

Gastrocopta armigerella (Reinhardt, 1877) and Gastrocopta theeli (Westerlund, 1877) in western Tien Shan, Kyrgyzstan, and their further occurrence in Asia (Mollusca, Gastropoda, Pupilloidea)

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Abstract

Gastrocopta armigerella (Reinhardt, 1877) has been described from Japan and is widespread in the Far East and China. Surprisingly, a few occurrences in central and western Asia have also become known. Forcart (1935) found *G. armigerella* in northern Iran. The authors found evidence of *G. armigerella* in western Tien Shan, Kyrgyzstan. The form from northern Tajikistan described by Schileyko (1984) as *G. buttoniana* agrees morphologically with *G. armigerella* as well. *Gastrocopta buttoniana* is known from western India and the Himalayan region. The evidence of *G. armigerella* from central and western Asia has come thus far from drift material at the high water line in river floodplains which suggests that these are sub-fossil or fossil shells (Holocene or Pleistocene) which have been relocated. No living example of *Gastrocopta* has been found there as yet. Possibly the species is now extinct in this region. *Gastrocopta theeli* (Westerlund, 1877) is the most widespread *Gastrocopta* in Eurasia. Its area ranges from the Caucasus to the Far East. The findings reported here are the first for this species in western Tien Shan.

Keywords

Asia, *Gastrocopta armigerella*, *Gastrocopta theeli*, Pupilloidea, Tien Shan

Introduction

Gastrocopta armigerella (Reinhardt, 1877) type locality Misaki (Japan), has been reported from Japan (Möllendorff 1901; Nekola et al. 2012; Nishi et al. 2017; WMSDB) and China: Gansu, Batang, eastern Tibet, Hunan, Xifeng, Yangtze region, Anhui, Zikarwei, Dshiangsu, Shandong, Shanghai (Möllendorff 1901; Pilsbry 1916–1918; Yen 1939; Chen and Gao 1987; Wu et al. 2007; Zhouxing and Deniu 2008; Pokryszko and Stworzewicz 2004; WMSDB). *Gastrocopta armigerella* has also frequently been found in a fossil state (Pleistocene) (e.g., Wu et al. 2007; Wu and Wu 2011) on the Chinese loess plateau (Xifeng and Luochuan). In addition, *G. armigerella* was reported from Korea (Möllendorff 1899; Pilsbry 1916–1918; National Institute of Biological Resources 2012). However, Pokryszko and Stworzewicz (2004), for example, doubt its occurrence in North Korea and suspect a confusion with *Gastrocopta hirasei* Pilsbry 1916, a synonym, which Pilsbry (1916–1918) originally described from China (see below).

Forcart (1935) surprisingly found *G. armigerella* in northern Iran near Meshhe-diser (Mazenderan Province) on the river floodplain in drift material from the Babul River not far from the coast. Because the shells were slightly smaller, he described these as a new sub-species *G. armigerella masenderanensis*.

Gastrocopta buttoniana is known from western India (northeast of the western Ghats, west and central Maharashtra) and the Himalayan region (Pakistan, northern India, Nepal) (Pilsbry 1916–1918: 137, pl. 21, fig. 16–17; Kuznetsov and Schileyko 1997; Mitra et al. 2005; Pokryszko et al. 2009: 433, 434, fig. 26, 27; Ramakrishna et al. 2010; Raheem et al. 2014; Budha et al. 2015; Bößneck and Meng 2018).

Schileyko (1984, with reference to Izzatullaev 1970) and subsequently Kantor and Sysoev (2005), Sysoev and Schileyko (2009), and Egorov (2008) refer to *Gastrocopta buttoniana* (Benson, 1849) from northern Tajikistan, south of the Hissar Mountains near Dushanbe, in drift material from the Kafirnigan River. On this matter, the authors present new data from western Tien Shan.

Gastrocopta theeli (Westerlund, 1877), type locality Mikoulino/Yeniseysk (Russia), is the most widespread *Gastrocopta* in Eurasia. Relict populations have been found in the Caucasus region: on the floodplains of the Kura and Rioni Rivers (Georgia), in Dagestan and the north Caucasus (Russia); as well as elsewhere in Russia and adjacent countries: in Chelyabinsk and Yeniseysk, central and southern Altay (Russia and Kazakhstan), Kyrgyz-Ala-Too in north west Tien Shan (Kazakhstan/Kyrgyzstan), in South Primorskij Kraj (Pilsbry 1916; Schileyko 1984; Uvalieva 1990; Egorov 2008; Sysoev and Schileyko 2009; Schileyko and Rymzhanov 2013), in Tuva (Zasyapkina 2012); in the Middle Amur River basin (Prozorova et al. 2014), in Holocene deposits from the upper Lena River in the Lake Baikal region (White et al. 2008); in Japan (e.g. Naohiro 2015; Nishi et al. 2017) and the Korean Peninsula (Prozorova et al. 2014).

As *G. coreana* Pilsbry, 1916, *G. theeli* has been reported from China: Tsinan Fu, Shangdong (Yen 1939), fossil (Pleistocene) from the Chinese loess plateau (e.g. Wu et al. 2007; Wu and Wu 2011); from Japan (e.g. Pilsbry 1916–1918) to North and South

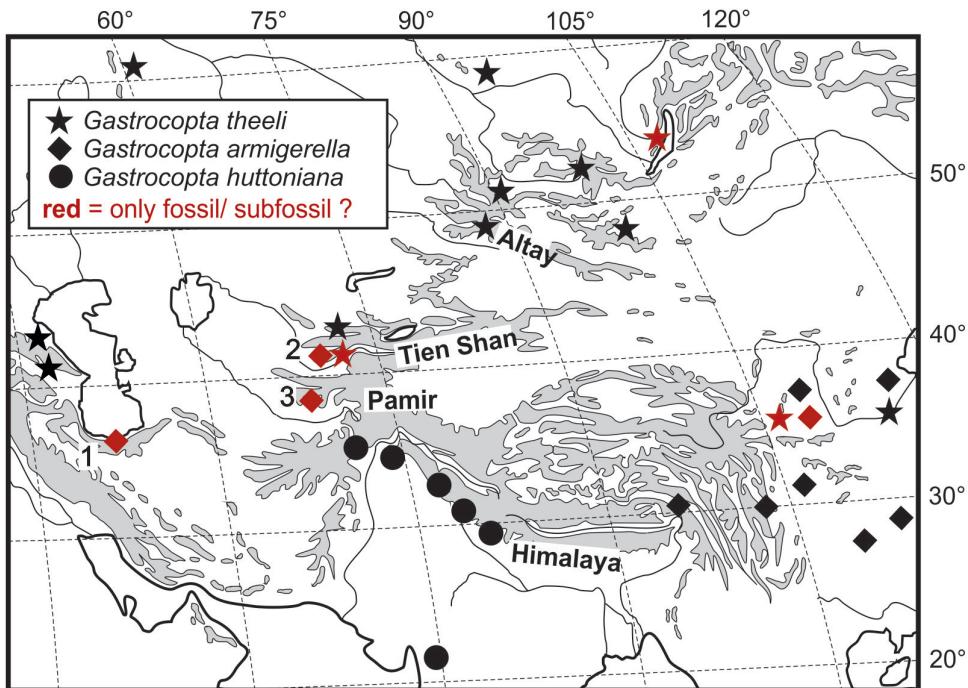


Figure 1. Map with locations of *Gastrocopta theeli*, *armigerella* and *huttoniana* in central Asia and adjacent territories; *G. armigerella*: 1 northern Iran, Babul River near Meshhediser, Mazenderan Province (Forcart 1935) 2 Kyrgyzstan, western Tien Shan, Kara Suu River near Dshany Dshol 3 northern Tajikistan, southern Hissar Mountains, Kafirnigan River near Dushanbe (Schileyko 1984).

Korea (e.g. Pilsbry 1916–1918; Pokryszko and Stworzewicz 2004; National Institute of Biological Resources 2012). *Gastrocopta coreana* Pilsbry 1916, type locality Kojeto (South Korea), is today often considered to be a synonym of *G. theeli* (e.g. Schileyko 1984; Prozorova et al. 2014; WMSDB). New data on the occurrence of *G. theeli* from the Altay, Tien Shan, Mongolia, and the Far East are submitted by the authors (Fig. 1).

Materials and methods

From the Kara Suu River floodplain in the western Tien Shan near Dshany Dshol (Kyrgyzstan), 860 m a.s.l., 41°35'05.8"N, 072°08'03.3"E, 21.07.1998, leg. S. Meng, the authors have a sample of river drift material from the high water line containing approximately 2000 gastropod shells in total. The genus *Gastrocopta* is predominant with ~ 430 shells. The *Gastrocopta* shells are probably all of fossil or sub-fossil origin. *Gastrocopta armigerella*, *G. theeli* and *G. huttoniana* are also evaluated in the bio-geographical context. Additional records of *G. theeli* in the Siberian Altay and the Far East collected by S. Meng are also included.

Results

Gastrocopta armigerella was found in the drift material from the Kara Suu River floodplain near Dshany Dshol, 860 m a.s.l. (western Tien Shan, Kyrgyzstan). The community as a whole contained mainly elements of the modern thermophilous communities of lowlands and large mountain valleys. The predominant forms were, e.g., *Vertigo pygmaea* (Draparnaud, 1801), *V. antivertigo* (Draparnaud, 1801), *Truncatellina callicratis* (Scacchi, 1833) or *Vallonia pulchella* (Müller, 1774). The shells of *G. armigerella* (Figs 6–8) comprise ~ 20 %, more than 400 shells, of the sample. No remnants of organic material, such as tissue or periostracum were found in any of the *G. armigerella* specimens. Because of their preservation it is assumed that the shells do not belong to the modern faunal communities and that the material is of Holocene or Late Pleistocene age. Three shells of *G. theeli*, probably fossils as well, were also found (Fig. 5). This is also a new record for the western Tien Shan. Two fossil or sub-fossil shells of *Vallonia zaru* Almuhametova, 1979, a species today restricted as a relict to the northern Tien Shan, were found as well.

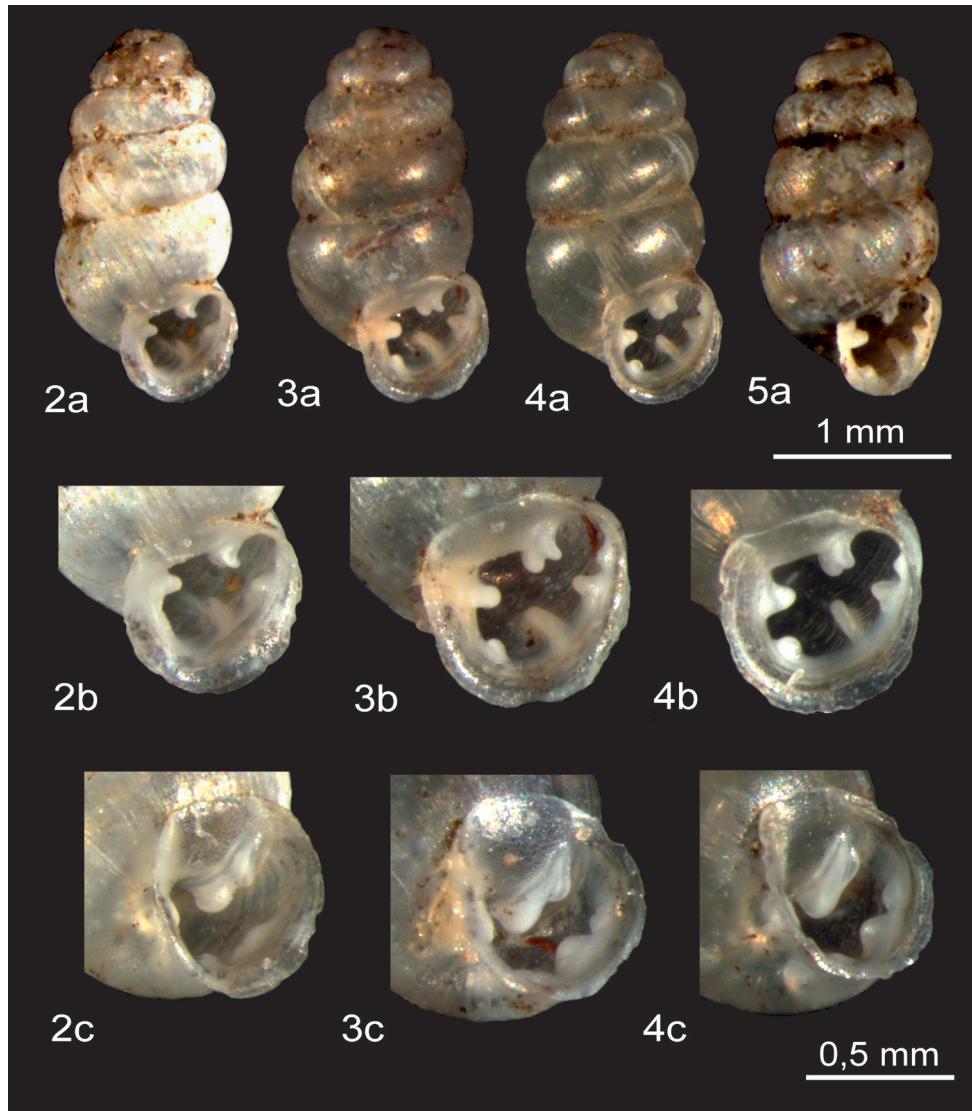
The shell morphology of *G. armigerella* from western Tien Shan (Figs 6–8) corresponds to the descriptions and figures of Reinhardt (1877: pl. 11, fig. 7), Pilsbry (1916–1918: pl. 21, fig. 1 as *G. a. hachijoensis*, pl. 21, fig. 5, 6, 7, 10 as *G. hirasei*), Forcart (1935: 421, fig. 2 as *G. a. masenderanensis*), Schileyko (1984: 197, fig. 114II as *G. huttoniana*), Chen and Gao (1987: 42, fig. 50), Pokryszko and Stworzewicz (2004: 135, fig. 3 as *G. hirasei*), Sysoev and Schileyko (2009: fig. 19 F as *G. huttoniana*), Nekola et al. (2012: 49, fig. 1) and Nishi et al. (2017: 27, fig. 2).

Gastrocopta armigerella has five markedly convex whorls. Compared with *G. huttoniana* and *G. theeli*, its apertural dentition is very strongly developed (Figs 2–9). *Gastrocopta armigerella* usually has 7–8 apertural teeth. The angular-parietal lamella has two calluses which are not completely fused. The front tip is inclined towards the palatal wall. An infraparietal (subparietal) callus is present. The columellar tooth forms a strong lamella. The columellar/basal callus is also well developed. There are two palatal lamellae, the lower one of which is more pronounced. In the suprapalatal position there is often a slight thickening of the apertural lip (Reinhardt 1877; Pilsbry 1916–1918; Forcart 1935).

In contrast, *G. theeli* has no infraparietal tooth, the angular-parietal lamella is almost completely fused and three lamellae are found on the palatal wall (Figs 3–5). In general, *G. theeli* and *G. armigerella* do not vary much and are relatively stable in their respective shell morphologies.

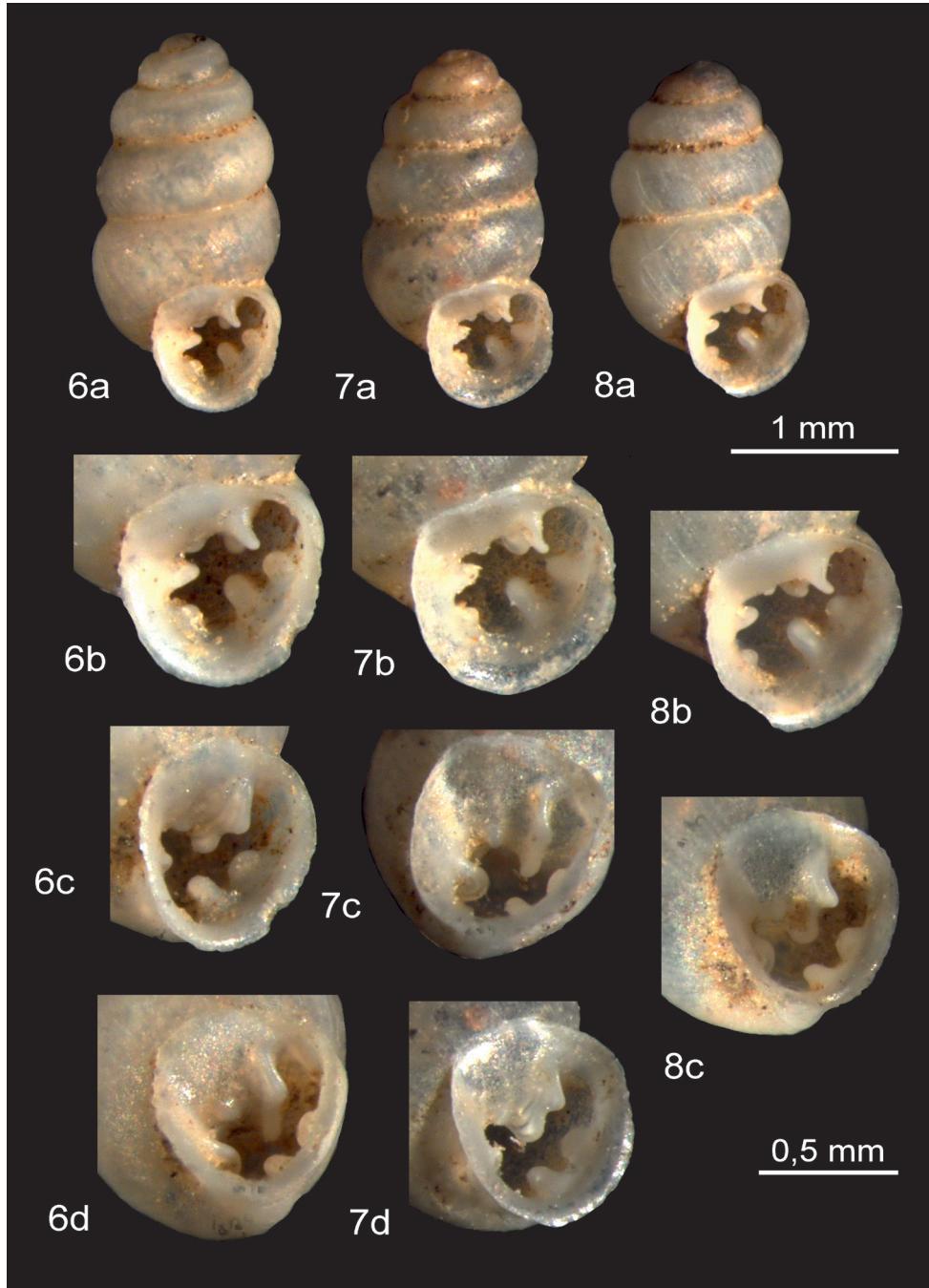
The *Gastrocopta* material from northern Tajikistan (Schileyko 1984; Sysoev and Schileyko 2009) corresponds morphologically to *G. armigerella*, including *G. armigerella* specimens from western Tien Shan and northern Iran (Forcart 1935) (Fig. 9). The shell sizes (2–2.3 × 1.1–1.2 mm) given by Schileyko (1984) also correspond to the material from western Tien Shan (2.1–2.5 × 1.1–1.2 mm). Since *G. armigerella* was only found in river drift material and never alive in northern Iran and northern Tajikistan, it must be assumed that this material is also fossil or sub-fossil.

In view of the breadth of its morphological variation, the definition of *G. huttoniana* is more problematic (Bößneck and Meng 2018). In the lectotype and paralecto-



Figures 2–5. *Gastrocopta buttoniana* **2 a–c** Himalaya, Simikot (District Humla/ Province Karnali, western Nepal), leg. U. Bößneck, 2001; *Gastrocopta theeli* **3–5:** **3 a–c** western central Altay, southeastern On-gudai, (Russia) **4 a–c** South Primorskij Kraj, south of Slawjanka, coast of Sea of Japan (Russia) **5 a** western Tien Shan Mountains, Kara Suu River near Dshany Dshol (Kyrgyzstan).

types from Simla in northern India (Raheem et al. 2014: fig. 37A, B), the columellar/basal callus is much reduced and merely indicated and there is a complete lack of an infraparietal tooth (Fig. 2). However, Pokryszko et al. (2009: 434, fig. 26–28) assumes for the *G. buttoniana* material from Pakistan that a small infraparietal callus is often present. Forms with an infraparietal callus are also known from Nepal but the systematic status of the material is uncertain (Bößneck and Meng 2018).



Figures 6–8. *Gastrocopta armigerella*: western Tien Shan, Kara Suu River floodplain (drift material) near Dshany Dshol (Kyrgyzstan), fossil or sub-fossil (Holocene or Pleistocene).

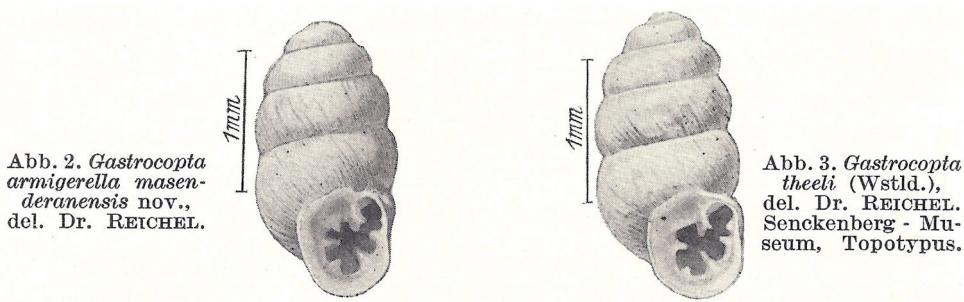


Figure 9. Original figure by Forcart (1935, p. 421), *Gastrocopta armigerella masendarenensis* from Meshhe-diser (northern Iran) in comparison with *Gastrocopta theeli*, topotype (shell from type locality Yeniseysk), Senckenberg Museum.

Gastrocopta theeli from western Tien Shan (Fig. 5) corresponds in its shell morphology to the descriptions and figures of Westerlund (1877: 113, fig. 4), Pilsbry (1916–1918: pl. 21, Figs 2–4, as *G. coreana*), Forcart (1935: 421, fig. 3, topotype), Schileyko (1984: 197, fig. 114I), Uvalieva (1990: 113, fig. 8), Sysoev and Schileyko (2009: 333, fig. 19G, paralectotype), Schileyko and Rymzhanov (2013: 399, pl. 5B, syntype of *Pupa denudata* Mousson 1887), White et al. (2008: 971, fig. 6i), and Pokryszko and Stworzewicz (2004: 135, fig. 3, as *G. coreana*).

In addition to the evidence of *G. theeli* in western Tien Shan, the authors can list the following further localities which confirm the main areas of occurrence of the species in the Altay and Far East (Fig. 1).

Tien Shan, Kyrgyzstan: western Tien Shan, Kara Suu River floodplain (drift material) near Dshany Dshol, 860 m a.s.l., 41°35'05.8"N, 072°08'03.3"E, 21.07.1998, leg. S. Meng, subfossil (?).

Altay, Russia: western central Altay, near Černyj Anuj, Ust' Kanskiy Rayon, grassland, subsoil carbonate, 697 m a.s.l., 51°23'17.10"N, 084°41'16.98"E, 04.08.2006, leg. S. Meng; central Altay, Onguday, eastern edge of town, dry grassy slope, under stones, ca. 850 m a.s.l., 50°45'N, 086°10'E, 17.07.1997, leg. S. Meng; Ursul River valley southeast Onguday, feather grass steppe on diabase rock, 747 m a.s.l., 50°43'38.88"N, 086°18'38.52"E, 05.08.2006, leg. S. Meng; feather grass steppe on diabase rock, 750 m a.s.l., 50°43'34.86"N, 086°18'32.52"E, 05.08.2006, leg. S. Meng; herb-rich meadow, 754 m a.s.l., 50°43'33.30"N, 086°18'33.78"E, 05.08.2006, leg. S. Meng; steppe slope, 754 m a.s.l., 50°43'27.00"N, 086°18'24.72"E, 05.08.2006, leg. S. Meng.

Mongolia: western Mongolia, Khar Us Lake National Park, rocks, 1200 m a.s.l., 48°20'N, 092°17'E, 30.07.1999, leg. M. Unruh.

Primorskij Kraj, Russia: South Primorskij Kraj, south of Slawjanka, coast of Japan Sea, south of Kap Krasnyj Utes, rock cliff, grasses and *Artemisia*, 10 m a.s.l., 42°46'43.2"N, 131°16'01.3"E, 21.07.2012, leg. S. Meng; meadow slope, 15 m a.s.l., 42°46'43.4"N, 131°15'54.4"E, 22.07.2012, leg. S. Meng; South Primorskij Kraj, Island Rikorba, Peter the Great Bay, south of Vladivostok, southwestern area of the

island, rock cliff, grasses and *Artemisia*, 10–20 m a.s.l., 42°51'51.7"N, 131°38'23.9"E, 28.07.2012, leg. S. Meng; southwestern area of the island, shrubs meadows on rocks, *Artemisia*, e.g., 30 m a.s.l., 42°52'04.3"N, 131°38'38.3"E, 29.07.2012, leg. S. Meng; southwestern area of the island, shrubs meadows on rocks, *Artemisia*, e.g., 30 m a.s.l., 42°51'47.7"N, 131°38'25.4"E, 29.07.2012, leg. S. Meng; southwestern area of the island, rock cliff, in grasses, 20 m a.s.l., 42°51'48.5"N, 131°38'22.4"E, 31.07.2012, leg. S. Meng; eastern area of the island, dry grassland, rock cliff, 90 m a.s.l., 42°51'54.6"N, 131°39'32.3"E, 31.07.2012, leg. S. Meng.

Discussion

The evidence of *G. armigerella* and *G. theeli* from the western Tien Shan is of great biogeographic significance. It has confirmed the occurrence of *G. armigerella* in central and western Asia as well as in the Far East of Russia and in China (Fig. 1). The findings from western Tien Shan constitute an important addition to the findings from northern Iran (Forcart 1935). The evidence from northern Tajikistan also fits into this picture. Although these specimens were identified as *G. huttoniana* (Schileyko 1984) they clearly correspond morphologically to *G. armigerella*. Since *G. armigerella* has so far not been found alive in western and central Asia and it is possible that the shells are sub-fossil or fossil, it must be assumed that the species has become extinct there. The dating of the shells, e.g. ¹⁴C dating, is problematic because the shells are extremely small. Finding the sediment deposits from which the shells were washed out would allow dating of the material with alternative methods. *G. theeli* has also not been found alive in western Tien Shan, but its (sub) fossil occurrence fits with the widespread distribution of relict populations of this species from the Caucasus to the Altay and the Far East.

Some forms of *G. armigerella* which differ slightly in their overall appearance have been described as a subspecies, such as *G. a. hachijoensis* Pilsbry, 1916 from Japan (Hachijojima, Izu, Hirase), *G. a. daitojimana* Kuroda, 1960 also from Japan and, as already mentioned, *G. a. masenderanensis* Forcart, 1935 from northern Iran. These forms cannot be discussed in greater detail here. They probably fall into the synonymy of *G. armigerella*.

Uvalieva (1990) mentioned *Gastrocopta gracilidens* (Sandberger, 1875) from the Pleistocene and Holocene in central Asia (Kazakhstan and the surrounding area) without more precise primary data and *G. huttoniana* from the Pleistocene of that area. *G. gracilidens* is a synonym for *G. nouletiana* (Dupuy, 1850). *G. nouletiana* is very similar to *G. armigerella*, but more compact in appearance and has a larger number of palatal teeth. Moreover, *G. nouletiana* was widespread in Eurasia in the Miocene approximately 15 million years ago (Steklov 1966: 141, fig. 48; Stworzewicz 1999: 164, fig. 59–61). In the case of *G. huttoniana*, it is possible that Uvalieva was referring to the description by Schileyko (1984). In conclusion, it must therefore be assumed that there are possibly further occurrences of *G. armigerella* in central Asia which have merely not yet been interpreted correctly.

Whether *G. coreana* and *G. theeli* are synonyms of each other remains an open question. Likewise, it is currently still unclear whether *G. armigerella* occurs in addition to *G. hirasei* in Korea. These questions can probably be only solved using molecular methods. In addition, it should be checked whether *G. buttoniana*, with its variable shell morphology in the Himalayan region, indeed represents a single taxon.

Acknowledgements

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A new species of *Lobellina* and first record of *Vietnura* from China (Collembola: Neanuridae: Neanurinae)

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Abstract

A new species of *Lobellina* Yosii, 1956 and a key to all species of the genus is provided. It is distinguished from all known members of the genus by its unique set of morphological characters: mandible with six teeth, cephalic chaeta O present, and free from tubercle Fr, cephalic tubercle Oc with three chaetae, cephalic tubercle Di separate, and tubercle Dl with four (sometimes three) chaetae, Ant. I with eight chaetae, and claw with an inner tooth. *Vietnura caerulea* Deharveng & Bedos, 2000 is recorded from China for the first time. New localities of *Rambutanura hunanensis* Jiang & Dong, 2018 and *Vitronura paraacuta* Wang, Wang & Jiang, 2016 from southwest China are also provided.

Keywords

key, *Lobellina yinae* sp. n., new records, taxonomy

Introduction

Maolan National Nature Reserve is located at Libo County, Qiannan Buyi and Miao Nationalities Autonomous Region of Guizhou Province, southwest China. It covers area of 212.85 km² and is located in the subtropical monsoon humid climate zone. The main objectives of Maolan National Nature Reserve are the protection of the karst

forest, and its rare animals and plants. It is from 430 to 1078 m above sea level. So far, no Neanuridae was reported from this reserve. During the field research at Maolan National Nature Reserve in 2015, four species of the subfamily Neanurinae were collected. They are described in the present paper.

Materials and methods

Specimens were extracted from soil samples with the aid of Tullgren funnels or directly collected with an aspirator, and preserved in 95% ethanol. They were cleared in Nesbitt's fluid and mounted on slides in Hoyer's medium. Preparations were dried for 7–15 days in oven at 55 °C, then ringed with lacquer. The morphological characters were observed and figures were drawn using a phase contrast microscope Nikon 80i. Material is deposited in Shanghai Entomological Museum, Chinese Academy of Sciences.

The terminology and layout of the tables used in this paper follow Deharveng (1983), Deharveng and Weiner (1984), Smolis and Deharveng (2006), and Smolis (2008). The abbreviations used are listed below.

General morphology

Abd.	abdomen	Scx2	subcoxa 2
Ant.	antenna	Ti	tibiotarsus
AOIII	sensory organ of antennal segment III	Th.	thorax
Cx	coxa	Tr	trochanter
Fe	Femur	VT	ventral tube

Groups of chaetae

Ag	antegenital	Ve or ve	ventroexternal
An	anal lobes	Vea	ventroexternoanterior
ap	apical	Vem	ventroexternomedial
ca	centroapical	Vep	ventroexteroposterior
cm	centromedial	Vel	ventroexternolateral
cp	centroposterior	Vec	ventroexternocentral
d	dorsal	Vei	ventroexternointernal
Fu	furcal	Vi or vi	ventrointernal
Vc	ventrocentral	VI	ventrolateral

Tubercles

An	antennal	Di	dorsointernal
Fr	frontal	Dl	dorsolateral
Af	antенно-frontal	L	ateral
Cl	clypeal	Oc	ocular
De	dorsoexternal	So	subocular

Types of chaetae

Ml	long macrochaeta	or	organite of Ant. IV
Mc	short macrochaeta	brs	border s-chaeta on Ant. IV
Mcc	very short macrochaeta	i	ordinary chaeta on Ant. IV
me	mesochaeta	mou	thin cylindrical chaetae on Ant.
mi	microchaeta		IV ("soies mousses")
ms	s-microchaeta	x	labial sensory papilla
s	s-chaeta		
bs	s-chaeta on Ant. IV	L'	ordinary lateral chaeta on Abd.
miA	microchaetae on Ant. IV	V	
iv	ordinary chaetae on ventral Ant.		
	IV		

Taxonomy

Tribe *Lobellini* Cassagnau, 1983

Genus *Lobellina* Yosii, 1956

Lobellina yinae sp. n.

<http://zoobank.org/FD11B2EC-7C4A-4480-BB09-BA7A3DEF144B>

Figs 1–9, Tables 1–4

Material. Holotype, male, on slide. Maolan National Nature Reserve, Libo County, Guizhou Province, China. 25°16.400'N, 107°53.864'E, ca. 780 m above sea level, 22 July 2015. Collected by Cheng-Wang Huang, Yan Liang and Ai-Min Liu. **Paratype**, one subadult, same slide and data as holotype.

Etymology. The species is named after Prof. Wen-Ying Yin, in honor of her important contributions to the study of Chinese soil animals.

Diagnosis. Three pigmented eyes, mandible with six teeth, cephalic chaeta O present and free from tubercle Fr, cephalic tubercle Oc with three chaetae, cephalic tubercle Di separate, tubercle Dl with four (sometimes three) chaetae, Ant. I with eight chaetae, and claw with single inner tooth.

