



## Five new species of *Lamiogethes* Audisio & Cline from China (Coleoptera: Nitidulidae: Meligethinae)

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### Abstract

Five new species of the genus *Lamiogethes* Audisio & Cline are described from western, central and southern China: *L. falcatus* sp. n. (Sichuan), *L. hastipennis* sp. n. (Hubei), *L. sagittalis* sp. n. (Shaanxi), *L. unditibis* sp. n. (Chongqing), and *L. limaelytralis* sp. n. (Sichuan). The first four new species appear to be morphologically related to *Lamiogethes ancestor* (Kirejtshuk, 1980) (comb. n.) from Central China, and allied taxa. *Lamiogethes limaelytralis* sp. n. appears to be more isolated, probably with relationships to the recently described *L. forcipennis* Liu, Huang, Cline & Audisio, 2017 and *L. convexistrigosus* Liu, Huang, Cline & Audisio, 2017 from Sichuan. All new species differ from other closely related taxa by details of the body shape and color, as well as the shape of the male and/or female genitalia.

**Key words:** taxonomy, distribution, pollen beetles, Cucujoidea, Lamiaceae

### Introduction

The genus *Lamiogethes* (Coleoptera: Nitidulidae: Meligethinae), established by Audisio & Cline (in Audisio *et al.* 2009), and subsequently treated, e.g., by Audisio (2012), Lasoń & Ghahari (2013), Audisio *et al.* (2014), Chen *et al.* (2015), and Liu *et al.* (2017), includes a large number of species (ca. 120), arranged in more than a dozen species-groups, mostly distributed in Palearctic, Afrotropical, and Madagascan Regions. There is an ever-increasing number of new species also known from the Indian subcontinent and SW China. The main biodiversity hotspots of this genus include the SW Palearctic, central and southern Africa, as well as the Chinese Transitional Zone (Audisio 1993, 1996; Kirejtshuk 1979, 1988, 1992; Audisio *et al.* 2005; Liu *et al.*, unpublished data). Larvae of most members of the genus are associated with flowers of Lamiaceae, with the exception of *L. socotranus* Audisio from Socotra Island (Audisio 2012), and a group of more or less closely related species from the Indian subcontinent and neighboring areas, including SW China (Kirejtshuk 1988; Audisio *et al.* 2009), which are likely associated with shrubs and small trees of the distantly related plant family Euphorbiaceae. This shift is likely due to a drastic and ancient ecological host-shift of their common ancestor. *L. socotranus* is likely associated as larvae with inflorescences of the endemic small tree *Cephalocroton socotranus* Balf.f. (Euphorbiaceae) (Audisio 2012). Recent data seem to confirm the probable association of at least some Indian and SW Chinese species groups (of Indian origin) of *Lamiogethes* with Euphorbiaceae. A currently undescribed species likely related to *L. conjungens* (Grouvelle, 1910), was collected in numbers in Yunnan in late May, 2017 on inflorescences of shrubs of *Mallotus apelta* (Lour.) Muell. Arg. (Euphorbiaceae) (Liu, unpublished data). These recent discoveries suggest an alternate scenario of the rather unexpected and neglected record reported by Easton (1968), when he described *Meligethes* (now *Lamiogethes*) *tilmani* Easton, 1968 from Nepal, which was collected on unidentified Euphorbiaceae.

Herein, we describe five new species from China, primarily based on a series of specimens recently collected

during four field trips to Chongqing, Guizhou, Zhejiang, Shaanxi, Hubei, Yunnan, and Sichuan (18–30 July 2015; 1–30 June 2016; 8 April – 24 May 2017; 12–24 June 2017). Additional material was also located in collections of the Chinese Academy of Sciences, Beijing. Four of the new species are members of the same species group (see descriptions below), and appear to represent only a fraction of the actual Chinese biodiversity of this clade (Kirejtshuk 1992; Audisio *et al.* 2005; Jelínek & Audisio 2007; Liu *et al.* 2017 and unpublished data).

An updated checklist of the currently known Chinese *Lamiogethes*, including approximately 50 described and undescribed species, is under preparation (Liu *et al.*, unpublished data). Those data will be presented in a separated paper devoted to the description of some additional species of the genus, which are not closely related to the taxa described and discussed herein.

**Abbreviations.** Acronyms for morphological measurements can be found in fig. 3 and Table 1 in Audisio *et al.* (2015). Acronyms of museum institutions are as follows:

CAR-MZUR—P. Audisio's collection, currently housed in the Zoological Museum, Sapienza Rome University, Rome, Italy

IZAS—Institute of Zoology, Chinese Academy of Sciences, Beijing, China

NWAU—Entomological Museum of the Northwest A&F University, Yangling, China

## Taxonomic part

### *Lamiogethes falcatus* sp. n.

(Figs. 1a, 2a–b, 3a, d, i, 5)

**Diagnosis.** Elongate, rather markedly transversely convex, medium-sized (2.5–2.6 mm) (Fig. 1a). Vaguely similar in external body shape and color to the rare Palearctic species *Lamiogethes buyssoni* (Brisout de Barneville, 1882) (in the *L. difficilis* species group: Audisio 1993). Dorsal surface closely and markedly punctate (spaces between pronotal and elytral punctures ca. 1.2–1.6× diameter), with smooth and shining interspaces; elytra together 1.1× wider than pronotum, without distinguishable traces of transverse strigose sculpturing. Pronotum with vaguely trapezoidal shape, and rather straight lateral sides, at least in posterior two-thirds (Fig. 1a). Pubescence on pronotum and elytra sparse, golden-yellowish, distinct, each individual seta distinctly shorter (ca. 0.80×) than antennomere 2. Body uniformly dark brown; legs uniformly orange-brown, antennae brown, with first and second antennomeres slightly paler, orange-yellowish. Male protarsi wider than in any other known *Lamiogethes*, ca. 1.3× wider than maximum width of antennal club (Figs. 1a, 3d), ratio WFTA/LFTA ≈ 0.40. Male metatibiae peculiarly shaped, markedly arcuately sinuate along inner edge, more than in any other known *Lamiogethes* (Figs. 1a, 3i) and sickle-shaped even along outer edge. Male genitalia distinctively shaped, with elongate, subparallel-sided and deeply incised tegmen (Fig. 2a), aedeagal median lobe peculiarly large, >3× longer than wide, maximum width proximad and peculiar, finely acute at distal apex (Fig. 2b), only similar to that of *L. hastipenis* sp. n. Female unknown with certainty (but see comments below in “Examined material”).

**Description.** *Size* (male holotype): body length 2.6 mm, width 1.45 mm.

*Body color and pubescence:* uniformly dark brown, tegument shining. Legs orange-brown with darker tarsal plates. Antennae brown to dark brown with pale brown first and second antennomeres. Pubescence golden, rather long and sparse, not concealing tegument, each individual seta ca. 0.80× as long as second antennomere (Fig. 1a).

