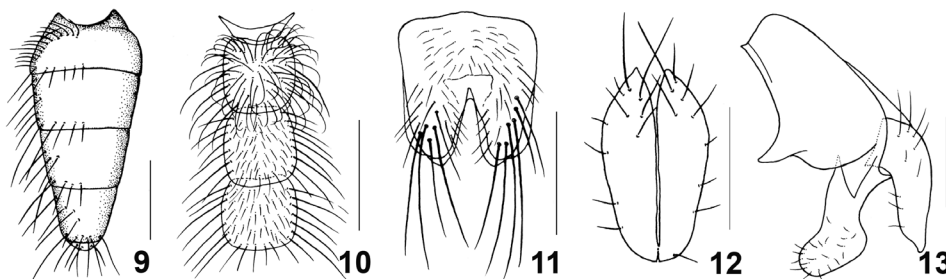
Female. Unknown.

Diagnosis and Key for the Helina subpubiseta-group

Etymology. The specific name is based on the sternite 2 with dense and long fringes.

Comments. This new species is similar to *Helina xingkaiensis* Xue and Zhang, 2008, but differs from it as follows: eyes bare, arista short plumose, the longest hairs about four-fifths of the width of postpedicel; anterior margin of gena with 2 rows of upcurved setae, inner vitta reaching a half of the middle of postsutural area of scutum, *dc* 2+3, coxae, fore femur, each tarsus dark brown, fore tibia, mid femur and hind femur brown, mid and hind tibiae yellow, hind femur without *pv*, hind tibia with 2 *av*

Type material: *Holotype*. One male (IESNU), China, Forest farm, Mount Erlang (38°48'33.85"N, 110°29'37.20"E), Sichuan, 2760 m, 27.viii.1983, Feng Yan. *Paratypes*. One male (IESNU), same data as holotype.



Figs. 9-13. *Helina cilitruncata* Xue, sp. n. (holotype). 9. Male abdomen (dorsal view). 10. Male sternites 1-4 (ventral view). 11. Male sternite 5 (ventral view). 12. Male cerci (posterior view). 13. Male terminalia (profile view). Scales: 9. 1.0 mm; 10. 1.0 mm; 11, 0.5 mm; 12, 0.25 mm; 13. 0.25mm.

***Helina compositimacula* Xue, sp. n. (Figs. 14-21)**

Male. Body length 7.0-8.4 mm.

Head: Eyes with sparse and short microchaetals; frons about 2.0 times as broad as postpedicel and 1.5 times as broad as anterior ocellus, interfrontal villi black, about 1.5-2.0 times as broad as frons, ocellar seta strong, about 1.3 times as long as the longest frontal seta, 7-8 pairs of *fr* on lower three-fifths of frons, without *ors*, fronto-orbital plate and parafacial with dark grey pruinosity, parafacial about 1.5 times broader than the width of postpedicel; antenna black; length of postpedicel about 2.5 times as long as its width; arista short plumose, the longest hairs about one-third of the width of postpedicel; vibrissal angle situated behind frontal angle; anterior margin of gena with a row of upcurved setae; genal height about two-fifths to a half of eye height; genal and postgena setulae all black; proboscis short, prementum with pruinosity, length of prementum about 2.0-2.5 times as long as its height; palpus black, slightly longer than the prementum.

Thorax: Ground-colour dark black, with greyish pruinosity; scutum with four black vittae and orange grey orange pruinosity, inner vitta not reaching the scutoscutellar suture; *acr* 0+1, *dc* 2+3, 16 male and 1 female specimens each with 1 thin seta between the first and the second *dc*, *ial* 0+2, *pra* about 1.5 times as long as the posterior notopleural seta, without posthumeral seta outside; notopleuron, lateral surface and ventral lateral margin of scutellum, basisternum of prosternum,

anepimeron, meron and katepimeron all bare; katepisternal setae 1+2.

Wing: Wing-base and veins brown, basicosta black, costal spine shorter than the length of r-m vein, Sc bow-shaped, radial node bare, R_{4+5} and M parallel, slightly bending towards rear in distal part, du-cu straight or S-shaped curved, crossveins r-m and dm-cu not clouded; calypters yellowish, lower calypter tongue-shaped protruding, haltere orange yellow.

Legs: Complete black; fore tibia with 1 median *pv*; mid femur with setiform *av* row, *pv* complete, middle part strong; mid tibia with 1 *ad* and a few specimens short, *p* 3, without *pv*; hind femur with complete *av* row, most of them about 2.0 times as long as the width of this femur, with thin and long *pv* in distal one-third; hind tibia with 2 rows of *av* and 2 rows of *pv* in distal three-fourths, *pv* rows longer, *ad* 2-4, without *pd*, *pv* short or absent in apical part; tarsi longer than tibiae, claws and pulvilli thin and long, sub-equal to the length of tarsomere 5.

Abdomen: Ground-colour black, long and oval in dorsal view, with grey to orange grey pruinosity; tergites each with a pair of large and dark brown patches, the coupled patches closer together, a few of the with syncretic trace; inner protuberance of cercus subequal to the outer protuberance in length, sternite 1 bare, patches on sternite 5 usually becoming narrow.