Description. General (Figs 1–3). Body length (without antenna) 1.8–2.1 mm. Cuticular granulations medium, tertiary granules absent, body without reticulations. Tubercles well developed on dorsal side of body. Body color red when alive, white in alcohol. Eyes 3+3, pigmented (Fig. 1). **Chaetal morphology** (Fig. 9). Dorsal ordinary chaetae of five types: Ml, Mc, Mcc, me, and mi. Macrochaetae Ml long, sheathed, weakly toothed and knobbed at apex. Macrochaetae Mc morphologically of two types: one is similar to Ml, but shorter, the other one with slightly pointed apex. Macrochaetae Mcc morphologically similar to Ml and shorter than Mc. Mesochaetae similar to ventral chaetae, thin, smooth, and pointed, with various length. Microchaetae shorter than mesochaetae, with acuminate tip. S-chaetae on terga thin, smooth, shorter than Mc, longer than Mcc. **Antenna** (Fig. 4 and Table 3). Antenna 4-segmented. Ant. I with eight

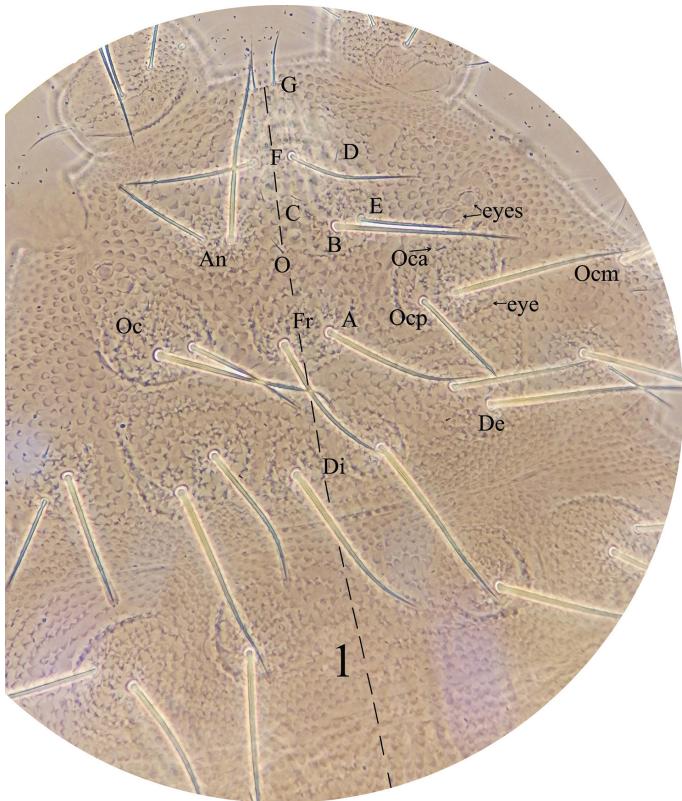


Figure 1. *Lobellina yiniae* sp. n. dorsal tubercle and chaetotaxy of head.

chaetae. Ant. II with eleven chaetae and dorsally with a smooth circular area. Ant. III dorsally fused to Ant. IV. AOIII consists of two short rods, ventral ms and two longer sensory chaetae (sgd and sgv), sgd on the same level position of the two rods, each rod exposed in separate pit. Ant. IV dorsally with eight thickened and blunt sensilla, slender i-chaeta, and minute capitate organite (or). Apical bulb distinct, trilobed. Each of the eight sensilla distinctly differentiated, larger and two times shorter than “mou”-chaetae. Ventral chaetotaxy of Ant. III–IV is shown in Table 3, ap with eight bs and three miA, ca with two bs and two miA, cm with three bs and one miA, cp with six bs and seven miA. On ventral side of Ant. III, Vi, Vc, Ve respectively with four, four, five chaetae, Ant. III dorsally with 4–5 d chaetae, d1, d2, d3 as me, d4 as mi, d5 as mi and sometimes absent. *Mouthparts*. Buccal cone moderately long, labrum ventral sclerifications truncated (Fig. 8). Labrum chaetotaxy: 0/2, 2. Labium with normal chaetotaxy, and chaeta F almost three times as long as chaeta A, without papillae x (Fig. 8). Maxilla styliform, consisting of two fused lamellae, apically with two tiny teeth (Fig. 7). Mandible with four apical teeth, one middle tooth, and one large basal tooth (Fig. 6). *Dorsal chaetotaxy and tubercles of head* (Fig. 1 and Table 1). Head with 14 tubercles. Tubercl Cl with four chaetae: 2G+2F; tubercle An with four chaetae: B, C, D, E; tubercle Oc with three chaetae; tubercle Fr with three chaetae, chaeta O present, shifting between the two tubercles

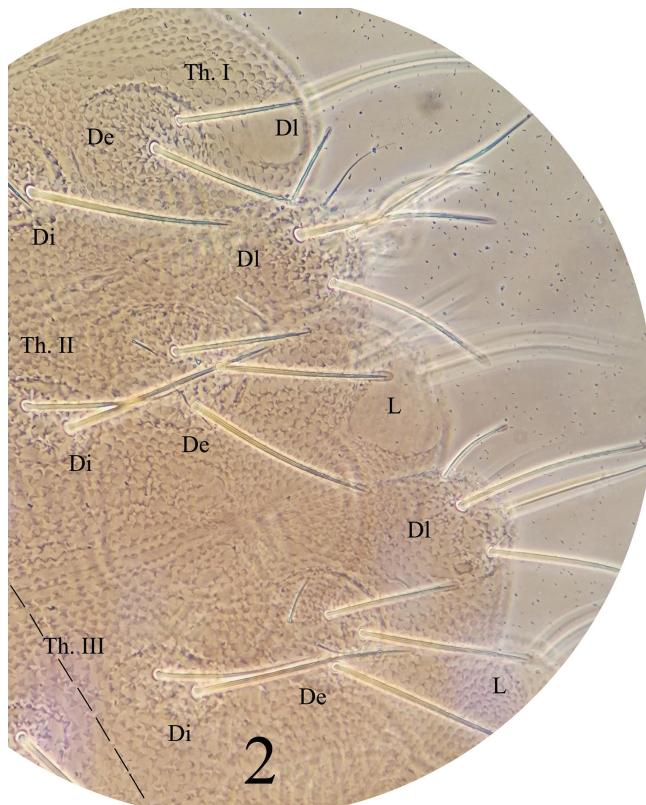


Figure 2. *Lobellina yiniae* sp. n. dorsal tubercles and chaetotaxy on Th. I–III.

An; tubercle Di with a single chaeta; De with three chaetae; tubercle Dl separate from tubercle L+So, with four (or three) chaetae; tubercle L+So with 13 chaetae. *Dorsal chaetotaxy and tubercles of thorax* (Fig. 2 and Table 4). Thoracic dorsal tubercles complete. Th. I with three tubercles, tubercle Di with one chaeta; tubercle De with two chaetae; tubercle Dl with one chaeta. Th. II with four tubercles, tubercle Di with three chaetae; tubercle De with five chaetae (4+s); tubercle Dl with five chaetae and one ms (4+s+ms); tubercle L with three chaetae. Th. III with four tubercles, tubercle Di with three chaetae; tubercle De with five chaetae (4+s); tubercle Dl with five chaetae (4+s); tubercle L with three chaetae. *Dorsal chaetotaxy and tubercles of abdomen* (Fig. 3 and Table 4). Dorsum of Abd. I with four tubercles, tubercle Di with two chaetae; tubercle De with four chaetae (3+s); tubercle Dl with three chaetae; tubercle L with four chaetae. Tubercles and chaetae arrangements of Abd. II–III as on Abd. I. Abd. IV with four tubercles, tubercle Di with two chaetae; tubercle De with three chaetae (2+s); tubercle Dl with three chaetae; tubercle L with 5–7 chaetae. Abd. V with four tubercles, tubercle Di with three chaetae; tubercle De with one chaeta (s); tubercle Dl with four chaetae; tubercle L with seven chaetae (without s chaeta). Abd. VI bilobed, each side of Abd. VI with one tubercle, each tubercle with seven chaetae. No cryptopygy. S-chaetae formula on tergites as 0, 2+ms, 2/1, 1, 1, 1, 1. *Ventral chaetotaxy* (Fig. 5, Table 2). On ventral side of head, groups

Table 1. Cephalic dorsal tubercles and chaetotaxy of *Lobellina yinae* sp. n.

Tubercl	Number of chaetae	Types of chaetae	Names of chaetae
Cl	4	Ml	F
		me	G
An	4	M	B
		Mcc	E
Fr	3	me	C, D
		Ml	A
		me	O
Oc	3	Ml	Ocm
		Mcc	Ocp
		me or mi	Oca
Di	1	Ml	Di1
			Chaetal homology uncertain
De	3	Ml	De1
		Mc	De2
		mi	Di2
Dl	4 (3)	Mc+Mcc+2me (or mi)	Chaetal homology uncertain
L+So	13	4Ml+9me	Chaetal homology uncertain

Table 2. Cephalic ventral chaetotaxy of *Lobellina yinae* sp. n.

Group	Number of chaetae
Vi	5
Vea	5
Vem	4
Vep	4
Labium	11, 0 X

Table 3. Chaetotaxy of antenna of *Lobellina yinae* sp. n.

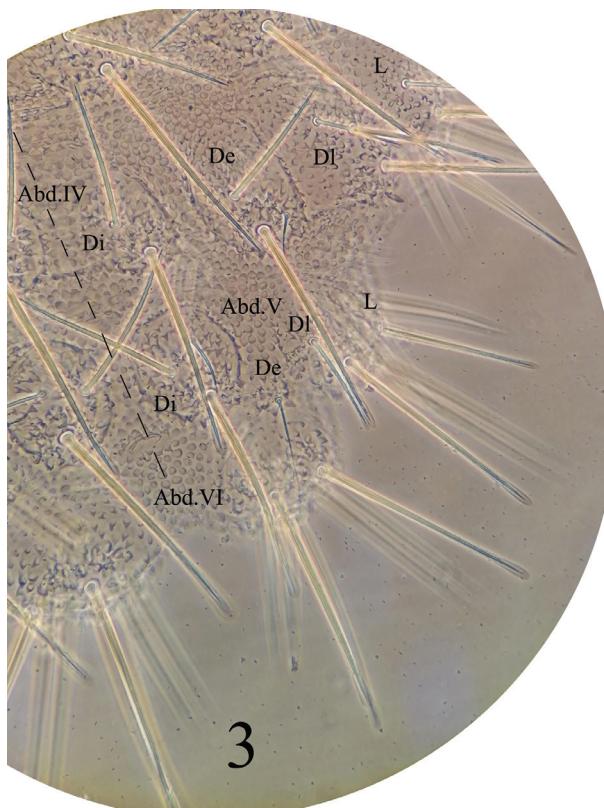
Segment, group	Number of chaetae	Segment, group	Number of chaetae
I	8	IV	or, 8 s, 12 mou, ? brs, 2 iv
II	11		
III	5 sensilla AOIII		
Ve	5	ap	8 bs, 3 miA
Vc	4	ca	2 bs, 2 miA
Vi	4	cm	3 bs, 1 miA
d	4(2me+2mi)–5(2me+3mi)	cp	1brs, 7 miA

Vea, Vem, and Vep with five, four, four chaetae respectively. Group Vi on head with five chaetae. On Abd. I, VT with one proximal and three distal chaetae. On Abd. III, furca rudimentary with three chaetae, and without microchaeta. On Abd IV, group Vei, Vec, Vel respectively with one, two, four chaetae. On Abd. V, group VI with 2–3 chaetae, Ag with 3–4 chaetae, chaeta L' absent. Anal lobe with 14–15 chaetae and three mi. Legs (Table 4). Unguis with an inner tooth and without lateral tooth. Chaeta M on tibiotarsus present. Tibiotarsus of foreleg, midleg, and hindleg with 19, 19, 18 chaetae respectively.

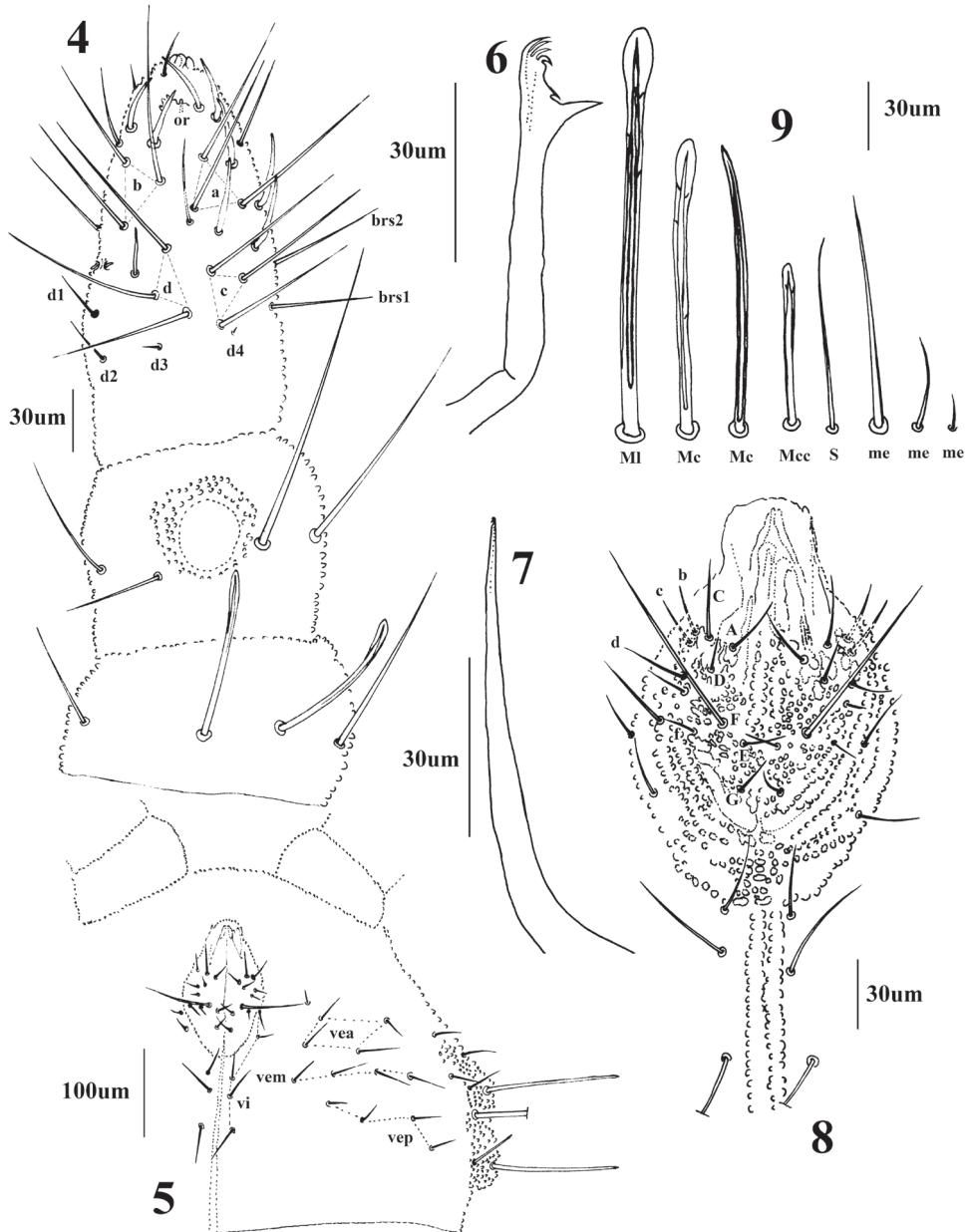
Ecology and distribution. In fallen leaves of bamboo. *Lobellina yinae* sp. n. is only known from Libo (Fig. 16).

Table 4. Postcephalic tubercles and chaetotaxy of *Lobellina yinae* sp. n.

	Terga				Legs				
	Di	De	Dl	L	Scx2	Cx	Tr	Fe	T
Th. I	Ml	Ml+me	Ml	—	0	3	6	13	19
Th. II	Ml+Mc+mi	Ml+Mc+Mcc+me+s	3Ml+Mcc+s+ms	Ml+2Mcc	2	7	6	12	19
Th. III	Ml+Mc+mi	Ml+Mc+Mcc+me+s	3Ml+Mcc+s	Ml+2Mcc	2	8	6	11	18
Terga					Sterna				
Abd. I	Ml+Mc	Ml+Mc+me+s	Ml+Mc+Mcc	Ml+Mc+2me	VT: 4				
Abd. II	Ml+Mc	Ml+Mc+me+s	Ml+Mc+Mcc	Ml+Mc+2me	Ve: 4–5, V1: 0				
Abd. III	Ml+Mc	Ml+Mc+me+s	Ml+Mc+Mcc	Ml+Mc+3me	Ve: 4, Fu: 3, 0 mi				
Abd. IV	Ml+Mc	Ml+Mc+s	Ml+Mc+Mcc	3Ml+2me or (3Ml+2me+2Mc)	Vei: 1, Vec: 1, Vel: 2, Vl: 4				
Abd. V	Ml+Mc+me	s	2Ml+Mc+Mcc	7me or 1Mc+6me	Ag: 3–4, Vl: 2–3, L: 0				
Abd. VI			2Ml+5me		Ve: 14–15, An: 3 mi				

**Figure 3.** *Lobellina yinae* sp. n. dorsal tubercles and chaetotaxy on Abd. IV–VI.

Remarks. To date, 15 species of the genus *Lobellina* are known from Asia and one from Central America (Cuba) (Deharveng and Weiner 1984, Ma and Chen 2008, Smolis 2017, Jiang et al. 2018). The new species is similar to *L. montana* Deharveng



Figures 4–9. *Lobellina yinae* sp. n. **4** dorsal chaetotaxy of antenna **5** ventral chaetotaxy of head **6** mandible **7** maxilla **8** Labium **9** types of body chaetae.

& Weiner, 1984 and *L. paraminuta* Deharveng & Weiner, 1984 from Korea by the following characters: cephalic chaeta O free from tubercle Fr (shifting between two tubercles An), cephalic tubercle Dl separate from tubercle L+So, tubercle Oc with three

chaetae, Abd. V with 3+3 dorsal tubercles and De separate from Dl, and claw with a distinct basal inner tooth. However, *L. yinae* sp. n. can be distinguished from *L. montana* and *L. paraminuta* by its mandible with six teeth versus seven, cephalic tubercle Dl with three or four chaetae versus five, tubercle De on Abd. I–III with four chaetae (3+s) versus three (2+s), and tubercle Dl on Abd. I–III with three chaetae versus two.

The new species is also similar to *L. fusa* Jiang, Wang & Xia, 2018 from China by the following characters: mandible with six teeth, maxilla styliform, tubercle Fr on head with three chaetae, tubercle Oc on head with three chaetae, Abd.V with 3+3 dorsal tubercles and De separate from Dl, and claw with a distinct basal inner tooth. However, the new species can be differentiated from *L. fusa* by the cephalic chaeta O of tubercle Fr free (not free in *L. fusa*), cephalic tubercles Di separated (fused in *L. fusa*), cephalic tubercle Dl with four chaetae (five in *L. fusa*), and each tubercle Dl on Abd. I–III with three chaetae (two chaetae in *L. fusa*).

Key to species of the genus *Lobellina* Yosii, 1956 (Modified from Jiang et al. 2018)

1	Cephalic chaeta O present	2
—	Cephalic chaeta O absent.....	7
2	Chaeta O included in tubercle Fr.....	3
—	Chaeta O free on tubercle Fr.....	4
3	Body color yellow, mandible with seven teeth, tubercle Oc with 2 chaetae, ventral tube with 5+5 chaetae, cephalic tubercles Di separate	
	..... <i>L. nanjingensis</i> Ma & Chen, 2008 (China)	
—	Body color red, mandible with six teeth, tubercle Oc with three chaetae, ventral tube with 4+4 chaetae, cephalic tubercles Di fused	
	..... <i>L. fusa</i> Jiang, Wang & Xia, 2018 (China)	
4	Mandible with six teeth, Cephalic tubercle Dl with four (or three) chaetae...	
	..... <i>L. yinae</i> sp. n. (China)	
—	Mandible with seven teeth, Cephalic tubercle Dl with five chaetae	5
5	Tubercle Dl on Th. II with six chaetae (4 +s+ms)	
	..... <i>L. montana</i> Deharveng & Weiner, 1984 (Korea)	
—	Tubercle Dl on Th. II with five chaetae (3+s+ms)	6
6	Tubercle Oc with mesochaeta Oca, Abd.V dorsally with 4+4 tubercles	
	..... <i>L. paraminuta</i> Deharveng & Weiner, 1984 (Korea)	
—	Tubercle Oc without chaeta Oca, Abd.V dorsally with 3+3 tubercles	
	..... <i>L. weinerae</i> Smolis, 2017 (Vietnam)	
7	Body macrochaetae smooth	8
—	Body macrochaetae serrate	13
8	Cephalic tubercle Oc with three chaetae	9
—	Cephalic tubercle Oc with two chaetae	10

9	Abd. V with 2+2 dorsal tubercles	
	..... <i>L. chosonica</i> Deharveng & Weiner, 1984 (Korea)	
-	Abd. V with 3+3 dorsal tubercles	
	..... <i>L. proxima</i> Deharveng & Weiner, 1984 (Korea)	
10	Tubercl Di on Abd. V with two chaetae	11
-	Tubercl Di on Abd. V with three chaetae <i>L. minuta</i> (Lee, 1980) (Korea)	
11	Mandible with three teeth..... <i>L. ipohensis</i> (Yosii, 1976) (Malaysia)	
-	Mandible with 6–8 teeth	12
12	Mandible with six teeth, tubercle De+Dl with six chaetae (5+s)	
	..... <i>L. pomorskii</i> Smolis, 2017 (Vietnam)	
-	Mandible with eight teeth, tubercle De+Dl with five chaetae (4+s)	
	..... <i>L. musangensis</i> (Yosii, 1976) (Malaysia)	
13	Cephalic tubercle Oc with two chaetae	14
-	Cephalic tubercle Oc with three chaetae	15
14	Abd. V with 2+2 dorsal tubercles	
	..... <i>L. ionescui</i> (Massoud & Gruia, 1974) (Cuba)	
-	Abd. V with 3+3 dorsal tubercles	
	..... <i>L. perfusionides</i> (Stach, 1965) (Vietnam)	
15	Abd. V with 2+2 dorsal tubercles <i>L. roseola</i> (Yosii, 1954) (Japan)	
-	Abd. V with 3+3 dorsal tubercles <i>L. kitazawai</i> (Yosii, 1969) (Japan)	

Tribe Neanurini Börner, 1901 (sensu Cassagnau, 1983)

Genus *Vietnura* Deharveng & Bedos, 2000: new record to China

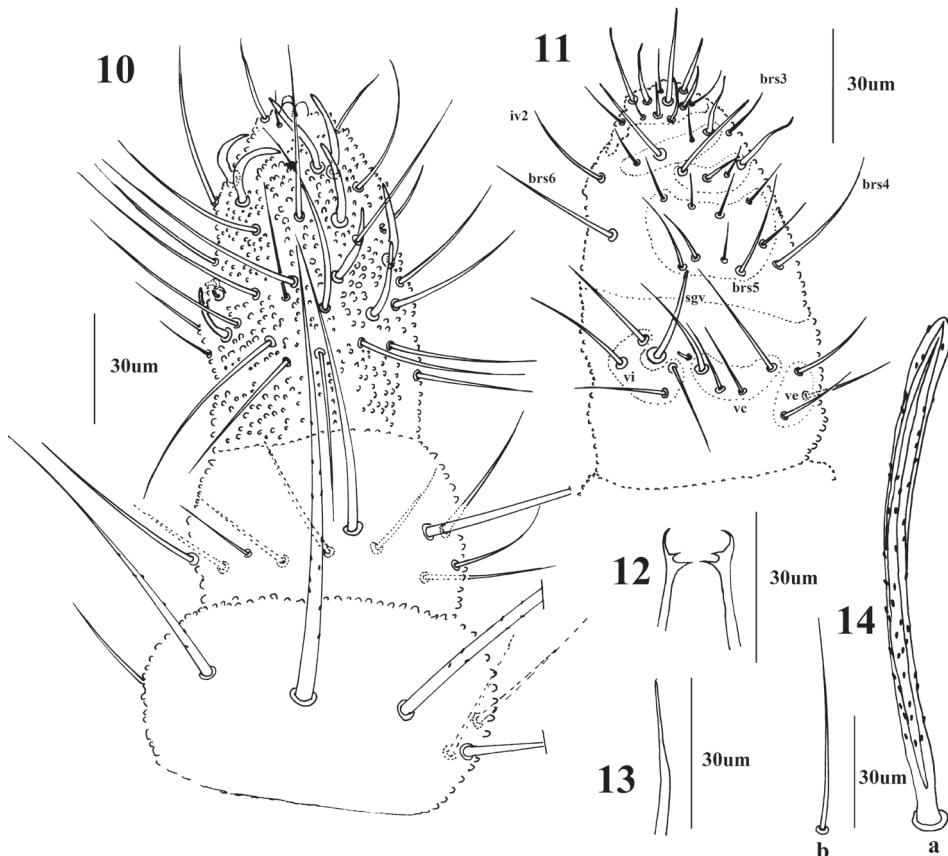
Vietnura caerulea Deharveng & Bedos, 2000: 209–214, figs 1–4 (Vietnam) new record to China

Material. Two males on the same slide, one of them submature, 25°17.453'N, 107°56.359'E, elevation 880–900 m. Three individuals in alcohol, Coordinates: 25°17.516'N, 107°56.371'E, elevation 840 m. One specimen in alcohol, 25°17.483'N, 107°56.245'E, elevation 731 m. All of them were collected by Cheng-Wang Huang, Yan Liang & Ai-Min Liu, from Maolan National Nature Reserve, Libo County, Guizhou Province, China, on 19 July 2015. Material deposited in Shanghai Entomological Museum, Chinese Academy of Sciences.

Description of the Chinese specimens (Figs 10–15, Tables 5–7). *Body length* (without antenna) 0.9–1.1 mm. Cuticular granulations medium, tertiary granules developed, body with reticulations. Tubercles well developed on dorsal side of body. Body color blue alive and in alcohol. Eyes 2+2, small and pigmented, all on tubercles Oc. *Chaetal morphology* (Fig. 14). Dorsal ordinary chaetae of four types: Ml, Mc, Mcc, and me. Macrochaetae Ml long, sheathed, distinctly toothed and knobbed at apex (Fig. 14a). Macrochaetae Mc morphologically similar to long macrochae-

Table 5. Cephalic ventral chaetotaxy of *Vietnura caerulea* Deharveng & Bedos, 2000.

Group	Number of chaetae
Vi	5
Vea	2
Vem	2
Vep	2
Labium	11, 0x

**Figures 10–14.** *Vietnura caerulea* Deharveng & Bedos, 2000 **10** dorsal side of antenna **11** ventral side of Ant. III–IV **12** mandible **13** maxilla **14** body setae, a: macrochaeta, b: S-chaeta.

tae, but shorter. Macrochaetae Mcc morphologically similar to Mc and shorter than Mc. Mesochaetae similar to ventral chaetae, thin, smooth, and pointed, with various lengths. S-chaetae of tergites thin, smooth, shorter than Mc and slightly longer than Mcc "mou" (Fig. 14b). S-chaetae formula on tergites as 0, 2+ms, 2/1, 1, 1, 1, 1. *Antenna.* Antenna 4-segmented. Ant. I with seven chaetae. Ant. II with 10–11 chaetae. Ant. III dorsally fused to Ant. IV. AOIII consists of two short rods, one ventral ms

Table 6. Chaetotaxy of antenna of *Vietnura caerulea* Deharveng & Bedos, 2000.

Segment, group	Number of chaetae	Segment, group	Number of chaetae
I	7	IV	or, 8 s, 12 mou, ? brs, 2 iv
II	10–11		
III	5 sensilla AOIII		
Ve	3	ap	7 bs, 4 miA
Vc	4	ca	2 bs, 2 miA
Vi	4	cm	3 bs, 1 miA
d	3	cp	1 brs, 8 miA

Table 7. Postcephalic tubercles and chaetotaxy of *Vietnura caerulea* Deharveng & Bedos, 2000.

Terga					Legs				
	Di	De	Dl	L	Scx2	Cx	Tr	Fe	T
Th. I	Mc	Mc+Mcc	Mc	—	0	3	6	13	19
Th. II	Ml+Mcc	Mc+Mcc +s	Ml+2Mcc +s+ms	Ml+Mc+ Mcc	2	7	6	12	19
Th. III	Ml+Mcc or Ml+2Mcc	Mc+Mcc +s	Ml+2Mcc +s	Ml+Mc+ Mcc	2	8	6	11	18
Terga					Sterna				
Abd. I	Ml+Mcc	Ml+Mcc +s	Ml+Mcc	Ml+Mcc+me	VT: 4				
Abd. II	Ml+Mcc	Ml+Mcc +s	Ml+Mcc	Ml+Mcc+me	Ve: 3				
Abd. III	Ml+Mcc	Ml+Mcc +s	Ml+Mcc	Ml+Mcc+me	Ve: 3–4, Fu: 3–4 me, mi: 0				
Abd. IV	Ml+Mcc	Ml+Mcc +s	Ml+Mcc	4me	Vei: 1, Vec: 2, Vel: 3, VI: 3–4				
Abd. V	2(Ml+Mcc)*	Ml+Mcc+ 2me+s			Ag: 2, VI: 2				
Abd. VI	7 (8)				Ve: 12, An: 1 mi				

*2 Di fused.

and two longer sensilla (sgd and sgv), sgd shifted basally to the back of the two rods, each rod exposed in separate pit (Fig. 10). Ant. IV dorsally with eight sensilla, slender i-chaeta, and minute capitate organite (or), apical bulb small, trilobed (Fig. 10). Sensilla thicker and shorter than “mou”-chaetae (Fig. 10). Ventral chaetotaxy of Ant. III–IV as in Fig. 11 and Table 6, group ap with seven bs and four miA, ca with two bs and two miA, cm with three bs and one miA, cp with eight miA and brs5. On ventral side of Ant. III, Vi, Vc, Ve respectively with four, four, three chaetae; dorsally with three d chaetae, d3 as mesochaeta (Fig. 10). Mouthparts. Buccal cone short, labral sclerifications not ogival. Labrum chaetotaxy: ?/2, 4. Labium with four basal, three distal, four lateral chaetae, without papillae x. Maxilla reduced, styliform (Fig. 13). Mandible reduced, tridentate (Fig. 12).

Dorsal chaetotaxy and tubercles (Table 7). Head with six tubercles. Tuberle Cl with four chaetae: two G and two F; tubercle Af+Oc with four chaetae: two B and two Ocm, chaeta O absent; tubercle Di+De with four chaetae: two Di1, two De1; tubercle Dl+L+So with eleven chaetae (5Ml+6me). Thorax and abdomen tubercles and chaetotaxy as in Table 7. Cryptopygy.

Ventral chaetotaxy (Fig. 15 and Table 5). On head, groups Vea, Vem and Vep with two, two, two chaetae respectively. Group Vi on head with five chaetae. VT with one proximal and three distal chaetae. On Abd. III, furca rudimentary with 3–4 chaetae,

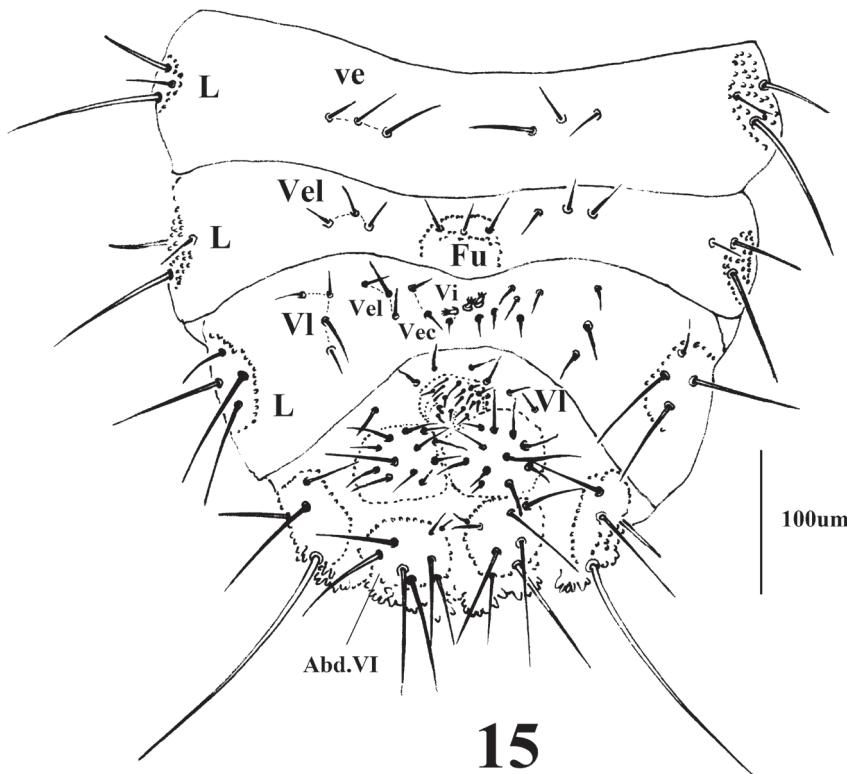


Figure 15. *Vietnura caerulea* Deharveng & Bedos, 2000, ventral side of Abd. II-VI.