*Dorsal habitus:* body shape (Fig. 1a) vaguely similar to *Lamiogethes brunnicornis* (Sturm, 1845). Clypeus with truncate anterior margin. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameter; space between punctures smooth and shining. Dorsal punctures on elytra rather large, separated by ca. 1.2–1.5 diameter; space between punctures smooth and shining. Ratio LPR1/LELY = 0.50; ratio WPR1/LPR1 = 1.79; ratio WPR2/LPR1 = 1.72; ratio WPR2/WPR1 = 0.96; ratio LELY/WELY = 1.03; ratio WPR1/WPRA = 1.66; ratio WPR1/WELY = 0.90; ratio WPR2/WELY = 0.86.

*Ventral habitus:* combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process nearly as wide as length of antennal club, punctation fine and sparse. Male metaventricle flattened posterior to midlength, with wide but shallow mediolongitudinal impression, occupying nearly posterior two-thirds, with a barely impressed but distinct, narrow median longitudinal stripe, encompassing three-quarters of the metaventricle length. Last visible ventrite simple, without tubercles or ridges.

**Appendages:** antennae short (Fig. 1a); ratio ANLE/HWEA = 0.75; ratio CLLE/W10J  $\approx$  1.30; ratio L03J/W03J = 2.20; ratio L03J/L02J = 0.92; ratio L03J/L04J = 2.38; ratio WFTA/LFTA  $\approx$  0.40 (Fig. 3d); ratio LETI/WITI  $\approx$  2.90. Protibiae with a series of 3–4 moderately sharp teeth, increasing in size from the first to the penultimate, shaped nearly as in the common Palearctic species *L. brunnicornis* (Fig. 3d). Male metatibiae peculiarly shaped, markedly arcuately sinuate along inner edge (Figs. 1a, 3i), and sickle-shaped along outer edge.

**Male genitalia:** distinctively shaped, with elongate and subparallel-sided tegmen (Fig. 2a), widest in middle, medial distal excision deep, narrowly V-shaped (ratio DTIN/LETE  $\approx$  0.44), inner margins of excision without any projection; ratio LETE/WITE  $\approx$  1.65. Median lobe of aedeagus large and long, ratio LEAE/WIAE  $>3\times$  longer than wide (Fig. 2b), exhibiting maximum width close to proximal base, with suddenly narrowed, acute distal apex.

**Female:** The only female referred to this species (see below) exhibits protarsi markedly narrower than in male (ratio WFTA/LFTA  $\approx$  0.25), and simple (not arcuate) metatibiae. Metaventricle almost flat, with a barely distinct but long longitudinal impressed stria, as in male.

**Ovipositor:** moderately large, with blunt apex, moderately sclerotized, not darkened distad (Fig. 3a). Styli peculiarly small, barely distinct, positioned at apex and slightly oriented posteriad. Preapical area of coxites bearing a couple of long sensorial setae (Fig. 3a). Basal portions of gonocoxites obliquely oriented distad and V-shaped, apices laterally directed and bluntly rounded. The only available female exhibits a folded, poorly sclerotized, and partially damaged ovipositor, whose drawing (Fig. 3a) has been in part assembled based on four renderings of the different sections of the same structure. For this reason the biometric measurements have not been recorded, and await better-preserved material.

**Variation:** body size 2.5–2.6 mm (length) and 1.35–1.45 mm (width), and sexually dimorphic protarsal shape.

**Examined material.** Holotype, ♂: **China:** Sichuan, Kangding, W portion of the town, 2770 m a.s.l., 30°0'36"N 101°34'12"E, 21.vi.2017, Audisio, Liu & Huang lgt, sparsely forested and bushy area, beating flowering *Rubus* sp. (Rosaceae), (NWAU). Paratype: same data as holotype, 1 ♂ (CAR-MZUR). Additional material that may be referred to the same species: same locality, 8.v.2017, Chen lgt, by beating low vegetation, 1 ♀ (NWAU).

**Distribution.** SW China (Sichuan) (Fig. 5).

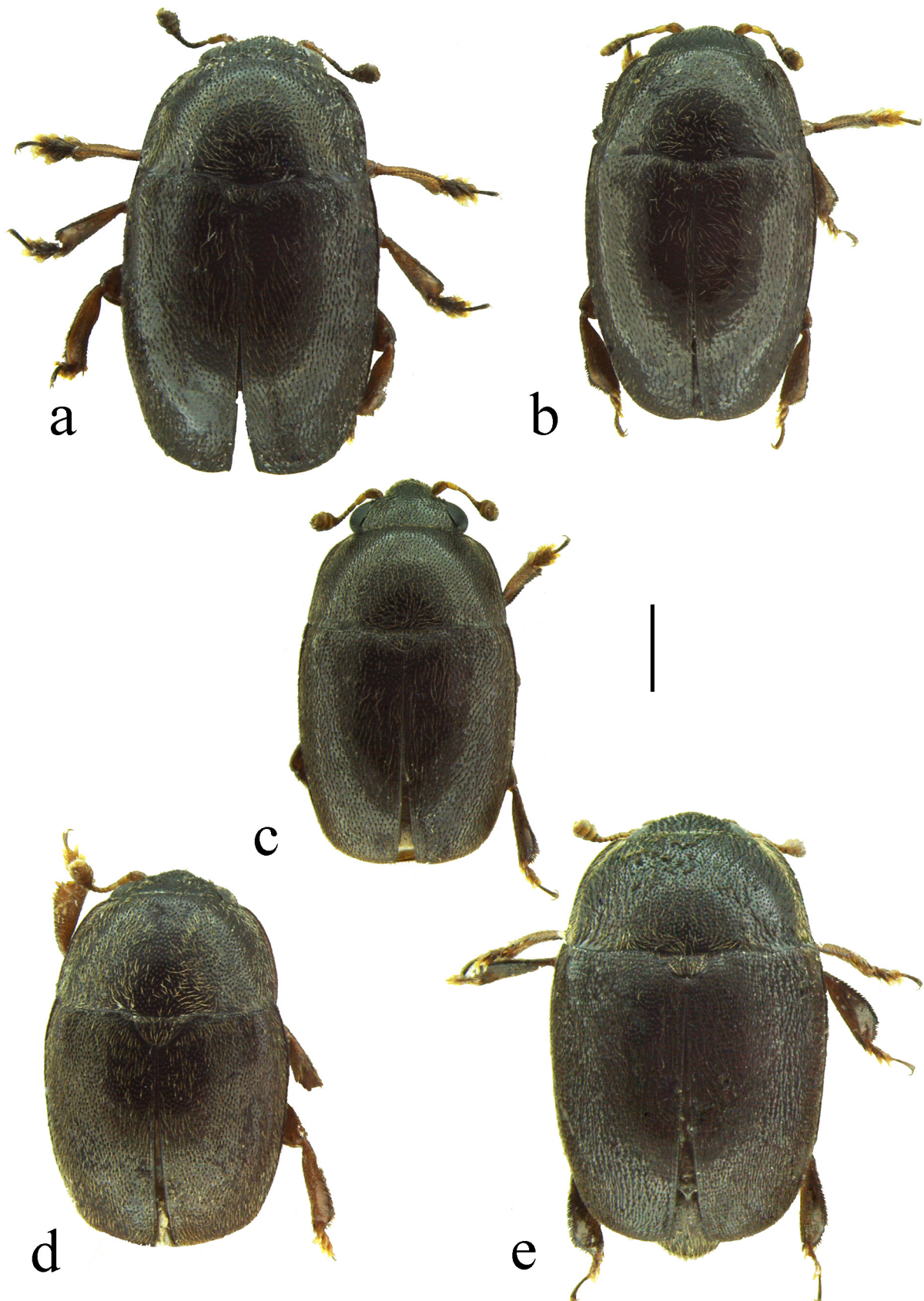
**Host-plants.** Unknown, but certainly Lamiaceae based on placement in the genus and species complex host preferences. The above cited *Rubus* sp. (Rosaceae) was likely an occasional food-plant before or after the flowering season of the species' larval host. Some other Chinese species of the moderately related *Lamiogethes kasparyani* (Kirejtshuk, 1984) and *L. forcipenis* (Liu, Huang, Cline & Audisio, 2017) groups appear to be associated as larvae with *Lamium* spp. (Lamiaceae) and related genera (Audisio *et al.* 2005; Liu *et al.* 2017 and unpublished data).

