

Research articleSubmitted: October 6th, 2017 - Accepted: December 7th, 2017 - Published: December 29th, 2017**Two new *Lamiogethes* Audisio & Cline from China (Coleoptera: Nitidulidae, Meligethinae)**Meike LIU^{1,3}, Min HUANG^{1,*}, Andrew Richard CLINE², Paolo AUDISIO³¹ Key Laboratory of Plant Protection Resources and Pest Management of Ministry of Education, Entomological Museum, Northwest A&F University - Yangling, Shaanxi, 712100, China - liumk2009@126.com; huangmin@nwsuaf.edu.cn² Plant Pest Diagnostics Center - California Department of Food & Agriculture, Sacramento, CA, USA - andrew.cline@cdfa.ca.gov³ Dipartimento di Biologia e Biotechnologie "Charles Darwin", Sapienza Università di Roma - Via Borelli 50, I-00161 Rome, Italy paolo.audisio@uniroma1.it

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Abstract

Two new species of the genus *Lamiogethes* Audisio & Cline, 2009 are described from China (Sichuan): *L. forcipenis* **sp. n.**, and *L. convexistrigosus* **sp. n.**, based on a series of recently collected specimens. The new species are both likely morphologically related to *L. potanini* (Kirejtshuk, 1979) from Sichuan and to *L. conjungens* (Grouvelle, 1910) from Yunnan. These new species clearly differ from their related taxa by details of the body shape and color, and the distinct shape of the male and female genitalia. Both new species are likely associated as larvae with a member of the genus *Phlomoides* Moench (Lamiaceae).

Key words: taxonomy, distribution, larval host-plants, pollen beetles, Lamiaceae.

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Introduction

The genus *Lamiogethes* (Coleoptera: Nitidulidae, Meligethinae) was established by Audisio & Cline (Audisio et al. 2009), and subsequently treated by Trizzino et al. (2009), Audisio (2012), Audisio et al. (2015) and Chen et al. (2015). It includes a large number of described species (ca. 100), arranged in a dozen species-groups, mostly distributed in the Palaearctic, Afrotropical, and Madagascan Regions, with a moderate number of additional species also known from the Indian subcontinent and SW China. The main biodiversity hotspots of this genus are in the SW Palaearctic, in Central and Southern Africa, as well as in the Chinese Transitional Zone (Audisio 1993, 1996; Kirejtshuk 1979, 1992; Audisio et al. 2005; Liu et al. unpublished records). Larvae of all members of the genus are associated with flowers of Lamiaceae, with the suspected exception of *L. socotranus* Audisio, 2012 from Socotra Island (Audisio 2012), and of a small group of related species from central and southern India (Kirejtshuk 1988; Audisio et al. 2009), which could be associated with small trees of the unrelated plant family Euphorbiaceae, probably due to a drastic and ancient ecological host-shift.

Herein, we describe two new species from Sichuan Province, China, based on a series of specimens recently collected during a field trip to Shaanxi, Hubei and Sichuan

(June 12th–24th, 2017), organized by the second author (M.H.). The new species are members of the same species group (see descriptions below), which appears to represent only a small fraction of the true Chinese biodiversity of *Lamiogethes*, almost certainly only poorly explored thus far, and including a large number of undescribed species (Kirejtshuk 1992; Audisio et al. 2005; Jelínek & Audisio 2007; Liu et al. unpublished data).

Abbreviations

Acronyms used in morphological measurements: refer to Fig. 3 and Table 1 in Audisio et al. (2015).