Vel with 3–4 chaetae. On Abd. IV, group Vei, Vec, Vel respectively with one, two, three chaetae, VI with three or four chaetae. On Abd. V, group VI with two chaetae, chaeta L' absent, Ag with two chaetae. Anal lobe with twelve chaetae and one mi.

Appendages. Unguis without tooth. Chaeta M on tibiotarsus present. Tibiotarsus of foreleg, midleg and hindleg, respectively with 19, 19, 18 chaetae. Chaetotaxy of ventral tube and furcular remnant as in Table 7.

Ecology and distribution. Among fallen leaves of bamboo and under broad-leaved trees in the forest. The species is described from Vietnam. In China, it is only known from Maolan National Nature Reserve, Libo County (Fig. 16).

Remarks. *Vietnura caerulea* is easily distinguished among Chinese Neanurinae by its blue body color, six tubercles on the head, 2+2 pigmented eyes on tubercle Af+Oc, and reduced mandible and maxilla. Additionally, Ve chaetal group of Abd. IV has 3–5 shortened, thickened, and distally ciliated chaetae (male), claw is toothless, and hypotrichosis is developed on body tubercles.



Figure 16. Map of China, with localities of *Lobellina yinae* sp. n. (**A**), *Rambutanura hunanensis* (**B**), *Vitronura paraacuta* (**C**) and *Vietnura caerulea* (**D**).

Tribe Paleonurini Cassagnau, 1989
Genus *Rambutanura* Deharveng, 1988

***Rambutanura hunanensis* Jiang & Dong, 2018**

Rambutanura hunanensis Jiang & Dong, 2018: 377–386, figs 1–14 (China)

Material. One juvenile, body length 2.2 mm, on slide; two specimens in alcohol, probably juvenile. Maolan National Nature Reserve, Libo County, Guizhou Province, China, 25°16.400'N, 107°53.864'E, ca. 890 m above sea level. 19 July 2015. Collected by Cheng-Wang Huang, Yan Liang, and Ai-Min Liu.

Diagnosis. The specimen from Libo County is characterized by its body without long digitate tubercles and tertiary granules, 2+2 depigmented eyes, mandible with four teeth, maxilla styliform, head with eight tubercles (Cl, Af, 2 Oc, 2 Di+De, 2 Dl+L+So), claw with a big inner tooth, and ventral tube with 5–6 chaetae. These characters are similar to those of *Rambutanura hunanensis* Jiang & Dong, 2018 from

Hunan Province; however, the presence of only four chaetae on genital plate reveals the immaturity of the Maolan specimens.

Remarks. The distribution of *R. hunanensis* is given in Fig. 16. The species has been collected from other localities in China, such as Huping Mountain, Shimen County, Hunan Province (unpublished). It is probably widely distributed in central and southwest China.

Genus *Vitronura* Yosii, 1969

Vitronura paraacuta Wang, Wang & Jiang, 2016

Vitronura paraacuta Wang, Wang & Jiang, 2016: 183–196, figs 1–7 (China)

Material. Two females, submature, on slides, five specimens in alcohol, Maolan National Nature Reserve, Libo County, Guizhou Province, China, 25°16.400'N, 107°53.864'E, ca. 880 m above sea level. 19 July 2015. Collected by Cheng-Wang Huang, Yan Liang, and Ai-Min Liu.

Diagnosis. The characters of the specimens from Maolan are consistent with those of *Vitronura paraacuta* Wang, Wang & Jiang, 2016: body tubercles well differentiated, head with 14 tubercles (only cephalic tubercle L fused to So), 2+2 depigmented eyes, mandible with four teeth, maxilla styliform, tubercles Fr and Oc with three chaetae each, and claw with an inner tooth.

Remarks. The arrangement of the dorsal body tubercles and numbers of chaetae on dorsal tubercles of *V. paraacuta* are very similar to those of *V. dentata* Deharveng & Weiner, 1984 from Korea. However, *V. paraacuta* can be differentiated from *V. dentata* by almost smooth body macrochaetae, four teeth on mandible, chaetae Di2, De2 on cephalic tubercle De and chaeta Oca on cephalic tubercle Oc being mesochaetae (*vs* serrated body macrochaetae, three teeth on mandible, chaetae Di2, De2 on cephalic tubercle De and chaeta Oca on cephalic tubercle Oc being microchaetae in *V. dentata*). The distribution of *V. paraacuta* is given in Fig. 16.

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The morphology of the preimaginal stages of *Rhinusa neta* (Germar, 1821) and notes on its biology (Coleoptera, Curculionidae, Mecinini)

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Abstract

A detailed description of the mature larva and pupa of *Rhinusa neta* (Germar, 1821) and new diagnostic features of this species are presented. The development cycle of *R. neta* in the standard conditions lasts almost 60 days: an 11-day egg period, a 29-day larval period, and an 18-day pupal period, on average. The larvae are parasitised by hymenopterans of the superfamily Chalcidoidea. Similarities and differences with *Rhinusa bipustulata* and other species of this genus are presented.

Keywords

Egg, host plant, life development, *Linaria vulgaris*, mature larva, parasitoid, Plantaginaceae, pupa, weevil

Introduction

The taxon *Rhinusa* attained the rank of the genus based on the classification made by Caldara (2001). It belongs to the tribe Mecinini and includes 40 species around the world (Caldara et al. 2014). In Poland, ten species have thus far been recorded (Petryszak 2004; Mokrzycki and Wanat 2005), of which two, *R. hispida* (Brullé, 1832) and *R. thapsicola* (Germar, 1821), were recognised by Caldara (2013) as synonymous with

R. tetra (Fabricius, 1792). The known host plants of *Rhinusa* species include plants only from the families Plantaginaceae and Scrophulariaceae (Caldara et al. 2010; Caldara et al. 2014; APG 2016). Weevils inhabit mainly warm habitats, such as pastures, sunlit slopes, sandbars, gravel pits, uncultivated strips between fields, roadsides, etc. (Koch 1992; Burakowski et al. 1997). Till now the data on the morphology and biology of preimaginal stages (in varying degrees of detail) are available for the following species: *R. asellus* (Gravenhorst, 1807), *R. antirrhini* (Paykull, 1800), *R. bipustulata* (Rossi, 1792), *R. collina* (Gyllenhal, 1813), *R. linariae* (Panzer, 1795), *R. neta*, *R. pilosa* (Gyllenhal, 1838) and *R. tetra* (Emden 1938; Scherf 1964; Anderson 1973; Burakowski et al. 1997; Gosik 2010a; Gassmann et al. 2014).

Rhinusa neta is a species distributed mainly in southern and central Europe, also noted in Belgium, the Caucasus, Afghanistan, Kazakhstan, Iran, Algeria, and Morocco (Burakowski et al. 1997, Caldara 2013). In Poland, it is found in twelve geographical realms in the lowlands and highlands (mainly in central and eastern Poland), as well as in some lower locations in the Eastern Sudetes and the Eastern Beskids. It inhabits dry, warm places in fields and on fallow land, roadsides, gravel pits, moors and rock faces, as well as in sunny thickets. It develops on *Linaria vulgaris* (L.) Mill., *L. genistifolia* (L.) Mill., *L. repens* (L.) Mill., *L. spuria* (L.) Mill., *Antirrhinum orontium* L. and *A. majus* L. (Plantaginaceae). Adults are active on plants from May to August. The larva feeds inside seed capsules on immature seeds (Smreczyński 1976, Burakowski et al. 1997). Feeding by the larvae does not cause swelling in the seeds, as in the case of feeding by the larvae of *R. antirrhini*. In North America, in laboratory conditions, it has also fed on species of the genera *Chaenorhinum* and *Kickxia* (Plantaginaceae), but in field conditions only on *L. vulgaris* and *L. dalmatica* (Wilson et al. 2005).

Rhinusa neta was introduced to the United States in 1937 and to Canada in 1957, and from the late 1950s, it was used in both countries for biological control of two species of toadflax (*L. vulgaris* and *L. dalmatica*). The primary host plant for *R. neta* in North America is *L. dalmatica* and the secondary host plant is *L. vulgaris*. *R. neta* is much less common in these countries and is found in more dispersed populations than the morphologically very similar *R. antirrhini*. When both species feed on *Linaria* at the same time, seed losses may reach 90% (Wilson et al. 2005).

The aim of present paper is to describe development stages (mature larva L₃ and pupa) of *Rhinusa neta* and collect a new diagnostic features of this species. Some data about biology are also presented.

Materials and methods

Collection in the field

Samples with flowering and fruiting *Linaria vulgaris* plants were collected from June to August in 2014–2016 in the following locations in the Lublin Upland (southeastern Poland): Garbów (51°22'15.91"N, 22°21'25.82"E), unplowed strip between

fields; Lublin ($51^{\circ}13'39.15''N$, $22^{\circ}38'31.43''E$), lawn next to the street; Lublin ($51^{\circ}14'42.21''N$, $22^{\circ}32'12.93''E$), ruderal vegetation next to tennis courts (UMCS campus); Niebrzegów (Bonów) ($51^{\circ}30'48.28''N$, $21^{\circ}57'03.43''E$), meadow; and Mięcmierz ($51^{\circ}18'22.50''N$, $21^{\circ}54'15.80''E$), unplowed strip between fields. Adults were collected from plants using a sweep net in series of 100 sweeps each time, at intervals of 3–7 days, from May to August on sunny, windless days, during the hours (10 am to 4 pm) where they are most active. To obtain preimaginal stages, the aboveground parts of *Linaria vulgaris* were collected for further detailed analysis in the laboratory. In total, ca. 520 specimens of the host plant were collected in the field and examined. The development stages (eggs, larvae, and pupae) were isolated from plants by making delicate cuts in the developing infructescence and extracting them from its interior. Some of the eggs and larvae (ten of both stages) were used for further breeding in the insectarium, and others were used for measurements (also ten) and microscope slides.

Breeding

Developmental stages (L_3) isolated from the generative parts were transferred to Petri dishes on an ongoing basis. Further breeding was carried out in accordance with recommendations by Scherf (1964) and Łętowski (1991). The Petri dishes were placed in an incubation chamber under the following conditions: temperature $25^{\circ}C$ during the day and $20^{\circ}C$ at night, humidity 40% during the day (16 h) and 50% at night (8 h). The humidity inside the Petri dishes was higher, 65–80%.

Graphics

Preparation of microscope slides of preimaginal stages and graphics. Larvae and pupae were treated with lactic acid $C_3H_6O_3$ (80%). Smaller morphological structures (mouth-parts) were first immersed in a cold KOH solution (5%) before being transferred to lactic acid. Developmental stages were analysed and documented using an OLYMPUS BX61 microscope at magnifications from $200\times$ to $400\times$. All graphics for the study were prepared using CorelDraw X8 software. Metric data are means from ten measurements. Drawings of the morphological structures of the larva and pupa were based on microscope slides prepared according to Łętowski (1991), Gosik (2010a), and Gosik et al. (2010). The nomenclature of larval (L_3) and pupal chaetotaxy was based mainly on the work of Marvaldi (2003), Oberprieler et al. (2014) and in the case unnamed structures the also on the work of Skuhrovec and Volovník (2015). The morphology of the egg, L_3 and pupa and the developmental cycle from egg to adult were described as well. The biological material is stored in ethyl alcohol C_2H_5OH (70%) at the Department of Zoology, Animal Ecology and Wildlife Management, University of Life Sciences in Lublin.

Setae of the thorax and abdomen of the larva (L_3) and pupa are described for one side only.

Results

Rhinusa neta (Germar, 1821)

Description of egg. *Measurements* (in mm). Egg length 0.47–0.51 (mean 0.49), width 0.25–0.29 (mean 0.27).

General. Oval, slightly oblate.

Colouration. Light yellow, smooth surface.

Description of mature larva. (Figure 1, Table 1) *Measurements* (in mm). Body length: 4.40–4.50 mm (mean 4.46). The widest part of the body (Ab. I) 1.73–1.8 (mean 1.76). Epicranium: length 0.54–0.59 (mean 0.57), width 0.58–0.63 (mean 0.61).

General. Body massive, strongly curved.

Colouration. Head yellow-brown, body light yellow, covered with black, numerous setae.

Vestiture. Cuticle with strongly chitinised spots in several places on dorsal side. Asperities of body integument present on the surface of all thoracic segments and first abdominal segment covering area occupied by a group of setae *prns* and *pds*. Analogous structure presents only on the surface of the first pedal lobe.

Head capsule (Figure 2): Head slightly oval. Endocarina (*enc*) long, nearly 4/5 of frons length. One stemma (*st*) located at end of frontal suture at height of *f5*. Frons with three distinct setae: longest (*f5*) at base of antennae, *fs1,4* located in the upper and lower part of frons near endocarina, and two small sensillae (unnumbered) close to *fs4*, which may be highly reduced setae *f2* and *f3*. Dorsum of epicranium with five setae (*des1–5*); *des3,5* longest and *des1,2,4* of intermediate length. Posterior epicranium with four small setae (*pes1–4*) arranged in arc not far behind *des2*. On anterior epicranium two long setae *les1–2* protrude from sides and visible *vcs*. Antennae (*at*) with conical sensorium and two very small spinose sensillae.

Clypeus with two setae of equal length (*cls1,2*) at base with one sensilla between them.

Mouthparts (Figs 3–5): Dorsal side of labrum (Figure 3a) ca. 0.09 mm wide with three pairs setae (*lms1–3*). Longest *lms1*, setae *lms2, 3* of similar length, only slightly shorter than *lms1*. Anterior margin of epipharynx arched, with three thick setae laterally (*als1–3*), two setae (*ams1–2*) on anterior margin, and one seta (*mes*) medially, between well-formed, arcuate labral rods (*lr*) (Figure 3b). Mandibles (Figure 4) massive, red-brown, with two large teeth and one small tooth on inner side; medially on mandible three short setae (*mds1–3*) in one line. Maxillae (Figure 5) yellowish. Palpifer with one long, medially located seta *sts1*, two apically placed setae of equal length *sts3–4* (or *pfs 1–2*) and one small *sts2* (or *mbs*) below molar part. Maxillary palpus with two segments; basal segment with one very short seta (*mxps*) and two sensillae, distal segment cylindrical with accessory process on dorsal side and ten conical papillae. Mala with six setae of unequal length (*dms1–6*), arranged in one line, comb-like, and separate group of three setae (*vms1–3*) situated apically. Labium: postmentum with three setae of unequal length (*pms1–3*) – longest *pms2* and shortest *pms3*. Prementum with

Table I. Differences of the mature larva (L_3) of *Rhinusa neta* and *R. bipustulata* based on the publications of Scherf 1964, Anderson 1973, Gosik 2010a, and on personal research.

	<i>Rhinusa neta</i>	<i>Rhinusa bipustulata</i>
Frontal suture of epicranium	V-shaped	Y-shaped
Endocarina	reaches 4/5 of frons	reaches 1/2 of frons
Setae of head	des – 5, pes – 4	des – 4, pes – 5
Stammata (ocelli)	well visible, larger	poorly visible, smaller
Antennae	basal membranous area with 2 sensillae	basal membranous area with 7 sensillae
Labrum, clypeus	clypeus with 2 <i>cls</i> and 1 sensilla	clypeus with 3 <i>cls</i> and no sensilla
Mandible	<i>mds</i> – 3	<i>mds</i> – 2
Maxillae	basal segment with 1 setae and 2 sensilla, distal segment with group of 10 short cuticular apical processes and 1 sensilla,	basal segment with 1 seta and 1 sensillum, distal segment with group of 4 long cuticular apical processes and 1 sensilla,
Labial complex	prelabium oval, with 2 processes in basal part, <i>lgs</i> 2 pair in 2 rows, labial palps one-segmented with 5 conical cuticular apical processes (4 short, 1 long)	prelabium heart-shaped, with 1 process in basal part, <i>lgs</i> 2 pair in 1 row, labial palps one-segmented with 5 conical cuticular apical processes (5 short)
Thorax (one side)	prothorax: <i>prns</i> on strongly sclerotised shield	prothorax: <i>prns</i> not on strongly sclerotised shield
Abdomen (one side)	8 unicameral spiracles located in middle of segments I–VIII, segments I–VII with 1 <i>prs</i> , 3 <i>dpls</i> , segment VIII with 1 <i>dls</i> , 3 <i>dpls</i>	8 unicameral spiracles located at anterior margin of segments I–VIII, segments I–VII with 2 <i>prs</i> , 1 <i>dpls</i> , segment VIII – 1 <i>prs</i> , 1 <i>dpls</i>

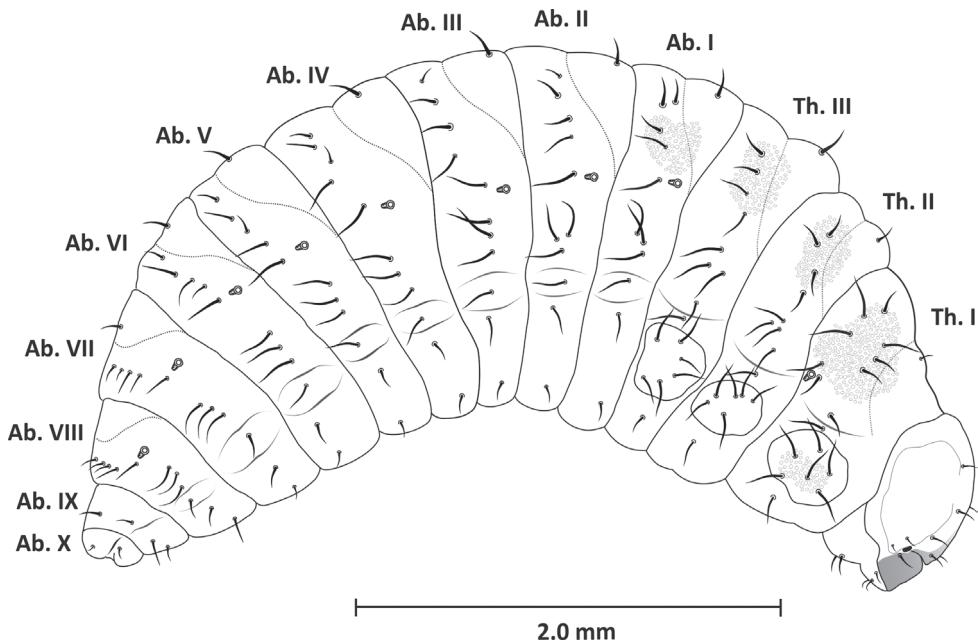


Figure 1. Mature larva (L_3), lateral view.

two distinct teeth on basal part, three setae (*prms1* and *lgs1–2*) and three sensillae. Seta *prms1* very long, more than three times longer than *lgs2*. One pair *lgs1* on apex and with them slightly larger pair *lgs2* placed closer together. Labial palpus 1-segmented, with four shorter and one longer papilla located apically.

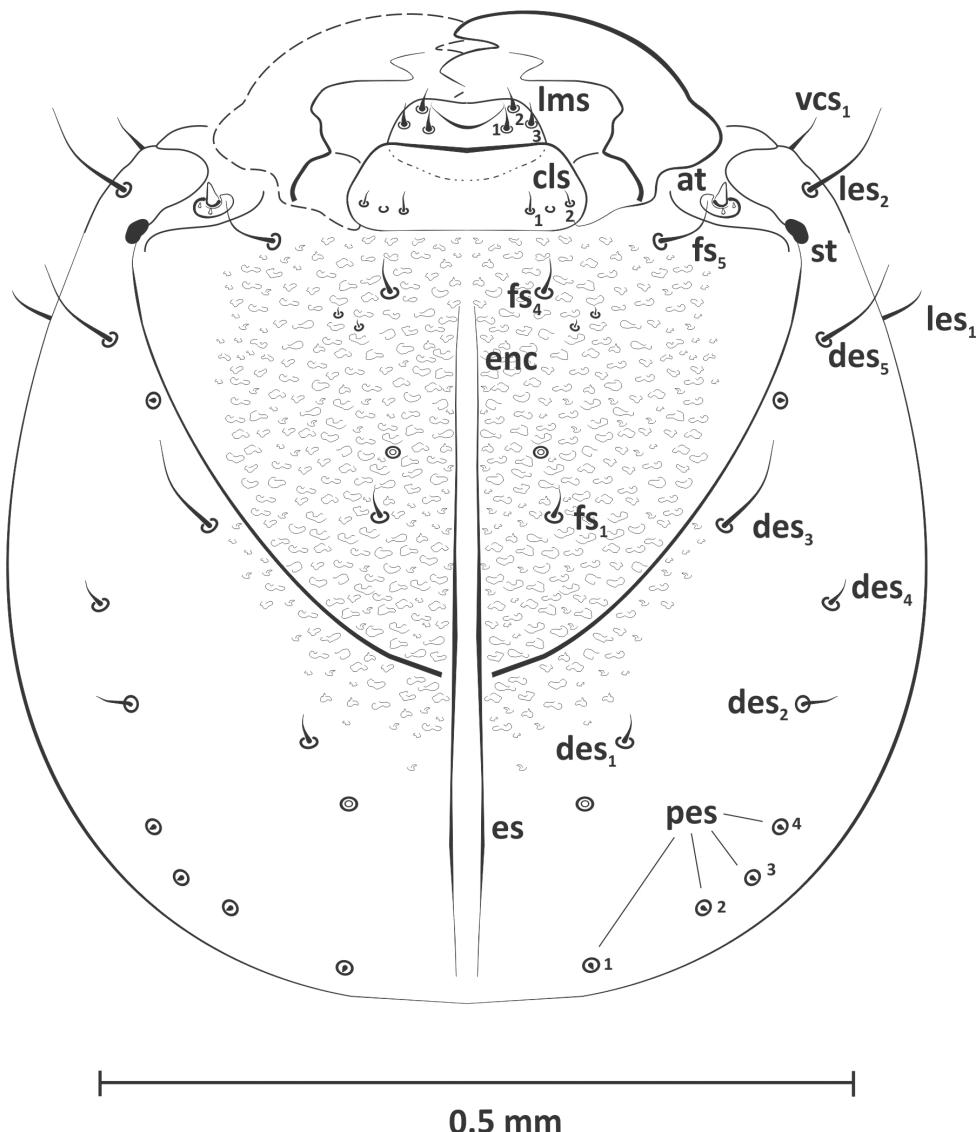


Figure 2. Mature larva (L_3), epicranium, dorsal view: *at* – antenna, *cls* – clypeal seta, *des* – dorsal epicranial seta, *enc* – endocarina, *es* – epicranial suture, *fs* – frontal seta., *les* – lateral epicranial seta, *lms* – labral seta, *st* – stemmata, *pes* – posterior epicranial seta, *vcs* – ventral cranial seta.

Thorax (Figure 6). Pronotal shields sclerotised, meso- and metanotum each with two folds: pro- and postdorsum. Spiracle unicameral, situated at intersegmental septum near pedal lobe. Prothorax with twelve setae: pronotum with seven (long *prns*1–6 and one short *prs*), epipleurum distinct with three setae of similar length (*dpls*1–2 and one *vpls*). Sternum outside pedal lobe with two setae (one *sts* and one *msts*). Pedal area on prothorax much more sclerotised than other two, with six setae of similar length

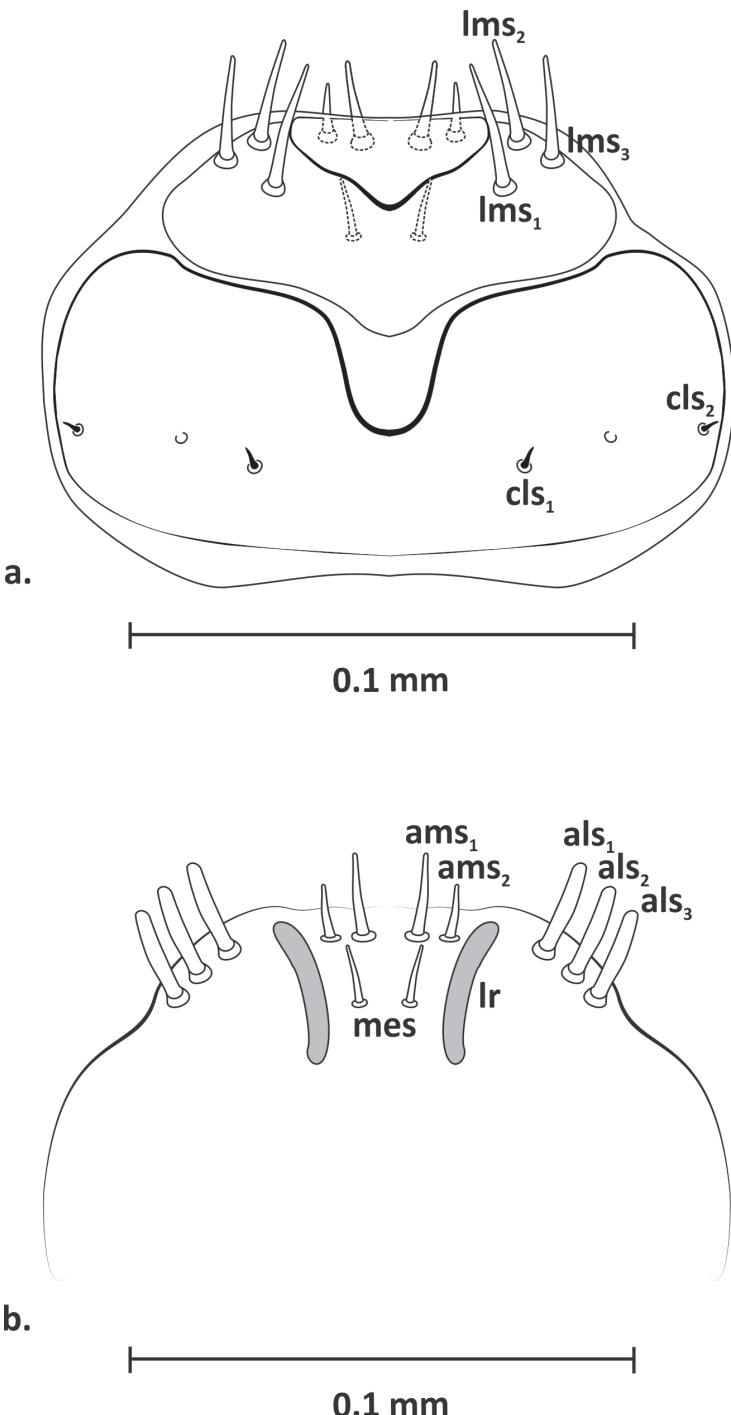


Figure 3. Mature larva (L_3), clypeus and labrum, dorsal view (a): *cls* – clypeal seta, *lms* – labral seta; epipharynx, ventral view (b): *als* – anterolateral epipharyngeal seta, *ams* – anteromedian epipharyngeal seta, *lr* – labral rod, *mes* – median epipharyngeal seta.

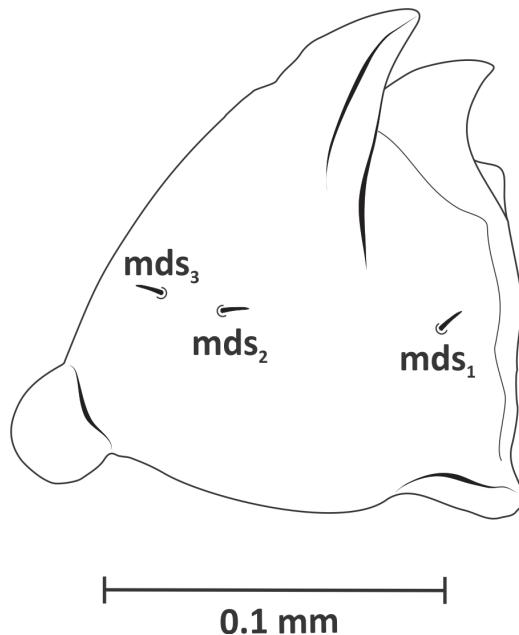


Figure 4. Mature larva (L_3), left mandible, dorsal view: mds – mandibular dorsal seta.

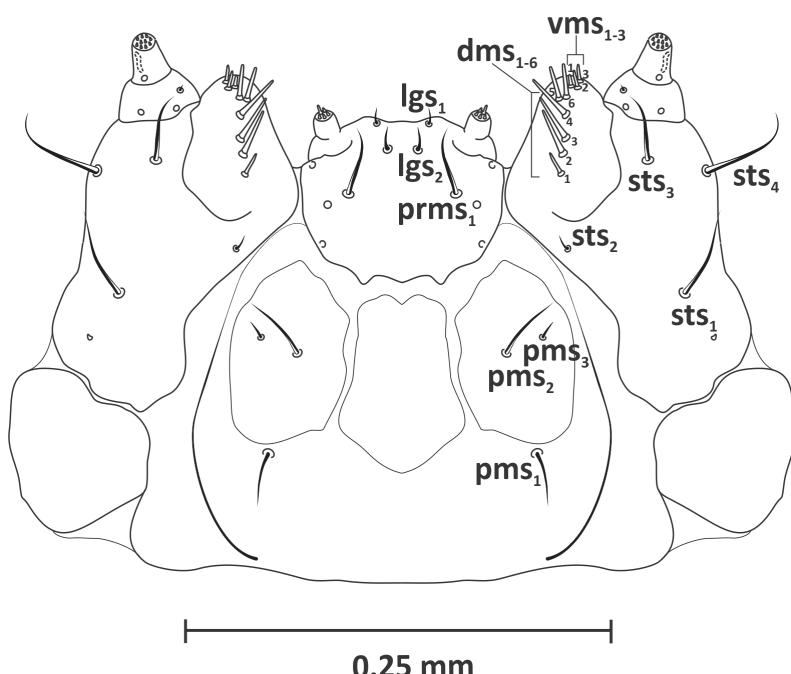


Figure 5. Mature larva (L_3), maxillae and labium (L_3): dms – dorsal malar seta, lgs – ligular seta, sts – stiptal seta, pms – postmental seta, $prms$ – premental seta, vms – ventral malar seta.

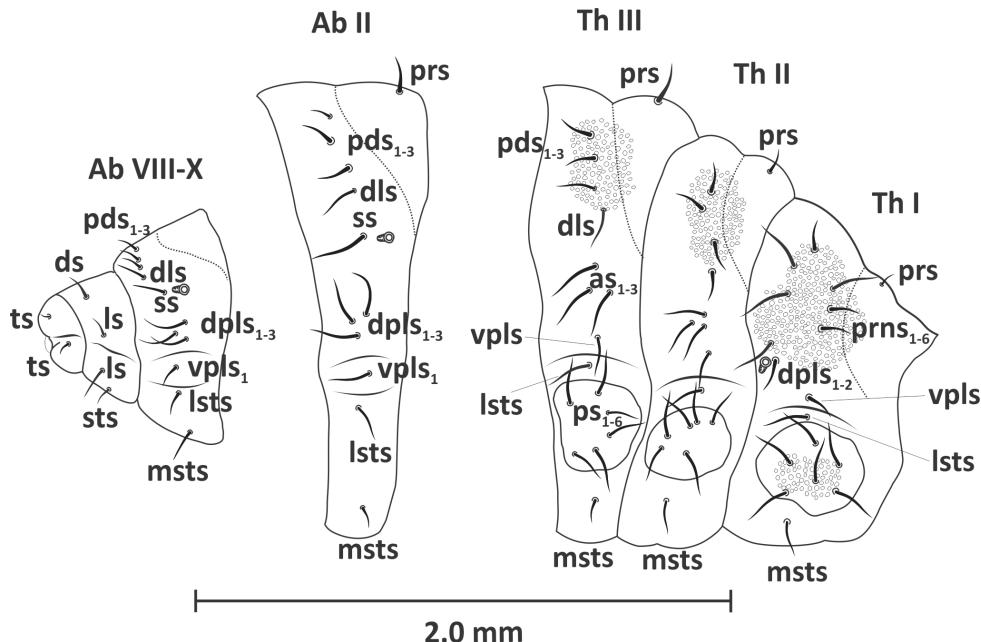


Figure 6. Mature larva (L_3), selected segments, lateral view: *as* – alar seta, *dls* – dorsolateral seta, *dpls* – dorsopleural seta, *ds* – dorsal seta, *ls* – lateral seta, *lsts* – laterosternal seta, *msts* – mediosternal seta, *pds* – postdorsal seta, *prs* – prodorsal seta, *prns* – pronotal seta, *ps* – pleural seta, *ss* – spiracular seta, *sts* – sternal seta, *ts* – terminal seta, *vpls* – ventropleural seta.