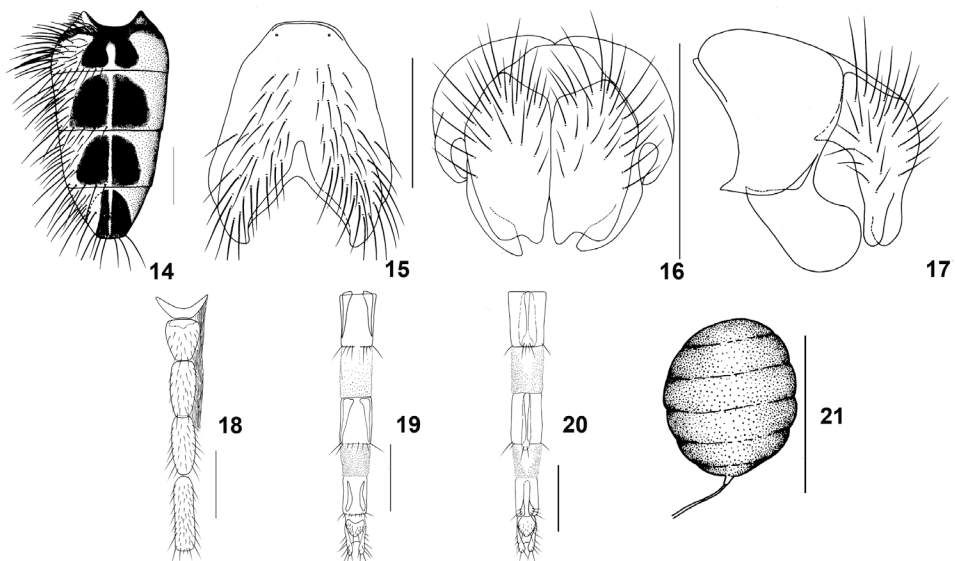
Female. Body length 6.0-7.0 mm, frons about 0.4 times as broad as the head, frontal vitta about 3.0 times as broad as frons, frontal triangle reaching the middle part of frons, upper orbital seta 2, parafacial about 2.0 times as broad as postpedicel, *dc* 2+3, hind femur without distinct *pv* in distal part, hind tibia with 4-5 *av*, *ad* 2, other characteristics of external morphology same to the male.

Etymology. The specific name is based on the patches on abdomen large and close together.

Comments. This new species is similar to *Helina dicrocercacma* Feng, 2004, but differs from it as follows: 7-8 pairs of *fr* on lower three-fifths of frons, arista short plumose, the longest hairs about one-third of the width of postpedicel, genal height about two-fifths to a half of eye height, legs complete black, hind tibia with 2 rows of *av* and 2 rows of *pv* in distal three-fourths.

Type material: *Holotype.* One male (IESNU), China, Snowmountain Baimang (28°26'13.33"N, 99°06'10.37"E), Sichuan, 4000 m, 7.vii.2006, Chang Liang. *Paratypes.* 27 males (IESNU), one female (IESNU), same data as holotype; one male (IESNU), 5.vii.2006, other data as holotype; 21 males (IESNU), 17 female (IESNU), Wang Mingfu, other data as holotype; 5.vii.2006, Wang Mingfu, other data as holotype; 7 males (IESNU), China, Moirigkawagarbo (28°26'21.04"N, 98°41'5.16"E), 2900-3200, 6.vii.2006, Wang Mingfu; 29 males (IESNU), 6 females (IESNU), Wang You, other data as holotype.

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Figs. 14-21. *Helina compositimacula* Xue, **sp. n.** (holotype). 14. male abdomen (dorsal view). 15. male sternite 5 (ventral view). 16. male cerci (posterior view). 17. male terminalia (profile view). 18. female sternites 1-5 (ventral view). 19. female ovipositor (dorsal view). 20. female ovipositor (ventral view). 21. female spermatheca. Scales: 14. 1.0 mm; 15. 0.5 mm; 16. 0.5 mm; 17. 0.5 mm; 18. 1.0 mm; 19. 1.0 mm; 20. 1.0 mm; 21. 0.2 mm.

***Helina deslargideleta* Xue, sp. n. (Figs. 22-25)**

Male. Body length 8.0 mm.

Head: Eyes with dense and long ciliae; frons about 1.2-1.6 times as broad as anterior ocellus, interfrontal villi black, at the narrowest point disappeared, ocellar seta strong, subequal to the length of the longest frontal seta, 8-9 pairs of *fr* on lower three-fifths of frons, without *ors*, fronto-orbital plate and parafacial with silver grey pruinosity, parafacial about 1.5 times broader than the width of postpedicel; antenna black; length of postpedicel about 2.5 times as long as its width; arista short plumose, the longest hairs about two-thirds to four-fifths of the width of postpedicel; vibrissal angle situated behind frontal angle; anterior margin of gena with 2 rows of irregular upcurved setae; genal height about one-third of eye height; genal and postgena setulae all black; prementum with pruinosity, length of prementum about 2.0-2.5 times as long as its height; palpus black, subequal to the length of the prementum.

Thorax: Ground-colour black; scutum with four black vittae, inner vitta reaching the scutoscutellar suture, subequal to the length of median pruinose vitta on the presutural area of scutum; *acr* 0+1, *dc* 2+4, *ial* 0+2, *pra* equal to or shorter than the length of the posterior notopleural seta; notopleuron, lateral surface and ventral lateral margin of scutellum, proepisternum hollow in centre, basisternum of prosternum, anepimeron, meron and katepimeron all bare; katepisternal setae 2+2.

Wing: Wing-base slightly with a brown colour and veins brown, basicosta orange, costal spine slightly shorter than the length of r-m vein, crossveins r-m and dm-cu clouded, Sc bow-shaped, radial node bare, du-cu slightly S-shaped curved; calypters yellow, lower calypter tongue-shaped protruding, haltere orange yellow.