Acronyms of museum institutions:

ARCC A.R. Cline's collection, currently housed in the Plant Pest Diagnostics Center in Sacramento, California, USA

BMNH The Natural History Museum, London

CAR-MZUR

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

CAS California Academy of Sciences, Sacramento, USA

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

NMPC National Museum, Prague, Czech Republic
NWAU Entomological Museum of the Northwest A&F University, Yangling, China

***Lamiogethes forcipenis* sp. n.**

(Figs 1, 3–4, 7)

Diagnosis. Oval, rather short, transversely convex, medium-sized (2.2–2.5 mm) (Fig. 1); vaguely similar in external shape and color to short and convex specimens of the widespread southern European species *Lamiogethes bucciarellii* (Audisio, 1976) (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 1.1× wider than pronotum, with strong and almost complete transverse strigose sculpturing. Pronotum with characteristic trapezoidal shape, and markedly straight lateral sides, at least in their posterior two thirds (Fig. 1). Pubescence on pronotum and elytra sparse, golden-yellowish, distinct, each individual seta distinctly shorter (ca. 0.80×) than 2nd antennomere. Body uniformly dark brown to blackish, including peripheral dorsal margins (pronotal carina) of pronotum; legs uniformly dark brown to blackish, antennae dark brown, with second and third antennomeres slightly paler, brownish. Male front tarsi markedly wide, ratio WFTA/LFTA ca. 0.40. Male posterior tibiae normally shaped, only slightly and regularly arcuate along their inner edge (Fig. 1), ca. 0.32× as wide as long, comparatively markedly wider than in *L. convexistrigosus* sp. n. Male genitalia very distinctly shaped, with wide, large, forceps-shaped and deeply incised tegmen (Fig. 3), aedeagal median lobe also large, short, <2× longer than wide, its maximum width in the middle, and with peculiar chisel-shaped distal apex (Fig. 4). Female with moderately large ovipositor, with long distal styli and with markedly darkened blunt apex (Fig. 7).

Description

Size (male holotype): body length 2.40 mm, width 1.38 mm.

Body color and pubescence: uniformly dark brown, tegument moderately shiny, including lateral dorsal sides of pronotum, without metallic hues on dorsal surface. Legs dark brown to blackish, antennae dark brown with paler, brown second and third antennomeres. Pubescence golden, rather fine and sparse, each individual seta ca. 0.80× as long as second antennomere (Fig. 1).

Dorsal habitus: body shape (Fig. 1) vaguely recalling that of the S European and E Mediterranean *Lamiogethes bucciarellii*. Clypeus with anterior margin distinctly sinuate in the middle. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameters; 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 = 0.50; ratio WPR1/LPR1 = 1.90; ratio WPR2/LPR1 = 1.83; ratio WPR2/WPR1 = 0.94; ratio LELY/WELY = 0.95; ratio WPR1/WPRA = 1.65; 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 peculiarly wide before the apex, nearly 1.5× as wide as length of antennal club, with fine and sparse punctation. Male metaventrite rather sparsely punctured, flattened posterior to midlength, with wide but rather shallow mediolongitudinal impression, occupying nearly the posterior two-thirds, and with a narrow median unpunctured and shining longitudinal stripe, crossing the three-quarters of the metaventrite length. Last visible ventrite with a blunt but distinct tubercle close to the middle portion of its posterior edge.

Appendages: antennae rather short (Fig. 1); ratio ANLE/HWEA = 0.78; ratio CLLE/W10J = 1.25; ratio L03J/W03J = 2.3; ratio L03J/L02J = 0.85; ratio L03J/L04J = 2.15; front tarsi rather strongly widened, ratio WFTA/LFTA = 0.40; ratio LETI/WITI ≈ 2.50. Front tibiae with a group of 4–5 asymmetrical, moderately developed and pointed predistal teeth, arranged nearly as in the S European species *L. bucciarellii* (Fig. 130n in Audisio 1993). Posterior tibiae rather wide, ratio LPTI/WPTI ≈ 3.0 (Fig. 1).

Male genitalia: very distinctly shaped, with large, short and subparallel-sided proximad, peculiarly forceps-shaped tegmen (Fig. 3); median lobe of the aedeagus moderately large, rather short, ratio LEAE/WIAE ≈ 1.67 longer than wide, abruptly narrowed distad, with peculiar chisel-shaped distal apex (Fig. 4). Tegmen widest little before its forceps-shaped apex, medial distal excision deep, widely U-shaped (ratio DTIN/LETE ≈ 0.40), at the base of which and on a more ventral plane is a double, low, incised laminar projection (Fig. 3); ratio LETE/WITE ≈ 1.60. Median lobe of the aedeagus exhibiting maximum width close to its middle portion (Fig. 4).