**Habitat.** Locality data indicate this species prefers the edges of high altitude sparsely forested and bushy areas.

**Phenology.** The few available specimens were collected in middle June and probably also occur in early May, which indicates adult activity at least from late April to July.

**Etymology.** The specific epithet is derived from the Latin *falcatus* (= sickle-shaped), due to its peculiarly sickle-shaped male metatibiae (Figs. 1a, 3i).

**Taxonomic remarks.** As reported above, this new species is vaguely similar in external shape to *L. buyssoni* from Europe (see Audisio 1993), as well as to other E Palearctic species of the genus; however, it is probably more closely related to *L. hastipenis* sp. n. described below, sharing with the latter a similar overall body shape, type of punctuation, and peculiarly sword-tip-shaped distal apex of the large and long median lobe of the aedeagus. Male specimens of the latter species are markedly different in having straight metatibiae, simple and narrower protarsi, more deeply impressed metaventricle, posterior edge of last abdominal ventrite with small shining tubercle, and differently shaped tegmen. We hypothesize that *L. falcatus* sp. n., *L. hastipenis* sp. n., *L. sagittalis* sp. n., and *L. unditibiis* sp. n. belong to the same species complex as *Lamiogethes ancestor* (Kirejtshuk, 1980) (**comb. n.**) from Hua Mts. (E Shaanxi), known to the authors only based on the original description. This species was correctly placed by Kirejtshuk (1980) within the previous "*Meligethes*" (s.l.) *difficilis* species group, all other species of which have been later transferred to *Lamiogethes* by Audisio *et al.* (2009). In that paper, we tentatively and erroneously attributed *L. ancestor* to the unrelated genus *Sagittogethes* Audisio & Cline (Audisio *et al.* 2009), due to the convergent shape of the distal apex of the aedeagus. *Lamiogethes ancestor* and the five new species described herein all share a rather peculiar shape of the distal portion of the aedeagus, distinctly sword-tip-shaped like in most species of *Sagittogethes*, a trait unknown in any other described *Lamiogethes*. As discussed above, all these species are probably not distantly related from *L. kasparyani* and other taxa of NE and Central China (Audisio *et al.* 2005).



**FIGURE 1.** Habitus of *Lamiogethes* spp.: **a**, *L. falcatus* sp. n. male from China, Sichuan; **b**, *L. hastipenis* sp. n., male from China, Hubei; **c**, *L. sagittalis* sp. n., male from China, Shaanxi; **d**, *L. unditibiis* sp. n., male from China, Chongqing; **e**, *L. limae-lytralis* sp. n., male from China, Sichuan. Scale bar: 0.5 mm (Figs. a–e).

***Lamiogethes hastipennis* sp. n.**

(Figs. 1b, 2c–d, 3e, 5)

**Diagnosis.** Vaguely similar in external body shape and color to the rare Palearctic species *L. buyssoni* (Brisout de Barneville, 1882) (in the *L. difficilis* species group: Audisio 1993). Male protarsi wide, but markedly narrower than in the closely related *L. falcatus* sp. n., ca. 0.9× as wide as maximum width of the antennal club (Figs. 1b, 3e), ratio WFTA/LFTA ≈ 0.28. Male metatibiae normally shaped, not arcuately sinuate along inner edge (Fig. 1b) and rather rectilinear along most of their outer edge. Male genitalia distinctively shaped, with elongate, subparallel-sided and deeply incised tegmen (Fig. 2c), aedeagal median lobe peculiarly large, >3× longer than wide, maximum width proximad, and peculiar, sword-tip-shaped distal apex (Fig. 2d), similar to *L. falcatus* sp. n.

**Description.** *Size* (male holotype): body length 2.30 mm, width 1.32 mm.

*Body color and pubescence:* uniformly dark brown, tegument shiny. Legs brown to dark brown, with paler tarsal plates, antennae brown to dark brown with paler second and third antennomeres. Pubescence pale golden, moderately long and sparse, not concealing tegument, each individual seta ca. 0.80× as long as second antennomere (Fig. 1b).

*Dorsal habitus:* body shape (Fig. 1b) vaguely similar to *L. buyssoni*. Clypeus with truncate anterior margin. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameter; space between punctures smooth and shining. Dorsal punctures on elytra rather large, separated by ca. 1.2–1.5 diameter; space between punctures smooth and shining. Ratio LPR1/LELY = 0.50; ratio WPR1/LPR1 = 1.82; ratio WPR2/LPR1 = 1.68; ratio WPR2/WPR1 = 0.93; ratio LELY/WELY = 1.02; ratio WPR1/WPRA = 1.70; ratio WPR1/WELY = 0.92; ratio WPR2/WELY = 0.85.

*Ventral habitus:* combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process slightly wider than length of antennal club, with fine and sparse punctation. Male metaventrite markedly and widely impressed, with a rather deep semi-circular transverse impression, occupying nearly posterior two-thirds. Last visible ventrite with a small, shining tubercle in middle of posterior edge.