Legs: Complete black; fore tibia without median *p*; mid femur without *av*, 1 *a* and 3 *pd* in pre-apical part, *pv* complete, 6-7 strong in basal half; mid tibia with 6-7 *p*; hind femur with *av* row in distal one-fourth, without *pv*; hind tibia with 6-8 pectinate *av* in distal three-fifths, *ad* 2-3, posterior of middle part with 5-7 setulae, without *pv* in apical part; tarsi longer than tibiae, claws and pulvilli long and large, equal to or longer than the length of tarsomere 5.

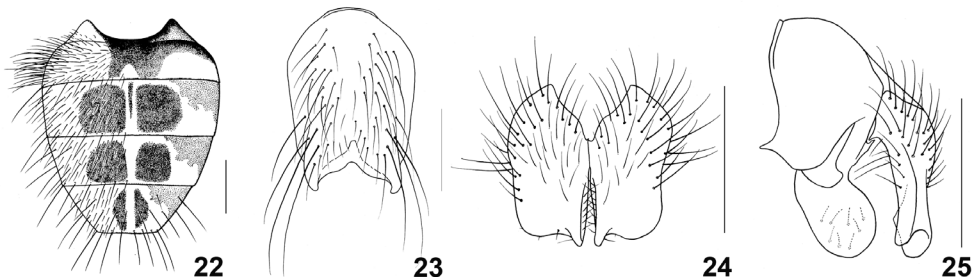
Abdomen: Ground-colour black, broad and oval in dorsal view, with dense and greyish pruinosity; tergites 3 and 4 each with a pair of large and black patches, bilateral of each tergite with shifting patches, the middle part of tergite 5 with a pair of long and black patches, slightly syncretic, sternite 1 bare.

Female. Unknown.

Etymology. The specific name is based on that the new species is similar to *Helina largideleta* Xue, Wang and Tong, 2003. However, there is still some difference both in external morphology and terminalia between the two species.

Comments. This new species is similar to *Helina largideleta* Xue, Wang and Tong, 2003, but differs from it as follows: arista short plumose, the longest hairs about two-thirds to four-fifths of the width of postpedicel, *pra* equal to or shorter than the length of the posterior notopleural seta, crossveins r-m and dm-cu clouded, basal part of sternite 5 broader, setae longer, 3-4 pairs in distal part especially longer, cercus broader, outer protuberance broad and large, inner protuberance slightly shorter, inner margin part with many thin hairs.

Type material: *Holotype.* One male (IESNU), China, Snowmountain Baimang (28°26'13.33"N, 99°06'10.37"E), Yunnan, 3800-4000 m, 5.vii.2006, Wang Mingfu. *Paratypes.* One male (IESNU), same data as holotype.



Figs. 22-25. *Helina deslargideleta* Xue, sp. n. (holotype). 22. male abdomen (dorsal view). 23. male sternite 5 (ventral view). 24. male cerci (posterior view). 25. male terminalia (profile view). Scales: 22. 1.0 mm; 23. 0.5 mm; 24, 0.5 mm; 25. 0.5 mm.

***Helina moirigkawagarboensis* Xue, sp. n. (Figs. 26-29)**

Male. Body length 7.0-8.0 mm.

Head: Eyes with short and light orange ciliae; frons narrow than the width of postpedicel and 1.5-2.0 times as broad as anterior ocellus, frontal vitta black, at the narrowest point linear, 7-8 pairs of *fr* on lower half of frons, without *ors*, ocellar seta about three-fifths of the length of the longest frontal seta, fronto-orbital plate and parafacial with dark grey pruinosity, middle part of parafacial subequal to the width of postpedicel; antenna black; length of postpedicel about 3.5 times as long as its width; arista long plumose, the longest hairs about 1.5 times as long as the width of postpedicel; lunule brown, epistoma not protruding, anterior margin of gena with a row of upcurved setae; genal height slightly shorter than three-tenths of eye height; genal and postgena setulae all black; vibrissal angle situated behind frontal angle, occiput with grey pruinosity, epicephalon with black hairs; prementum with a little pruinosity, slightly shiny, proboscis short, length of prementum about 2.2 times as long as its height; labellum large, subequal to the length of prementum, palpus black, about 1.4 times as long as the prementum.

Thorax: Ground-colour black, arthropleure with a little grey pruinosity, slightly shiny; presutural area of scutum with steel grey pruinosity, postsutural area of scutum with orange grey pruinosity, scutum with four black vittae, inner vitta reaching the middle of postsutural area of scutum, posterior half part of postsutural area of scutum with a median vitta; *prst acr* hair-like, about 8 rows, only a pair of *acr* strong near scutoscutellar suture, *dc* 2+4, *ial* 0+2, *pra* about 1.5 times as long as the length of the posterior notopleural seta, postpronotal setae 3, posthumeral seta 1+0, basal and apical scutellar setae strong, about 2.0 times as long as the length of scutellum, lateral scutellar setae 1 pair, slightly longer than the prebasal scutellar seta; notopleuron, lateral surface and ventral lateral margin of scutellum, basisternum of prosternum, anepimeron, meron and katepimeron all bare; anterior anepisternal seta 1, katepisternal setae 1+2; anterior and posterior spiracles large and brown, anatergite with dark orange hairs.