Female: Females of this species exhibit protarsi distinctly narrower than in male (ratio WFTA/LFTA ≈ 0.25). Metaventrite almost flat, not impressed, with a barely distinct but long unpunctured and shining longitudinal stria, nearly as in the male. Ovipositor (Fig. 7) moderately large, with blunt and markedly darkened apex, moderately sclerotized, and with peculiarly long, distally placed styli; ratio STLE/DSIA ≈ 4.5; ratio STLE/CGOW ≈ 0.44; ratio GONL/CGOW ≈ 2.66. Combined basal portions of gonocoxites transverse, widely V-shaped, apices laterally directed and bluntly pointed. Ratio OVPL/GONL ≈ 2.24; ratio OVPL/body length ≈ 0.22.

Variation: body sizes 2.2–2.5 mm (length) and 1.30–1.40 mm (width).

Examined material. Holotype, ♂: **China:** W Sichuan, Xiangcheng County, 3100–3400 m a.s.l., 28°59'40"N,



Figs 1-2 – Habitus of *Lamiogethes* species: **1**, male of *L. forcipenis* sp. n., paratype from Sichuan; **2**, male of *L. convexistrigosus* sp. n., paratype from Sichuan; Scale bar: 500 μ m.

99°55'05''E, 19 Jun 2017, beating mixed flowering vegetation, Liu & Audisio lgt (NWAU). Paratypes: 12 ♂♂, 5 ♀♀, same data as holotype (NWAU, CAR-MZUR, NMPC, ARCC, IZAS). Additional material not included in the type series: same data as holotype, ca. 20 specimens preserved in pure ethanol (NWAU, CAR-MZUR).

Distribution. SW China (W Sichuan).

Host-plants. Unknown, but certainly among Lamiaceae. In the forest clearings where the new species was collected by beating on different flowering vegetation (including Ranunculaceae, Rosaceae, and other unrelated plant families), a large number of specimens of *Phlomoides umbrosa* (Turczaninow) (Lamiaceae) have been observed in the area, although they were not in flower at the time. A few specimens of this same plant species were found in flower elsewhere (Fig. 9) not far from the type locality (unfortunately not in company with additional specimens of this new species), helping us in confirming their specific identification. However, it is possible that this species, mainly flowering in July, could be the true larval host-plant of *Lamiogethes forcipenis* sp. n.; but additional collecting events are needed that focus on obtaining larval material. The few thus far known specimens of *L. forcipenis* sp. n. were collected and observed in company with a huge number (hundreds) of the closely related, and much smaller in average size, *L. convexistrigosus* sp. n. (see below).

Habitat. This species appears to prefer the edges of high altitude, sparsely forested and bushy areas, chiefly in forest clearings.

Phenology. The short series of available specimens was

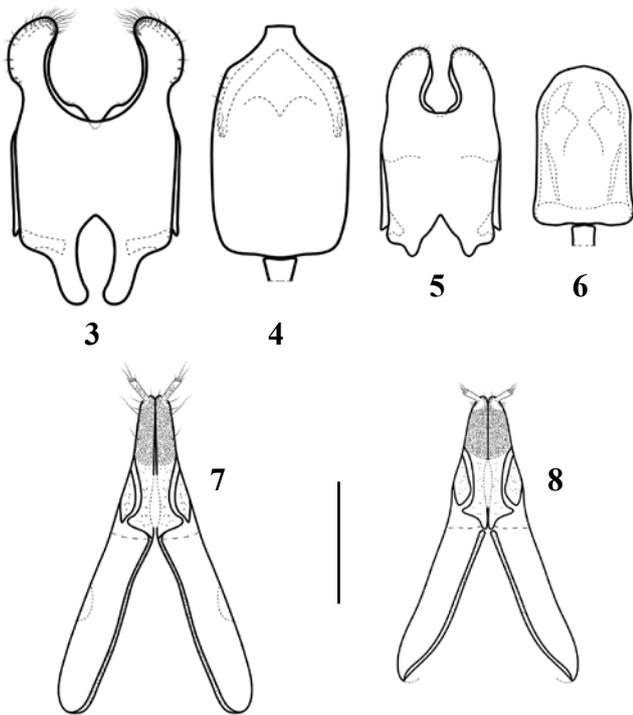
collected in middle June, but the late flowering season of its potential host-plants (see above) likely indicates adult activity at least from May to early August.