(*ps*₁₋₆) on all segments of thorax. Chaetotaxy of meso- and metathorax analogous, consisting of eleven setae: mesonotum with five setae (*pds*₁₋₃, one *prs* and one *dls*). Epipleurum with four setae (*as*₁₋₃ and one *vpls*), sternum with two setae (one *lsts* and one *msts*). Pedal areas of meso- and metathorax unsclerotised.

Abdomen (Figure 6). Abdominal segments I-VII of similar shape. Tergites I-VII with two folds, prodorsum with one seta on ridge (*prs*₁), postdorsum with five setae: four located dorsally (*pds*₁₋₃, *dls*₁) and one, longest seta (*ss*) on spiracular area. Epipleurum with four setae (*dpls*₁₋₃ and 1 *vpls*), sternum with two setae (one *lsts* and one *msts*). Segments I-VIII with unicameral spiracles, others (IX-X) without spiracles. Segment VIII with two folds, setae arranged as on segments I-VII, except for lack of seta *prs*. Segment IX with four setae, two on pleura (one *ds* and one *ls*) and two on sterna (one *ls* and one *sts*). Segment X with two small setae, one on pleura and one on sterna (both *ts*).

Description of pupa. (Figs 7–9, Table 2) *Measurements* (in mm). Body length: 3.32–3.40 (mean 3.35), width (between the apex of mesofemora) 1.90–1.98 (mean 1.92).

Colouration. Yellow-brown with distinct chaetotaxy.

Head (ventral view): rostrum reaches end of mesothorax, with one short seta (*drs*) apically. Head with distinct eyes and one seta (*sos*) at their inner edge. Antennae at base of rostrum. Massive. **Thorax:** pronotum wider than long, trapezoid-shaped,

Table 2. Differences of the pupa of *Rhinusa neta* and *R. bipustulata* based on the publications of Scherf 1964, Anderson 1973, Gosik 2010a, and on personal research.

	<i>Rhinusa neta</i>	<i>Rhinusa bipustulata</i>
Body	length 3.35 mm (mean), width (between the apex of mesofemora) 1.92 mm (mean), yellow-brown	length 2.9–5.0 mm, width (between the apex of mesofemora) 1.50–2.60 mm, white or yellowish
Head	rostrum with 1 seta (<i>drs</i>), head with 1 seta (<i>sos</i>)	rostrum with 3 setae – 2 <i>drs</i> , 1 <i>es</i> , head with 2 setae (<i>brs</i>)
Thorax	pronotum: 8 setae: 2 <i>aps</i> , 3 <i>lps</i> , 2 <i>bps</i> , 1 <i>dps</i> , all femora with 1 long seta (<i>fes</i>)	pronotum: 9 setae: 2 <i>aps</i> , 3 <i>lps</i> , 2 <i>bps</i> , 2 <i>dps</i> , all femora with 2 long setae (<i>fes</i>)
Abdomen	dorsal part of segments I–VIII with 4 setae of unequal length in one row and 2 of setae located laterally on pleural area III–VIII ventral part of segments I–VIII with 4 of setae, of which 1 medial is longer and 3 shorter, arranged in row abdominal segment VIII with 4 setae of unequal length located dorsally, 1 lateral slightly shorter and 4 short setae located ventrally in regular line abdominal segment IX without setae pseudocerci (urogomphi) longer, clearly visible	dorsal part of segments I–VIII with 4 setae of unequal length in one group (3) and 1 seta located laterally and 1 seta on pleural area I–VIII ventral part of segments I–VII with 5 short setae distributed in regular lines abdominal segment VIII with 2 microsetae located dorsally and 2 short, thin setae located ventrally abdominal segment IX with 3 microsetae located ventrally pseudocerci (urogomphi) very short, poorly visible

with two distinct, highly sclerotised, bare tubercles at anterior margin, with eight long setae: *aps*1–2, *lps*1–3, *dps*2, and *bps*1–2 (Figs 7–9). Mesonotum longer than metanotum. Latter with two clearly visible scutellar shields posteriorly. Dorsal part of meso- and metanotum with three setae (*msns*, *mtns*) of unequal length located laterally. All femora with one long, thin seta (*fes*) located apically. *Abdomen*: tergites I–VII with four setae in one row slightly beyond midpoint of segment. Longest located near lateral outer margin, on segments I–V below spiracle entrance, on others (VI–VII) centrally. Of three remaining setae, two short – centrally located and third from middle of segment, second from centre somewhat shorter, but clearly shorter than outer seta. Segment VIII with four setae, shortest located medially, longest approx. three times longer than first. Segment IX with one distinct urogomphi, darker, bent back, highly chitinised (pseudocerci – *pc*) (Figs 7, 8). Sternites: segments I–VIII with four setae arranged in one row, of similar length except longest pair located medially (Figs 7, 9). Spiracles on abdominal segments I–V placed laterally, functional. Pleurites (III–VIII) with seta of equal length, slightly shorter and curved on segment VIII, pleurites (I–II) without setae (Figure 7).

Biological information. After overwintering, adults emerge in May and June, depending on weather conditions in the year (Burakowski et al. 1997; Wilson et al 2005). Initially, they feed on the vegetative parts of plants, and after the inflorescence has been formed they feed on the generative parts. After copulation, the females lays eggs into channels bored in the seed capsules and then uses excrement to seal the hole. One or two larvae were usually observed in one seed capsule. Approximately 10–12 days after eggs were laid eggs in the laboratory, L₁ larvae appeared, which fed on the seeds without causing them to swell. The full larval stage lasted on average 29 days, followed by pupation. This stage lasted approximately 18 days. The full development

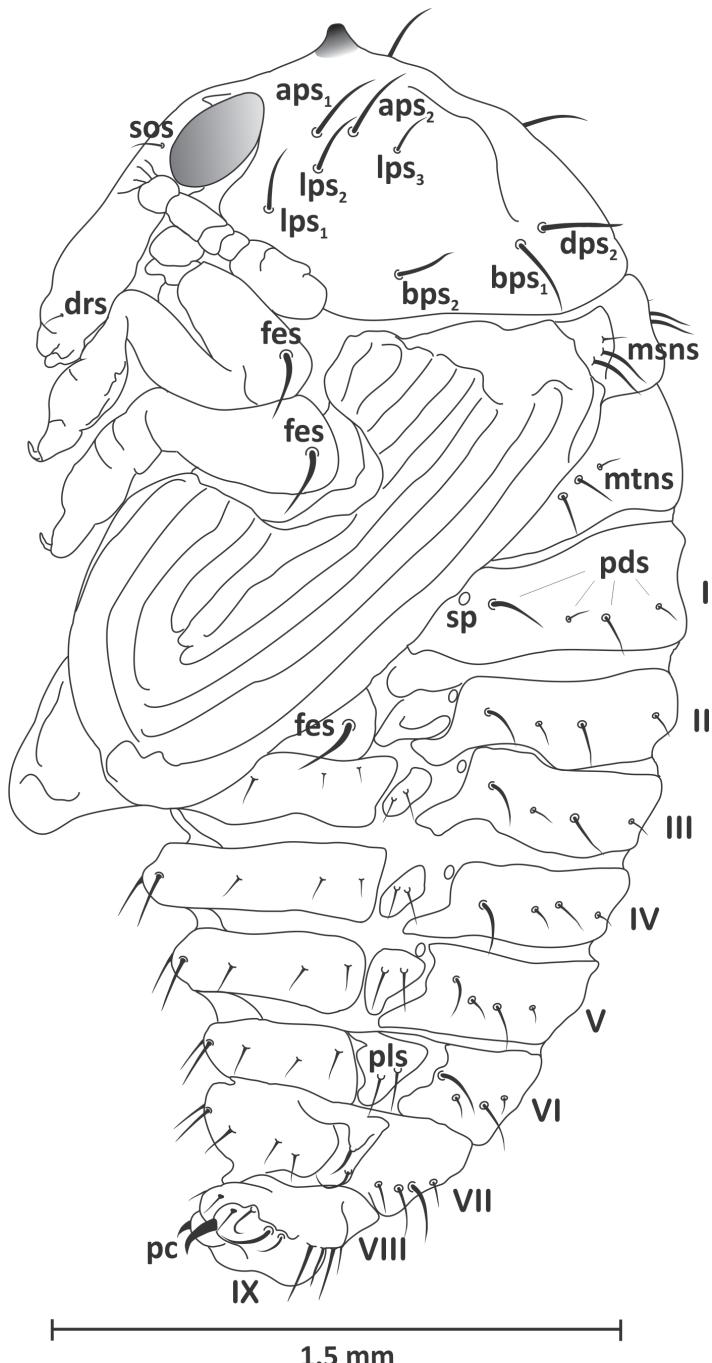


Figure 7. Pupa, lateral view: *aps* – apical pronotal seta, *bps* – basal pronotal seta, *dps* – discal pronotal seta, *drs* – distrorostral seta, *fes* – femoral seta, *lps* – lateral pronotal seta, *msns* – mesonotal seta, *mtns* – metanotal seta, *pds* – postdorsal seta, *pls* – pleural seta, *pc* – pseudocerci, *sos* – supraorbital seta, *sp* – spiracle.

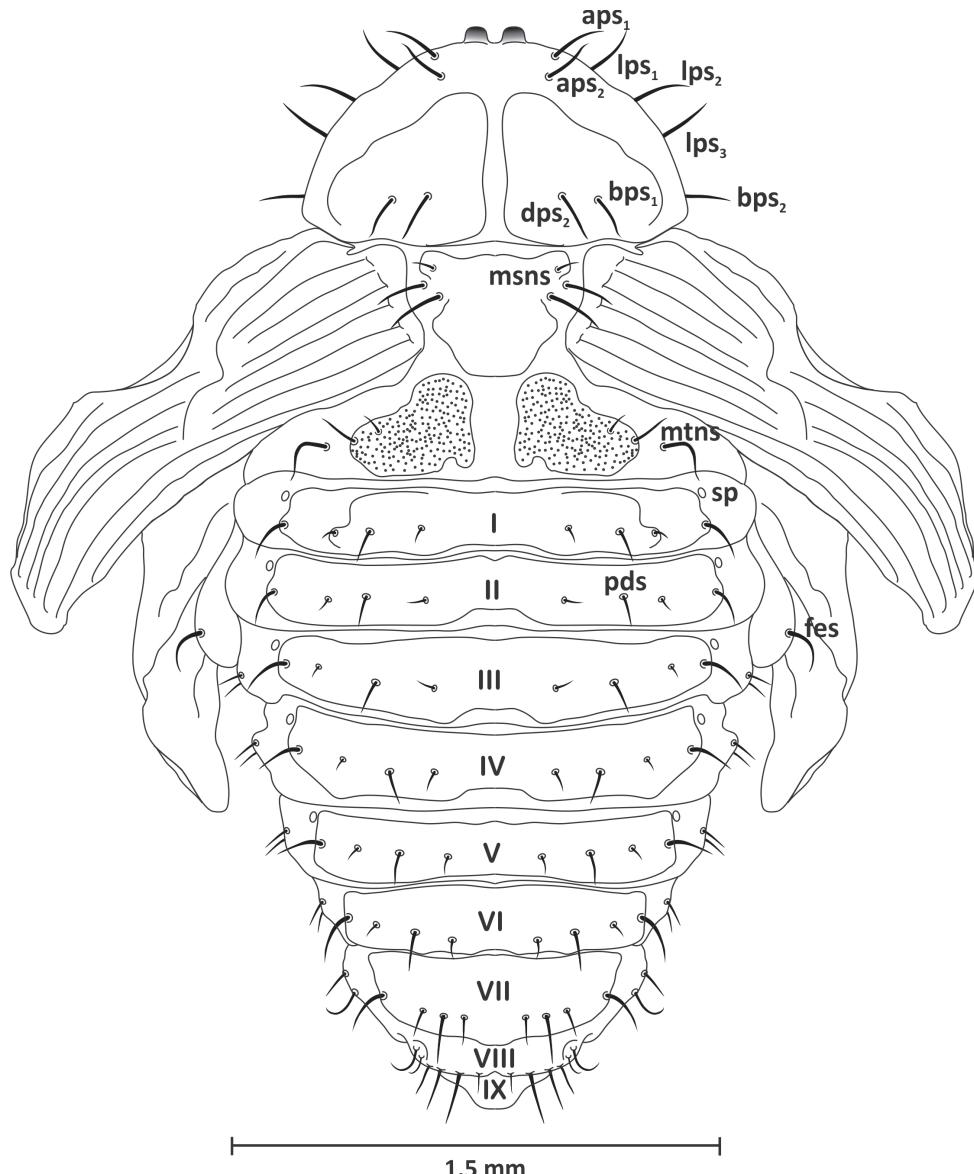


Figure 8. Pupa, dorsal view: *aps* – apical pronotal seta, *bps* – basal pronotal seta, *dps* – discal pronotal seta, *fes* – femoral seta, *lps* – lateral pronotal seta, *msns* – mesonotal seta, *mtns* – metanotal seta, *pds* – postdorsal seta, *sp* – spiracle,

cycle of the beetle in laboratory conditions averaged 58 days. Some larvae died in the seed capsules, having been attacked by parasitic hymenopterans of the superfamily Chalcidoidea, with parasitism reaching 20%. Species complete one generation per year and the new generation of adults emerge in August and September.

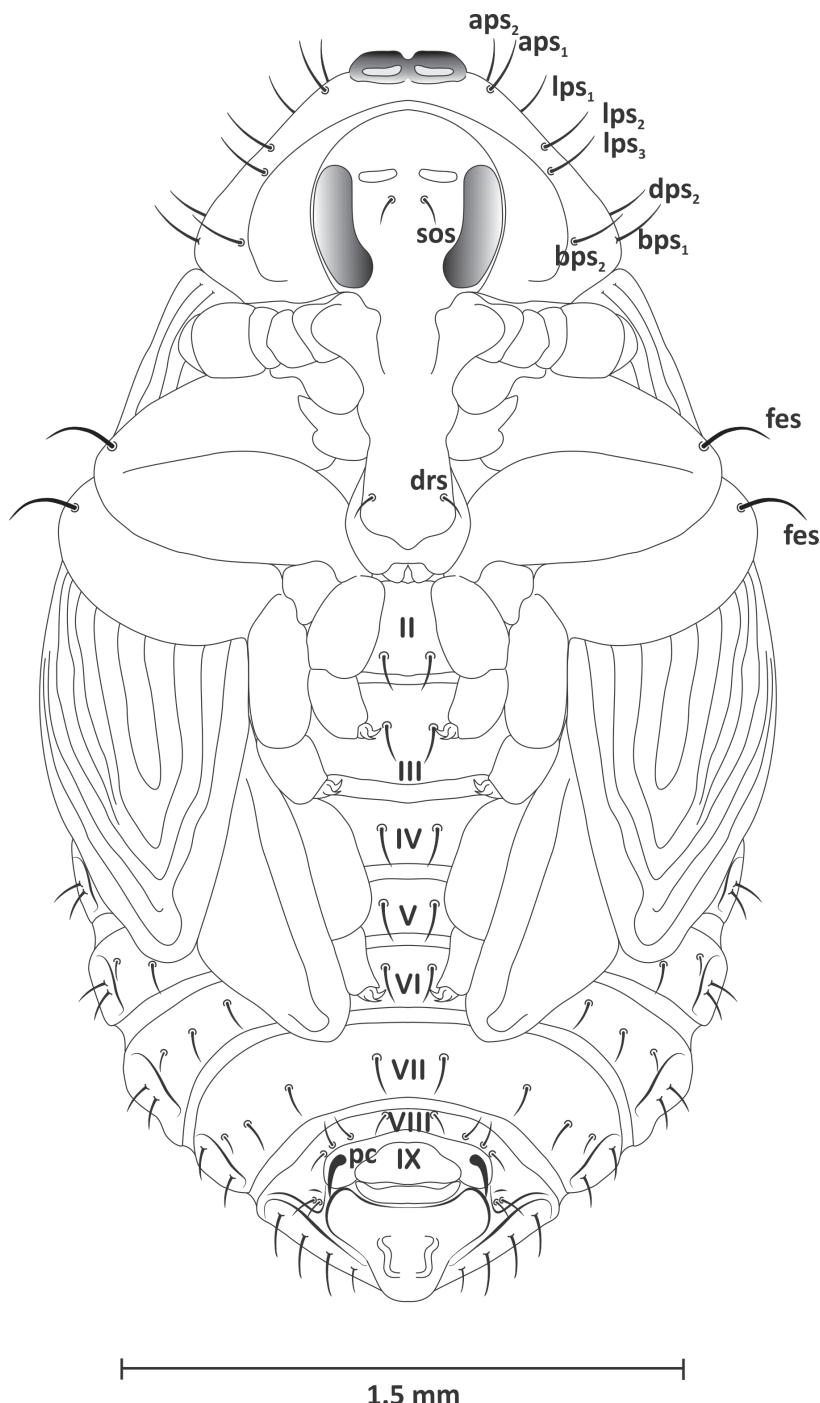


Figure 9. Pupa, ventral view: *aps* – apical pronotal seta, *bps* – basal pronotal seta, *dps* – discal pronotal seta, *drs* – distrirostral seta, *fes* – femoral seta, *lps* – lateral pronotal seta, *pc* – pseudocerci, *sos* – supraorbital seta.

Discussion

In the last ten years a number of studies by various authors have described the larval and pupal morphology of several taxa of Curculionoidea (Curculionidae, Apionidae): Lixinae (Gosik and Skuhrovec 2011; Gosik and Wanat 2014; Skuhrovec and Volovnik 2015; Trnka et al. 2015, 2016), Tychiini (Skuhrovec et al. 2014, 2015; Gosik et al. 2017), Ceutorhynchinae (Gosik 2010b), *Bagous* (Gosik 2008), Hyperini (Skuhrovec 2006, 2007; Skuhrovec and Bogusch 2016), Entiminae (Gosik and Sprick 2013; Gosik et al. 2016), Molytinae (Sprick and Gosik 2014; Arzanov 2016) and Apionidae (Gosik et al. 2010; Wang et al. 2013; Łętowski et al. 2015). However, within the tribe Mecinini there are only two studies providing detailed descriptions of certain preimaginal stages of a few taxa (Gosik 2010a; Jiang and Zhang 2015).

In the genus *Rhinusa*, the most detailed morphology of immature stages in Europe can be found only for the species *R. bipustulata* in a study by Gosik (2010). For the remaining, fragmentarily described species, the only such studies are publications by Emden (1938) (larvae: *R. antirrhini*, *R. collina*, *R. neta*), Scherf (1964) (larvae: *R. antirrhini*, *R. bipustulata*, *R. collina*, *R. linariae*, *R. neta*, *R. tetra* and pupae: *R. antirrhini*, *R. bipustulata*, *R. collina*, *R. linariae*) and Anderson (1973) (larvae: *R. antirrhini*, *R. neta*, *R. tetra* and pupae: *R. antirrhini*, *R. neta*, *R. tetra*). For the very closely related genus *Gymnetron*, the immature stages of three species (*G. miyoshii* Miyoshi, 1922, *G. auliense* Reitter, 1907 and *G. vittipenne* Marseul, 1876) have recently been described (Jiang and Zhang 2015).

A study by Emden (1938) includes key characters by which the larvae of *R. neta* can be distinguished from *R. antirrhini* and *R. collina*. *R. neta* has a lighter, brownish-yellow head with a coarsely granulate frons. In addition, this species has 2–3 basal bristles of the maxillary mala that are more prominent than the others (Figure 5).

Scherf (1964) presents only few data on the biology of *R. neta* larvae, regarding its spectrum of host plants, feeding site, and the shape of the cecidia it causes. A work by Anderson (1973) presents graphics illustrating the frons of *R. neta* with an identical arrangement of setae (but unnumbered and unnamed) as in the present study, as well as characteristic, transverse asperities on its surface, making the L_3 larvae easily distinguishable from *Rhinusa antirrhini*, which also feeds on the seeds of *Linaria* sp. (in which the frons of the L_3 larva is smooth). Another distinctive character of *R. neta* is the presence of a long endocarina extending 4/5 of the length of the frons. On the epipleuron and pleuron of the abdominal segments (I–VIII) of the L_3 larvae, there is a group of setae *dpls*1–3 and *vpls*1, which differs from the typical arrangement found in weevils (*dpls*1–2 and *vpls*1–2), but is confirmed in the key by Anderson (1973), according to which the three epipleural setae *dpls* distinguish *R. neta* from *R. antirrhini*, which has only two.

The number of setae on the dorsal surface of mandible within the Curculionidae family usually varies from 0 to 2. On this surface, there are also sensillae in the number of 0 to 3. The mandible of the discussed taxon generally resembles the system present in Ceutorhynchinae in terms of the setae and sensillae system (Scherf 1964), except that *R. neta* has three setae of similar length arranged in one line. The arrangement of the three setae at the mandible surface discussed in the paper is unique within this family.

In regard to the characters contained in the key by Marvaldi (2003) describing the length of a few setae on the frons (*fs4*, *des5*, and *les*), they are also well visible in this species, but setae *fs5*, *des3*, and *les2* are well developed as well. On the other hand, the lengths of setae *fs4* and *fs5*, which in Curculionidae sensu lato should be at least of similar length (or *fs4* should be longer), are not in agreement. In *R. neta* the pattern is reversed, as *fs5* is longer than *fs4*. A similar relationship between the lengths of these two setae is also reported in a study on *R. bipustulata* (Gosik 2010a), where *fs5* is designated as *fs3*.

As regards the biology of species, in addition to *Rhinusa* taxa, data on *R. pilosa* have been published as well (Gassmann et al. 2014). Phylogenetic research by Caldara et al. (2010), based on morphological data and host plants, indicates that the taxa most closely related to *R. neta* are *R. collina* (which is also confirmed in the key by Emden (1938)), *R. eversmanni*, *R. canescens* and *R. soluta*, but their preimaginal stages have not yet been described in detail. The similarities and differences between the larvae and pupae of *R. neta* and *R. bipustulata*, which has been studied in the greatest detail by Gosik (2010a), are presented below. The most significant differences between these species in the case of the L₃ larval instars and pupae are shown in bold in Tables 1 and 2.

The information given in the two tables, grouping all available differences in the morphological structure of the L₃ larva and pupa, can be used to prepare more detailed keys, both between the taxa given above and at the level of the tribe.

In the case of the pupae of the two taxa, the differences are in the number and location of the pairs of setae on the rostrum and head, number of pairs of setae on the prothorax, number of setae on the femora, location of the setae on the tergites, number of setae on the pleurites, number of setae on the sternites of segments I-IX, and length of the pseudocerci (or urogomphi).

Data presented by Wilson et al. (2005) indicate that in Canada the development cycle of *R. neta* lasts ca. 40–60 days, including 20–30 days for the larval stages and 10–15 days for the pupal stage.

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Checklist of *Epicauta* Dejean from America (Meloidae, Meloinae, Epicautini)

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Abstract

This paper presents a comprehensive list of American *Epicauta*. Two hundred and sixty-four named species were recorded in this checklist based primarily on literature and museum records. Seventy-two species were included in the subgenus *Macrobasis* and 192 species into the nominotypic subgenus. Nomenclatural modifications are provided for *E. langei* Borchmann and *E. nigripes* Borchmann, both junior synonyms of *E. pilme* (Molina); *E. albicincta* Borchmann, junior synonym of *E. suturalis* (Haag-Rutenberg); *E. lugubris* Denier, junior synonym of *E. tristis* (Mäklin); and *E. wagneri* Pict, junior synonym of *E. vicina* (Haag-Rutenberg). Three hundred and ninety-two new records for South America are provided.

Keywords

blister beetles, Epicautini, new records, review

Introduction

Reviews of American *Epicauta* Dejean (1834) were compiled by several authors in different contributions (Werner 1945, 1954, 1955, 1957, 1958, 1973; Kaszab 1953, 1969; Pinto 1975, 1980, 1984, 1999; Admas and Selander 1979; Selander 1982; Selander and Mathieu 1969; Ballmer 1980). The most recent reviews of North and Cen-

tral America were compiled by Pinto (1999) and García-París et al. (2007) and they listed a total of 173 and 124 respectively. There are no contributions for South America that include *Epicauta* in a catalogue. The reviews are gathered mostly from works dating to the last century, such as Berg 1881, 1883; Burmeister 1881; Horn 1873; Brèthes 1910, 1915; Borchmann 1917, 1930, 1937, 1940; Denier 1933a, b, 1934, 1935a, b, 1940; Pic 1928; Blackwelder 1945; Werner 1945, 1954, 1955; Martínez 1951, 1952, 1954, 1955, 1958, 1959, 1992; MacSwain 1956; Adams and Selander 1979; Selander 1981a b, 1982, 1984, 1991; Selander and Mathieu 1969; Agafitei and Selander 1980; Kaszab 1959, 1960; 1963a, b; and Pinto 1975, 1980, 1984, 1991. In fact, the South American species are listed in the old catalogue of Blackwelder (1945) which includes others North and Central American *Epicauta* species. The need to verify and update the checklist of Americas *Epicauta* became evident after the authors presented numerous new records for South America and saw the need to include all species of *Epicauta* in a single and updated catalogue.

Materials and methods

The species of *Epicauta* were arranged in the order of the reviews of Pinto (1991) and the distribution data were compiled analysing all the available publications and museum data from the following institutions: Museo de La Plata, La Plata, Argentina (**MLPA**) (see Campos-Soldini et al. 2009), Instituto y Fundación Miguel Lillo, Tucumán, Argentina (**IMLA**), Museo de Ciencias Naturales “Florentino Ameghino” (**MCNFA**), and Museo Argentino de Ciencias Naturales ‘Bernardino Rivadavia’, Buenos Aires, Argentina (**MACN**), and the private collection of Barriga-Tuñón.

For seasonal distribution and information on larval stages see Selander and Weddle (1969), Pinto (1980, 1991), Bologna (1991), and Pinto and Bologna (1999). For identification keys to *Macrobasis* and the nominotypical subgenus from North and Central America see Pinto (1991). For host plants and identification keys to *E. bella* group, *E. vittata* group, and *E. maculata* group from South America see Campos-Soldini (2011), Campos-Soldini and Roig-Juñent (2011), and Campos-Soldini and Roig-Juñent (2015), respectively. Junior synonyms are provided for each species when applicable.

Results

Two hundred and sixty-four named species are recorded in this checklist based primarily on the literature and museum records. Seventy-two species are included in the subgenus *Macrobasis* and 192 species into the nominotypical subgenus. Nomenclatural modifications are provided for *E. langei* Borchmann and *E. nigripes* Borchmann junior synonym of *E. pilme* (Molina), *E. albicincta* Borchmann junior synonym of *E. suturalis* (Haag-Rutenberg), *E. lugubris* Denier junior synonym of *E. tristis* (Mäklin) and *E. wagneri* Pict junior synonym of *E. vicina* (Haag-Rutenberg). Three hundred and nine-

ty-two new records for South America are provided for the following species: *E. adspersa* (Klug); *E. aemula* (Fischer); *E. albomarginata* (Mäklin); *E. anthracina* (Erichson); *E. assimilis* (Haag-Rutembreg); *E. aterrima* (Klug); *E. avellanea* Denier; *E. aymara* Denier; *E. bosqi* Denier; *E. bruchi* Borchmann; *E. brunneipennis* (Haag-Rutembreg); *E. carmelita* (Haag-Rutenberg); *E. caustica* Rojas; *E. clericalis* (Berg); *E. costipennis* Borchmann; *E. curticollis* Borchmann; *E. diagramma* (Burmeister); *E. excavata* (Klug); *E. flavogrisea* (Burmeister); *E. floydwerneri* Martínez; *E. franciscana* Denier; *E. fulvicornis* (Burmeister); *E. fumosa* (Germar); *E. grammica* (Fischer); *E. griseonigra* (Fairmaire); *E. hieroglyphica* (Haag-Rutenberg); *E. inconstans* (Fischer); *E. koehleri* Denier; *E. kraussi* (Haag-Rutenberg); *E. leopardina* (Hagg-Rutenberg); *E. lizeri* Denier; *E. luctifera* (Fairmaire); *E. minutepunctata* Borchmann; *E. missionum* (Berg); *E. montei* Denier; *E. natateri* Haag-Rutenberg; *E. nigropunctata* Blanchard; *E. philaemata* (Klug); *E. pilme* Molina; *E. pluvialis* Borchmann; *E. pullata* (Berg); *E. purpureiceps* (Berg); *E. riojana* (Fairmaire); *E. rutilifrons* Borchmann; *E. sanguinithorax* (Haag-Rutenberg); *E. semi-vittata* (Fairmaire); *E. subvittata* (Erichson); *E. suturalis* (Haag-Rutenberg); *E. talpa* (Haag-Rutenberg); *E. tristis* (Mäklin); *E. vicina* (Haag-Rutenberg); *E. vidua* (Klug); *E. xanthomera* (Fischer); *E. xanthocephala* (Klug); *E. yungana* Denier; and *E. zebra* (Dohrn) (Figs 1–9). *Epicauta rutilifrons* is the only species with its new records not mapped because it did not have reference points.

Checklist

Epicautini Denier, 1935

Epicauta Dejean, 1834

[†]*Epicauta sanctoruensis* Zaragoza-Caballero & Velasco-de León, 2003

Species of *Epicauta* (*Maculata*)

Epicauta (*Macrobasis*) *alastor* Skinner, 1904

Epicauta alastor Skinner, 1904: 217; Werner 1945: 436; 1954: 27; Werner et al. 1966: 46; Selander and Mathieu 1969: 15; Pinto 1991: 69.

Distribution. Mexico, United States.

Location. Mexico: Sinaloa, Sonora. United States: Arizona, California, Texas.

Epicauta (*Macrobasis*) *albida* (Say, 1824)

Lytta albida Say, 1824: 305.

Lytta luteicornis LeConte, 1854: 84.

Cantharis albida: Gemminger and Harold 1870: 2147.

Macrobasis albida: LeConte, 1863–66: 68; Horn 1873: 89; Snow 1879: 69; Dugès 1889: 57; Champion 1891–93: 397; Chittenden 1903: 26; Fall and Cockerell 1907: 209.

Epicauta albida: Denier 1935: 152; Werner 1945: 511; Blackwelder 1945: 482; Dillon 1952: 403; MacSwain 1956: 55; Parker and Wakeland 1957: 26; Selander and Mathieu 1969: 110; Pinto 1991: 69.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, Nuevo León, Tamaulipas. United States: Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, Wyoming.

***Epicauta (Macrobasis) alpina* Werner, 1944**

Epicauta alpina Werner, 1944: 67; Werner et al. 1966: 49; Pinto 1991: 80.

Distribution. United States.

Location. United States: Arizona, New Mexico, Texas.

***Epicauta (Macrobasis) apicalis* Dugès, 1889**

Epicauta apicalis Dugès, 1889: 410; Denier 1935: 152; Blackwelder 1945: 482; Pinto 1991: 75.

Distribution. Mexico.

Location. Mexico: Nayarit.

***Epicauta (Macrobasis) arizonica* Werner, 1944**

Epicauta arizonica Werner, 1944: 72; 1966: 48; Selander 1982: 797; Pinto 1991: 71.

Distribution. Mexico, United States.

Location. Mexico: Baja California Sur, Chihuahua, Nayarit, Sonora. United States: Arizona.

***Epicauta (Macrobasis) atricolor* Champion, 1892**

Epicauta atricolor Champion, 1892: 419; Denier 1935: 152; Blackwelder 1945: 482; Werner 1954: 27; 1958: 1; Pinto 1982: 405; 1991: 80; 1991: 80.

Distribution. Mexico.

Location. Mexico: Morelos, Oaxaca, Veracruz.

***Epicauta (Macrobasis) atripilis* Champion, 1892**

Epicauta atripilis Champion, 1892: 410; Denier 1935: 152; Blackwelder 1945: 482; Pinto 1991: 75.

Distribution. Mexico.

Location. Mexico: Oaxaca, Veracruz.

Epicauta (Macrobasis) atrivittata (LeConte, 1854)

Lytta atrivittata LeConte, 1854: 224.

Macrobasis atrivittis [sic]: LeConte 1863–66: 68 (lapsus calami).

Cantharis atrivittata: Gemminger and Harlod 1870: 2148.

Macrobasis atrivittata: Horn 1873: 90; Snow 1907: 186; Fall and Cockerell 1907: 209.

Epicauta atrivittata: Denier 1935: 152; Selander and Mathieu 1969: 88; Pinto 1991: 70.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango. United States: Arizona, New Mexico, Texas.

Epicauta (Macrobasis) balli Werner, 1945

Epicauta balli Werner, 1945: 460; Werner et al. 1966: 34; Pinto 1991: 81.

Distribution. United States.

Location. United States: Arizona.

Epicauta (Macrobasis) bekeri (Dugès, 1889)

Epicauta bekeri Dugès, 1889: 113.

Macrobasis bekeri: Champion 1892: 400.

Epicauta bekeri: Denier 1935: 153; Blackwelder 1945: 482; Werner 1949: 76; Pinto 1991: 72.

Distribution. Mexico.

Location. Mexico: Colima, Durango, Morelos, Nayarit.