Wing: Slightly with a light brown colour, wing-base orange yellow, veins brown in distal half part and orange yellow in basal half part, basicosta yellow, distal part of subcostal sclerite with thin and yellowish hairs, costal spine slightly subequal to the length of r-m vein, crossveins r-m and dm-cu not distinctly clouded, Sc bow-shaped, radial node bare, R₄₊₅ and M straight and slightly diverging in distal part; calypters and haltere light orange, lower calypter tongue-shaped protruding.

Legs: Complete black; fore tibia without median *p*; mid femur with complete and setiform *av*, most of them about two-thirds of the width of this femur, 5-6 strong *p_v* in basal half part; mid tibia with 3-4 *p*, without *ad*; hind femur with distinct *av* in distal three-fifths, becoming strong towards distal half part, without *p_v*; hind tibia with 4-5 *av* in distal three-fifths, 2 *ad* in middle part, 5-6 posterior setulae in distal half; tarsi longer than tibiae, claws and pulvilli of fore leg long and large, about 1.3 times as long as the length of tarsomere 5, claws and pulvilli of mid and hind legs shorter, subequal to the length of tarsomere 5.

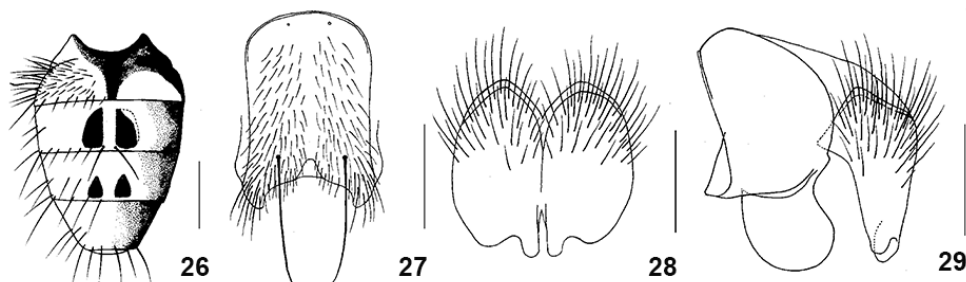
Abdomen: Ground-colour black, oval in dorsal view, with dense and orange grey pruinosity; tergites 3 and 4 each with a pair of black patches, patches close to the central, patches on tergite 4 smaller, middle part of tergite 3 with a pair of strong posterior marginal setae, length subequal to the length of tergite 3, sometimes the median marginal setae on tergite 4 slightly strong, tergites 4 and 5 each with a row of discal setae; sternite 1 bare, sternites 2-5 each with a pair of long setae, inner protuberance of cercus longer.

Female. Unknown.

Etymology. The specific name is based on the locality of the new species.

Comments. This new species is similar to *Helina guizhenae* Feng, 1999, but differs from it as follows: frons about 1.5-2.0 times as broad as anterior ocellus, arista long plumose, the longest hairs about 1.5 times as long as the width of postpedicel, katepisternal setae 1+2, legs complete black, fore tibia without median p , mid femur with complete and setiform av .

Type material: *Holotype*. One male (IESNU), China, Moirigkawagarbo (28°26'21.04"N, 98°41'5.16"E), Yunnan, 2900 m, 31.v.2013, Sun Hongkui. *Paratypes*. One male (IESNU), same data as holotype.



Figs. 26-29. *Helina moirigkawagarboensis* Xue, sp. n. (holotype). 26. Male abdomen (dorsal view). 27. Male sternite 5 (ventral view). 28. Male cerci (posterior view). 29. Male terminalia (profile view). Scales: 26. 1.0 mm; 27. 0.5 mm; 28. 0.25 mm; 29. 0.25 mm.

***Helina subdeleta* Xue, sp. n. (Figs. 30-33)**

Male. Body length 8.4-8.6 mm.

Head: Eyes with medium long ciliae, the length of most ciliae about 2.0 times as long as the width of anterior ocellus; frons about 2.0 times as broad as anterior ocellus, fronto-orbital plate adjoin, about a half of the width of frons, 8-9 pairs of fr on lower two-fifths of frons, without ors , fronto-orbital plate and parafacial with dense and silver white pruinosity, parafacial about 1.3 times broader than the width of postpedicel; antenna black; length of postpedicel about 3.5 times as long as its width; arista long plumose, the longest hairs about 2.0 times as long as the width of postpedicel; vibrissal angle situated behind frontal angle, epistoma not protruding; anterior margin of gena with 2 rows of upcurved setae; genal height about one-fourth of eye height; genal and postgena setulae all black, epicephalon with black hairs; proboscis short,

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prementum with pruinosity, length of prementum about 2.2-2.5 times as long as its height; palpus black, about 1.4 times as long as the prementum, labellum medium large, about three-fourths of the length of prementum.

Thorax: Ground-colour black, with steel grey pruinosity; scutum with four black vittae, inner vitta reaching the middle of postsutural area of scutum, narrower than the median and pale pruinose vitta; *prst acr* hair-like, about 4 rows, *acr* 0+1, *dc* 2+4, *ial* 0+2, *pra* about 1.4 times as long as the posterior notopleural seta; notopleuron, lateral surface and ventral lateral margin of scutellum, proepisternum hollow in centre, basisternum of prosternum, anepimeron, meron and katepimeron all bare; anterior anepisternal seta 1, proepisternal setae 2, upper proepimeral setae 2, with 1-2 long hairs around base, katepisternal setae 1+2, anterior and posterior spiracles brown.