Etymology. The specific epithet of this new species is derived from the Latin *forceps* (= forceps), and *penis* (= male genitalia), due to its large and peculiarly forceps-shaped tegmen (Fig. 3).

Taxonomic remarks. As reported above, this new species is vaguely similar in external shape to convex and short specimens of *L. bucciarellii* from S Europe and E Mediterranean areas (see Audisio 1993) as well as to other E Palearctic species of this genus, but is probably more closely related to *L. convexistrigosus* sp. n. below and to *L. potanini*, described from Sichuan (Kangding area) (Kirejtshuk 1979), sharing with the former its body shape, type of punctation, and shape of front tibiae. Specimens of both related species are however much smaller (1.7–2.1 mm), and are markedly different in having an acutely (*L. potanini*) or widely (*L. convexistrigosus*) pointed distal apex of the median lobe of the aedeagus, and markedly different and much smaller tegmen.

***Lamiogethes convexistrigosus* sp. n.**
(Figs 2, 5-6, 8)

Diagnosis. Rather short, oval, markedly transversely convex, small-sized (1.7–2.1 mm) (Fig. 2); vaguely similar in external shape and color to short and convex specimens of the widespread southern European species *Lamiogethes morosus* (Erichson, 1845) (in the *L. difficilis* species group: Audisio 1993). Dorsal surface closely and marked-



Figs 3-8 – Male (3-6) and female (7-8) genitalia of *Lamiogethes* species: 3-4, male genitalia (tegmen and median lobe of the aedeagus in dorsal view) of *L. forcipenis* sp. n., paratype from Sichuan; 5-6, male genitalia (tegmen and median lobe of the aedeagus in dorsal view) of *L. convexistrigosus* sp. n., paratype from Sichuan; 7-8, female genitalia (ovipositor in dorsal view) of *L. forcipenis* sp. n. (7), paratype from Sichuan and of *L. convexistrigosus* sp. n. (8), paratype from Sichuan; Scale bar: 0.2 mm.

ly punctate (spaces between pronotal and elytral punctures ca. 1.2–1.6× their diameter), with smooth and shining interspaces; elytra 1.1× wider than pronotum, with rather strong and almost complete transverse sculpturing. Pronotum with characteristic trapezoidal shape, and markedly straight lateral sides, at least in their posterior two thirds (Fig. 2). Pubescence on pronotum and elytra sparse, golden-yellowish, distinct, each individual seta distinctly shorter (ca. 0.80×) than 2nd antennomere. Body uniformly dark brown to blackish, without metallic hues, including its peripheral margins (pronotal carina) of pronotum; legs uniformly brown to dark brown, antennae brown, with second and third antennomeres slightly paler, and slightly paler antennal club. Male front tarsi moderately wide, ratio WFTA/LFTA = 0.36. Male posterior tibiae normally shaped, only slightly and regularly arcuate along their inner and outer edges (Fig. 2), ca. 0.25× as wide as long, comparatively markedly narrower than in *L. forcipenis* sp. n. Male genitalia distinctly shaped, with deeply incised tegmen (Fig. 5), aedeagal median lobe rather short, <2× longer than wide, its maximum width close to its proximal basis, and with moderately pointed distal apex (Fig. 6). Female with moderately large ovipositor, with long distal styli and with markedly darkened blunt apex (Fig. 8).