Epicauta (Macrobasis) bipunctata Werner, 1958

Epicauta bipunctata Werner, 1958: 7; Selander and Ahafitei 1982: 200; Pinto 1991: 81.

Distribution. Mexico.

Location. Mexico: Guerrero, Jalisco, Morelos.

Epicauta (Macrobasis) borrei Werner, 1958

Lytta fumosa Haag-Rutenberg, 1880: 40, nec Germar, 1824.

Cantharis borrei Dugès, 1881: 145.

Macrobasis borrei Horn, 1885: 107.

Macrobasis fumosa: Champion 1899: 178.

Epicauta borrei: Denier 1935: 153; Blackwelder 1945: 482; Pinto 1991: 81.

Distribution. Mexico.

Location. Mexico: Aguascalientes, Durango, Guanajuato, Jalisco, Mexico, Michoacán, Zacatecas.

Epicauta (Macrobasis) candezi (Haag-Rutenberg, 1880)

Lytta candezi Haag-Rutenberg, 1880: 43.

Epicauta diversicornis: Champion 1892: 399 (in part).

Epicauta candezi: Werner 1949: 76; Pinto 1991: 72.

Distribution. El Salvador, Guatemala, Mexico.

Location. El Salvador and Guatemala: country labeled only. Mexico: Chiapas, Yucatán.

Epicauta (Macrobasis) cinereiventris Champion, 1892

Epicauta cinereiventris Champion, 1892: 411; Denier 1935: 154; Blackwelder 1945: 483; Pinto 1991: 75.

Distribution. Mexico.

Location. Mexico: Chiapas, Guerrero.

Epicauta (Macrobasis) croceicincta Dugès, 1881

Cantharis croceicincta Dugès, 1881: 143; Champion 1892: 42.

Epicauta croceicincta: Denier 1935: 154; Blackwelder 1945: 483; Werner 1954: 27; Pinto 1991: 75.

Distribution. Mexico.

Location. Mexico: Guanajuato, Jalisco.

Epicauta (Macrobasis) disparilis (Champion, 1892)

Macrobasis disparilis Champion, 1892: 398.

Epicauta disparilis: Denier 1935: 154; Blackwelder 1945: 483; Werner 1973: 463; Pinto 1991: 78.

Distribution. Mexico.

Location. Mexico: Guerrero, Puebla.

Epicauta (Macrobasis) distorta (Champion, 1892)

Macrobasis distorta Champion, 1892: 396.

Epicauta distorta: Denier 1935: 154; Blackwelder 1945: 483; Werner 1973: 463; Pinto 1991: 79.

Distribution. Costa Rica, Honduras, Mexico, Nicaragua.

Location. Mexico: Guerrero.

***Epicauta (Macrobasis) diversicornis* (Haag-Rutenberg, 1880)**

Lytta diversicornis Haag-Rutenberg, 1880: 42.

Lytta pallida Haag-Rutenberg, 1880: 42.

Macrobasis flavens Dugès, 1889: 58.

Epicauta diversicornis: Denier 1935: 154; Blackwelder 1945: 483; Werner 1949: 76;

Pinto 1991: 72.

Distribution. Mexico.

Location. Mexico: Guerrero, Hidalgo, Jalisco, Mexico, Michoacán, Morelos, Sinaloa, Sonora.

***Epicauta (Macrobasis) dohrni* (Haag-Rutenberg, 1880)**

Lytta dohrni Haag-Rutenberg, 1880: 45.

Lytta bimaculosa Kirsch, 1886: 336.

Lytta bogotensis Pic, 1916: 9.

Epicauta dohrni: Champion 1892: 409; Denier 1935: 22; Blackwelder 1945: 483;

Pinto 1991: 73.

Distribution. Colombia, Panama: country labeled only.***Epicauta (Macrobasis) evanescens* Champion, 1892**

Epicauta evanescens Champion, 1892: 412; Denier 1935: 155; Blackwelder 1945: 483;

Pinto 1991: 76.

Distribution. Guatemala, Mexico.

Location. Guatemala: country labeled only. Mexico: Chiapas.

***Epicauta (Macrobasis) excors* (Fall, 1909)**

Macrobasis excors Fall, 1909: 166.

Epicauta excors: Denier 1935: 155; Werner 1945: 503; Pinto 1991: 79.

Distribution. Mexico.

Location. Mexico: Baja California Sur.

***Epicauta (Macrobasis) fabricii* (LeConte, 1853)**

Lytta cinerea Fabricius, 1798: 119, nec *Meloe cinereous* Forster, 1771.

Lytta fabricii LeConte, 1853: 343.

Lytta debilis LeConte, 1853: 344.

Cantharis fabricii: Gemminger and Harold 1980: 2150.

Epicauta murinoides Dillon, 1952: 409.

Epicauta fabricii: Werner et al. 1966: 46; Selander 1982: 820; Pinto 1991: 74.

Distribution. Canada, United States.

Location. Canada: Manitoba. United States: Arizona, Colorado, Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, Utah.

***Epicauta (Macrobasis) flagellaria* (Erichson, 1848)**

Lytta flagellaria Erichson, 1848: 566.

Cantharis flagellaria: Gemminger and Harold 1870: 2150.

Lytta intermedia Haag-Rutenberg, 1880: 56.

Epicauta intermedia: Blackwelder 1945: 483.

Epicauta flagellaria: Blackwelder 1945: 483; Werner 1949: 76; Pinto 1991: 72.

Distribution. Colombia: Barranquilla, Tolima, Panama, Trinidad, Venezuela.

***Epicauta (Macrobasis) flavocinerea* (Blatchely, 1910)**

Macrobasis flavocinereus Blatchely, 1910: 1359.

Epicauta flavocinerea: Denier 1935: 155; Werner 1945: 499; Pinto 1991: 74.

Distribution. Canada, United States.

Location. Canada: New Brunswick. United States: Colorado, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, North Dakota, South Dakota, Wisconsin, Wyoming.

***Epicauta (Macrobasis) forticornis* (Haag-Rutenberg, 1880)**

Lytta forticornis Haag-Rutembeerg, 1880: 41.

Epicauta forticornis: Denier 1935: 155; Blackwelder 1945: 483; Werner 1949: 75; Pinto 1991: 72.

Distribution. Mexico.

Location. Mexico: Guerrero, Morelos, Nayarit, Yucatán.

***Epicauta (Macrobasis) funesta* (Chevrolat, 1834)**

Lytta funesta Chevrolat, 1834: 3.

Cantharis funesta: Gemminger and Harold 1870: 2150.

Epicauta funesta: Champion 1892: 410; Denier 1935: 155; Blackwelder 1945: 483; Selander and Agafitei 1982: 200; Pinto 1991: 76.

Distribution. Mexico.

Location. Mexico: Puebla, Veracruz.

***Epicauta (Macrobasis) gissleri* (Horn, 1878)**

Macrobasis gissleri Horn, 1878: 58.

Epicauta gissleri: Denier 1935: 155; Werner 1945: 496; Werner et al. 1966: 52; Pinto 1991: 78

Distribution. United States.

Location. United States: Arizona, New Mexico, Texas.

Epicauta (Macrobasis) haroldi (Haag-Rutenberg, 1880)

Lytta haroldi Haag-Rutenberg, 1880: 44.

Epicauta haroldi: Champion 1892: 410; Denier 1935: 156; Blackwelder 1945: 483; Werner 1958: 1; Pinto 1991: 76.

Distribution. Costa Rica, Guatemala.

Epicauta (Macrobasis) hirsutipubescens (Maydell, 1934)

Macrobasis hirsutipubescens Maydell, 1934: 334.

Epicauta virgulata: Werner 1945: 512 (in part).

Epicauta hirsutipubescens: Denier 1940: 420; Werner 1949: 110; Werner et al. 1966: 51; Pinto 1991: 83.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Sonora. United States: Arizona, New Mexico, Texas.

Epicauta (Macrobasis) humeralis (Dugès, 1889)

Macrobasis humeralis Dugès, 1889: 58; Champion, 1892: 400.

Epicauta humeralis: Denier 1935: 156; Werner 1949: 76; Pinto 1991: 72.

Distribution. Mexico.

Location. Mexico: Morelos, Jalisco, Nayarit.

Epicauta (Macrobasis) immaculata (Say, 1824)

Lytta immaculata Say, 1824: 304.

Lytta articularis Say, 1824: 304.

Lytta fulvescens LeConte, 1854: 447.

Cantharis fulvescens: Gemminger and Harold 1870: 2150.

Cantharis immaculata: Gemminger and Harold 1870: 2151.

Macrobasis fulvescens: LeConte 1863-66: 68; Snow 1879: 69.

Macrobasis immaculata: LeConte 1863-66: 68; Horn 1873: 93; Ulke 1875: 862; Chittenden 1903: 26; Blatchley 1910: 1359; Milliken 1921: 7; Hatch and Ortenburger 1930: 13; Böving and Craighead 1931: 96; Carruth 1931: 53; Gilberston and Horsfall 1940: 5; Montgomery and Amos 1941: 254; Schwitzgebel and Wilbur 1942: 42.

Cantharis basalis Dugès, 1881: 144; 1889: 71.

Macrobasis basalis: Champion 1892: 402.

Epicauta immaculata: Denier 1935: 156; Werner 1945: 489; Dillon 1952: 407; MacSwain 1956: 52; Selander and Mathieu 1969: 113; Pinto 1991: 70.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, Tamaulipas, Veracruz. United States: Alabama, Arkansas, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Tennessee, Texas, West Virginia.

***Epicauta (Macrobasis) ingrata* Fall, 1907**

Epicauta ingrata Fall, 1907: 258; Denier 1935: 156; Werner et al. 1966: 45; Pinto 1991: 77

Distribution. United States.

Location. United States: Arizona, Colorado, New Mexico.

***Epicauta (Macrobasis) isthmica* Werner, 1949**

Epicauta isthmica Werner, 1949: 72; Pinto 1991: 73.

Distribution. Belize, Costa Rica, Honduras, Mexico, Nicaragua, Panama.

Location. Belize, Costa Rica, Honduras, Nicaragua, and Panama. Mexico: Querétaro, Veracruz.

***Epicauta (Macrobasis) labialis* (Dugès, 1881)**

Cantharis labialis Dugès, 1881: 145.

Macrobasis labialis: Dugès 1889: 86.

Ganospasta labialis: Champion 1892: 403.

Epicauta labialis: Selander 1954: 86; Werner 1958: 19; Pinto 1991: 81.

Distribution. Mexico.

Location. Mexico: Guanajuato, Jalisco.

***Epicauta (Macrobasis) languida* (Horn, 1895)**

Macrobasis languida Horn, 1895: 252.

Epicauta languida: Denier 1935: 156; Blackwelder 1945: 483; Werner 1945: 501; 1954: 113; Pinto 1991: 90.

Distribution. Mexico.

Location. Mexico: Baja California Sur.

***Epicauta (Macrobasis) lauta* (Horn, 1885)**

Macrobasis lauta Horn, 1885: 108.

Epicauta compressicollis Champion, 1892: 427.

Epicauta macroflexi Dillon, 1952: 414.

Epicauta lauta: Denier 1935: 156; Vaurie 1950: 86; Werner 1954: 27; Werner et al. 1966: 47; Selander 1982: 797; Pinto 1991: 78.

Epicauta lauta rossi Werner, 1949: 108.

Epicauta lauta lauta: Selander 1954: 86.

Distribution. Mexico, United States.

Location. Mexico: Baja California Sur, Chihuahua, Coahuila, Durango. United States: Arizona, California, New Mexico, Texas.

***Epicauta (Macrobasis) leoni* Dugès, 1889**

Epicauta leoni Dugès, 1889: 15; Denier 1935: 156; Blackwelder 1945: 483; Werner 1958: 15; Selander and Agafitei 1982: 200; Pinto 1991: 82.

Distribution. Mexico.

Location. Mexico: Michoacán, Nuevo León, San Luis Potosí, Tamaulipas.

***Epicauta (Macrobasis) liebecki* Werner, 1944**

Epicauta liebecki Werner, 1944: 72; Werner et al. 1966: 49; Pinto 1991: 73.

Distribution. United States.

Location. United States: Arizona.

***Epicauta (Macrobasis) linearis* (LeConte, 1858)**

Lytta linearis LeConte, 1858: 23.

Epicauta linearis: Denier 1935: 156; Werner 1945: 513; Selander 1954: 86; Werner et al. 1966: 56; Pinto 1991: 83.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Durango. United States: Arizona, New Mexico, Texas.

***Epicauta (Macrobasis) longicollis* (LeConte, 1853)**

Lytta longicollis LeConte, 1853: 343.

Macrobasis longicollis: LeConte 1863-66: 68; Horn 1873: 90; Champion 1891-93: 397; Snow 1906: 174; Fall and Cockerell 1907: 209; Cockerell and Harris 1925: 31.

Cantharis longicollis: Gemminger and Harold 1870: 2151.

Epicauta longicollis: Denier 1935: 156; 1940: 421; Blackwelder 1945: 483; Werner 1945: 508; Vaurie 1950: 35; Dillon 1952: 406; MacSwain 1956: 56; Selander and Mathieu 1969: 109; Pinto 1991: 71.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila. United States: Arizona, Colorado, Missouri, New Mexico, Texas.

***Epicauta (Macrobasis) maculifera* (Maydell, 1934)**

Macrobasis maculifera Maydell, 1934: 335.

Epicauta maculifera: Denier 1940: 421; Werner 1945: 514; 1973: 463; Werner et al. 1966: 50; Pinto 1991: 79.

Distribution. United States.

Location. United States: Arizona.

***Epicauta (Macrobasis) melanochroa* Wellman, 1910**

Cantharis nigra Dugès, 1870: 161.

Epicauta nigra: Dugès 1889: 76, nec Woodhouse 1800.

Epicauta melanochroa Wellman, 1910: 24 (n. repl. name); Werner 1958: 11; Pinto 1991: 82

Distribution. Mexico.

Location. Mexico: Guanajuato, Jalisco, Mexico, Michoacán, Morelos, Nayarit, Querétaro.

***Epicauta (Macrobasis) mimetica* (Horn, 1875)**

Cantharis mimetica Horn, 1875: 154.

Epicauta mimetica: Werner 1945: 453; 1958: 17.

Distribution. United States.

Location. United States: Texas.

***Epicauta (Macrobasis) murina* (LeConte, 1853)**

Cantharis unicolor Kirby, 1837: 241, nec *Cantharis unicolor* Faldermann, 1835.

Lytta murina LeConte, 1853: 344.

Cantharis murina: Gemminger and Harold 1870: 2152.

Epicauta murina: Werner 1945: 499; Pinto 1991: 74.

Distribution. Canada, United States.

Location. Canada: New Brunswick. United States: Colorado, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, North Dakota, South Dakota, Wisconsin, Wyoming.

***Epicauta (Macrobasis) nigrithibialis* Werner, 1958**

Epicauta nigrithibialis Werner, 1958: 5; Pinto 1991: 82.

Distribution. Mexico.

Location. Mexico: Coahuila.

***Epicauta (Macrobasis) niveolineata* (Haag-Rutenberg, 1880)**

Lytta niveolineata Haag-Rutenberg, 1880: 46.

Epicauta niveolineata: Denier 1935: 158; Blackwelder 1945: 483; Werner 1958: 4; Selander and Agafitei 1982: 200; Pinto 1991: 82.

Distribution. Mexico.

Location. Mexico: Chiapas, Guerrero, Oaxaca, Veracruz.

***Epicauta (Macrobasis) ochrea* (LeConte, 1853)**

Lytta ochrea LeConte, 1853: 342.

Cantharis ochrea: Gemminger and Harold 1870: 2152.

Cantharis protarsalis Dugès, 1877: 62.

Macrobasis ochrea: Champion 1892: 401.

Epcicauta monoliformis Dillon, 1950: 103.

Epicauta ochrea: Denier 1935: 158; Blackwelder 1945: 484; Werner 1945: 495; 1954:

106; Werner et al. 1966: 52; Pinto 1991: 78.

Distribution. Mexico, United States.

Location. Mexico: Guanajuato, Sonora. United States: Arizona, Oklahoma, Texas, Utah.

***Epicauta (Macrobasis) pacifica* Maydell, 1934**

Epicauta pacifica Maydell, 1934: 330; Denier 1940: 421; Blackwelder 1945: 484; Pinto 1991: 76.

Distribution. Mexico.

Location. Mexico: Jalisco.

***Epicauta (Macrobasis) parkeri* Werner, 1944**

Epicauta parkeri Werner, 1944: 71; 1945: 497; Werner et al. 1966: 53; Pinto 1991: 78.

Distribution. United States.

Location. United States: Arizona, Colorado, New Mexico.

***Epicauta (Macrobasis) polingi* Werner, 1944**

Epicauta polingi Werner, 1944: 71; Werner et al. 1966: 48; Selander 1982: 804; Pinto 1991: 73.

Epicauta luteola Dillon, 1952: 411.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Nuevo León, Tamaulipas. United States: Arizona, Texas.

***Epicauta (Macrobasis) prosopidis* Werner, 1973**

Epicauta prosopidis Werner, 1973: 461; Pinto 1991: 79.

Distribution. Mexico.

Location. Mexico: Durango.

***Epicauta (Macrobasis) punctum* (Dugès, 1870)**

Cantharis punctum Dugès, 1870: 158.

Epicauta punctum: Champion 1892: 410; Blackwelder 1945: 484; Pinto 1991: 76.

Distribution. Mexico.

Location. Mexico: Morelos, Oaxaca.

***Epicauta (Macrobasis) purpurea* (Horn, 1885)**

Macrobasis purpurea Horn, 1885: 108.

Epicauta purpurea: Werner 1945: 504; 1973: 463; Werner et al. 1966: 50; Pinto 1991: 79.

Distribution. Mexico, United States.

Location. Mexico: Durango, Sinaloa, Sonora. United States: Arizona.

***Epicauta (Macrobasis) segmenta* (LeConte, 1853)**

Lytta segmenta LeConte, 1853: 343.

Apterospasta segmentata: LeConte 1862: 272; 1863-66: 68.

Macrobasis segmenta: Horn 1873: 93; Champion 1891-93: 401; Chittenden 1903: 26; Snow 1906: 174; 1907: 150; Carruth 1931: 54; Whelan 1939: 118.

Macrobasis cinctothorax Dugès, 1889: 65.

Epicauta segmenta: Blackwelder 1945: 484; Selander and Mathieu 1969: 116; Pinto 1991: 71.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Sinaloa, Sonora. United States: Arizona, California, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming.

***Epicauta (Macrobasis) selanderorum* Werner, 1958**

Epicauta selanderorum Werner, 1958: 6; Pinto 1991: 82.

Distribution. Mexico.

Location. Mexico: Jalisco, Michoacán, Querétaro.

***Epicauta (Macrobasis) stigmata* (Dugès, 1870)**

Cantharis stigmata Dugès, 1870: 159.

Lytta neglecta Haag-Rutenberg, 1880: 54.

Epicauta stigmata: Denier 1935: 159; Blackwelder 1945: 484; Werner 1958: 9; Pinto 1982, Pinto 1991: 82.

Distribution. Mexico.

Location. Mexico: Guanajuato, Jalisco, Mexico, Michoacán, Morelos, Querétaro, Puebla, Tlaxcala.

***Epicauta (Macrobasis) subglabra* (Fall, 1922)**

Macrobasis subglabra Fall, 1922: 173.

Epicauta subglabra: Denier 1935: 159; Werner et al. 1966: 47; Pinto 1991: 74.

Distribution. Canada, United States.

Location. Canada: Alberta, Manitoba, Saskatchewan. United States: Arizona, Idaho, Michigan, New Mexico, North Dakota, South Dakota.

***Epicauta (Macrobasis) sublineata* (LeConte, 1854)**

Lytta sublineata LeConte, 1854: 447.

Cantharis sublineata: Gemminger and Harold 1870: 2154.

Macrobasis sublineata: LeConte 1863-66: 68; Horn 1873: 94.

Macrobasis megacephala Champion, 1892: 402.

Epicauta reinhardi Dillon, 1952: 413.

Epicauta sublineata: Selander and Mathieu 1969: 116; Pinto 1991: 71.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, Nuevo León, Tamaulipas. United States: Texas.

***Epicauta (Macrobasis) tenella* (LeConte, 1854)**

Lytta tenella LeConte, 1854: 23.

Cantharis tenella: Gemminger and Harold 1870: 2154.

Epicauta merkeliana Horn, 1891: 43.

Epicauta tenella: Horn 1891: 43; Denier 1935: 159; Selander 1954: 87; Werner et al. 1966: 45; Pinto 1991: 79.

Distribution. Mexico, United States.

Location. Mexico: Baja California, Chihuahua, Durango, Sonora. United States: Arizona, California, New Mexico, Nevada, Texas.

***Epicauta (Macrobasis) tenuemarginata* Werner, 1958**

Epicauta tenuemarginata Werner, 1958: 13; Pinto 1991: 83.

Distribution. Mexico.

Location. Mexico: Jalisco, Michoacán.

***Epicauta (Macrobasis) tenuicornis* (Champion, 1892)**

Macrobasis tenuicornis Champion, 1892: 400.

Epicauta tenuicornis: Werner 1954: 27; Pinto 1991: 73.

Distribution. Mexico.

Location. Mexico: Guerrero, Michoacan, Morelos, Puebla.

***Epicauta (Macrobasis) tenuilineata* (Horn, 1894)**

Macrobasis tenuilineata Horn, 1894: 436.

Epicauta tenuilineata: Denier 1935: 159; Blackwelder 1945: 484; Werner 1945: 502; Werner et al. 1966: 35; Pinto 1991: 80.

Distribution. Mexico, United States.

Location. Mexico: Baja California Sur. United States: Arizona, California.

***Epicauta (Macrobasis) tenuis* (LeConte, 1853)**

Lytta tenuis LeConte, 1853: 343.

Cantharis tenuis: Gemminger and Harold 1870: 2154.

Epicauta tenuis: Denier 1935: 159; 1940: 422; Werner 1945; Pinto 1991: 80.

Distribution. United States.

Location. United States: Florida, Georgia, South Carolina.

***Epicauta (Macrobasis) terminata* (Dugès, 1870)**

Cantharis terminata Dugès, 1870: 157; Gemminger and Harold 1870: 2154.

Epicauta terminata: Dugès 1889: 78; Champion 1892: 409; Denier 1935: 159; Blackwelder 1945: 484; Selander 1954: 88; Pinto 1991: 77.

Distribution. Mexico.

Location. Mexico: Colima, Guerrero, Jalisco, Michoacán, Oaxaca, Puebla, Veracruz.

***Epicauta (Macrobasis) texana* Werner, 1944**

Epicauta texana Werner, 1944: 73; Selander and Mathieu 1969: 110; Pinto 1991: 71.

Distribution. Mexico, United States.

Location. Mexico: Durango. United States: Arizona, New Mexico, Texas.

***Epicauta (Macrobasis) tarsa* (LeConte, 1853)**

Lytta tarsa LeConte, 1853: 343.

Epicauta tarsa: Denier 1935: 159; 1940: 422; Werner 1945: 508; 1973: 463; Arnold 1976: 28; Pinto 1991: 79.

Distribution. United States.

Location. United States: Alabama, Florida, Massachusetts, Mississippi, North California, Oklahoma, Texas.

***Epicauta (Macrobasis) tripartita* Champion, 1892**

Epicauta tripartita Champion, 1892: 421; Denier 1935: 159; Blackwelder 1945: 484; Vaurie 1950: 25; Werner 1958: 4; Pinto 1991: 83.

Distribution. Mexico.

Location. Mexico: Chihuahua, Nayarit, Sinaloa.

***Epicauta (Macrobasis) triquetra* Werner, 1958**

Epicauta triquetra Werner, 1858: 15; Pinto 1991: 83.

Distribution. Mexico.

Location. Mexico: San Luis Potosí.

***Epicauta (Macrobasis) unicalcarata* Champion, 1892**

Epicauta unicalcarata Champion, 1892: 412; Denier 1935: 160; Blackwelder 1945: 484; Pinto 1982: 406; Pinto 1991: 77.

Distribution. Mexico.

Location. Mexico: Guerrero.

***Epicauta (Macrobasis) uniforma* Werner, 1944**

Epicauta uniforma Werner, 1944: 67; 1945: 452; 1958: 5; Werner et al. 1966: 49; Selander and Agafitei 1982: 138; 1982: 201; Pinto 1991: 83.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Durango, Sonora, Zacatecas. United States: Arizona, Colorado, New Mexico, Texas.

***Epicauta (Macrobasis) valida* (LeConte, 1853)**

Lytta segmentata LeConte, 1853: 342 (in part).

Lytta valida LeConte, 1858: 39.

Apterospasta valida: LeConte 1862: 272; 1863-66: 68.

Macrobasis segmentata: Horn 1873: 93 (in part); Carruth 1931: 54 (in part).

Epicauta segmenta: Werner 1945: 490 (in part).

Epicauta valida: Selander & Mathieu, 1969: 118; Pinto 1991: 71.

Distribution. United States.

Location. United States: Colorado, Kansas, Louisiana, Nebraska, New Mexico, Oklahoma.

***Epicauta (Macrobasis) virgulata* (LeConte, 1866)**

Macrobasis virgulata LeConte, 1866: 156.

Epicauta virgulata: Denier 1935: 169; Werner 1945: 512 (in part); 1949: 108; Werner et al. 1966: 51; Pinto 1991: 83.

Distribution. Mexico, United States.

Location. Mexico: Baja California Norte, Baja California Sur, Sinaloa, Sonora. United States: Arizona, California.

Species of *Epicauta* (*Epicauta*)

Epicauta (*Epicauta*) *abadona* Skinner, 1904

Epicauta abadona Skinner, 1904: 217; Denier 1935: 152; Werner et al. 1966: 37; Adams and Selander 1979: 249; Pinto 1991: 347.

Epicauta abadona: Maydell 1934: 331 (*lapsus*).

Epicauta mutchleri Maydell, 1934: 331.

Terra typica. *E. abadona*, Holotype male, Phoenix, Arizona; ANSP. *E. mutchleri*, Holotype male, Phoenix, Arizona; AMNH.

Distribution. Mexico, United States.

Location. Mexico: Sinaloa, Sonora. United States: Arizona.

Epicauta (*Epicauta*) *abeona* Pinto, 1980

Epicauta abeona Pinto, 1980: 69; 1991: 272.

Terra typica. Holotype male, Ixtlán del Río, Nayarit; LACM.

Distribution. Mexico.

Location. Mexico: Aguascalientes, Distrito Federal, Jalisco, Mexico, Nayarit.

Epicauta (*Epicauta*) *adspersa* (Klug, 1825)

Lytta adspersa Klug, 1825: 434.

Epicauta conspersa Curtis, 1845: 472.

Cantharis adspersa Burmeister, 1881: 29; Berg 1881: 307; Gemminger and Harold 1870: 2147.

Epicauta adspersa: Bruch 1914: 403; Borchmann 1917: 70; Denier 1935b: 152; Bosq 1943: 10; Blackwelder 1945: 482; Di Iorio 2004: 165; Campos-Soldini and Roig-Juñent 2015: 20; Pinto and Bologna 2016: 205.

Terra typica. one Type (s?) Mendoza, Argentina; MLPA location unknown.

Distribution. Argentina, Brazil, Peru, Uruguay.

Location. Argentina: Buenos Aires, Córdoba, Chubut, Entre Ríos, La Pampa, La Rioja, Mendoza, Neuquén, Río Negro, Salta, San Juan, Santa Fe, Santiago del Estero, Tucumán. Brazil: Junin. Uruguay: Montevideo.

New records (Figure1): Argentina: Buenos Aires (Flores, La Plata, Las Martinetas, San Nicolás, Tandil); Chubut (Trelew); Córdoba (Calamuchita, El Sauce, Río IV, Sal-sacate, Villa María); Entre Ríos (Concordia, Diamante, Federación, Gualeguaychú, Villaguay) La Pampa (General Pico); La Rioja (Nonogasta, Villa Unión); Mendoza (Cacheuta, Los Pejecitos, Puesto la Obligación, San Rafael, Santa Rosa, Uspallata); Neuquén (Zapala); Río Negro (Choele Cheol); Santa Fe (Reconquista, Rosario); San Juan (Caligasta, Valle Fétil, Villa Nueva, Zonda). Brazil: Mato Grosso (states labeled only). Uruguay: Montevideo (Canelones, Maldonado, Minas, Peñarol, Piriapolis, Punta del Este) [MLPA, Barriga-Tuñón, IADIZA, FIMLA, MACN].

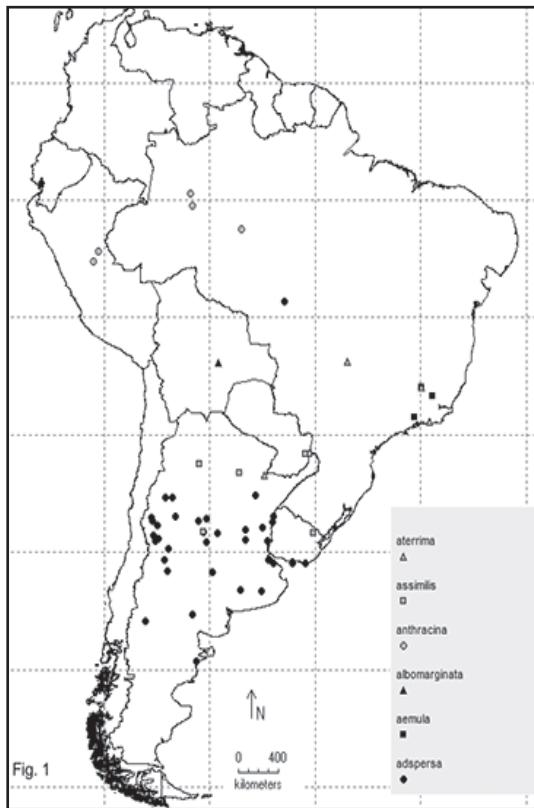


Figure 1. New distribution records for: *E. adspersa*; *E. aemula*; *E. albomarginata*; *E. anthracina*; *E. assimilis*; and *E. aterrima*.

***Epicauta (Epicauta) aemula* (Fischer, 1827)**

Cantharis aemula Fischer, 1827: 20; Gemminger and Harold 1870: 2147.

Lytta aemula Hagg-Rutenberg, 1880: 53.

Epicauta aemula: Borchmann 1917: 70; Denier 1935: 152; Blackwelder 1945: 482; Adams and Selander 1979: 255.

Terra typica. Type (s?) Brazil; location unknown.

Distribution. Bolivia, Brazil.

Location. Bolivia: Coroico. Brazil: São Paulo.

New records (Figure 1): Brazil: Minas Gerais (Viçosa); Belo Horizonte (Minas); Rio de Janerio (Itatiaia) [MLPA].

***Epicauta (Epicauta) afoveata* Werner, 1949**

Epicauta afoveata Werner, 1949: 103; 1955: 5; Pinto 1972: 256; 1991: 135.

Terra typica. Holotype male, Borrego, California; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Baja California Norte, Cedros Island. United States: California.

Epicauta (Epicauta) albolineata (Dugès, 1877)

Cantharis albolineata Dugès, 1877: 64; Vázquez and Zaragoza 1979: 579.

Epicauta albolineata: Dugès 1889: 84; Champion 1892: 416; Denier 1935: 152; Blackwelder 1945: 482; Werner 1945: 451; Kaszab 1960: 285; Werner et al. 1966: 23; Pinto 1991: 114.

Epicauta duplicata Casey, 1891: 172.

Epicauta costaricensis Kaszab, 1960: 284.

Terra typica. Holotype male, Tupataro, Guanajuato, Mexico; UNAM.

Distribution. Costa Rica, Guatemala, Mexico, United States.

Location. Costa Rica: Belvedero, Santa Elena. Guatemala: Purulha. Mexico: Aguascaliente, Colima, Guanajuato, Guerrero, Jalisco, Mexico, Michoacán, Morelos, Nayarit, San Luis Potosí, Sonora. United States: Arizona.

Epicauta (Epicauta) albomarginata (Mäklin, 1875)

Cantharis albomarginata Mäklin, 1875: 625.

Epicauta albomarginata: Denier 1935: 152; Denier 1940: 419; Blackwelder 1945: 482.

Epicauta denieri Pic, 1933: 26; Denier 1935: 152.

Epicauta limbaticollis Pic, 1924: 2; Denier 1935: 152.

Terra typica. Unknown.

Distribution. Bolivia, Paraguay, Peru.

Location. Bolivia: Lagunillas, Santa Cruz. Paraguay: San Carlos, Río Apa, between Punta Apa and Vella Vista; Santa Cruz. Peru.

New records (Figure 1): Bolivia: Santa Cruz (departament labeled only) [MLPA].

Epicauta (Epicauta) alphonssii Horn, 1874

Epicauta Maura LeConte, 1851: 162; Horn 1873: 97; Fall 1901: 184; Moore 1937: 42.

Lytta Maura: LeConte 1853: 339.