*Appendages:* antennae short (Fig. 1b); ratio ANLE/HWEA = 0.80; ratio CLLE/W10J = 1.40; ratio L03J/W03J = 2.00; ratio L03J/L02J = 0.85; ratio L03J/L04J = 2.45; ratio WFTA/LFTA ≈ 0.28; ratio LETI/WITI ≈ 3.30. Protibiae with a series of 3–5 moderately sharp teeth, increasing in size from first to penultimate, similarly shaped as the Palearctic species *L. difficilis* (Fig. 3e). Metatibiae simple, not arcuately curved nor sinuate along inner side (Fig. 1b).

*Male genitalia:* distinctively shaped, with elongate and subparallel-sided tegmen (Fig. 2c), widest in middle, medial distal excision deep, narrowly V-shaped (ratio DTIN/LETE ≈ 0.45), inner margins of excision with an obtuse gibbosity close to base; ratio LETE/WITE ≈ 2.05. Median lobe of aedeagus large and long, ratio LEAE/WIAE >3 (>3× longer than wide; Fig. 2d), maximum width close to proximal base, with abruptly narrowed, sword-tip-shaped distal apex, and markedly concave proximal apex.

*Female:* unknown.

*Variation:* body size 2.30–2.35 mm (length) and 1.32–1.35 mm (width).

**Examined material.** Holotype, ♂: **China:** Hubei, Shennongjia National Forest Park, Shennong peak Scenic Area, sparsely forested and bushy area below the trail gate, ca. 2500 m a.s.l., ca. 31°16'12"N 110°10'12"E, 16.vi.2017, Audisio & Liu lgt, beating flowering bushes of *Rubus rosifolius* Sm. (Rosaceae), (NWAU). Paratype: same data as holotype, 1 ♂ (CAR-MZUR).

**Distribution.** S China (Hubei) (Fig. 5).

**Host-plants.** Unknown, but certainly among Lamiaceae. The above cited *Rubus rosifolius* (Rosaceae) was an occasional food-plant before or after the flowering season of the species' larval host. Some other Chinese species of the somewhat related *Lamiogethes kaspanyani* group, appear to be associated as larvae to *Lamium* spp. (Lamiaceae) and related genera (Audisio *et al.* 2005; Liu *et al.* unpublished data).

**Habitat.** Locality data suggest this species prefers the edges of high altitude sparsely forested and bushy areas.

**Phenology.** The few available specimens were collected in middle June, which likely indicates adult activity at least from May to July.

**Etymology.** The specific epithet is derived from the Latin *hasta* (= lance), due to its peculiarly lance-shaped or sword-tip-shaped apex of the median lobe of aedeagus (Fig. 2d).

**Taxonomic remarks.** As reported above, this new species is vaguely similar in external shape to *L. buyssoni*

from Europe (see Audisio 1993), as well as to other E Palearctic species of the genus, but is more closely related to *L. falcatus* sp. n. described above, sharing with the latter an overall similar body shape and size, type of punctation, and peculiarly sword-tip-shaped distal apex of the median lobe of aedeagus. Male specimens of the latter species are different in possessing metatibiae arcuately curved (simple in *L. hastipennis*), much wider protarsi and protibiae, less strongly impressed metaventricle, and markedly different tegmen. As discussed above, *L. falcatus* sp. n., *L. hastipennis* sp. n., *L. sagittalis* sp. n. and *L. unditibiis* sp. n. belong to the same species complex, also including *L. ancestor* from central E China.

### ***Lamiogethes sagittalis* sp. n.**

(Figs. 1c, 2e–f, 3b, f, 5)

**Diagnosis.** Vaguely similar in external body shape and color to small specimens of the common Palearctic species *L. brunnicornis* (in the *L. difficilis* species group: Audisio 1993). Male genitalia distinctively shaped, with elongate, subparallel-sided and deeply incised tegmen (Fig. 2e), aedeagal median lobe moderately large, ca. 2.2× longer than wide, its maximum width proximad, and with arrowhead-shaped distal apex (Fig. 2f).

**Description.** *Size* (male holotype): body length 2.20 mm, width 1.45 mm.

*Body color and pubescence:* uniformly dark brown, tegument shiny. Legs brown to dark brown, with paler tarsal plates, antennae brown to dark brown with paler second and third antennomeres. Pubescence pale golden, moderately long and sparse, not concealing tegument, each individual seta ca. 0.80× as long as second antennomere (Fig. 1c).

*Dorsal habitus:* body shape (Fig. 1c) vaguely similar to *L. brunnicornis*. Clypeus with truncate anterior margin. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameter; space between punctures smooth and shining. Dorsal punctures on elytra rather large, separated by ca. 1.2–1.5 diameter; space between punctures smooth and shining. Ratio LPR1/LELY = 0.49; ratio WPR1/LPR1 = 1.89; ratio WPR2/LPR1 = 1.80; ratio WPR2/WPR1 = 0.95; ratio LELY/WELY = 1.02; ratio WPR1/WPRA = 1.77; ratio WPR1/WELY = 0.92; ratio WPR2/WELY = 0.88.

*Ventral habitus:* combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process nearly as wide as antennal club, only with fine and sparse punctation. Male metaventricle markedly and widely impressed, with a rather deep semi-circular transverse impression, occupying nearly the posterior two-thirds; with two distinctly raised elongate longitudinal tubercles, nearly as long as second antennomere, placed on each side of the impression, prior to middle portion. Last visible ventrite with a large and moderately transverse shining tubercle in middle of posterior edge.

*Appendages:* antennae rather short (Fig. 1c); ratio ANLE/HWEA = 0.70; ratio CLLE/W10J = 1.20; ratio L03J/W03J = 2.4; ratio L03J/L02J = 0.80; ratio L03J/L04J = 2.0; ratio WFTA/LFTA ≈ 0.34; ratio LETI/WITI ≈ 3.40. Protibiae with a series of 3–5 moderately sharp teeth, increasing in size from the first to penultimate, shaped nearly as in the rare Caucasian endemic species *L. amei* Audisio & Kirejtshuk, 1988 (Fig. 3f). Metatibiae simple, not arcuately curved nor sinuate along their inner side, with a series of peculiarly long and slender spurs along outer edges (Fig. 1c).