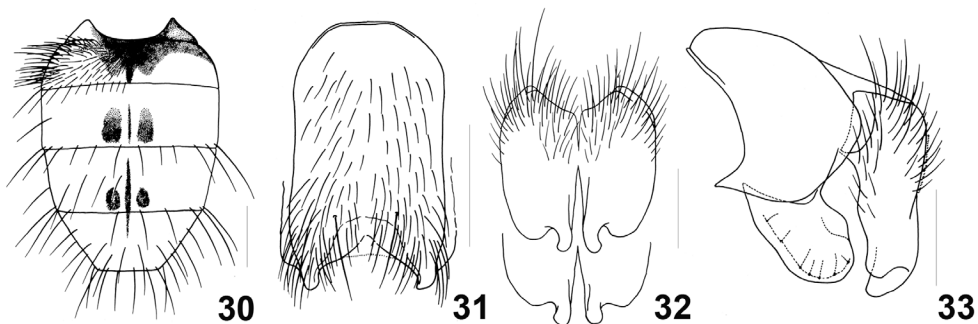
Wing: With a light orange colour and veins orange, tegula orange, basicosta yellow, costal spine distinct, crossveins r-m and dm-cu not distinctly clouded, Sc bow-shaped, radial node bare, du-cu slightly S-shaped curved; calypters yellowish, lower calypter tongue-shaped protruding, haltere yellow.

Legs: Complete black, sometimes femora slightly with a dark brown colour; fore tibia without median *p*; mid femur without distinct *av*, 1 *a* and 3 *pd* in pre-apical part, 4-5 *pv* in basal half; mid tibia with 3-4 *p*; hind femur with complete *av* row, strong in distal half, short and setiform in basal half except body hairs, most of them about a half of the width of this femur, without *pv*; hind tibia with 3 *av*, *ad* 2, without *pd*, posterior of middle part with 4-5 setulae, without *pv* in apical part; tarsi longer than tibiae, claws and pulvilli long and large, subequal to the length of tarsomere 5.

Abdomen: Ground-colour black, broad and oval in dorsal view, with dense and grey to grey orange pruinosity, without shifting patches; middle part of tergites 2-5 each with a narrow, traces shape and a dark colour vitta, tergites 3 and 4 each with a pair of dark brown patches and a pair of median marginal setae; tergite 6 and sternite 1 bare.

Female. Unknown.

Etymology. The specific name is based on that the new species is similar to *Helina deleta* (Stein, 1914).



Figs. 30-33. *Helina subdeleta* Xue, sp. n. (holotype). 30. Male abdomen (dorsal view). 31. Male sternite 5 (ventral view). 32. Male cerci (posterior view). 33. Male terminalia (profile view). Scales: 30. 1.0 mm; 31. 0.5 mm; 32. 0.2 mm; 33. 0.2 mm.

Comments. This new species is similar to *Helina deleta* (Stein, 1914), but differs from it as follows: arista long plumose, the longest hairs about 2.0 times as long as the width of postpedicel, *pra* about 1.4 times as long as the posterior notopleural seta, katepisternal setae 1+2, hind femur with complete *av* row.

Type material: *Holotype*. One male (IESNU), China, Mount Paoma (30°02'59.42"N, 101°58'2.92"E), Sichuan, 2800-3500 m, 14.vii.2005, Chang Liang. *Paratypes*. One male (IESNU), same data as holotype.

***Helina tigrivestigia* Xue, sp. n. (Figs. 34-37)**

Male. Body length 6.1-6.3 mm.

Head: Eyes bare, only with several sporadic and short ciliae on the lower margin; frons about 2.0-2.5 times as broad as anterior ocellus, interfrontal villi black, at the narrowest point linear, fronto-orbital plate subequal to the width of anterior ocellus, ocellar seta about six-sevenths of the length of the longest frontal seta, 7-8 pairs of *fr* on lower three-fifths of frons, with thin hairs among their base, without *ors*, fronto-orbital plate with blue grey pruinosity and parafacial with orange grey pruinosity, parafacial about 1.5 times broader than the width of postpedicel; antenna black; length of postpedicel about 3.2-3.4 times as long as its width; arista short plumose, the longest hairs about two-fifths of the width of postpedicel; lunule orange, vibrissal angle situated behind frontal angle; anterior margin of gena with 2 rows of upcurved setae; gena and occiput with grey pruinosity, genal height higher than one-third of eye height; genal and postgena setulae all black, epicephalon with hairs; prementum with a little grey pruinosity, length of prementum about 2.2-2.5 times as long as its height; palpus black, about 1.3 times as long as the prementum, lateral part of labellum with 5-6 pairs of uncinata and small prestomal teeth.

Thorax: Ground-colour black, with a little blue grey pruinosity, slightly shiny; scutum with four black vittae, inner vittae slightly narrow and obviously narrower than the median and blue grey pruinose vitta, reaching the middle of postsutural area of scutum; *prst acr* hair-like, about 4 rows, only a pair of *acr* strong near scutoscuteellar suture, *dc* 2+4, *ial* 0+2, *pra* thin and long, subequal to the length of the posterior notopleural seta, postpronotal setae 2, posthumeral seta 1+0, basal and apical scutellar setae strong, notopleuron, lateral surface and ventral lateral margin of scutellum, proepisternum hollow in centre, basisternum of prosternum, anepimeron, meron and katepimeron all bare; anterior anepisternal seta 1, katepisternal setae 1+2, spiracles large and brown.