Description

Size (male holotype): body length 1.85 mm, width 1.10 mm.

Body color and pubescence: uniformly dark brown, tegument shiny, including lateral dorsal sides of pronotum, without metallic hues on dorsal surface. Legs brown to dark brown, antennae brown with paler second and third antennomeres and antennal club. Pubescence golden, rather fine and sparse, each individual seta ca. 0.80× as long as second antennomere (Fig. 2).

Dorsal habitus: body shape (Fig. 2) vaguely recalling that of the S European and E Mediterranean *Lamiogethes morosus*, with narrower pronotum. Clypeus with anterior margin distinctly sinuate in the middle. Dorsal punctures on pronotum rather fine and deep, each puncture separated from another by ca. 1.2–1.6 diameters; 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 = 0.52; ratio WPR1/LPR1 = 1.82; ratio WPR2/LPR1 = 1.72; ratio WPR2/WPR1 = 0.94; ratio LELY/WELY = 0.95; ratio WPR1/WPRA = 1.60; ratio WPR1/WELY = 0.88; ratio WPR2/WELY = 0.84.

Ventral habitus: combined outer edges of antennal grooves almost straight, parallel-sided along most of length. Prosternal process peculiarly wide before the apex, nearly 1.4× as wide as length of antennal club, with fine and dense punctation. Male metaventrite densely punctured, with wide but rather shallow mediolongitudinal impression, occupying nearly the posterior two-thirds, and with a very narrow median unpunctured and shining longitudinal stripe, crossing the three-quarters of the metaventrite length. Last visible ventrite with a blunt but very distinct tubercle rather close to the middle portion of its posterior edge.

Appendages: antennae rather short (Fig. 2); ratio ANLE/HWEA = 0.75; ratio CLLE/W10J = 1.18; ratio L03J/W03J = 2.3; ratio L03J/L02J = 0.85; ratio L03J/L04J = 2.12; front tarsi rather widened, ratio WFTA/LFTA = 0.36; ratio LETI/WITI ≈ 2.20. Front tibiae with a group of 3–4 asymmetrical, moderately developed and pointed predistal teeth, arranged nearly as in the S European species *L. morosus* (Fig. 130/ in Audisio 1993). Posterior tibiae long and slender, ratio LPTI/WPTI ≈ 4.0. (Fig. 2).

Male genitalia: distinctly shaped, with moderately elongate, forceps-shaped tegmen (Fig. 5); median lobe of aedeagus rather small, short, ratio LEAE/WIAE ≈ 1.57 longer than wide, abruptly narrowed distad, with slightly pointed distal apex (Fig. 6). Tegmen widest near the middle, medial distal excision deep, U-shaped (ratio DTIN/LETE ≈ 0.33), at the base of which on a more ventral plane is a double, low, incised laminar projection (Fig. 5); ratio LETE/WITE ≈ 1.70. Median lobe of the aedeagus exhibiting maximum width close to its proximal portion (Fig. 6). **Female:** Females of this species exhibit protarsi distinctly narrower than in male (ratio WFTA/LFTA ≈ 0.24).

Metaventricle almost flat, not impressed, with a barely distinct, very narrow but long unpunctured and shining longitudinal stria, nearly as in male. Ovipositor (Fig. 8), moderately large, with blunt and markedly darkened apex, moderately sclerotized, and peculiarly long, distally placed styli; ratio STLE/DSIA \approx 4.0; ratio STLE/CGOW \approx 0.40; ratio GONL/CGOW \approx 2.75. Combined basal portions of gonocoxites transverse, widely V-shaped, apices laterally directed and bluntly pointed. Ratio OVPL/GONL \approx 2.16; ratio OVPL/body length \approx 0.24.

Variation: body sizes 1.7–2.1 mm (length) and 1.05–1.24 mm (width). Several specimens exhibit uniformly reddish-brown legs and antennae.