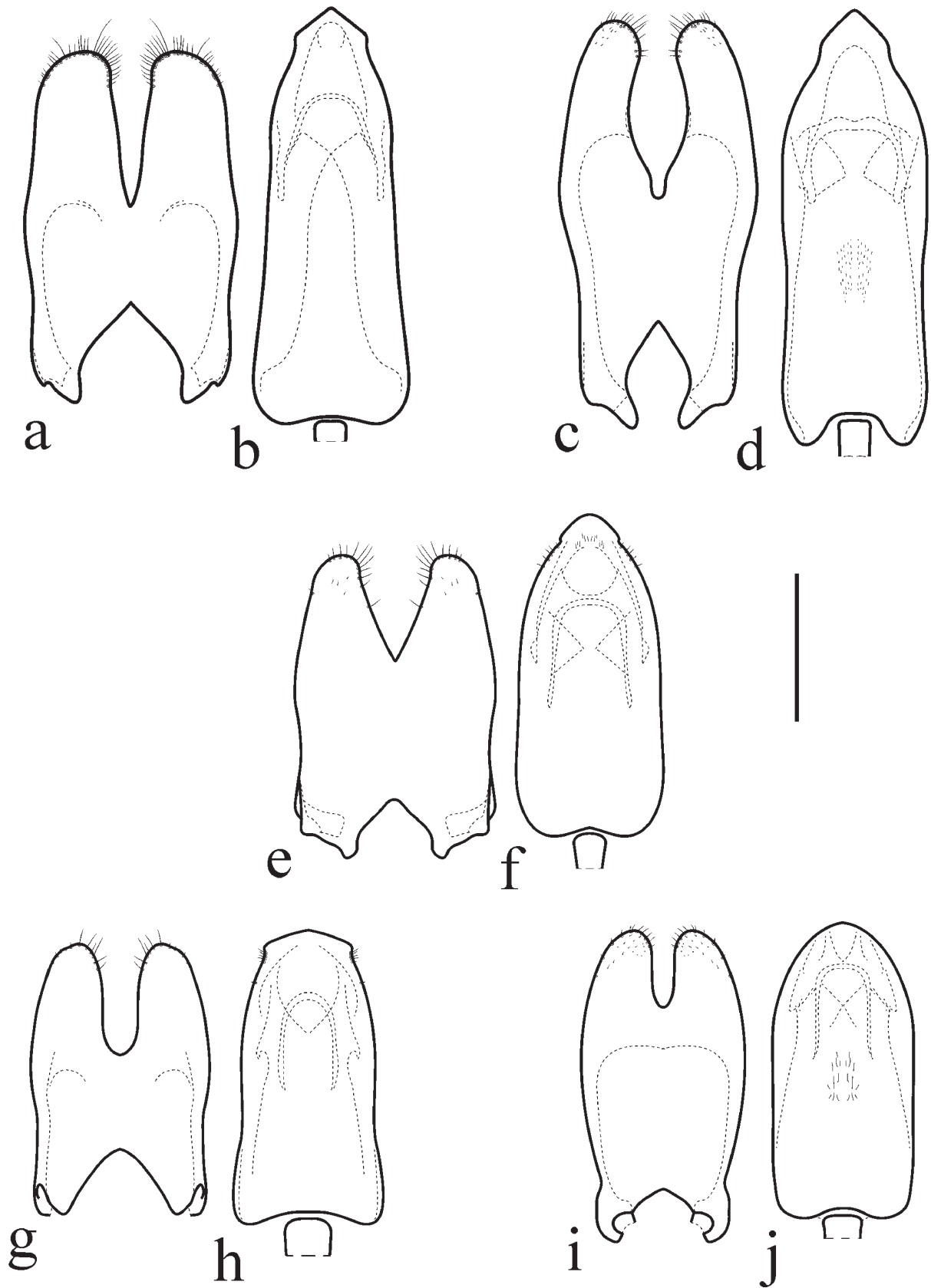
*Male genitalia:* distinctively shaped, with elongate and subparallel-sided tegmen (Fig. 2e), widest in middle, medial distal excision deep, V-shaped (ratio DTIN/LETE ≈ 0.37), inner margins of excision simple, without projection; ratio LETE/WITE ≈ 1.48. Median lobe of aedeagus large and long (ratio LEAE/WIAE ≈ 2.2; Fig. 2f), exhibiting maximum width close to proximal base, with suddenly narrowed, arrowhead-shaped distal apex and slightly concave proximal apex.

*Female:* the only known female paratype is slightly larger than the male holotype, 2.5 mm length. Protarsal plates narrower than in male, ratio WFTA/LFTA ≈ 0.25. Metaventricle appearing simple, flattened; last abdominal ventrite without distal tubercle.

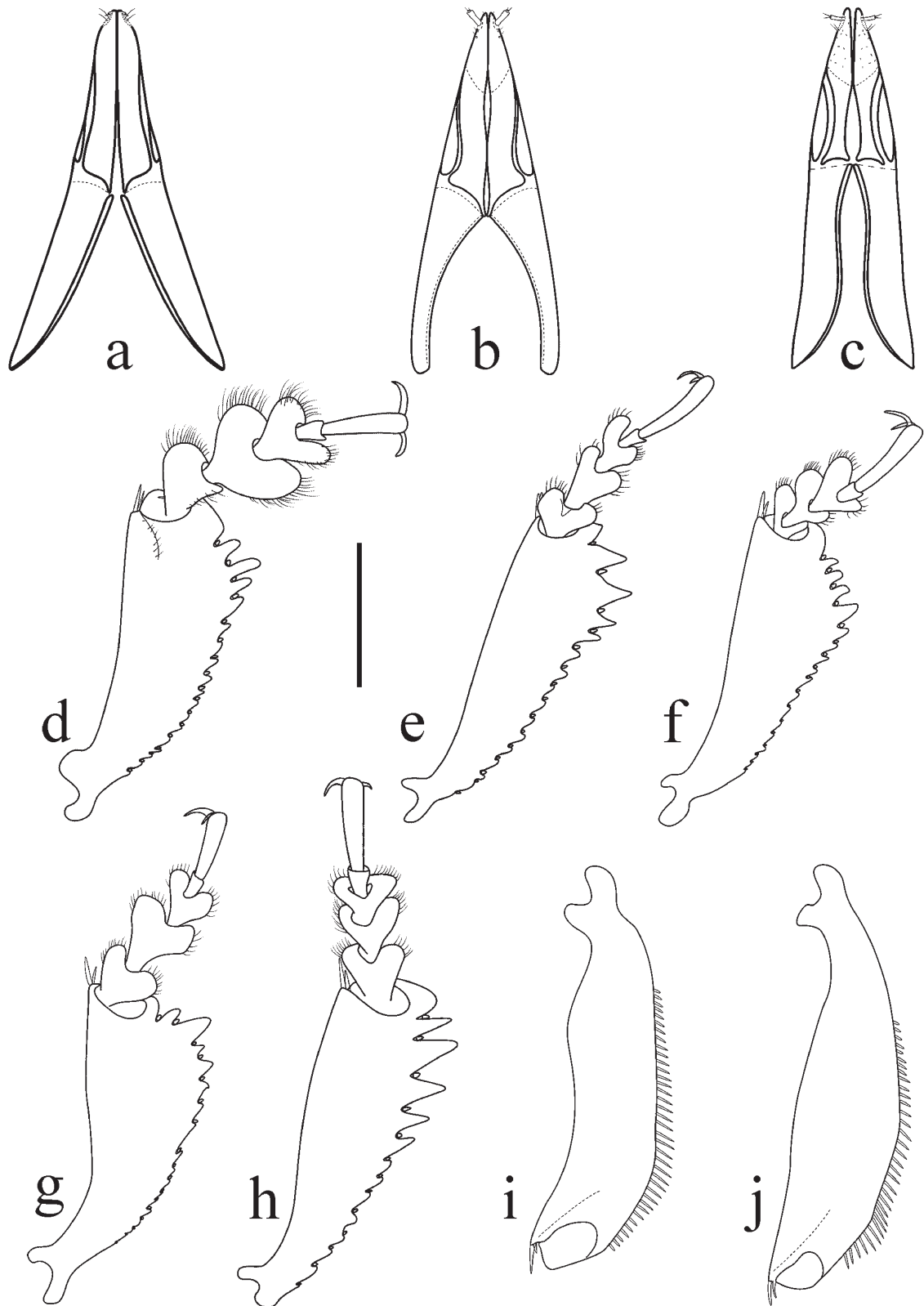
*Ovipositor:* mid-sized, with moderately pointed distal apex, not darkened distad, rather long subapical styli, and distinctly “V”-shaped basicoxites (Fig. 3b).