Wing: Slightly transparent, wing-base slightly with a light orange colour and veins brown, basicosta dark brown, costal spine short, Sc bow-shaped, radial node bare, R₄₊₅ and M parallel, du-cu indistinctly clouded; calypters orange yellow, lower calypter tongue-shaped protruding, haltere orange yellow.

Legs: Complete black; fore tibia with 1-2 median *pv*; mid femur without distinct *av*, 1 *a* and 3 *pd* in pre-apical part, *pv* complete, thin and hair-like in distal half and 4-5 strong in basal half; mid tibia with 1 *ad* and sometimes the unilateral one short, *p* 4-5; hind femur with distinct *av* in distal one-third, without *pv*; hind tibia with 5-6 setiform *av* in distal three-fifths, *ad* 2, usually with 1 *pd* in sub-basal part, posterior of middle

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part with 3-4 setulae, without *pv* in apical part; tarsi longer than tibiae, claws slightly longer than pulvilli, about four-fifths of the length of tarsomere 5.

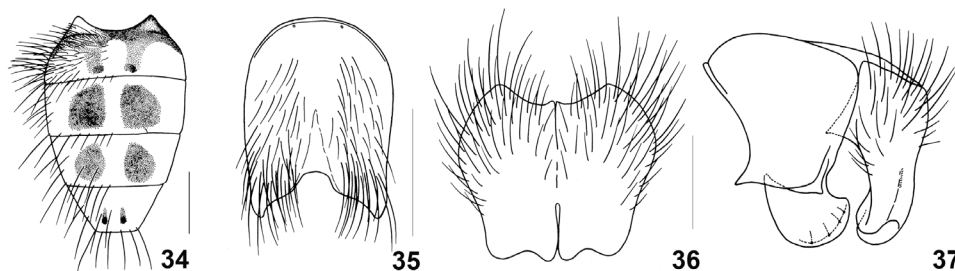
Abdomen: Ground-colour black, oval in dorsal view, with dense and blue grey pruinosity; tergites 2-5 each with a pair of patches, tergites 3 and 4 broad, patches on tergites 2 and 5 small and usually indistinct, posterior marginal setae on tergites 4 and 5 distinct, without shifting patches, sternite 1 bare.

Female. Unknown.

Etymology. The specific name is based on the shape of patches on tergites 3 and 4, which looks like the footprints of tiger.

Comments. This new species is similar to *Helina angulisternita* Xue and Feng, 1988, but differs from it as follows: 7-8 pairs of *fr* on lower three-fifths of frons, *dc* 2+4, mid tibia with 1 *ad*, hind femur with distinct *av* in distal one-third, without *pv*, hind tibia with 2 *ad*, usually with 1 *pd* in sub-basal part.

Type material: *Holotype*. One male (IESNU), China, Snowmountain Baimang (28°26'13.33"N, 99°06'10.37"E), Yunnan, 4250 m, 27.vii.2008, Fei Xudong. *Paratypes*. One male (IESNU), same data as holotype.



Figs. 34-37, *Helina tigrivestigia* Xue, sp. n. (holotype). 34. Male abdomen (dorsal view). 35. Male sternite 5 (ventral view). 36. Male cerci (posterior view). 37. Male terminalia (profile view). Scales: 34, 1.0 mm; 35. 0.5 mm; 36. 0.2 mm; 37. 0.2 mm.

Species distributions

Helina alea Feng and Xue, 2004

Distribution : Sichuan (type-locality: Mount Erlangshan), Yunnan.

Helina altica Wang, Xue and Wang, 2005

Distribution: Tibet (type-locality: Mount Doxong La)

Helina ampyxocerca Xue, 2001

Distribution: Shaanxi (type-locality: Pingheliang, Ningshan)

Helina angulisternita Xue and Feng, 1988

Distribution : Sichuan (type-locality: Mount Erlangshan)

Helina callia Feng, 2004

Distribution : Sichuan (type-locality: Forest farm, Mount Erlangshan)

Helina coniocerca Feng and Xu, 2008

Distribution: Tibet (type-locality: Zhangmu)

Helina deleta (Stein, 1914)

Distribution: Liaoning, Heilongjiang, Jilin, Inner Mongolia, Shanxi, Gansu, Ningxia, Qinghai, Tibet, Sichuan, Yunnan; Japan, Europe (type-locality: Italy).

Helina dicrocercacma Feng, 2004

Distribution : Sichuan (type-locality: Mount Jiaoding, Hanyuan)

Helina flavipulchella Xue and Du, 2008

Distribution : Yunnan (type-locality: Sipsongpanna)

Helina guizhenae Feng, 1999

Distribution : Sichuan (type-locality: Mount Erlang Muyepeng)

Helina harbinensis Zhang and Ma, 1997

Distribution : Heilongjiang (type-locality: Harbin City)

Helina hyeta Feng and Xue, 2002

Distribution : Sichuan (type-locality: Kangding)

Helina largideleta Xue, Wang and Tong, 2003

Distribution : Qinghai (type-locality: Batang, Yushu), Yunnan, Sichuan.

Helina meiguica Qian and Feng, 2005

Distribution : Sichuan (type-locality: Meigu)

Helina minutideleta Xue, 2002

Distribution : Jilin (type-locality: Mount Paekdu)

Helina paomashana Feng, 2000

Distribution : Sichuan (type-locality: Kangding), Yunnan.

Helina phantodonta Feng, 2004

Distribution : Sichuan (type-locality: Hanyuan).