Epicauta alphonssii Horn, 1874: 364; Denier 1935: 152; Pinto 1991: 138.

Epicauta punitcollis: MacSwain 1943: 364.

Epicauta californica Werner, 1945: 479 (n. repl. name for *E. Maura* LeC, 1851, nec Faldeman, 1833); Werner 1955: 3; Middlekauf 1958: 9, 10; Pinto 1972: 256; Doyen and Opler 1973: 308.

Terra typica. *E. maura* LeConte, lectotype male (designated by Werner 1945), California; MCZC. *E. alphonssii* Horn holotype female, Mariposa Co., California; MCZC.

Distribution. United States.

Location. United States: California.

***Epicauta (Epicauta) andersoni* Werner, 1944**

Epicauta andersoni Werner, 1944: 66; 1945: 444; Vaurie 1950: 23; Werner et al. 1966: 40; Arnold 1976: 24; Pinto 1978: 57; 1980: 54; 1991: 273.

Terra typica. Holotype male, Gallo Springs, New Mexico; USNM.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua. United States: Arizona, Colorado, Kansas, New Mexico, Oklahoma, Utah.

***Epicauta (Epicauta) anthracina* (Erichson, 1848)**

Lytta anthracina Erichson, 1848: 566.

Epicauta anthracina: Blackwelder 1945: 482; Kaszab 1960: 41; Pinto and Bologna 2016: 205.

Terra typica. Unknown.

Distribution. Brazil, Guyana, Peru.

Location. Brazil: Amazonas. Guayana. Peru: Coronel Portillo.

New records (Figure 1): Brazil: Amazonas (Manicoré, Tefé). Peru: Coronel Portillo (Pucallpa; Río Ucayali) [MLPA].

***Epicauta (Epicauta) apache* Pinto, 1980**

Epicauta maculata: Werner 1945: 441 (in part); 1949: 96; Dillon 1952: 393 (in part); Werner et al. 1966: 38; Pinto 1975: 429; Arnold 1976: 23.

Epicauta apache Pinto, 1980: 62; 1991: 273.

Terra typica. Holotype male Willcox, Arizona; CASC.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Sonora. United States: Arizona, Colorado, Kansas, Nebraska, Oklahoma, Texas.

***Epicauta (Epicauta) apure* Adams & Selander, 1979**

Epicauta apure Adams & Selander, 1979: 255.

Terra typica. Holotype male, San Fernando, Apure, Venezuela; AMNH.

Distribution. Venezuela, Trinidad, Tobago.

Location. Venezuela: Apure, Monagas. Trinidad: George. Tobago: country labeled only.

***Epicauta (Epicauta) aragua* Adams & Selander, 1979**

Epicauta grammica: Denier 1933: 39 (in part); 1935: 20 (in part).

Epicauta aragua Adams & Selander, 1979: 251.

Terra typica. Holotype male, Maracay, Aragua, Venezuela; AMNH.

Distribution. Colombia, Costa Rica, El Salvador, Honduras, Panama, Venezuela.

Location. Colombia: Magdalena, Meta, Santander. Costa Rica: Guanacaste, San José Higuito. El Salvador: La Libertad, San Salvador. Honduras: Copán, Francisco Morazán. Panama: Canal Zone, Chiriquí, Coclé. Venezuela: Apure, Aragua, Bolívar, Carabobo, Distrito Federal, Guarico, Miranda, Monagas, Portuguesa, Trujillo, Zulia.

Epicauta (Epicauta) assimilis (Haag-Rutembreg, 1880)

Lytta assimilis Haag-Rutembreg, 1880: 26.

Epicauta assimilis: Denier 1935: 152; Blackwelder 1945: 482.

Terra typica. Type (s?) Rio Grande, Brazil; “Mus. Vind. and Haag-Rutembreg (in part); ZSBS.

Distribution. Argentina: Chaco, Córdoba, Misiones, Tucumán. Brazil. Paraguay: Alto Paraná. Uruguay: Cerro Largo.

New records (Figure 1): Argentina: Chaco (Charata); Córdoba (Calamuchita); Misiones (Puerto Aguirre); Tucumán (Villa Monti). Paraguay: Alto Paraná. Uruguay: Cerro Largo [MLPA, MACN].

Epicauta (Epicauta) aspera Werner, 1944

Epicauta aspera Werner, 1944: 70; 1945: 488; 1949: 105; Werner et al. 1966: 41; Arnold 1976: 24; Pinto 1991: 141.

Terra typica. Holotype male Salida, Colorado; MCZC.

Distribution. United States.

Location. United States: Arizona, Colorado, Kansas, New Mexico, Oklahoma, Texas.

Epicauta (Epicauta) aterrima (Klug, 1825)

Lytta aterrima Klug, 1825: 432; Burmeister 1881: 27.

Cantharis aterrima: Gemminger and Harold 1870: 2148; Berg 1881: 305.

Epicauta aterrima: Bruch 1911: 403; Borchmann 1917: 71; Denier 1935: 152; Blackwelder 1945: 482.

Terra typica. Type (s?) Brazil; MLPA.

Distribution. Argentina, Brazil.

Location. Argentina: Corrientes, Puerto Cazador. Brazil: Amazonas.

New records (Figure 1): Argentina: Corrientes (Puerto Cazador). Brazil: Bello Horizonte (Minas); Goyas (Río Verde); Río de Janeiro (State labeled only) [MLPA].

Epicauta (Epicauta) atomaria (Germar, 1821)

Lytta atomaria Germar, 1821: 154; Burmeister 1881: 29; Berg 1881: 307; Martínez 1992: 5.

Lytta punctata Germar, 1824: 287.

Cantharis germari Fischer, 1827: 24.

Cantharis atomaria: Gemminger and Harold 1870: 2148.

Epicauta atomaria: Bruch 1914: 403; Borchmann 1917: 70; Denier 1935b: 152; Bosq 1943: 10; Hayward 1942: 22; Blackwelder 1945: 482; Viana and Williner 1974: 15; Martínez 1992: 5; Di Iorio 2004: 167; Campos-Soldini 2015: 22.

Terra typica. *Lytta atomaria*: Type (?) Brazil.

Distribution. Argentina, Bolivia, Brazil, Paraguay, Uruguay.

Location. Argentina: Buenos Aires, Catamarca, Córdoba, Corrientes, Entre Ríos, Formosa, Jujuy, Mendoza, Misiones, La Pampa, La Rioja, Río Negro, Santiago del Estero, Salta, San Juan, San Luis, Salta, Tucumán. Bolivia: Chiquitos, Río Negro, Santa Cruz, Santiago, Tarija. Brazil: Encruzilhada, Rio Prado, Cafapara. Paraguay: Asunción, Cordillera, Departamento de San Pedro, Guaira. Uruguay: Maldonado, Montevideo, Cerro Largo.

Epicauta (Epicauta) atrata (Fabricius, 1775)

Lytta atrata Fabricius, 1775: 260; 1781: 329; 1801: 79.

Meloe trichrus Pallas, 1798: 100.

Lytta coracina Illiger, 1804: 171 (unnecessary repl. name for *atrata* Fabricius, see Werner 1945: 470).

Cantharis trichrus: Fischer 1827: 23.

Lytta atrata convolvuli Melsheimer, 1846: 53.

Cantharis trichrus: Gemminger and Harold 1870: 2155.

Lytta convolvuli: Le Conte 1866: 157; Horn 1873: 97.

Epicauta convolvuli: LeConte 1866: 157; Horn 1873: 97.

Cantharis convolvuli: Gemminger and Harold 1870: 2149.

Epicauta trichrus: Horn 1875: 153; Wickham 1896: 34; Blatchley 1910: 1361; Chittenden 1911: 92; Ulke 1902: 54; Sherman 1913: 246; Mutchler and Weiss 1924: 9, 18; Carruth 1931: 51

Epicauta trichura Wellman, 1910: 24 (unnecessary replacement name for *trichrus* Palmas; see Werner 1945: 470); Denier 1935: 159.

Epicauta pensylvanica: Borchmann 1917: 79; Staig, 1940: 135.

Epicauta atrata: Werner 1945: 470; Dillon 1952: 387; Pinto 1975: 451; 1991: 294; Arnold 1976: 26; Selander 1981: 757; 1982: 812; Staines 1983: 46; Berrios-Ortiz 1985: 180; Lago and Mann 1987: 5; Pinto 1991: 294.

Terra typica. *E. atrata* Lectotype (sex?) (designated by Werner 1945) America, GUHC.

E. trichrus, type locality unknown. *E. convolvuli*, type locality unknown.

Distribution. Canada, Mexico, United States.

Location. Canada: Manitoba. Mexico: Nuevo León, San Luis Potosí, Tamaulipas. United States: Alabama, Arkansas, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Virginia, West Virginia, Wyoming.

Epicauta (Epicauta) atropos Pinto, 1991*Epicauta atropos* Pinto, 1991: 299.**Terra typica.** Holotype female, Mitchel, Nebraska; CASC.**Distribution.** Canada, United States.**Location.** Canada: Alberta. United States: Arizona, Colorado, Kansas, Montana, Nebraska, Oklahoma, South Dakota, Utah.***Epicauta (Epicauta) avellanea*** Denier, 1834*Epicauta avellanea* Denier, 1934.**Terra typica.** Holotype male, Córdoba: Valle de los Reartes. MACN.**Distribution.** Argentina.**Location.** Argentina: Córdoba (Valle de los Reartes).**New records** (Figure 2): Argentina: Córdoba (Calamuchita, Valle de los Reartes [MLPA].***Epicauta (Epicauta) aymara*** Denier, 1935*Epicauta aymara* Denier, 1935: 152.**Terra typica.** Holotype male, Vilaconta; MLPA. Allotype female and paratype male and female, Vilaconta; DEI.**Distribution.** Peru: Apurímac.**New records** (Figure 2): Peru: Apurímac (Andahuaylas) [FIMLA].***Epicauta (Epicauta) basimaculata*** (Hagg-Rutenberg, 1880)*Lytta basimaculata* Haag-Rutenberg, 1880: 48.*Cantharis rufescens* Dugès, 1881: 48.*Epicauta rufescens*: Dugès 1889: 75.*Epicauta basimaculata*: Champion 1892: 406; Blackwelder 1945: 482; Pinto 1982: 407; 1991: 240.**Terra typica.** *E. basimaculata* lectotype male (designated by Pinto 1982) Mexico; ZSMC.**Distribution.** Guatemala, Mexico.**Location.** Guatemala: San Marcos, Talisman. Mexico: Chiapas, Colima, Guerrero, Jalisco, Mexico, Michoacán, Morelos, Nayarit, Oaxaca, Veracruz.***Epicauta (Epicauta) batesii*** Horn, 1875*Epicauta batesii* Horn, 1875: 153; Sherman 1913: 468; Staines 1983: 46.*Epicauta batesii*: Mutchler and Weiss 1924: 10, 18; Denier 1935: 153; Selander 1984: 3; Pinto 1991: 302.



Figure 2. New distribution records for: *E. avellanea*; *E. aymara*; *E. bosqi*; *E. bruchi*; *E. brunneipennis*; and *E. carmelita*.

Terra typica. Lectotype female (designated by Werner 1945), Savannah, Georgia; MCZC.

Distribution. United States.

Location. United States: Florida, Georgia, New Jersey, Mississippi, North Carolina, South Carolina.

Epicauta (Epicauta) bella Mäklin, 1875

Epicauta bella Mäklin, 1875: 631; Borchmann 1917: 71; Denier 1935b: 153; Blackwelder 1945: 482; Campos-Soldini 2011: 578.

Lytta exclamationis Berg, 1889: 120; Bruch 1914: 405; Borchmann 1917: 94.

Terra typica. Type (s?) *Lytta exclamationis*, Tandil, Argentina; Uruguay; MLPA.

Distribution. Argentina, Bolivia, Uruguay.

Location. Argentina: Buenos Aires, Tandil. Uruguay (country labeled only).

Epicauta (Epicauta) bispinosa Werner, 1949

Epicauta bispinosa Werner, 1949: 95; Werner et al. 1966: 39; Pinto 1975: 435; 1980: 23, 42; 1991: 118; Arnold 1976: 27; Selander 1981: 780; Selander and Agafitei 1982: 138.

Terra typica. Holotype male, east of Sonoita, Arizona; MCZC.

Distribution. United States.

Location. United States: Colorado, Kansas.

***Epicauta (Epicauta) boliviensi* Kaszab, 1963**

Epicauta boliviensis Kaszab, 1963.

Terra typica. Holotype male, Bolivia, Cochabamba; SUNM.

Distribution. Bolivia.

Location. Bolivia: Cochabamba.

***Epicauta (Epicauta) borchmanni* Denier, 1935**

Epicauta borchmanni Denier, 1935: 153; Blackwelder 1945: 482.

Terra typica. Holotype and Allotype (sex?) Jujuy; MLPA.

Distribution. Argentina.

Location. Argentina: Jujuy.

***Epicauta (Epicauta) borgmeieri* Denier, 1935**

Epicauta borgmeieri Denier, 1935: 153; Blackwelder 1945: 482.

Terra typica. Holotype male (?) Campos Grande, Mato Grosso, Brazil; MLPA.

Distribution. Brazil.

Location. Brazil: Mato Grosso, Campo Grande, Porto Murthino.

***Epicauta (Epicauta) bosqi* Denier, 1935**

Epicauta bosqi Denier, 1935: 135; Bosq 1943: 11; Blackwelder 1945: 482; Viana and Williner 1974: 11; Hayward 1960: 22; Di Iorio 2004: 168; Campos-Soldini and Roig-Juñent 2011: 24.

Terra typica. Holotype female, Rosario, Santa Fe, Argenitna, MLPA.

Distribution. Argentina.

Location. Argentina: Buenos Aires, Chaco, Córdoba, Corrientes, Entre Ríos, Formosa, Misiones, Neuquén, Salta, Santa Fe, Santiago del Estero.

New records (Figure 2): Argentina: Buenos Aires (Villa Gesel); Córdoba (Baratelli, Calamuchita, Calchín); Formosa (Laguna Yema); Salta (Güemez); Santa Fe (Quebrada Bulava, La Rubia, Recreo, Rosario, Santa Fe, Santo Tomé) [IADIZA, Barriga-Tuñón, MLPA, MACN, MCNFA].

***Epicauta (Epicauta) brasiliera* Selander, 1981**

Epicauta brasiliera Selander, 1981: 587.

Terra typica. Holotype male, São Domingo, Mato Grosso do Sul, Brazil; MNH.

Distribution. Brazil.

Location. Brazil: Goiás, Mato Grosso, Mato Grosso do Sul, São Paulo.

***Epicauta (Epicauta) bruchi* Borchmann, 1930**

Epicauta bruchi Borchmann, 1930: 93; Denier 1935b: 154; Blackwelder 1945: 482; Martínez 1992: 5; Di Iorio 2004: 168.

Terra typica. Type (s?) Catamarca: Santa María, Tucumán: Tafí del Valle; MACN.

Distribution. Argentina.

Location. Argentina: Catamarca, Chubut, Córdoba, Mendoza, Misiones, Neuquén, Salta, Tucumán. Perú (country labeled only).

New records (Figure 2): Argentina: Catamarca (La Ciénaga, Valle de Santa María); Chubut (Province labeled only); Córdoba (Capilla del Monte); Mendoza; Misiones; Neuquén; Salta (Cafayate); Tucumán (La Quebradita, Tafí del Valle) [MLPA, FIMLA, MACN].

***Epicauta (Epicauta) brunnea* Werner, 1944**

Epicauta brunnea Werner, 1944: 67; 1945: 454; Dillon 1952: 400; Werner et al. 1966: 33; Pinto 1982: 402; 1991: 217.

Epicauta innomina Dillon, 1952: 401.

Terra typica. *E. brunnea* holotype male, Alpine, Texas; MCZ.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Sinaloa, Sonora. United States: Arizona, New Mexico, Texas.

***Epicauta (Epicauta) brunneipennis* (Haag-Rutenberg, 1880)**

Lytta brunneipennis Haag-Rutenberg, 1880: 29.

Cantharis brunneipennis: Burmeister 1881: 24; Berg 1881: 304.

Epicauta brunneipennis: Bruch 1914: 403; Borchmann 1917: 72; Denier 1935b: 154, 1940: 419; Blackwelder 1945: 482; Viana and Williner 1974: 14; Di Iorio 2004: 168; Campos-Soldini and Roig-Juñent 2011: 579.

Terra typica. Type (s?) Buenos Aires; ZSBS.

Distribution. Argentina, Brazil, Paraguay, Uruguay.

Location. Argentina: Buenos Aires, Catamarca, Chaco, Córdoba, Corrientes, Chaco, Entre Ríos, Formosa, Mendoza, Misiones, Salta, San Luis, Tucumán. Brazil: São Paulo. Uruguay.

New records (Figure 2): Argentina: Entre Ríos (Chajarí, Parque Nacional el Palmar); Chaco (Resistencia); Córdoba (Salsacate); Corrientes (Ibarreta); Formosa (Barbolomé de las Casas, Parque Río Pilcomayo, Pirané); Misiones (Departamento de Concepción); Salta (Chicoana, La Viña, Orán, Sumalago); San Luis (San Gerónimo); Santa Fe (Villa Ana); Tucumán (province labeled only). Uruguay: country labeled only [MLPA, Barriga-Tuñón, FIMLA, MACN].

***Epicauta (Epicauta) bucephala* Kaszab, 1960**

Epicauta bucephala Kaszab, 1960: 406; Pinto and Bologna 2016: 205.

Terra typica. Holotype male and Allotype female, Andahuaylas, Peru; SMB.

Distribution. Peru.

Location. Peru: Andahuaylas, 3800 m; Apurimac.

***Epicauta (Epicauta) callosa* LeConte, 1866**

Epicauta callosa LeConte, 1866: 158; Horn 1973: 99; Packard 1889: 225; Milliken 1921: 6; Carruth 1931: 52; Denier 1935: 154; Gilberston and Horsfall 1940: 20; Werner 1945: 468; 1949: 103; Vaurie 1950: 29; Dillon 1952: 384; Selander 1954: 24; Parker and Wakeland 1957: 26; Burke 1963: 53; Werner et al. 1966: 43; Goeden 1971; Rees 1973: 179; Arnold 1976: 25; Pinto 1977: 141; 1991: 304.

Cantharis callosa: Gemminger and Harold 1870: 2148.

Epicauta pseudocallosa Dillon, 1952: 387.

Terra typica. *E. callosa*, Lectotype female (designated by Werner 1945) Nebraska; MCZC. *E. pseudocallosa*, Holotype male, MacLennan Co., Texas; TAMU.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Nuevo León, Tamaulipas. United States: Arizona, Arkansas, Colorado, Kansas, Louisiana, Montana, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming.

***Epicauta (Epicauta) candidata* Champion, 1892**

Epicauta candidata Champion, 1892: 426; Denier 1935: 154; Blackwelder 1945: 482; Dillon 1952: 395; Pinto 1991: 120.

Terra typica. Holotype female, Villa Lerdo, Durango; BMNH. Pinto (1991) indicates that the type is damage.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Zacatecas. United States: Texas.

***Epicauta (Epicauta) carmelita* (Haag-Rutenberg, 1880)**

Lytta carmelita Haag-Rutenberg, 1880: 46.

Epicauta carmelita: Dugès 1889: 61; Champion 1892: 417; Maydell 1934: 332; Denier 1935: 154; 1940: 419; Pinto 1982: 407; 1991: 123; Mathieu 1983: 158.

Terra typica. Lectotype male (designated by Pinto, 1982) “N. Granada (former name of Colombia and Panama); BMNH.

Distribution. Colombia, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Panama, Venezuela.

Location. Costa Rica: Bebedero, Canas, La Pacifica, Santa Elena, Taboga. Guatemala: Coatepeque, Jalpatagua, San Sebastián. Honduras: Guaimaca, La Paz, Siquate-

peque, Zamorano. Mexico: Chiapas, Oaxaca, Veracruz. Nicaragua: Chontales, Rivas. Panama: Canal Zone, El Coronero. Venezuela: Merida.

New records (Figure 2): Venezuela: Mérida (Mérida) [MLPA].

***Epicauta (Epicauta) cardui* (Dugès, 1889)**

Henons [sic] *conferta*: Dugès 1869: 102.

Henons cardui Dugès, 1889: 36; Champion 1891: 368; Van Dayke 1928: 409, 411.

Epicauta cardui: Pinto 1991: 174.

Terra typica. Neotype male (designated by Pinto, 1991), Toluca, Mexico.

Distribution. Mexico.

Location. Mexico: Aguascalientes, Colima, Distrito Federal, Durango, Guanajuato, Jalisco, Mexico, Michoacán, Morelos, Oaxaca, Querétaro.

***Epicauta (Epicauta) castadiva* Pinto, 1991**

Epicauta castadiva Pinto, 1991: 176.

Terra typica. Holotype male, south of Valle Nacional (4200'), Oaxaca, Mexico; CASC.

Distribution. Mexico.

Location. Mexico: Oaxaca.

***Epicauta (Epicauta) caustica* Rojas, 1857**

Epicauta caustica Rojas, 1857: 441; Denier 1935: 22; Blackwelder 1945: 482; Selander 1981: 584.

Cantharis caustica: Gemminger and Harold 1870: 2148.

Lytta caustica: Haag-Rutenberg 1880: 53.

Terra typica. Neotype male (designated by Selander, 1981) San Juan de las Morras, Guarico, Venezuela.

Distribution. Panamá, Venezuela.

Location. Argentina: Córdoba; Misiones. Panamá: Canal Zone. Venezuela: Apure, Aragua, Bolívar, Carabobo, Guarico, Zulia. Paraguay: Villa Florida

New records (Figure 3): Argentina: Córdoba (Calamuchita, San Miguel de los Ríos, Yacanto); Misiones (Pindapoy). Paraguay: Villa Florida [MLPA, MACN].

***Epicauta (Epicauta) cavernosa* (Courbon, 1855)**

Cantharis cavernosa Courbon, 1855: 1006.

Cantharis cavernosa: Gemminger and Harold 1870: 2148.

Cantharis cavernosa: Berg 1881: 306.

Cantharis nigropunctata Burmeister, 1881: 28 (partim); Berg 1881: 306; Bruch 1914: 404; Borchmann 1917: 72.

Epicauta cavernosa: Borchmann 1917: 72; Bruch 1914: 404; Blackwelder 1945: 482; Viana and Williner 1974: 15; Campos-Soldini and Roig-Juñent 2015: 24.

Terra typica. Unknown.

Distribution. Argentina, Brazil, Uruguay.

Location. Argentina: Buenos Aires, Córdoba, Mendoza, San Luis. Brazil: country labeled only. Uruguay: Cerro Pelado, Cerro Largo, Cuchilla de Melo, Fraile Muerto, Punta del Este, Chuy.

***Epicauta (Epicauta) caviceps* Horn, 1873**

Epicauta caviceps Horn, 1873: 99; 1874: 37; 1891: 43; Van Dyke 1928: 129; Maydell 1934: 329; Denier 1935: 154; Werner 1945: 481; Werner et al. 1966: 42; Pinto 1972: 256; 1991: 142.

Epicauta caviceps: MacSwain 1956: 59.

Terra typica. Lectotype male (designated by Werner, 1945) Arizona; MCZC.

Distribution. United States.

Location. United States: Arizona, California, Nevada, Utha.

***Epicauta (Epicauta) cazieri* Dillon, 1952**

Epicauta cazieri Dillon, 1952: 394; Pinto 1975: 441; 1991: 119.

Terra typica. Holotype male, Sierra Blanca, Texas; AMNH.

Distribution. United States.

Location. United States: Kansas, New Mexico.

***Epicauta (Epicauta) cicatrix* Werner, 1951**

Epicauta cicatrix Werner, 1951: 5; Pinto 1991: 144.

Terra typica. Holotype male, Presidio, Texas; USNM.

Distribution. United States.

Location. United States: Texas.

***Epicauta (Epicauta) cinctipennis* (Chevrolat, 1834)**

Lytta cinctipennis Chevrolat, 1834: 59.

Cantharis cinctipennis: Dugès, 1869: 101; 1870: 126.

Epicauta cinctipennis: Dugès 1889: 85; Champion 1892: 420; Denier 1935: 154; Blackwelder 1945: 483; Wirth 1956: 22; Pinto 1982: 403, 407; 1991: 164.

Terra typica. *E. cinctipennis* Lectotype male (designated by Pinto 1982) Mineral del Zimapan, Mexico; UZMH.

Distribution. Mexico, United States.

Location. Mexico: Guanajuato, Hidalgo, Morelos, Nuevo León, Puebla, Querétaro, San Luis Potosí. United States: Arizona, New Mexico, Texas.

***Epicauta (Epicauta) cinerea* (Forster, 1771)**

Meloe cinerea Forster, 1771: 62.

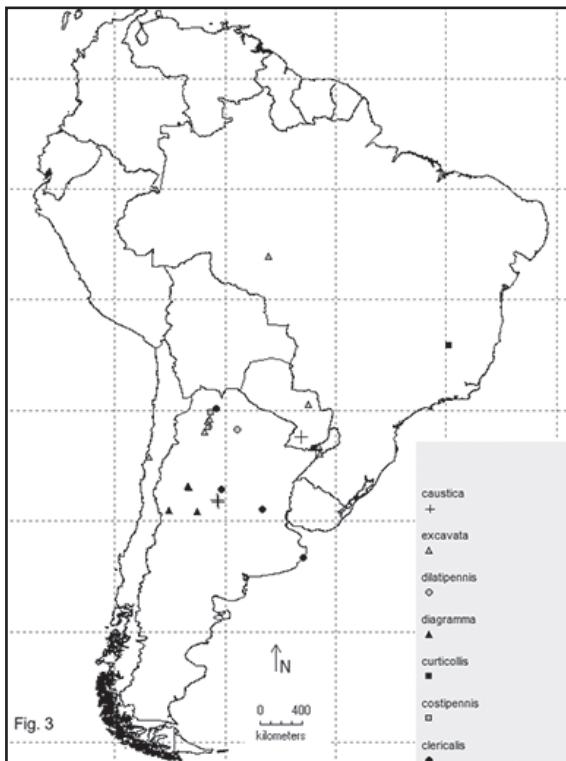


Figure 3. New distribution records for: *E. clericalis*; *E. costipennis*; *E. curticollis*; *E. diagramma*; *E. dilatipennis*; and *E. excavata*.

Meloe cinerea: Pallas 1798: 98.

Meloe clematides Woodhouse, 1800: 213.

Epicauta fissilabris LeConte, 1850: 232; Horn 1873: 102; 1885: 111; Gibson 1912: 87; Blackwelder 1945: 483; Werner 1945: 456.

Lytta cinerea: LeConte 1853: 339.

Lytta fissilabris: LeConte 1853: 339.

Cantharis cinerea: Gemminger and Harold 1870: 2148.

Epicauta cinerea: Horn 1873: 101 (in part); 1875: 153; Denier 1935: 154; Sherman 1913: 246; Carruth 1931: 300; 1970: 1786; Rees 1973: 181; Arnold 1976: 21; Staines 1983: 47.

Epicauta (Epicauta) cinerea: MacSwain 1956: 48; Pinto 1991: 177.

Terra typica. *E. cinerea*, *E. clematides* both unknown, Pinto (1991); *E. fissilabris* Holotype female, Kakabeka [Falls], Lake Superior; MCZC.

Distribution. Canada, United States.

Location. Canada: Manitoba, Ontario, Saskatchewan. United States: Alabama, Arkansas, Colorado, Connecticut, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Mis-

souri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin.

***Epicauta (Epicauta) circellaris* Borchmann, 1942**

Epicauta circellaris Borchmann, 1942; Pinto and Bologna 2016: 205.

Terra typica. Type (s?), Peru; type locality unknown.

Distribution. Peru.

***Epicauta (Epicauta) clericalis* (Berg, 1881)**

Cantharis clericalis Berg, 1881: 308.

Epicauta clericalis: Borchmann 1917: 73; Bruch 1914: 404; Denier 1935: 154; Blackwelder 1945: 483; Campos-Soldini and Roig-Juñent 2011: 25.

Epicauta luteolineata var. *brevebasalis* Pic, 1933: 26.

Epicauta luteolineata var. *discolineata* Pic, 1933: 26; Denier 1935: 154; Blackwelder 1945: 483.

Terra typica. Holotype male (sex?) Misiones, Argentina, MLPA.

Distribution. Argentina.

Location. Argentina: Buenos Aires, Córdoba, Chaco, Entre Ríos, Formosa, Jujuy, Mendoza, Misiones, San Juan, Santa Fe, Santiago del Estero, Tucumán.

New records (Figure 3): Argentina: Buenos Aires (Villa Gesel); Córdoba (El Sauce); Jujuy (Ledesma); Santa Fe (Rosario) [Barriga-Tuñón, MLPA].

***Epicauta (Epicauta) conferta* (Say, 1824)**

Meloe confertus Say, 1824: 281.

Henous techanus Haldemann, 1952: 377.

Henous confertus: LeConte 1853: 330; Riley 1877: 562; Champion 1891: 368; Van Dyke 1928: 410; Carruth 1931: 54; Gilberston and Horsfall 1940: 19; Horsfall 1942: 93; 1943: 20.

Henous texanus: LeConte 1883: 167; Vaurie 1950: 25; Selander and Pinto 1967: 411; Selander and Weddler 1969: 32; Rees 1973: 183; Arnold 1976: 20; Agafitei and Selander 1980: 11; Selander 1981: 777; Selander and Agafitei 1982: 141; Berriós-Ortíz 1985: 180. Pinto 1991: 210.

Epicauta (Henous) conferta: MacSwain 1956: 45.

Terra typica. *E. conferta* Neotype female (designated by Werner 1945) Dallas, Texas; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Nuevo León. United States: Arkansas, Illinois, Iowa, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, Texas.

***Epicauta (Epicauta) convergenta* Kaszab, 1963**

Epicauta convergenta Kaszab, 1963: 338; Pinto and Bologna 2016: 205.

Terra typica. Holotype male, Machupichu, Cuzco, Peru; SUNM.

Distribution. Peru.

Records. Peru: Cusco.

***Epicauta (Epicauta) cora* García-París & Ruiz, 2013**

Epicauta cora García-París & Ruiz, 2013: 59.

Terra typica. Holotype sex?) Nayarit, Huaynamota, Los Sabinos, Mexico; CNIN-IBUNAM.

Distribution. Mexico.

Lacality records. Mexico: Nayarit, Río Huaynamota, Los Sabinos.

***Epicauta (Epicauta) corvina* (LeConte, 1858)**

Lytta corvina LeConte, 1858: 21.

Cantharis corvina: Gemminger and Harold 1870: 2149.

Epicauta corvina: Horn 1873: 96, 102; 1885: 111; Dugès 1877: 66; Champion 1892: 418; Milliken 1921: 6; Cockerell and Harris 1925: 32; Carruth 1931: 52; Denier 1935: 154; Blackwelder 1945: 483; Werner 1945: 446; Vaurie 1950: 23; Dillon 1952: 389; Werner et al. 1966: 32; Pinto 1973: 968; 1977: 139; 1991: 220; Arnold 1976: 19; Pinto and Mayor 1986: 602.

Terra typica. Lectotype female (designated by Werner 1945) Valley of the Gila, Arizona; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Sinaloa, Sonora. United States: Arizona, Colorado, Iowa, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming.

***Epicauta (Epicauta) corybantica* Pinto, 1991**

Epicauta corybantica Pinto, 1991: 145.

Epicauta alphonsei: Fall 1901: 184; Werner 1945: 480; 1955: 3; Pinto 1972: 256.

Epicauta alphonsei: Moore 1937: 42.

Terra typica. Holotype male, S. Adelanto, San Bernardino Co., California.

Distribution. United States.

Location. United States: California.

***Epicauta (Epicauta) costata* (LeConte, 1854)**

Lytta costata LeConte, 1854: 84; 1858: 23.

Pleuropompha costata: LeConte 1862: 273; LeConte and Horn 1883: 421; Cockerell and Harris 1925: 30; Werner 1943: 31; 1945: 426; Vaurie 1950: 38; Dillon 1952: 378; Gupta 1965: 457; 1971: 14; Werner et al. 1966: 53; Goeden 1971: 47, 48; Pinto 1973: 957; 1977: 135; Arnold 1976: 30; Selander 1981: 780.

Cantharis costata: Gemminger and Harold 1870: 2149.

Epicauta costata: Pinto 1984: 381; 1991: 228; Pinto and Mayor 1986: 602.

Terra typica. Holotype female Frontera (Rio Grande), New Mexico: MCZC.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila, Durango, Sonora. United States: Arizona, California, New Mexico, Oklahoma, Texas.

***Epicauta (Epicauta) costipennis* Borchmann, 1930**

Epicauta costipennis Borchmann, 1930: 93; Denier 1935: 154; Blackwelder 1945: 483; Campos-Soldini et al. 2009: 4.

Terra typica. Type (s?) Troquero, Jujuy; MACN.

Distribution. Argentina.

Location. Argentina: Jujuy.