*Variation:* body size 2.20–2.52 mm (length) and 1.45–1.55 mm (width), and sexually dimorphic body size.

**Examined material.** Holotype, ♂: **China:** Shaanxi, Taibai Mts, Mei Xian, Haopingsi Natural Protection Area, ca. 2000 m a.s.l., ca. 34°2'24"N 107°25'12"E, 29.vii.2015, Huang, Liu & Cao lgt, by netting on flowering vegetation, (NWAU). Paratype: same data as holotype, 1 ♀ (CAR-MZUR).



**FIGURE 2.** Male genitalia (tegmen and median lobe of aedeagus, dorsal view) of *Lamiogethes* spp.: **a–b**, *L. falcatus* **sp. n.**, male from China, Sichuan; **c–d**, *L. hastipenis* **sp. n.**, male from China, Hubei; **e–f**, *L. sagittalis* **sp. n.**, male from China, Shaanxi; **g–h**, *L. unditibiis* **sp. n.**, male from China, Chongqing; **i–j**, *L. limaelytralis* **sp. n.**, male from China, Sichuan. Scale bar: 0.2 mm (Figs. a–j).



**FIGURE 3.** Female genitalia (ovipositor, ventral view) of *Lamiogethes* spp. (a–c): a, *L. falcatus* sp. n. from China, Sichuan (female not selected as paratype); b, *L. sagittalis* sp. n., female from China, Shaanxi; c, *L. unditibiis* sp. n., female from China, Chongqing. Protibiae of *Lamiogethes* spp. (d–h): d, *L. falcatus* sp. n., male from China, Sichuan; e, *L. hastipenis* sp. n., male from China, Hubei; f, *L. sagittalis* sp. n., male from China, Shaanxi; g, *L. unditibiis* sp. n., male from China, Chongqing; h, *L. limaelytralis* sp. n., male from China, Sichuan. Metatibiae of *Lamiogethes* spp. (i–j): i, *L. falcatus* sp. n., male from China, Sichuan; j, *L. unditibiis* sp. n., male from China, Chongqing. Scale bar: 0.2 mm (Figs. a–j).



**Distribution.** Central China (Shaanxi) (Fig. 5).

**Host-plants.** Unknown, but likely among Lamiaceae.

**Habitat.** Locality data indicate that this species prefers the edges of high altitude, sparsely forested and bushy areas.

**Phenology.** The two available specimens were collected at the end of July, which likely indicates adult activity at least from June to August.

**Etymology.** The specific epithet is derived from the Latin *sagitta* (= arrow), due to its peculiarly arrowhead-shaped apex of the median lobe of the aedeagus (Fig. 2f), strongly resembling the condition typical of most members of the distantly related genus *Sagittogethes* Audisio & Cline, 2009 (Audisio *et al.* 2009).

**Taxonomic remarks.** As reported above, this new species is vaguely similar in external shape to small specimens of *L. brunnicornis* from Europe (see Audisio 1993), as well as to other E Palearctic species of the genus. However, it is rather closely related to *L. falcatus* sp. n. and *L. hastipenis* sp. n. described above, sharing with them a similar body shape and size, type of punctuation, and the peculiarly sword-tip-shaped or arrowhead-shaped distal apex of the median lobe of the aedeagus. Male specimens of both above-mentioned species exhibit markedly different tegmen shape and much longer and narrower median lobe of the aedeagus. We propose that *L. sagittalis* sp. n. belongs to the same species complex as *L. ancestor* mentioned above.



FIGURE 4. Map of vegetation zones of China. For complete details refer to Fang *et al.* (2002) and <http://www.chinamaps.org/china/china-land-cover-map-large-2.html>.

***Lamiogethes unditibiis* sp. n.**

(Figs. 1d, 2g–h, 3c, g, j, 5)

**Diagnosis.** Vaguely similar in external body shape and color to the common Palearctic species *Lamiogethes persicus* (Faldermann, 1835) (in the *L. difficilis* species group: Audisio 1993). Dorsal surface closely and markedly punctate (spaces between pronotal and elytral punctures ca. 1.2–1.6× their diameter), with smooth and shining interspaces; elytra together ca. 1.2× wider than pronotum, without distinguishable traces of transverse strigose sculpturing. Pronotum with vaguely trapezoidal shape, and rather straight lateral sides, at least in posterior two thirds (Fig. 1d). Pubescence on pronotum and elytra sparse, golden-yellowish, distinct, each individual seta distinctly shorter (ca. 0.80×) than antennomere 2. Body uniformly dark brown; legs and antennae uniformly brown to orange brown. Male protarsi moderately wide, ca. 0.9× as wide as maximum width of antennal club (Fig. 1d), ratio WFTA/LFTA ≈ 0.30. Male metatibiae slightly undulate along inner edge (Fig. 3j). Male genitalia distinctively shaped, with elongate, subparallel-sided and very deeply incised tegmen (Fig. 2g), aedeagal median lobe moderately large, ca. 2× longer than wide, maximum width proximad, and with characteristic short sword-tip-shaped distal apex (Fig. 2h).

**Description.** *Size* (male holotype): body length 2.20 mm, width 1.40 mm.

*Body color and pubescence:* uniformly dark brown, tegument shiny. Legs and antennae uniformly brown to orange brown. Pubescence pale golden, moderately long and sparse, not concealing tegument, each individual seta ca. 0.80× as long as second antennomere (Fig. 1d).

*Dorsal habitus:* Clypeus with nearly truncate anterior margin. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameter; space between punctures smooth and shining. Dorsal punctures on elytra rather large, separated by ca. 1.1–1.4 diameters; space between punctures smooth and shining. Ratio LPR1/LELY = 0.60; ratio WPR1/LPR1 = 1.79; ratio WPR2/LPR1 = 1.74; ratio WPR2/WPR1 = 0.93; ratio LELY/WELY = 1.02; ratio WPR1/WPRA = 1.70; ratio WPR1/WELY = 0.96; ratio WPR2/WELY = 1.05.