Helina platycerca Feng, 2000

Distribution : Sichuan (type-locality: Hanyuan).

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Helina qilianshanensis Wu, 1989

Distribution : Gansu (type-locality: Subei).

Helina raoheensis Liu, Cui and Ma, 2000

Distribution : Heilongjiang (type-locality: Raohe).

Helina solata Xue and Feng, 2002

Distribution : Sichuan (type-locality: Hanyuan).

Helina spilopardalis Xue and Zhang, 2005

Distribution : Gansu (type-locality: Shiyaziliang, Qiujiaba, Wenxian).

Helina subpubiseta Xue, 1986

Distribution : Liaoning (type-locality: Caohekou).

Helina xianggelilaensis Xue, Feng and Tong, 2005

Distribution : Yunnan (type-locality: Xianggelila).

Helina xingkaiensis Xue and Zhang, 2008

Distribution : Heilongjiang (type-locality: Xingkai).

Helina yaanensis Feng and Xue, 2003

Distribution : Sichuan (type-locality: Yaan).

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REFERENCES

- De Carvalho, C. J. B., Couri, M. S., Pont, A. C., Pamplona, D., Lopes, S. M., 2005, A Catalogue of the Muscidae (Diptera) of the Neotropical Region. *Zootaxa*, 860: 1-282.
- Emden, F. I. van, 1951, Muscidae C., Scatophaginae, Anthomyiinae, Lispiinae, Finniinae and Phaoniinae. *Ruwenzori Expedition 1934-35*, 2: 325-710.
- Emden, F.I. van, 1965, *The fauna of India and the - adjacent countries*. Delhi, Government of India, 647 pp.
- Fan, Z. D., 1992, *Key to the Common Flies of China, second edition*. Beijing, Science Press, 992 pp.
- Feng, Y., 1999, Two new species of the genus *Helina* from Sichuan, China (Diptera: Muscidae). *Chinese Journal of Vector Biology and Control*, 10(2): 81-83.
- Feng, Y., 2000, Eight new species of the Muscidae from Sichuan, China (Diptera: Muscidae). *Sichuan Journal of Zoology*, 19(1): 3-7.

- Feng, Y., 2004, Two new species of the genus *Helina* from western Sichuan, China (Diptera: Muscidae). *Chinese Journal of Vector Biology and Control*, 15(1): 31-32.
- Feng, Y., 2004, Four new species of the genus *Helina* (Diptera: Muscidae) from western Sichuan Province, China. *Acta Parasitologica et Medica Entomologica Sinica*, 11(2): 91-95.
- Feng, Y., Xue, W. Q., 2002, Five new species of the genus *Helina* (Diptera: Muscidae) from Sichuan, China. *Entomotaxonomia*, 24(4): 261-268.
- Feng, Y., Xue, W. Q., 2003, Three new species of the genus *Helina* from Sichuan, China, (Diptera: Muscidae). *Sichuan Journal of Zoology*, 22(1): 3-5.
- Feng, Y., Xue, W. Q., 2004, Two new species of the genus *Helina* (Diptera: Muscidae) from Sichuan province, China. *Entomotaxonomia*, 26(1): 64-66.
- Feng, Y., Xu, R. M., 2008, Five new species of the Muscidae (Diptera: Muscidae) from Tibet in China. *Acta Parasitologica et Medica Entomologica Sinica*, 15(1): 45-50.
- Hennig, W., 1957-1958, *Muscidae*. In: Lindner, E. (Ed.), *Die Fliegen der palaearktischen Region*. 63b. Stuttgart, Schweizerbart, 145-232.
- Huckett, H. C., 1965, The Muscidae of northern Canada, Alaska, and Greenland (Diptera). *Memoirs of the Entomological Society of Canada*, 42: 1-369.
- Liu, D. H., Cui, C. Y., Ma, Z. Y., 2000, A New Species of *Helina* R. - D. from Heilongjiang, China (Diptera : Muscidae). *Chinese Journal of Vector Biology and Control*, 11(3): 164-165.
- McAlpine J. F., 1981, *Morphology and Terminology-adults*. In: McAlpine J. F., Peterson B. V., Shewell G. E., Teskey H. J., Vockeroth J. R., Wood D. M., (Eds) *Manual of Nearctic Diptera*, Research Branch, Agriculture Canada Monograph, 27, Ottawa, 1: 9-63.
- Pont, A. C., 1977, *Family Muscidae*. In: Delfi-nado, M. D. & Hardy, D. E. (Ed.), *A Catalogue of the Diptera of the Oriental Region*. Vol. 3. Suborder Cyclorhapha (excluding Division Aschiza). Honolulu, University Press of Hawaii, 451-523.
- Pont, A. C., 1980, *Family Muscidae*. In: Crosskey, R.W. (Ed.), *Catalogue of the Diptera of the Afrotropical Region*. London, British Museum (Natural History), 721-761.
- Pont, A. C., 1986, *Family Muscidae*. In: Soós, Á. & Papp, L. (Eds.), *Catalogue of Palaearctic Diptera*. Vol. 11. Scatophagidae-Hypodermatidae. Budapest, Akadémiai Kiadó, 57-215.
- Pont A. C., 1989, *Family Muscidae*. In: Evenhuis, N.L. (Ed.), *Catalog of the Diptera of the Australasian and Oceania Regions*. Special Publications of the Bernice Pauahi Bishop Museum. Honolulu, Bishop Museum Press, and Leiden, E. J. Brill, 86: 675-699.
- Qian, W. P., Feng, Y., 2005, Three new species of the genus *Helina* from China (Diptera: Muscidae). *Chinese Journal of Vector Biology and Control*, 16 (4): 258-260.
- Ringdahl, O., 1924, Översikt av de hittills i vart land funna arterna tillhörande släktena *Mydaea* R.-D., och *Helina* R.-D. (Muscidae). *Entomologisk Tidskrift*, 45:49-66.
- Ringdahl, O., 1949, Forsök till artgruppering inom släkten *Phaonia* R.-D., och *Helina* R.-D. (fam. Muscidae). *Entomol Tidsk*, 70:136-146.
- Ringdahl, O., 1956, Svensk insektfauna: Muscidae, Stockholm. *Entomologiska Foreningen*, 1: 1-334.
- Skidmore, P., 1985, The biology of the Muscidae of the world. *Series Entomologica*, 29: 1-550.
- Stein, P., 1914, H. Sauter's Formosa-Ausbeute, Anthomyiidae (Diptera). *Supplementa Entomologica*, 4: 13-56.
- Wang, M. F., 2013, New synonymies and new combinations of Muscidae from China (Diptera, Muscoidea). *ZooKeys*. 290: 31-38.
- Wang, M. F., Wang, R. R., Xue, W. Q., 2006a, A review of the *Quadrum* species group of *Helina* Robineau-Desvoidy (Diptera: Muscidae) from China. *Oriental Insects*, 40: 171-178.
- Wang, M. F., Wang, R. R., Xue, W. Q., 2006b, A review of the *H. obtusipennis* species-group of the genus *Helina* R.-D. (Diptera: Muscidae) from the Palaearctic and Oriental regions, with description of one new species. *Zootaxa*, 1137: 63-68.