New records (Figure 3): Argentina: Jujuy (Torquero) [MLPA].

***Epicauta (Epicauta) crassitarsis* Maydell, 1935**

Epicauta crassitarsis Maydell, 1935: 72; Denier 1940: 419; Werner 1945: 439; Werner et al. 1966: 38; Adams and Selander 1979: 234; Pinto 1991: 241.

Terra typica. Holotype male, Tempe, Arizona; USNM.

Distribution. Mexico, United States.

Location. Mexico: Sinaloa, Sonora. United States: Arizona.

***Epicauta (Epicauta) crucerea* Selander, 1981**

Epicauta crucerea Selander, 1981: 589.

Terra typica. Holotype male, Chiquitos, Santa Cruz, Bolivia; MNH.

Distribution. Bolivia.

Location. Bolivia: Santa Cruz (San José de Chiquitos, 700 m).

***Epicauta (Epicauta) cupraeola* (Dugès, 1869)**

Cantharis cupraeola Dugès, 1869: 112; Horn 1885: 107; Vásquez and Zaragoza 1979: 578.

Cantharis rufipedes Dugès, 1870: 163.

Cantharis cinctella Dugès, 1877: 59.

Lytta subvittata Haag-Rutenberg, 1880: 47; Pinto, 1982: 47.

Epicauta insignis Horn, 1885: 110; Werner 1945: 437; Dillon 1952: 397; Werner et al. 1966: 37; Pinto 1977: 137.

Epicauta rufipedes: Dugès 1889: 64; Champion 1892: 407; Denier 1935: 22; Vaurie 1950: 17; Selander 1954: 87; 1959: 210; Pinto 1982: 404.

Epicauta cinctella: Dugès 1889: 69.

Epicauta vittula Beauregard, 1889: 113 (n repl. name for *E. subvittata* (Haag-Rutenberg) nec Erichson, 1848).

Epicauta cupraeola: Champion 1982: 408; Dugès 1889: 69; Denier 1935: 152; 1940: 419; Blackwelder 1945: 483; Pinto 1991: 244; García-París and Ruiz 2013.

Terra typica. *E. cupraeola* Holotype male, “en los cerros de Guanajauto” lost. Neotype male (designated by Pinto 1991); BMNH. *E. rufipedes* Types (s) Hacienda de la Noria, Michoacán, Mexico; CASC. *E. cinctella* Type (s) states of Veracruz, Mexico, lost; Neotype male (designated by Pinto, 1991); CASC. *E. subvittata* Lectotype male (designated by Pinto 1982) Mexico; UZMH. *E. insignis* Lectotype male (designated by Werner, 1945) Arizona; MCZC.

Distribution. Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, United States.

Location. Costa Rica: Alajuela, Bebedero, Cabo Santa Elena, La Pacifica, Las Canas, Leberia, Palo Verde, Turrialba, Turrubales. El Salvador: La Unión, Quezaltepeque, San Andrés, San Salvador. Guatemala: Guatemala, Managua, Rabinal, Sacapulas, Salama, San Gerónimo, Zacapa. Honduras: Siguatepeque, Tegucigalpa. Mexico: Aguascalientes, Campeche, Chiapas, Chihuahua, Coahuila, Colima, Distrito Federal, Durango, Guanajuato, Guerrero, Jalisco, Mexico, Michoacán, Morelos, Nayarit, Quintana, San Luis de Potosí, Sinaloa, Sonora, Veracruz, Yucatán, Zacatecas. Nicaragua: Chontales, Jinotega, Managua, Nandaime, Rivas. United States: Arizona, New Mexico.

Epicauta (Epicauta) curticollis Borchmann, 1930

Epicauta curticollis Borchmann, 1930: 92.

Terra typica. Type (?) male and female, Santa Trinidad, Paraguay; type locality unknown.

Distribution. Argentina: Misiones. Brazil: Mina Gerais. Paraguay (country labeled only).

New records (Figure 3): Argentina: Misiones (Province labeled only). Brazil: Mina Gerais (Diamantina) [MLPA].

Epicauta (Epicauta) curvicornis (Haag-Rutenberg, 1880)

Lytta curvicornis Haag-Rutenberg, 1880: 54.

Lytta funebris Haag-Rutenberg, 1880: 44.

Macrobasis antennalis Dugès 1881: 148; 1889: 54.

Epicauta curvicornis: Champion 1892: 406; Dinier 1935: 154; Blackwelder 1945: 483
Pinto 1982: 407; 1984: 378; 1991: 264.

Epicauta (Epicauta) curvicornis: Werner 1973: 461.

Terra typica. *E. curvicornis* Lectotype male (designated by Pinto 1982) Mirador, Veracruz, Mexico; BMNH.

Distribution. Mexico.

Location. Mexico: Guerrero, Michoacán, Morelos, Oaxaca, Puebla, Veracruz.

***Epicauta (Epicauta) delicata* Mathieu, 1983**

Epiauta delicata Mathieu, 1983: 158; Pinto 1984: 381; 1991: 230.

Terra typica. Holotype male, Paila, Coahuila.

Distribution. Mexico.

Location. Mexico: Coahuila.

***Epicauta (Epicauta) diagramma* (Burmeister, 1881)**

Cantharis diagramma Burmeister, 1881: 24.

Cantharis griseonigra: Berg 1881: 304 (*partim*).

Lytta griseonigra: Borchmann 1917: 405 (*partim*).

Epicauta diagramma: Denier 1935b: 154; 1940: 419; Blackwelder 1945: 483; Campos-Soldini 2011: 580.

Terra typica. Type (s?) Uruguay; type locality unknown.

Distribution. Argentina, Uruguay.

Location. Argentina: Buenos Aires: Tandil; Mendoza; San Juan; San Luis. Uruguay (country labeled only).

New records (Figure 3): Argentina: Mendoza (Cerro Cacheuta); San Juan (Las Tumanas, Valle Fétil); San Luis (San Gerónimo) [IADIZA, Barriga-Tuñón, FIMLA, MACN].

***Epicauta (Epicauta) diana* Pinto, 1991**

Epicauta diana Pinto, 1991: 253. García-París and Ruiz 2013.

Terra typica. Holotype male, Villa Unión, Sinaloa, Mexico; CASA.

Distribution. Mexico.

Location. Mexico: Oaxaca, Sinaloa.

***Epicauta (Epicauta) dilaticornis* Borchmann, 1952**

Epicauta dilaticornis Borchmann, 1952; Pinto and Bologna 2016: 205.

Terra typica. Holotype female, Peru, Pampa de Cangallo; type locality unknown.

Distribution. Peru.

Location. Peru: Ayacucho; Pampa de Cangallo, 3450 m; Querobamba; Tayapampa 4025 m.

***Epicauta (Epicauta) dilatipennis* Pic, 1916.**

Epicauta dilatipennis Pic, 1916: 8; Denier 1935b: 154, 1940: 419; Blackwelder 1945:

483; Campos-Soldini and Roig-Juñent 2015: 26.

Terra typica. Unknown.

Distribution. Argentina.

Location. Argentina: Misiones, Santiago del Estero.

New records (Figure 3): Argentina: Santiago del Estero (San Ignacio) [MACN].

***Epicauta (Epicauta) diversipubescens* Maydell, 1934**

Epicauta diversipubescens Maydell, 1934: 333; Denier 1940: 420; Werner 1945: 487; 1949: 106, 108; 1954: 110; 1955: 5; Pinto 1991: 147.

Terra typica. Holotype male, Albuquerque, New Mexico; USNM.

Distribution. United States.

Location. United States: New Mexico, Texas.

***Epicauta (Epicauta) emarginata* Champion, 1892**

Epicauta emarginata Champion, 1892: 426; Vaurie 1950: 30; Denier 1935: 155; Blackwelder 1945: 483; Werner 1954: 105; Werner et al. 1966: 44; Pinto 1982: 407; 1991: 307.

Epicauta calcarata Werner, 1944: 70; 1945: 477; Dillon 1952: 416.

Terra typica. *E. emarginata*, Lectotype male (designated by Pinto 1982) San Isidro, Coahuila, Mexico; BMNH.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Coahuila. United States: Arizona, New Mexico, Texas.

***Epicauta (Epicauta) ennsi* Werner, 1957**

Epicauta ennsi Werner, 1957: 97; Hoebeke 1978: 4; Pinto 1991: 308.

Terra typica. Holotype male, north of Rockport, Aransas Co., Texas; SEMC.

Distribution. United States.

Location. United States: Texas.

***Epicauta (Excavata) excavata* (Klug, 1825)**

Cantharis excavata Klug, 1825: 440; Gemminger and Harold 1870: 2150

Cantharis sulcifrons Chevrolat, 1829: 135; Gemminger and Harold 1870: 2154

Epicauta excavata: Borchmann 1917: 74; Denier 1935: 155, 1940: 420; Blackwelder 1945: 483. Martinez 1992: 5–6; Di lorio 2004: 168; Campos-Soldini and Roig-Juñent 2011: 26.

Terra typica. Unknown.

Distribution. Argentina, Brazil, Paraguay.

Location. Argentina: Misiones, Jujuy, Salta. Brazil: Río Grande do Sul. Chile: Huasco. Paraguay: San Pedro.

New records (Figure 3): Argentina: Misiones (Departamento de Concepción, Departamento de Santa María, San Ignacio); Salta (El Abisal, Coronel Moldes, Corralito, La Viña, Rosario de Lerma, Sumalago). Brazil: Matto Grosso (Rancho Grande). Chile: Huasco (Canto del Agua). Paraguay: San Pedro (Cororo) [Barriga-Tuñón, MACN].

***Epicauta (Epicauta) excavatifrons* Maydell, 1934**

Epicauta excavatifrons Maydell, 1934: 330; Denier 1940: 420; Werner 1945: 484; 1955: 5; Selander 1984: 3; Pinto 1991: 149.

Terra typica. Holotype female, Ocala, Marion Co., Florida; ANSP.

Distribution. United States.

Location. United States: Alabama, Florida, Mississippi.

***Epicauta (Epicauta) falcolorandina* García-París et. al., 2016**

Epicauta falcolorandina García-París, Ruiz, Sánchez-Vilas & López-Estrada, 2016: 946.

Terra typica. Holotype female, Venezuela, Parapara; CNIN-IBUNAM.

Distribution. Venezuela.

Location. Venezuela: Falcon, Lara.

***Epicauta (Epicauta) fallax* Horn, 1885**

Epicauta fallax Horn, 1885: 111; Fall 1901: 184; Denier 1935: 155; Werner 1945: 450; 1954: 108; Ballmer 1980: 83; Pinto 1991: 332.

Epicauta ensiformis Werner, 1944: 68.

Terra typica. *E. fallax*, Lectotype male (designated by Pinto 1991) Owens Valley, California; MCZC.

Distribution. United States.

Location. United States: California.

***Epicauta (Epicauta) ferruginea* (Say, 1824)**

Lytta ferruginea Say, 1824: 298; LeConte 1853: 341.

Cantharis ferruginea: Gemminger and Harold 1870: 2150.

Epicauta ferruginea: LeConte 1866; Horn 1873: 153; 1875: 153; 1891: 43; Champion 1892: 425; Wickham 1896: 34; Milliken 1921: 6; Carruth 1931: 51; Denier 1935: 155; Werner 1945: 465; Vaurie 1950: 28; Dillon 1952: 386; Parker and Wakeland 1957: 26; Gupta 1965: 454; Hatch 1965: 107; Werner et al. 1966: 43; Church 1967: 756; Rees 1973: 187; Arnold 1976: 25; Kumar et al. 1976: 23; Lavigne 1976: 755; Pinto 1991: 309.

Terra typica. Neotype female (designated by Werner 1945) Cambridge, Nebraska; MCZC.

Distribution. Canada, Mexico, United States.

Location. Tipical Race: Canada: Alberta, Manitoba, Saskatchewan. Mexico: Chihuahua. United States: Arizona, Colorado, Idaho, Kansas, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming. East Race: United State: Texas.

***Epicauta (Epicauta) flavogrisea* (Burmeisteir, 1881)**

Lytta flavogrisea Haag-Rutenberg, 1880: ?.

Cantharis flavogrisea Burmeister, 1881: 29.

Epicauta flavogrisea: Denier 1935: 155; Blackwelder 1945: 483;

Terra typica. Type (s?) Buenos Aires: Bahía Blanca; presumably in ZSBS.

Distribution. Argentina: Buenos Aires. Paraguay.

New records (Figure 4): Argentina: Buenos Aires (Sierra de la Ventana) [MACN].

***Epicauta (Epicauta) flobcina* Pinto, 1991**

Epicauta flobcina Pinto, 1991: 182.

Terra typica. Holotype male, Easton, Pennsylvania; CASC.

Distribution. United States.

Location. United States: Alabama, District of Columbia, Georgia, Illinois, Iowa, Kentucky, Massachusetts, Maryland, Minnesota, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Virginia, West Virginia, Wisconsin.

***Epicauta (Epicauta) floridensis* Werner, 1944**

Epicauta floridensis Werner, 1944: 68; 1945: 458; Arnold 1976: 22; Staines 1983: 47;

Selander 1984: 3; Pinto 1991: 184.

Epicauta pseudosolani: Dillon 1952: 395 (in part).

Terra typica. Holotype male, Sebring, Florida; MCZC.

Distribution. United States.

Location. United States: Alabama, Florida, Illinois, Louisiana, Mississippi, Missouri, New Jersey, Oklahoma, South Carolina, Texas.

***Epicauta (Epicauta) floydwerneri* Martínez, 1955**

Lytta rubriceps Blanchard, 1843: 200.

Epicauta floydwerneri Martínez, 1955: 58; 1992: 6. (New name for *E. rubriceps* (Blanchard, 1843), not *E. rubriceps* (Redtenbacher, 1842)).

Terra typica. Type (s?) Santa Cruz, Bolivia; MNHN, location unknown.

Distribution. Argentina, Bolivia, Brazil, Paraguay.

Location. Argentina: La Rioja, Mendoza, Jujuy, Misiones, Salta. Bolivia: Santa Cruz de la Sierra, El Cidral, Estación de Experimentación Agrícola Saavedra. Brazil: Parabíia. Paraguay: Colonia Nueva Italia, Departamento de Amambay.

New records (Figure 4): Argentina: Misiones (Concepción); Salta (Alemania, Ca-piautí, Chiloana, Coronel Moldes, La Viña, Pocitos, Rosario de Lerma, San Martín, Sumalago). Paraguay: Departamento de Amambay [Barriga-Tuñon, MACN].

***Epicauta (Epicauta) fortis* Werner, 1944**

Epicauta fortis Werner, 1944: 69; 1945: 466; Vaurie 1950: 28; Dillon 1952: 386; Werner et al. 1966: 43; Pinto 1975: 451; Arnold 1976: 25; Pinto 1991: 25.

Terra typica. Holotype male, Phoenix, Arizona; MCZC.

Distribution. Mexico, United States.

Location. Typical Race: Mexico: Baja California Norte, Baja California Sur, Chihuahua, Sonora. United States: Arizona, California, Kansas, Nevada, New Mexico, Oklahoma, Texas. East Texas Race: Mexico: Tamaulipas. United States: Texas.

***Epicauta (Epicauta) franciscana* Denier, 1935**

Epicauta franciscana Denier, 1935: 155; Blackwelder 1945: 483; Campos-Soldini et al. 2009: 4.

Terra typica. Holotype male, Rosario, Santa Fe, Argentina; MLPA.

Distribution. Argentina, Uruguay.

Location. Argentina: Buenos Aires, Santa Fe, La Rioja. Uruguay: Cerro Largo (Departament labeled).

New records (Figure 4): Argentina: Santa Fe (Rosario) [MLPA].

***Epicauta (Epicauta) fuliginosa* (Oliver, 1795)**

Cantharis fuliginosa Oliver, 1795: 14.

Epicauta fuliginosa: Borchmann 1917: 75.

Terra typica. Type (s?) unspecified locality; location, possibly in the MNHN.

Distribution. Colombia: country labeled only.

***Epicauta (Epcauta) fulvicornis* (Burmeister, 1881)**

Cantharis fulvicornis Burmeister, 1881: 29; Berg, 1881: 307.

Epicauta fulvicornis: Bruch 1914: 404; Denier 1935: 155; Bosq 1943: 11; Hayward 1942: 22; Blackwelder 1945: 483; Martínez 1992: 6; Di Iorio 2004: 168; Campos-Soldini and Roig-Juñent 2011: 26.

Epicauta testaceicornis Pic, 1916: 8.

Lytta fulvicornis: Borchmann 1917: 94.

Epicauta fourcadei Denier, 1939: 179; Blackwelder 1945: 483; Campos-Soldini et al. 2009: 4.

Terra typica. two Types *Cantharis fulvicornis*, Mendoza, province labeled only; MACN. Holotype (sex?) *Epicauta fourcadei*, Argentina; MLPA.

1–3 is deposited at MLPA (La Plata, Argentina).

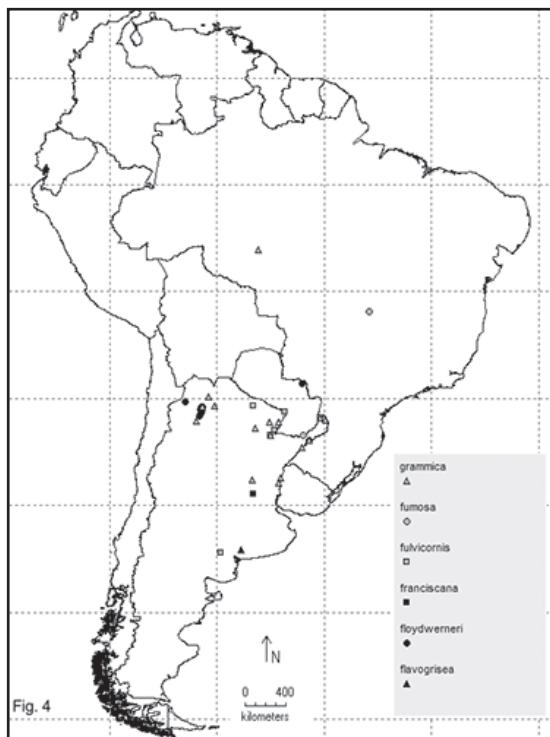


Figure 4. New distribution records for: *E. flavogrisea*; *E. floydwerneri*; *E. franciscana*; *E. fulvicornis*; *E. fumosa*; and *E. grammica*.

Distribution. Argentina, Paraguay.

Location. Argentina: Chaco, Corrientes, Entre Ríos, Fromosa, La Rioja, Misiones, Santa Fe, Santiago del Estero, Salta, Tucumán.

New records (Figure 4): Argentina: Chaco (General Vedia, Río Tapengo); Formosa (Clorinda, Las Lomitas); Misioines (Chulumani, Iguazú) [MLPA, FIMLA, MACN].

Epicauta (Epicauta) fumosa (Germar, 1824)

Lytta fumosa Germar, 1824: 173.

Cantharis fumosa: Gemminger and Harold 1870: 2150.

Anomalonyx fumosus Denier, 1935: 161.

Anomalonychus fumosus Sailor, 1940: 46; Kaszab 1963: 340.

Epicauta fumosa: Borchmann 1917: 75; Blackwelder 1945: 483; Pinto 1984: 378.

Terra typica. *Anomalonychus fumosus* Holotype male, Alotype female and one Paratype, Santa Catharina, Brazil in the Sammlung des Museums G. Frey. *Anomalonyx fumosus*; MLPA location unknown.

Distribution. Argentina, Brazil.

Location. Argentina: Misiones. Brazil: Goyaz.

New records (Figure 4): Argentina: Misiones (Province labeled only). Brazil: Goyaz [MACN].

Epicauta (Epicauta) funebris Horn, 1873

Epicauta funebris Horn, 1873: 102; Milliken 1921: 6; Denier 1935: 23; Horsfall 1943: 41; Werner 1945: 447; Dillon 1952: 389; Selander and Weddle 1969: 37; Rees 1973: 188; Arnold 1976: 20; Selander 1981: 777; Pinto 1977: 141; 1991: 186.

Epicauta cinerea: Riley 1877: 551, 561; Chittenden 1903: 24; Milliken 1921: 6; Rees 1973: 181

Epicauta pestifera Werner, 1949: 100 (n, repl. name for *E. solani* Werner, 1945 nec Denier, 1940); Gupta 1965: 455; Selander and Weddler 1969: 37; Arnold 1976: 21; Adams and Selander 1979: 173, 217; Selander 1981: 777; 1982: 427; 1984: 3; Staines 1983: 48; Lago and Mann 1987: 5; MacCormik and Carrel 1987: 310; Blodgett and Higging 1988: 1461

Epicauta (Epicauta) solani: MacSwain 1956: 46.

Terra typica. *E. funebris* Lectotype (designated by Werner 1945) Texas; MCZC. *E. pestifera* Holotype male, Norwood Pennsylvania; MCZC.

Distribution. United States.

Location. United States: Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin.

Epicauta (Epicauta) geniculata (Haag-Rutenberg, 1880)

Lytta geniculata Haag-Rutenberg, 1880: 28.

Epicauta geniculata: Blackwelder 1945: 483.

Terra typica. Type (?) Brazil, presumably in ZSBS.

Distribution. Argentina, Brazil, countries labeled only.

Epicauta (Epicauta) grammica (Fischer, 1827)

Cantharis grammica Fischer, 1827: 19; Gemminger and Harold 1870: 2151.

Epicauta grammica: Borchmann 1917: 75; Denier 1935: 155, 1940: 420; Blackwelder 1945: 483; Martínez 1992: 6; Campos-Soldini and Roig-Juñent 2011: 27.

Epicauta fidelis Brethes, 1925: 14.

Terra typica. *Cantharis grammica*, Type (?) Brazil; RMM, present location unknown.

E. fidelis Holotype (?) Santa Fe, Argentina; MACN.

Distribution. Argentina, Bolivia, Brazil, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Panama, Paraguay, Uruguay and Venezuela.

Location. Argentina: Chaco, Córdoba, Corrientes, Entre Ríos, Formosa, Jujuy, Misiones, Salta, Santa Fe, Rio Negro, Santa Fe, Salta, Tucumán. Paraguay: Departamento de San Pedro. Bolivia: Cochabamba. Brazil: Mato Grosso, Minas Gerais, São Paulo. Colombia: Magdalena, Meta, Santander, Vélez, Guanacaste, Puntarenas, San José, Coyolar. El Salvador: La Libertad. Guatemala: Izabal, Cuyotenango. Honduras:

Copán, Francisco Morazón. Panama: Canal Zone, Coclé, Panamá. Uruguay: Rio Negro. Venezuela: Apure, Aragua, Bolívar, Carabobo, Distrito Federal, Miranda, Monagas, Portuguesa, Sucre, Trujillo, Zulia.

New records (Figure 4): Argentina: Chaco (Resistencia, Saenz Peña); Corrientes (Santo Tomé); Entre Ríos (Concordia, Parque Nacional el Palmar); Formosa (Campos Villafañe, Río Pilcomayo); Jujuy (Ledesma); Misiones (Iguazú, Piñalito, Santa María); Salta (Cafayate, Las Lajitas, Paso del Rey, Sumalao); Santa Fe (Piquete). Brazil: Mato Grosso (Rancho Grande) [Barriga-Tuñon, MLPA, MACN].

Epicauta (Epicauta) griseonigra (Fairmaire, 1873)

Cantharis griseonigra Fairmaire, 1873: 73; Berg 1881: 304 (partim).

Cantharis centralis Burmeister, 1881: 25.

Lytta griseonigra: Bruch 1914: 405 (partim).

Epicauta centralis var. *ochraceocincta* Pic, 1916: 22

Epicauta griseonigra: Borchmann 1917: 76 (partim); Denier 1935b: 156 (partim); Blackwelder 1945: 483 (partim); Viana and Williner 1974: 15; Martínez 1992: 6–7; Campos-Soldini 2011: 581.

Epicauta centralis: Borchmann 1917: 72; Bruch 1914: 404; Blackwelder 1945: 483; Di Iorio 2004: 168.

Terra typica. *Cantharis centralis*, Type (s?) Córdoba, La Rioja, Santiago del Estero; MHNP.

Distribution. Argentina, Uruguay.

Location. Argentina: Catamarca, Córdoba, Entre Ríos, Formosa, La Rioja, Mendoza, Salta, San Juan, San Luis, Santiago del Estero, Tucumán. Uruguay: country labeled only.

New records (Figure 5): Argentina: Córdoba (Calamuchita, El Sauce, Mansilla); Formosa (Bartolomé de las Casas, El Colorado, Laguna Yema); Salta (Chioacán, Salta Forestal); San Juan (Las Tunas); San Luis (El Balde, San Gerónimo) [Barriga Tuñón].

Epicauta (Epicauta) heterodera Horn, 1891

Epicauta heterodera Horn, 1891: 43; Maydell 1934: 333; Denier 1935: 156; Werner 1945: 478; Selander 1984: 3; Pinto 1991: 315.

Epicauta watsoni Blatchley, 1918: 58.

Terra typica. *E. heterodera* Lectotype female (designated by Werner 1945) northern Florida; MCZC. *E. watsoni*, Holotype female, near Gainsville, Florida; PURC.

Distribution. United States.

Location. United States: Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina.

Epicauta (Epicauta) hieroglyphica (Haag-Rutenberg, 1880)

Lytta hieroglyphica Haag-Rutenberg, 1880: 26.

Epicauta hieroglyphica: Borchmann 1917: 76; Blackwelder 1945: 483.

Terra typica. Type (s?) Brazil; presumably in ZSBS.

Distribution. Colombia and Brazil, countries labeled only.

New records (Figure 5): Colombia: Barranquilla (District labeled only) [MLPA].

Epicauta (Epicauta) horni Champion, 1892

Cantharis cinerea Dugès, 1869: 160.

Cantharis vicina Dugès, 1881: 147 (inappropriate repl. name). Horn 1885: 107.

Epicauta vicina: Dugès 1889: 70.

Epicauta horni: Champion 1892: 412 (n. repl. name of *E. cinerea* (Dugès), nec Foster, 1771; and for *E. vicina* (Dugès), nec Haag-Rutenberg, 1880); Denier 1935: 156; Blackwelder 1945: 483; Pinto 1991: 274.

Terra typica. Neotype male (designated by Pinto 1991) Guanajuato, Mexico; BMNH.

Distribution. Mexico.

Location. Mexico: Colima, Guanajuato, Tamaulipas.

Epicauta (Epicauta) hubbelli Werner, 1973

Epicauta (Epicauta) hubbelli Werner, 1973: 460.

Epicauta hubbelli: Pinto 1984: 378; 1991: 266.

Terra typica. Holotype male, Mexico, Chiapas; MCZC.

Distribution. Mexico.

Location. Mexico: Chiapas; Oaxaca.

Epicauta (Epicauta) imitatrix Kaszab, 1960

Epicauta imitatrix Kaszab, 1960: 405; Pinto and Bologna 2016: 205.

Terra typica. Holotype male and Allotype female, Puna de Andahuaylas, 4000 m, Peru; SMB.

Distribution. Peru.

Location. Peru: Apurímac, Ayacucho, Huanta, 2660 m.

Epicauta (Epicauta) impressifrons Van Dayke, 1928

Epicauta impressifrons Van Dayke, 1928: 262; 1929: 129; Denier 1935: 156; Werner 1945: 482; 1945: 482; 1949: 103, 105; 1955: 5; Pinto 1972: 256; 1991: 150.

Terra typica. Holotype male, Palm Springs, Riverside Co., California; CASC.

Distribution. United States.

Location. United States: California.

Epicauta (Epicauta) inconstans (Fischer, 1827)

Cantharis inconstans Fischer, 1827: 17; Gemminger and Harold 1870: 2151.

Epicauta inconstans: Borchmann 1917: 76; Denier 1935: 156; 1940: 420; Blackwelder 1945: 483.



Figure 5. New distribution records for: *E. griseonigra*; *E. hieroglyphica*; *E. inconstans*; *E. leopardina*; *E. koehleri*; and *E. kraussi*.

Terra typica. Unknown.

Distribution. Paraguay, Brazil.

Location. Paraguay: Villeta. Brazil (Country labeled only).

New records (Figure 5): Paraguay: Villeta (Colonia Nueva Italia) [MLPA].

Epicauta (Epicauta) insueta Werner, 1955

Epicauta insueta Werner, 1955: 11; Pinto 1991: 151.

Terra typica. Holotype male, Toluca, Mexico; AMNH.

Distribution. Mexico.

Location. Mexico: Toluca.

Epicauta (Epicauta) jeffersi Pinto, 1980

Epicauta normalis: Werner, 1949: 96 (in part); Werner et al. 1966: 38 (in part); Arnold 1976: 23.

Epicauta jeffersi Pinto, 1980: 56; 1991: 275.

Terra typica. Holotype male, southeast of Willcox, Arizona; CASC.

Distribution. United States.

Location. United States: Arizona, Colorado, Oklahoma.

***Epicauta (Epicauta) jimenezi* Dugès, 1889**

Epicauta jimenezi Dugès, 1889: 73; Champion 1892: 417; Denier 1935: 156; Vaurie 1950: 23; Blackwelder 1945: 483; Werner 1954: 110; Werner et al. 1966: 32; Vázquez and Zaragoza 1979: 580; Pinto 1991: 222.

Epicauta nigropilosa Maydell, 1934: 332; Denier 1940: 421.

Terra typica. *E. jimenezi* Holotype (sex?) Guadalajara, Mexico; UNAM. *E. nigropilosa* Holotype (sex?) Guadalajara, Mexico; UNAM.

Distribution. Mexico, United States.

Location. Mexico: Durango, Jalisco, Sinaloa, Sonora. United States: Arizona.

***Epicauta (Epicauta) kansanas* Werner, 1944**

Epicauta kansanas Werner, 1944: 70; 1945: 476; Ballamer 1980: 84; Pinto 1991: 332.

Terra typica. Holotype male, type locale unknown, erroneously labeled “Sedgewick Co., Kansas”; USNM.

Distribution. United States.

Location. United States: Kansas.

***Epicauta (Epicauta) koehleri* Denier, 1940**

Epicauta koehleri Denier, 1940: 420; Bosq 1943: 11; Viana and Williner 1974: 11; Di Iorio 2004: 168; Campos-Soldini and Roig-Juñent 2015: 28.

Terra typica. Holotype male, Allotype female, Santa Fe: Sancti Spiritu; MLPA, location unknown.

Distribution. Argentina, Bolivia.

Location. Argentina: Buenos Aires, Chubut Mendoza, Golfo San Jorge, Neuquén, San Juan, Santa Cruz, Santa Fe, Río Negro. Bolivia: Nor Yungas, La Paz.

New records (Figure 5): Argentina: Formosa (Bermejo, Laguna Yema); Neuquén (Lago Verde, San Martín de los Andes, Río Agrio) [IADIZA, FIMLA, MACN].

***Epicauta (Epicauta) koehleri* var. *solani* Denier, 1940**

Epicauta koehleri var. *solani* Denier, 1940: 421.

Terra typica. Holotype and Allotype (sex?), Argentina; MLPA, location unknown.

Distribution. Argentina.

Location. Argentina: Mendoza, Neuquén, San Juan, Santa Cruz.

***Epicauta (Epicauta) korytkowskii* Kaszab, 1978**

Epicauta korytkowskii Kaszab, 1978: 331; Pinto and Bologna 2016: 205.

Terra typica. Type (?) Santa Cruz, Peru; type locality unknown.

Distribution. Peru.

Location. Peru: Cajamarca; Santa Cruz.

Epicauta (Epicauta) kraatzi (Haag-Rutenberg, 1880)

Lytta kraatzi Haag-Rutenberg, 1880: 22.

Epicauta kraatzi: Borchmann 1917: 76.

Terra typica. Type (s?) Brazil; presumably in ZSBS.

Distribution. Brazil (Country labeled only).

Epicauta (Epicauta) kraussi (Haag-Rutenberg, 1880)

Lytta kraussi Haag-Rutenberg, 1880: 25.

Epicauta kraussi: Borchmann 1917: 97.

Terra typica. Type (s?) Irisanga, Brazil, in the collection of the “Mus. Vind. and Haag-Rutenberg (in part); ZSBS.

Distribution. Argentina: Córdoba. Brazil: Goyaz (Río Verde).

New Records (Figure 5): Argentina: Córdoba (Calamuchita) [MLPA].

Epicauta (Epicauta) laevicornis Werner, 1973

Epicauta (Epicauta) laevicornis Werner, 1973: 458.

Epicauta laevicornis: Pinto 1984: 378; 1991: 267.

Terra typica. Holotype male, Mountains and canyons north of Ajijic, Jalisco, Mexico; MCZC.

Distribution. Mexico.

Location. Mexico: Colima, Guerrero, Jalisco, Mexico, Michoacán.

Epicauta (Epicauta) latitarsis (Haag-Rutenberg, 1880)

Lytta latitarsis Haag-Rutenberg, 1880: 33.

Epicauta latitarsis: Blackwelder 1945: 483; Pinto and Selander 2016: 205.