*Ventral habitus:* combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process only slightly wider than length of antennal club, only with moderately impressed and dense punctation. Male metaventrite moderately impressed, with a shallow semi-circular transverse impression, occupying nearly the posterior two-thirds, and with a couple of barely distinct and scarcely raised small tubercles slightly before middle. Last ventrite with a small, shining tubercle in middle of posterior edge.

*Appendages:* antennae rather short (Fig. 1d); ratio ANLE/HWEA = 0.75; ratio CLLE/W10J = 1.25; ratio L03J/W03J = 2.00; ratio L03J/L02J = 0.75; ratio L03J/L04J = 2.00; ratio WFTA/LFTA ≈ 0.29; ratio LETI/WITI ≈ 2.90. Protibiae with a series of 3–5 moderately sharp teeth, increasing in size from first to penultimate, shaped nearly as in the common Palearctic species *L. morosus* (Erichson, 1845) (Fig. 3g). Metatibiae slightly undulate along inner side (Figs. 1d, 3j).

*Male genitalia:* distinctively shaped, with elongate and subparallel-sided tegmen (Fig. 2g), widest in middle, medial distal excision deep, narrowly U-shaped (ratio DTIN/LETE ≈ 0.43), inner margins of excision without gibbositities close to base; ratio LETE/WITE ≈ 1.51. Median lobe of aedeagus large and long, ratio LEAE/WIAE ≈ 2× longer than wide (Fig. 2h), exhibiting maximum width close to proximal base, with abruptly narrowed, sword-tip-shaped distal apex, and markedly concave proximal apex.

*Female:* The female of this species exhibits protarsi slightly narrower than in male (ratio WFTA/LFTA ≈ 0.24), and simple (not undulate) metatibiae. Metaventrite almost flat, without distinct impression or longitudinal stria.

*Ovipositor:* middle-sized, with rather pointed distal apex, not darkened distad, and peculiarly long and narrow subapical styli (Fig. 3c).

*Variation:* body size 2.10–2.20 mm (length) and 1.35–1.40 mm (width), and sexually dimorphic shape of protarsi and metatibiae.

**Examined material.** Holotype, ♂: **China:** Chongqing, Jinyun Mt., [ca. 700 m a.s.l., ca. 29°28'12"N 106°12'0"E], 26.iv.1939, without further data, (IZAS). Paratypes: same data as holotype, 1 ♂, 3 ♀♀ (IZAS).

**Distribution.** S China (Chongqing) (Fig. 5).

**Host-plants.** Unknown, but probably among Lamiaceae.

**Habitat.** Locality data indicate that this species prefers the edges of middle-low altitude, sparsely forested and bushy areas.

**Phenology.** The few available specimens were collected at the end of April, which likely indicates adult activity at least from late April to at least early June.

**Etymology.** The specific epithet is derived from the Latin *unda* (= wave), and *tibia* (= tibia), due to the slightly sinuate inner edge of the metatibiae in males (Fig. 3j).

**Taxonomic remarks.** As reported above, this new species is vaguely similar in external shape to *L. persicus* from Europe (see Audisio 1993), as well as to other E Palearctic species of the genus, but is likely more closely related to the three other species described above. This species shares with them an overall similar body shape and size, type of punctuation, and peculiarly sword-tip-shaped distal apex of the median lobe of aedeagus. Male specimens of the other species are markedly different in possessing a longer median lobe of aedeagus and markedly different tegmen. *Lamiogethes unditibiis* sp. n. could represent a species of the group more closely related to *L. ancestor* (from E Shaanxi), which exhibits markedly different tegmen, but vaguely similar median lobe of the aedeagus (Figs. 2g–h herein and figs. 24–25, p. 178, in Kirejtshuk 1992).

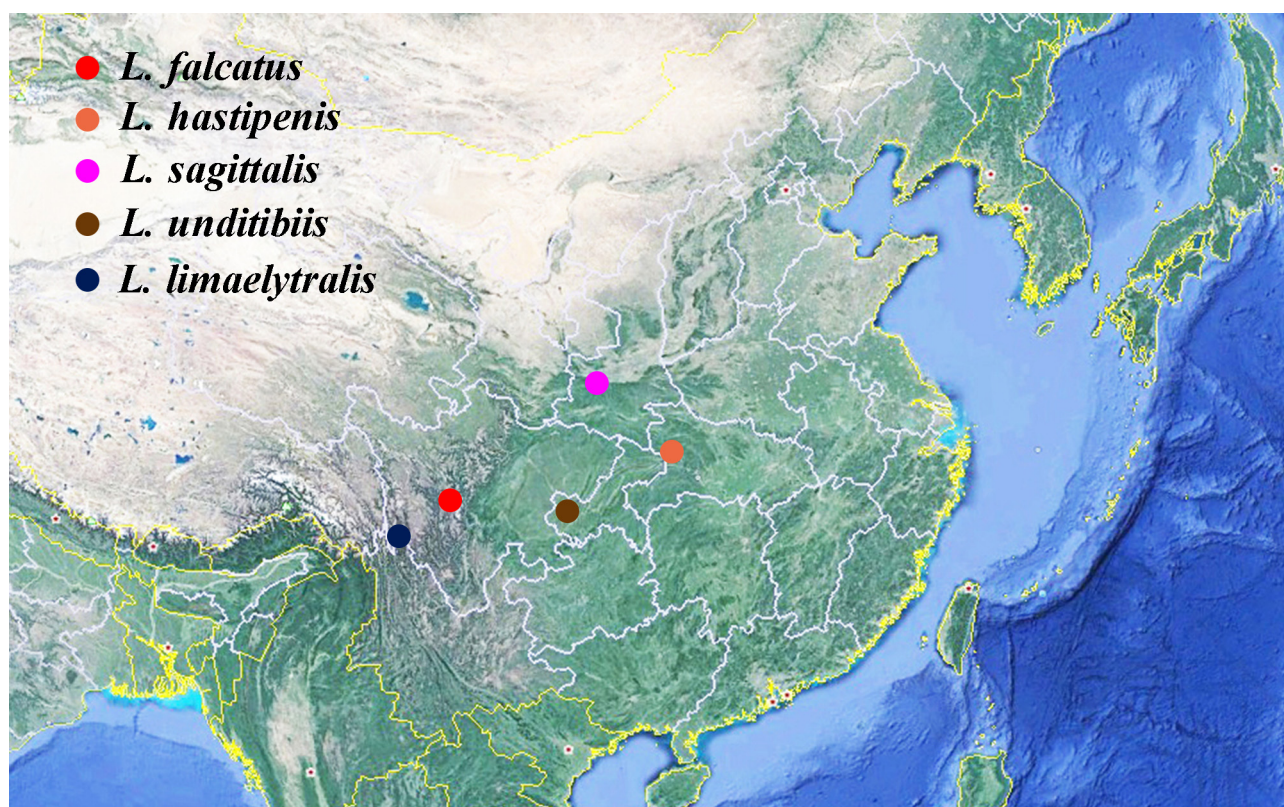


FIGURE 5. Distribution map of Chinese *Lamiogethes* treated herein.