Examined material. Holotype, ♂: **China**: W Sichuan, Xiangcheng County, 3100–3400 m a.s.l., 28°59'40"N, 99°55'05"E, 19 Jun 2017, beating mixed flowering vegetation, Liu & Audisio lgt (NWAU). Paratypes: 20 ♂♂, 20 ♀♀, same data as holotype (NWAU, CAR-MZUR, NMPC, ARCC, IZAS); Sichuan, Xiangcheng County, 3800–3900 m a.s.l., 29°00'14"N, 99°55'55"E, 19 Jun 2017, Liu & Audisio lgt, on *Phlomoides umbrosa* (Turczaninow) (Lamiaceae), 1 ♂, 1 ♀ (NWAU; CAR-MZUR). Additional material not included in the type series: same data as holotype, ca. 150 specimens preserved in pure ethanol (NWAU, CAR-MZUR); **China**: N Yunnan, Lijiang, 1800 m a.s.l., 26°53'N, 100°18'E, 23 Jun/21 Jul 1992, beating mixed flowering vegetation, E. Jendek lgt, 1 ♂, 1 ♀ (NMPC, CAR-MZUR).

Distribution. SW China (W Sichuan, N Yunnan).

Host-plants. Unknown with certainty, but certainly among Lamiaceae. In the forest clearings where the new species was collected by beating on different flowering vegetation (including Ranunculaceae, Rosaceae, and other unrelated plant families), a large number of specimens of *Phlomoides umbrosa* (Turczaninow) (Lamiaceae) have been observed in the area, although they were not in flower at the time. A few whitish-flowering specimens of this same plant species were found elsewhere (Fig. 9) not far from the type locality (in company with two additional adult specimens of the new species), and this occurrence helped us to identify the plant. It is likely that this species, mainly flowering in July, could be the true larval host-plant of *Lamiogethes convexistrigosus* sp. n.; but additional collecting events are needed that focus on obtaining larval material. The huge number of specimens of this new species were collected and observed in company with a much small number of specimens of the closely related, and much larger in average size, *L. forcipenis* sp. n. (see above).

Habitat. This species appears to prefer the edges of high altitude sparsely forested and bushy areas, chiefly in forest clearings.

Phenology. The large series of available specimens was collected in middle June (Sichuan) and between end of



Fig. 9 – The likely larval host-plant of both *Lamiogethes forcipenis* sp. n., and *L. convexistrigosus* sp. n., *Phlomoides umbrosa* (Turczaninow) (Lamiaceae) from Sichuan, Xiangcheng County.

June and late July (Yunnan), but the late flowering season of its potential host-plants (see above) likely indicates adult activity at least from May to early August.

Etymology. The specific epithet of the new species is derived from the Latin *convexus* (= convex), and *strigosus* (= strigose) due to its combination of small, rather convex body shape, and strong elytral strigosity (Fig. 2).

Taxonomic remarks. As reported above, this new species is vaguely similar in external shape to small specimens of the common Palaearctic species *L. morosus* (see Audisio 1993), as well as to other E Palaearctic species of this genus, but is probably more closely related to *L. forcipennis* sp. n. above and to *L. potanini*, described from Central Sichuan (Kangding area) (Kirejtshuk 1979), sharing with the former its body shape, type of elytral punctation, and shape of front tibiae. Specimens of the former species are however larger (2.2–2.5 mm) and are markedly different in having a narrowly spatulate distal apex of the median lobe of the aedeagus, as well as a markedly different and much larger tegmen; *L. potanini* exhibits a much more acutely pointed distal apex of the median lobe of the aedeagus, and quite distinct tegmen (Kirejtshuk 1979, 1992). A related and similar species known from the SW China (Yunnan) is *L. conjungens* (Grouvelle, 1910), which has nearly the same body size and shape of the front tibia, but exhibits a different, brownish body color, and has quite different male genitalia (Grouvelle 1910; Audisio & Liu unpublished data).

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