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- Wang, M. F., Xue, W. Q., Wang, R. R., Zhang, D., 2005a, Notes on *Helina laxifrons* species-group of the genus *Helina* R.-D. from China (Diptera: Muscidae). *Chinese Journal of Vector Biology and Control*, 16(6): 416-417.
- Wang, M. F., Xue, W. Q., Wang, R. R., 2005c, A new species of *Helina* R. -D. from Qinghai-Xizang plateau, China (Diptera: Muscidae). *Acta Zootaxonomica Sinica*, 30(1): 191-193.
- Wang, M. F., Xue, W. Q., Zhang, D., 2004, Notes on Annose species-group of *Helina* R.-D (Diptera: Muscidae) in China. *Entomologia Sinica*, 11 (4): 293-301.
- Wang, M. F., Zhang, D., Xue, W. Q., 2005b, A review of the *hirsutitibia* species-group of the genus *Helina* Robineau-Desvoidy (Diptera: Muscidae) from China, with the description of one new species. *Pan-Pacific Entomologist*, 81: 114-121.
- Wu, J. W., 1989, Five new species of the genus *Helina* from Gansu, China (Diptera: Muscidae). *Entomotaxonomia*, 11(4): 323-332.
- Xue, W. Q., 1998, *Muscidae*, In: Xue W.Q. & Chao C.M. (Eds.), *Flies of China*. Shenyang: Liaoning Science and Technology Press, 1: 1116-1165.
- Xue, W. Q., Zhang, X. Z., 2005, *Muscidae*, In: Zhang X.K. (Ed.), *Insect Fauna of Middle-West Qinling Range and South Mountains of Gansu Province*. Beijing, Science Press, 800-829.
- Xue, W. Q., 2001, Four new species of the genus *Helina* R.-D. (Diptera: Muscidae) from China. *Entomotaxonomia*, 23 (2): 131-136.
- Xue, W. Q., 2002, Three new species of the genus *Helina* from Changbai Mountains, China (Diptera: Muscidae). *Acta Zootaxonomica Sinica*, 27(3): 637-639.
- Xue, W. Q., Du, J., Zhang, L., 2008, Descriptions of five new species of *Helina* Robineau-Desvoidy (Diptera: Muscidae) from China. *Entomologica Fennica*, 19: 105- 113.
- Xue, W. Q., Feng, Y., 1988, Two new species of the genus *Helina* (Diptera: Muscidae). *Entomotaxonomia*, 10(3-4): 203-206.
- Xue, W. Q., Feng, Y., 2002, Five new species of the genus *Helina* from Sichuan Province, China (Diptera: Muscidae). *Zoological Research*, 23(6): 499-503.
- Xue, W. Q., Feng, Y., Tong, Y. F., 2005, A taxonomic study on *Helina* R.-D. (Diptera: Muscidae) from China. *Oriental Insects*, 39: 35-62.
- Xue, W. Q., Wang, M. F., Tong, Y. F., 2003, Four new species of the genus *Helina* R.-D. from Qinghai, China (Diptera: Muscidae). *Acta Zootaxonomica Sinica*, 28 (4): 754-758.
- Xue, W. Q., Wang, M. F., Cao, R. F., 1986, Descriptions of the new species of the genus *Helina* from China. *First International Congress of Dipterology*, 1-17.
- Xue, W. Q., Wang, S., Tian, X., 2012, A review of species-groups and description of two new species of *Helina* (Diptera: Muscidae) from China. *Oriental Insects*, 46 (2): 107-115.
- Zhang, L. P., Ma, Z. Y., 1997, A new species of *Helina* R.-D. from China (Diptera: Muscidae). *Acta Zootaxonomica Sinica*, 22(1): 100-102.

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