***Lamiogethes limaelytralis* sp. n.**

(Figs. 1e, 2i–j, 3h, 5)

**Diagnosis.** Vaguely similar in external body shape and color to small specimens of the common Palearctic species *L. brunnicornis* (in the *L. difficilis* species group: Audisio 1993). Male metatibiae rather normally shaped, not sinuate along inner edge (Fig. 1e) and rather rectilinear along most of outer edge. Male genitalia distinctively shaped, with elongate, deeply and narrowly incised tegmen (Fig. 2i), aedeagal median lobe moderately large, ca. 2.1× longer than wide, maximum width at distal two-thirds, and with simple, ogive-shaped distal apex (Fig. 2j).

**Description.** *Size* (male holotype): body length 2.60 mm, width 1.55 mm.

*Body color and pubescence:* uniformly dark brown, tegument shiny. Legs brown to dark brown, with slightly paler tarsal plates and protibiae, antennae uniformly reddish-brown. Pubescence golden, rather long and sparse, not concealing tegument, each individual seta ca. 0.90× as long as second antennomere (Fig. 1e).

*Dorsal habitus:* body shape (Fig. 1e) vaguely similar to the common European species *L. brunnicornis*. Clypeus with slightly arcuately sinuate anterior margin. Dorsal punctures on pronotum fine and deep, each puncture separated from another by ca. 1.2–1.6 diameter; space between punctures smooth and shining. Dorsal punctures on elytra large, separated by ca. 1.2–1.5 diameter; space between punctures smooth and shining. Ratio LPR1/LELY =

0.48; ratio WPR1/LPR1 = 1.97; ratio WPR2/LPR1 = 1.85; ratio WPR2/WPR1 = 0.94; ratio LELY/WELY = 0.95; ratio WPR1/WPRA = 1.69; ratio WPR1/WELY = 0.90; ratio WPR2/WELY = 0.85.

**Ventral habitus:** combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process wide, nearly as 1.5× as wide as antennal club, with coarse and close punctation. Male metaventricle markedly and widely impressed, with a rather deep semi-circular transverse impression, occupying posterior half, and two distinctly raised elongate longitudinal tubercles, nearly as long as second antennomere, situated on each side of impression, prior to middle portion. Last visible ventrite appearing simple, without distinct shining tubercle in middle of posterior edge.

**Appendages:** antennae rather short (Fig. 1e); ratio ANLE/HWEA = 0.71; ratio CLLE/W10J = 1.30; ratio L03J/W03J = 2.6; ratio L03J/L02J = 0.90; ratio L03J/L04J = 2.0; ratio WFTA/LFTA ≈ 0.33; ratio LETI/WITI ≈ 3.40. Protibiae with a series of 3–5 moderately sharp teeth, increasing in size from first to penultimate, shaped nearly as in the S European and Anatolian species *L. bucciarellii* Audisio, 1976 (Fig. 3h). Metatibiae simple, not arcuately curved or sinuate along inner side (Fig. 1e).

**Male genitalia:** distinctively shaped, with elongate tegmen (Fig. 2i), widest in middle, medial distal excision moderately deep and narrowly U-shaped (ratio DTIN/LETE ≈ 0.27), inner margins of excision simple, without projection; ratio LETE/WITE ≈ 1.73. Median lobe of aedeagus rather large and long (ratio LEAE/WIAE ≈ 2.1; Fig. 2j), exhibiting maximum width nearly at distal two-thirds, with narrowed, ogive-shaped distal apex and slightly concave proximal apex.

**Female:** unknown.

**Variation:** body size 2.50–2.60 mm (length) and 1.50–1.55 mm (width).

**Examined material.** Holotype, ♂: **China:** Sichuan, Xiangcheng Co., above Xiangcheng, 3100–3400 m a.s.l., 28°35'24"N 99°33'0"E, 19.vi.2017, Liu & Audisio (NWAU). Paratype: same data as holotype, 1 ♂ (CAR-MZUR).

**Distribution.** SW China (Sichuan) (Fig. 5).

**Host-plants.** Unknown, but probably among Lamiaceae. The two males included in the type material were collected intermixed among numerous specimens of *L. convexistrigosus* Liu, Huang, Cline & Audisio, 2017 and a few *L. forcipenis* Liu, Huang, Cline & Audisio, 2017; both species may be associated with *Phlomidodes umbrosa* (Lamiaceae) (Liu *et al.* 2017).

**Habitat.** Locality data indicate this species prefers the edges of high altitude, forested and bushy areas.

**Phenology.** The two available specimens were collected in middle June, which likely indicates adult activity at least from May to July.

**Etymology.** The specific epithet is derived from the Latin *lima* (= file), due to its peculiarly strong and rather uniformly transversely strigose elytra (Fig. 1e), similar to the condition typical of some members of the genus *Astylogethes* Kirejtshuk, 1979, which are not closely related.

**Taxonomic remarks.** As reported above, this new species is vaguely similar in external body shape to *L. brunnicornis* from Europe (see Audisio 1993), as well as to other E Palearctic species of the genus, but is almost certainly more closely related to *L. forcipenis* from Sichuan and allied species (Liu *et al.* 2017). However, male specimens of the latter species exhibit a markedly different tegmen and median lobe of the aedeagus. Possible phylogenetic relationships of *L. limaelytralis* sp. n. with *L. ancestor* and allied species described above need further analyses.

## Conclusions

The five new species described herein provide additional insight into the biodiversity of this species-rich genus of Meligethinae. However, further research is needed to construct a more complete knowledge of this taxonomic group in the area. A series of hitherto recognized undescribed species (with no less than 50 new species) includes additional endemic taxa for China. Most known species are concentrated in temperate mixed conifer/deciduous forests (where more widespread E Siberian and Euro-Asiatic elements prevail), in warm temperate deciduous-broadleaf forests (where endemic central Chinese elements prevail), and in subtropical evergreen broadleaf forests (where S Chinese endemic and subendemic elements prevail) (Fig. 4; refer also to Fang *et al.* (2002) and to <http://www.chinamaps.org/china/china-land-cover-map-large-2.html>).

Combining the incomplete present-day faunistic coverage and field efforts made thus far in several provinces and mountain systems of China [e.g., Xizang (Tibet) and most of the S, E and SE provinces have been only superfi-

cially explored], we estimate that the actual number of Chinese species within this genus could include no less than 60–70 species.

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