Terra typica. Type (s?) Peru, Coll: Haag-Rutenberg; presumably in ZSBS.

Distribution. Peru.

Location. Peru: Ayacucho.

Epicauta (Epicauta) leopardina (Hagg-Rutenberg, 1880)

Lytta leopardina Haag-Rutenberg, 1880: 30.

Cantharis leopardina: Burmeister 1881: 24; Berg, 1881: 304.

Epicauta leopardina: Bruch 1914: 404; Borchmann 1917: 77; Denier 1935: 156; Bosq 1934: 327; 1942: 11; Blackwelder 1945: 483; Viana and Williner 1974: 11; Martínez 1992: 7; Di Iorio 2004: 169; Campos-Soldini and Roig-Juñent 2015: 27.

Terra typica. Syntypes (sex?) Córdoba, Argentina; in the Haag-Rutenberg Collection, ZSBM.

Distribution. Argentina, Brazil, Colombia.

Location. Argentina: Buenos Aires, Catamarca, Córdoba, Chaco, Entre Ríos, Formosa, Mendoza, Misiones, Neuquén, Salta, San Juan, San Luis, Santa Fe, Santiago del Estrelo, Tucumán. Brazil: Goyaz, Río de Janeiro. Colombia: Atlántico.

New records (Figure 5): Argentina: Catamarca (Andgalá); Córdoba (Agua de Oro, Calamuchita, Cruz del Eje, Ischilín Quilino, La Falda, Laboulage, La Falda); La Rioja (Talamuyuna); Formosa (Laguna Yema, Palmar Largo); Mendoza (Desaguadero, Lavalle, Ñacuñán); Salta (Alemania, Carapari, Figueroa, María Juana, Piquete); San Juan (Las Rumanas, Valle Féritl); San Luis (Balde, San Gerónimo); Santa Fe (Arrufo, Colastiné Sur, La Rubia, Recreo, Rincón Norte, San Cristobal); Tucumán (Gobernador Garmendia) [IADIZA, FIMLA, MACN, MLPA, MCNFA].

***Epicauta (Epicauta) leucocoma* Champion, 1892**

Epicauta leucocoma Champion, 1892: 425; Denier 1935: 156; Pinto 1982: 407; 1991: 254.

Terra typica. Lectotype male (designated by Pinto 1982) Tepanistlahuaca (= Tepanixtlahuaca) Oaxaca, Mexico.

Distribution. Mexico.

Location. Mexico: Guerrero, Jalisco, Oaxaca.

***Epicauta (Epicauta) limbaticollis* Pic, 1924**

Epicauta limbaticollis Pic, 1924: 32; Pinto and Bologna 2016: 205.

Terra typica. Type (s?) Peru; type locality unknown.

Distribution. Peru: country labeled only.

***Epicauta (Epicauta) lizeri* Denier, 1934**

Epicauta lizeri Denier, 1934: 271; Denier 1940: 421; Blackwelder 1945: 483; Campos-Soldini et al. 2009: 5; Campos-Soldini and Roig Juñent 2015: 29.

Terra typica. Holotype, allotype, and eight paratypes (sex?), Argentina: MLPA; two paratypes, location unknown; MACN.

Distribution. Argentina, Bolivia.

Location. Argentina: Catamarca, Chaco, Jujuy, La Rioja, Salta, Santa Cruz, Santiago del Estero, Tucumán. Bolivia: Santa Cruz.

New records (Figure 6): Argentina: Salta (province labeled only); Tucumán (Tafí del Valle). Bolivia: Santa Cruz (Lagunilla); [MLPA, FIMLA, MACN, MLPA].

***Epicauta (Epicauta) luctifera* (Fairmaire, 1873)**

Cantharis luctifera Fairmaire, 1873: 534; Berg 1881: 303.

Cantharis leucomoma Burmeister, 1881: 22.

Lytta luctifera: Bruch 1914: 405.

Epicauta luctifera: Borchmann 1917: 77; Bosq 1943: 11; Hayward 1942: 23; Blackwelder 1945: 483; Viana and Williner 1974: 14; Di Iorio 2004: 169; Campos-Soldini 2011: 582.

Terra typica. *Cantharis leucocoma*, Type (?) Uruguay; type locality unknown.

Distribution. Argentina, Uruguay.

Location. Argentina: Buenos Aires; Córdoba, San Luís, Tucumán. Uruguay (Montevideo).

New records (Figure 6): Argentina: Córdoba (Calamuchita, El Sauce). Uruguay: Florida (Arroyo Chico); Montevideo: (Minas) [Barriga-Tuñón, MLPA].

Epicauta (Epicauta) luteolineata Pic, 1933

Epicauta luteolineata Pic, 1933: 25.

Epicauta missionum var *luteolineata*: Denier 1935: 157; 1940: 421; Blackwelder 1945: 483; Di Iorio 2004: 169; Campos-Soldini and Roig-Juñent 2011: 38.

Terra typica. Syntypes (sex?), “Río Salado” Argentina; type locality unknown.

Distribution. Argentina.

Location. Argentina: Mendoza, Misiones, Santa Fe; Salta, Santiago del Estero, Tucumán.

Epicauta (Epicauta) maculata (Say, 1823)

Lytta maculata Say, 1823: 298; LeConte 1853: 340.

Lytta conspersa LeConte, 1853: 340; 1866: 158.

Cantharis maculata: Gemminger and Harold 1870: 2151.

Epicauta maculata: LeConte 1866: 158; Denier 1935: 156; Gilberston and Horsfall 1940: 14; Larson 1943: 480; Werner 1944: 65; 1945: 441; 1949: 95 (in part); Vauri 1950: 19; Dillon 1952: 393; (in part); Arnold 1976: 23; Pinto 1980: 64; 1991: 275; Bouseman 1986: 366.

Cantharis punctata: Dugès 1870: 161.

Epicauta media Dugès, 1889: 82.

Epicauta conspersa: Champion 1892: 413.

Epicauta nogales Werner, 1944: 65; 1945: 442; 1949: 96; Dillon 1952: 391; Werner et al. 1966: 39; Pinto 1975: 430.

Terra typica. *E. maculata*: Neotype male (designated by Werner 1945) Indianola, Nebraska; MCZC. *E. conspersa* Lectotype male (designated by Werner 1945) Missouri. *E. punctata* apparently lost. *E. media* Holotype male, Nogales, Arizona; MCZC.

Distribution. Canada, Guatemala, Mexico, United States.

Location. Canada: Manitoba, Saskatchewan. Guatemala: Chichicastenango, Huehuetenango. Mexico: Aguascalientes, Chihuahua, Coahuila, Distrito Federal, Du-

rango, Guanajuato, Hidalgo, Jalisco, Michoacan, Nuevo León, Oaxaca, Queréteros, Sonora, Zacatecas. United States: Arizona, Colorado, Illinois, Iowa, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas.

***Epicauta (Epicauta) magnomaculata* Martin, 1932**

Epicauta magnomaculata Martin, 1932: 169; Maehler 1939: 65; Denier 1940: 421; Werner 1945: 445; Pinto 1980: 46; 1991: 276.

Terra typica. Holotype male, Ballart, Inyo Co., California; CASC.

Distribution. United States.

Location. United States: California.

***Epicauta (Epicauta) major* Pic, 1924**

Cantharis marginata: Dugès 1877: 59.

Epicauta marginata: Dugès 1889: 78.

Epicauta cinerea: Champion 1892: 421.

Epicauta cinctipennis major Pic, 1924: 2.

Epicauta subatra: Denier 1935: 22.

Epicauta major: Pinto 1991: 191.

Terra typica. Syntypes from southern Tamaulipas and San Luis Potosí south; MNHP.

Distribution. Costa Rica, Guatemala, Honduras, Mexico, Panama.

Location. Costa Rica: Carillo, Cartago, Dos Ríos, Hamburg Farm, Juan Viñas, La Estrella, San Carlos. Guatemala: Senahu, Panzós, Tikal. Honduras: Tela. Mexico: Campeche, Chiapas, Oaxaca, Quintana Roo, San Luis Potosí, Tabasco, Veracruz, Yucatan. Panama: Cerro Salud, Maje Island.

***Epicauta (Epicauta) mexicana* (Dugès, 1889)**

Henous mexicanus Dugès, 1889: 37; Champion, 1892: 369; Van Dyke 1928: 409.

Epicauta mexicana Pinto, 1991: 196.

Terra typica. Lectotype male (designated by Pinto 1991) Mexico; HMNH.

Distribution. Mexico.

Location. Mexico: Hidalgo, Veracruz.

***Epicauta (Epicauta) minutepunctata* Borchmann, 1930**

Epicauta minutepunctata Borchmann, 1930: 94; Denier 1935: 157; Blackwelder 1945: 483; Campos-Soldini and Roig-Juñent 2015: 31.

Epicauta rosilloi Martínez, 1952: 255; Campos-Soldini and Roig-Juñent 2015.

Terra typica. Type (?) Mendoza: Pedregal; MACN.

Distribution. Argentina.

Location. Argentina: Buenos Aires, Jujuy, Salta, San Luis: San Francisco, Tucumán.



Figure 6. New distribution records for: *E. lizeri*; *E. luctifera*; *E. minutepunctata*; *E. missionum*; *E. montei*; and *E. nattereri*.

New records (Figure 6): Argentina: Buenos Aires (province labeled only); Entre Ríos (Concordia); Salta (Chicoana, Salta Forestal, Tabillar) San Luis (San Francisco); Tucumán (Río Mediano) [MLPA, Barriga-Tuñón, FIMLA, MACN].

Epicauta (Epicauta) mirabilis Kaszab, 1963

Epicauta mirabilis Kaszab, 1963: 338; Pinto and Bologna 2016: 205.

Terra typica. Holotype male, Ayacucho, Peru; SUNM.

Distribution. Peru.

Location. Peru: Ayacucho.

Epicauta (Epicauta) missionum (Berg, 1881)

Cantharis missionum Berg, 1881: 306.

Cantharis clericalis Berg, 1881: 308

Epicauta missionum Borchmann, 1971: 78; Denier 1935b: 157; Blackwelder 1945: 483; Campos-Soldini et al. 2009: 5; Campos-Soldini and Roig-Juñent 2015: 38.

Epicauta luteolineata var. *brevebasalis* Pic, 1933: 26.

Epicauta luteolineata var. *discolineata* Pic, 1933: 26; Denier 1935: 154; Blackwelder, 1945: 483.

Epicauta missionum var. *luteolineata*: Denier 1935b: 157; 1940: 421; Blackwelder 1945: 483; Di Iorio 2004: 169.

Epicauta clericalis var. *discolineata*: Denier 1935: 154; Blackwelder 1945: 483.

Terra typica. Holotype female, Misiones, Argentina; MLPA.

Distribution. Argentina, Brazil, Uruguay.

Location. Argentina: Buenos Aires, Córdoba, Entre Ríos, Formosa, Jujuy, La Rioja, Mendoza, Misiones, Neuquén, Rosario, Salta, San Juan, San Luis, Santa Fe, Santiago del Estero, San Luis, Tucumán. Brazil: Matto Grosso. Paraguay: San Pedro de Cororo. Uruguay: Rivera.

New records (Figure 6): Argentina: San Luis (Las Lajitas, San Gerónimo); Misiones (Lagunilla). Brazil: Matto Grosso (Rancho Grande). Paraguay: San Pedro (Cororo). Uruguay: Rivera (Sierra de la Rivera) [Barriga-Tuñon].

Epicauta (Epicauta) mixta Dugès, 1889

Lytta neglecta Haag-Rutenberg, 1880: 54.

Epicauta mixta Dugès, 1889: 83; Vázquez and Zaragoza 1979: 580; Pinto 1982: 404; 1991: 224; Pinto and Mayor 1986: 602.

Epicauta neglecta: Champion 1982 (in major part).

Terra typica. Holotype (?) Oaxaca, Mexico; UNAM.

Distribution. Mexico.

Location. Mexico: Chiapas, Distrito Federal, Guerrero, Hidalgo, Mexico, Michoacán, Morelos, Oaxaca, Veracruz.

Epicauta (Epicauta) modesta (Haag-Rutenberg, 1880)

Lytta modesta Haag-Rutenberg, 1880: 53.

Epicauta modesta: Champion 1892: 423; Denier 1935: 157; Blackwelder 1945: 483; Pinto 1991: 125.

Terra typica. Holotype male, Mexico; ZSMC.

Distribution. Mexico, country labeled only.

Epicauta (Epicauta) monachica (Berg, 1883)

Lytta monachica Berg, 1883: 68.

Epicauta monachica: Blanchard 1891: 495; Bruch 1914: 404; Borchmann 1917: 78; Denier 1935b: 157; Bosq 1934: 327; 1943: 11; Hayward 1942: 23; Blackwelder 1945: 483; Viana and Williner 1974: 87; Martinez 1992: 7; Di Iorio 2004: 170; Campos-Soldini et al. 2009: 5; Campos-Soldini and Roig-Juñent 2011: 39.

Terra typica. Lectotype female (designated by Adams and Selander 1979) Rodeo del Medio, Mendoza, Argentina; MLPA.

Distribution. Argentina, Bolivia, Brazil.

Location. Argentina: Catamarca; Córdoba, Chaco, La Rioja: Chilecito, Quebrada de Olta, Santiago del Estero, Salta, Santa Fe, Catamarca, Córdoba, Corrientes, Chaco, Formosa, La Rioja, Mendoza, Misiones, Salta, San Juan, Santa Fe, Santiago del Estero, Tucumán. Bolivia: Lagunilla. Brazil: Mato Grosso.

***Epicauta (Epicauta) monrosi* Kaszab, 1960**

Epicauta monrosi Kaszab, 1960: 402; Pinto and Bologna 2016: 205.

Terra typica. Holotype and Paratype male, Cuzco, 3200–4200 m, Peru; SUMB.

Distribution. Peru.

Location. Peru: Cusco.

***Epicauta (Epicauta) montara* Ballmer, 1980**

Epicauta montara Ballmer, 1980: 85; Pinto 1991: 333.

Terra typica. Holotype male, Montara, San Mateo Co., California; CASC.

Distribution. United States.

Location. United States: California.

***Epicauta (Epicauta) montei* Denier, 1935**

Epicauta montei Denier, 1935: 157; Blackwelder 1945: 483; Dilorio 2004: 170; Campos-Soldini et al. 2009: 5.

Terra typica. Holotype (sex?), Allotype (sex?) and Paratype (s?) Brazil: Mina Gerais, Bello Horizonte; Goyaz, Río Verde; Río de Janeiro, Mendes; Río Grande do Soul. Uruguay: Cerro Largo; in the Sección de Entomología del Instituto de Biología Vegetal de Río de Janeiro.

Distribution. Brazil, Uruguay.

Location. Argentina: Misiones. Brazil: Bello Horizonte (Mina Gerais); Goyaz: Río Verde; Río de Janeiro: Mendes; Río Grande do Soul. Uruguay: Cerro Largo.

New records (Figure 6): Argentina: Misiones. Brazil: Goyaz: Río Verde; Mina Gerais (Passa quattro) [MLPA].

***Epicauta (Epicauta) nattereri* Haag-Rutenberg, 1880**

Epicauta nattereri Haag-Rutenberg, 1880: 78; Denier 1935: 157; Blackwelder 1945: 483.

Terra typica. Type (s?) Irizanga, Brazil; “Mus. Vind. and Haag-Rutenberg; ZSBS.

Distribution. Brazil.

Location. Brazil: Goyaz.

New records (Figure 6): Brazil: Goyaz (Río Verde).

***Epicauta (Epicauta) nigrans* Mäklin, 1875**

Epicauta nigrans Mäklin, 1875; Pinto and Bologna 2016: 205.

Terra typica. Type (s?) Peru; type locality unknown.

Distribution. Peru (country labeled only).

Epicauta (Epicauta) nigropunctata (Blanchard, 1843)

Cantharis nigropunctata Blanchard, 1843: 200; Gemminger and Harold 1870: 2152.

Cantharis nigropunctata: Burmeister 1881: 28 (partim).

Epicauta nigropunctata: Borchmann 1917: 79; Denier 1935b: 158; Blackwelder 1945: 483; Bosq 1942: 11; Di Iorio 2004: 170; Campos-Soldini and Roig-Juñent 2015: 32.

Epicauta breyeri Denier, 1934: 273; 1935b: 154; Blackwelder 1945: 482.

Terra typica. *E. breyeri* Holotype male, Allotype female, La Rioja: Patquia; MACN; MLPA location unknown.

Distribution. Argentina, Bolivia, Brazil, Uruguay.

Location. Argentina: Catamarca, Chaco, Córdoba, Corrientes, Misiones, Mendoza, Salta. Bolivia Chulumání, Coroico. Brazil: Paraná. Uruguay: Montevideo.

New records (Figure 7): Argentina: Catamarca (Cuesta del Totoral); Chaco (El Zapallar); Córdoba (Calamuchita, La Serranita); Corrientes (Santo Tomé); Mendoza (Nihuil); Misiones (Apostoles, Iguazú, Pindapoy, San Ingacio, San Javier, Santa María); Salta (Cabra Corral, Corralito, El Alisal, José de Metan). Brazil: Paraná (Guaraniacú) [MLPA, Barriga-Tuñón, MACN].

Epicauta (Epicauta) nigerrima (Dugès, 1870)

Cantharis nigerrima Dugès, 1870: 161.

Epicauta nigerrima: Dugès 1889: 77; Pinto 1991: 225.

Epicauta corvina: Horn 1885: 107; Champion 1892: 418; Werner 1945: 446.

Terra typica. Pinto (1991) indicates that three males in the Salle Collection (BMNH) are from León.

Distribution. Mexico.

Location. Mexico: Aguascaliente, Durango, Guanajuato, Jalisco, Michoacán, Nuevo León, Querétaro, Sinaloa.

Epicauta (Epicauta) nigritarsis (LeConte, 1853)

Lytta nigritarsis LeConte, 1853: 340.

Cantharis nigritarsis: Gemminger and Harold 1870: 2152.

Epicauta nigritarsis: Horn 1873: 100; 1885: 111; Denier 1935: 158; Werner 1945: 438; 1949: 105; Dillon 1952: 396; Selander 1959: 211; Werner et al. 1966: 37; Arnold 1976: 23; Pinto 1977: 137; 1982: 403; 1991: 282; Adams and Selander 1979: 234; Pinto and Mayor 1986: 602.

Epicauta hesitata Dillon, 1952: 398.

Epicauta (Epicauta) nigritarsis Dillon, 1952: 398.

Terra typica. *E. nigritarsis* Lectotype female (designated by Werner 1945) Mexican Boundary (Texas); MCZC. *E. hesitata* Holotype male, Belton, Texas; TAMU.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, Nuevo León, Tamaulipas. United States: Arizona, New Mexico, Oklahoma, Texas.

Epicauta (Epicauta) normalis Werner, 1944

Epicauta normalis Werner, 1944: 65 (in part); 1949: 95 (in part); Vaurie 1950: 2 (in part); Dillon 1952: 392; Hatch 1965: 105; Werner et al. 1966: 38 (in part); Lavigne and Pfadt 1966: 7; Church 1967: 756; Kumar et al. 1967: 23; Rodgers and Lavigne 1972: 19; Pinto 1975: 430; 1980: 58; 1991: 277.

Terra typica. Holotype male, Bridgeport, California; MCZC.

Distribution. Canada, United States.

Location. Canada: Alberta, Saskatchewan. United States: Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, North Dakota, South Dakota, Texas.

Epicauta (Epicauta) obesa (Chevrolat, 1835)

Lytta obesa Chevrolat, 1835: 81.

Cantharis obesa: Dugès 1870: 128; Gemminger and Harold 1870: 2152.

Lytta mus Haag-Rutenberg, 1880: 55.

Epicauta obesa: Dugès 1889: 66; Champion 1892: 424; Denier 1935: 158; Blackwelder 1945: 483; Werner 1949: 100; Pinto 1982: 403; 1991: 196.

Epicauta auricomans Champion, 1982: 424; Vaurie 1950: 28; Pinto 1982: 403.

Epicauta picta Werner, 1949: 100; Arnold 1976: 21; Hoebeke 1978: 14.

Epicauta pseudosolani Dillon, 1952: 395.

Terra typica. *E. obesa* two syntypes (?) Toulepeck (=Toulepec), Mexico; UZMH.

Distribution. Canada, Mexico, United States.

Location. Canada: Ontario. Mexico: Distrito Federal, Hidalgo, Jalisco, Michoacán, Morelos, Nuevo León, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Veracruz. United States: Arkansas, Connecticut, Florida, Georgia, Illinois, Iowa, Massachusetts, Michigan, New Hampshire, New Mexico, North Carolina, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Wisconsin.

Epicauta (Epicauta) occidentalis Werner, 1944

Epicauta lemniscata: Horn 1873: 100; Ortenburger and Hatch 1926: 144; Ingram 1927: 1; Ingram and Douglas 1932: 71; Horsfall 1943: 32 (in part); Douglas 1935: 686; Werner 1945: 463; Dillon 1952: 389.

Epicauta vittata: Bruner 1891: 15; Cockerell and Harris 1925: 31; Tafanelli and Bess 1968: 51.



Figure 7. New distribution records for: *E. nigropunctata*; *E. philaemata*; *E. pilme*; *E. pluvialis*; *E. pullata*; and *E. purpleiceps*.

Epicauta occidentalis Werner, 1944: 69; 1945: 465; Dillon 1952: 399; Adams and Selander 1979: 246; Blodgett and Higgins 1988: 1456; Ray et al. 1989: 187; Pinto 1991: 348.

Epicauta (Epicauta) lemniscata: MackSwain 1956: 60.

Terra typica. Holotype male, Cambridge, Nebraska; MCZC.

Distribution. United States.

Location. United States: Alabama, Arkansas, Colorado, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Dakota, Tennessee, Texas.

Epicauta (Epicauta) ocellata (Dugès, 1870)

Cantharis ocellata Dugès, 1870: 160; Horn 1885: 107.

Epicauta ocellata: Champion 1892: 414; Denier 1935: 158; Blackwelder 1945: 483; Selander 1959: 211; Pinto 1980: 70; 1991: 278.

Terra typica. Neotype male (designated by Pinto, 1980) Atlixco, Mexico; CASC.

Distribution. Mexico.

Location. Mexico: Coahuila, Durango, Morelos, Oaxaca, San Luis Potosí.

Epicauta (Epicauta) ochropus (Haag-Rutenberg, 1880)

Lytta ochropus Haag-Rutenberg, 1880: 28.

Epicauta ochropus: Blackwelder 1945: 483.

Terra typica. Type (s?) Brazil, presumably in ZSBS.

Distribution. Brazil, country labeled only.

Epicauta (Epicauta) oregonia Horn, 1875

Epicauta oregonia Horn, 1875: 153; Denier 1935: 158; Werner 1945: 461; Parker and Wakeland 1957: 26; 1975: 432; 1965: 105; Werner et al. 1966: 34; Church 1967: 755; Rees 1973: 199; Pinto 1975: 432, 435; 1980: 42; 1991: 286.

Terra typica. Lectotype male (designated by Werner 1945) Oregon; MCZC.

Distribution. Canada, United States.

Location. Canada: Alberta, British Columbia, Manitoba, Saskatchewan. United States: Arizona, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Dakota, Utah, Washington.

Epicauta (Epicauta) pardalis LeConte, 1866

Epicauta pardalis LeConte, 1866: 157 (as race of *E. maculata*); Horn 1873: 96 (as species); Cahmpion 1892: 414; Denier 1935: 158; Blackwelder 1945: 484; Werner 1944: 65; 1945: 443; Vaurie 1950: 21; Dillon 1952: 392; Selander 1954: 87; Werner et al. 1966: 40; Pinto 1975: 43; 1980: 50; Ray et al. 1989: 187.

Epicauta (Epicauta) pardalis: MacSwain 1956: 58; Pinto 1991: 278.

Terra typica. Lectotype male (designated by Werner 1945) Valley of the Gila; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Aguascalientes, Chihuahua, Coahuila, Durango, Sonora. United States: Arizona, New Mexico, Texas.

Epicauta (Epicauta) parvula (Haldeman, 1853)

Meloe parvus Haldeman, 1852: 377; LeConte 1853: 329.

Meloe parvulus Haldeman, 1853: 404 (n. repl. name for *M. parvus* Haldeman, nec Solier, 1851).

Namaspis parvulus: Van Dyke 1928: 411.

Epicauta parva: Werner 1945: 449; Kumar et al. 1976: 23; Lavigne 1976: 754; Agafitei and Selander 1980: 13.

Epicauta parvula: Pinto 1991: 212.

Terra typica. Type (s) Santa Fe (Pinto 1991) indicates that the type (s) species is unknown.

Distribution. United States.

Location. United States: Colorado, Kansas, Nebraska, New Mexico.

***Epicauta (Epicauta) pedalis* LeConte, 1866**

Epicauta pedalis LeConte, 1866: 157; Horn 1873: 99; 1885: 111; 1894: 356; Denier 1935: 158; Werner 1945: 440; 1949: 93–95; Pinto 1991: 255.

Cantabris pedalis: Gemminger and Harold 1870: 2152.

Terra typica. Lectotype male (designated by Werner 1945; erroneously as female) Cape San Lucas, Baja California Sur, Mexico.

Distribution. Mexico.

Location. Mexico: Baja California Sur.

***Epicauta (Epicauta) pensylvanica* (Degeer, 1775)**

Cantharis pensylvanica Degeer, 1775: 15.

Meloe nigra Woodhouse, 1800: 213.

Lytta pensylvanica: LeConte 1853: 339; 1854: 447.

Lytta morio LeConte, 1854: 447.

Cantharis pennsylvanica: Gemminger and Harold 1870: 2152.

Epicauta pensylvanica: Riley 1877: 561; Champion 1892: 418; Wickham 1896: 34; Ulke 1902: 54; Chittenden 1903: 25; 1911: 92; Blatchely 1910: 1363; Gibson 1912: 83; Sherman 1913: 246; Rau and Rau 1916: 260; Milliken 1921: 6; Mutchler and Weiss 1924: 10, 18; Cicerelli and Harris 1925: 31; Gowdey 1926: 13; Carruth 1931: 52; Staig 1940: 135; Horsfall 1914: 114; 1943: 13; Denier 1935: 158; Blackwelder 1945: 484; Vaurie 1950: 25; Dillon 1952: 388; Selander 1954: 24; 1981: 757; 1982: 156, 427; 1984: 2; Selander and Bouseman 1960: 202; Parker and Wakeland 1957: 26; Gupta 1965: 454; Werner et al. 1966: 33; Church 1967: 754; Mathwig 1968: 544; Selander and Weddle 1969: 36; Rees 1973: 200; Arnold 1976: 20; Kumar et al. 1976: 23; Lavigne 1976: 754; Adams and Selander 1979: 160, 172; Werner et al. 1980: 1405; McLain 1982: 396; Staines 1983: 47; Capinera et al. 1985: 1054; Goldburg 1987: 247; Lago and Mann 1987: 5; Blodgett and Higgins 1988: 1456; Ray et al. 1989: 187.

Epicauta pensylvanica: Horn 1873: 102; Werner 1945: 447.

Lytta atrata: Claypole 1881: 31.

Epicauta potosina Dugès, 1889: 89.

Epicauta (Epicauta) pensylvanica: MacSwain 1956: 47; Pinto 1991: 201.

Terra typica. *E. pensylvanica*, *E. nigra* types unknown. *E. morio* Lectotype female (designated by Werner 1945) Texas; MCZC. *E. potosina* Holotype (?) Huasteca de San Luis Potosí, Mexico; UNAM.

Distribution. Canada, Mexico, United States.

Location. Canada: Alberta, Manitoba, New Brunswick, Ontario, Quebec, Saskatchewan. Mexico: Chihuahua, Coahuila, Durango, Nuevo León. United States: Alabama, Arizona, Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine,

Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin, Wyoming.

***Epicauta (Epicauta) peruensis* Kaszab, 1960**

Epicauta peruensis Kaszab, 1960: 407; Pinto and Bologna 2016: 205.

Terra typica. Holotype male, Tarma, Paru; SUM.

Distribution. Peru.

Location. Peru: Mountain near Tarma 3300 m; Junín.

***Epicauta (Epicauta) philaemata* (Klug, 1825)**

Lytta philaemata Klug, 1825: 434.

Cantharis philaemata: Gemminger and Harold 1870: 2152.

Epicauta philaemata: Borchmann 1917: 69, Denier 1935b: 158, Blackwelder 1945: 484, Adams and Selander 1979: 259.

Terra typica. Syntype (s?) Brazil; ZMHU location unknown.

Distribution. Argentina, Brasil, Venezuela.

Location. Argentina: Misiones, Tucumán. Brazil: Río de Janeiro, São Paulo, Santa Catarina. Venezuela: country labeled only.

New records (Figure 7): Argentina: Misiones (Aristóbulo del Valle, Arroyo Yacutinga, Dos de Mayo) [MACN].

***Epicauta (Epicauta) phoenix* Werner, 1944**

Epicauta phoenix Werner, 1944: 66; 1945: 443; Werner et al. 1966: 39; Pinto 1980: 55; 1991: 279.

Terra typica. Holotype male, Phoenix, Arizona; MCZC.

Distribution. United States.

Location. United States: country labeled only.

***Epicauta (Epicauta) pilme* Molina, 1758**

Epicauta pilme Molina, 1758.

Epicauta langei Borchmann, 1930: 95; Denier 1935b: 156; Blackwelder 1945: 483; Di Iorio 2004: 168; Campos-Soldini et al. 2009: 4 **New Synonymy**.

Epicauta nigripes Borchmann, 1930: 91; Denier 1935b: 158; Blackwelder 1945: 483; Di Iorio 2004: 170 **New Synonymy**.

Diagnosis. The species *E. langei* and *E. nigripes* are phenotypically very similar to *Epicauta pilme* by the combination of the following characters: body length 7–14mm. Tegument black. Legs with femora orange with apex black, tibiae and tarsi black. Body vestiture black, setae short, erect and minimal (6–9 setae along one mm long line)

allowing to see tegument. Head subrectangular. Antenna subcylindrical, tapering to apex; ratios length (L_{Ant}) vs. width (W_{Ant}) of antennomere female (L_{Ant}/W_{Ant}): 1.5 (I), 1.3 (II), 1.6 (III), 1.2 (IV), 1 (V-VII), 2.5 (VIII-X) 3.5 (XI); male: 1.6 (I), 0.8 (II), 2 (III), 1.3 (IV-X), 2.6 (XI). Pronotum subcampaniform. For this reason, we consider these species as a single specific entity whose valid name is *E. pilma* by priority.

Terra typica. *E. nigripes*, Syntypes, Catamarca, Valle de Santa María; MCNBR. *E. langei*, Type (s?) Catamarca, La Rioja; MCNBR.

Distribution. Argentina and Chile.

Location. Argentina: Buenos Aires, Catamarca, Chubut, Mendoza, Neuquén, Río Negro, Salta. Chile: Antofagasta, Arica, Atacama, Aysén, Bío Bío, Cautín, Coquimbo, Chiloe, Lonquihue, Maule, O'Higgins, Parincota, Tarapacá, Valdivia, Valparaiso, Villa Rica.

New records (Figure 7): Argentina: Buenos Aires (Sierra de la Ventana); Chubut (El Ojo del Epuyen); Mendoza (Godoy Cruz, Las Heras); Neuquén (Huiliche, Lago Lacar, Parque Nacional Lanín, Perdriel, Pino Hachado, Pucará, Rinconada, San Martín de los Andes); Río Negro (Bariloche, El Bolsón, Chimpay) Salta (Cachipampa, Cuesta del Obispo, Isonza). Chile: Antofagasta; Arica; Atacama; Aysén; Bío Bío; Cautín (Temuco); Coquimbo; Chiloe; Lonquihue; Maule; O'Higgins, Parincota; Santiago de Chile; Tarapacá; Valdivia; Valparaiso; Villa Rica (Lago Caburgua) [MLPA, IADIZA, Barriga-Tuñón, FIMLA, MACN].

Epicauta (Epicauta) pluvialis Borchmann, 1930

Epicauta pluvialis Borchmann, 1830: 95; Denier 1935b: 158; Bosq 1943: 11; Blackwelder 1945: 484; Viana and Williner 1974: 11; Martínez 1992: 7; Di Iorio 2004: 171; Campos-Soldini and Roig-Juñent 2015: 33.

Terra typica. Type (s?) Buenos Aires and Mendoza; MCNBR.

Distribution. Argentina.

Location. Argentina: Buenos Aires, Catamarca, Córdoba, Chubut, Entre Ríos, La Pampa, La Rioja, Mendoza, Salta, San Juan, San Luís, Río Negro.

New records (Figure 7): Argentina: Buenos Aires (Miramar); Catamarca (Hualfín, Punta Balasto, Santa María); Chubut (Península de Valdés); Córdoba (Ascochinga, Los Cocos); Entre Ríos (Victoria); Mendoza (Barrancas, El Azufre, Challao, La Cuenca, La Agüadita, Las Heras, Lujan del Cuyo, Malargüe, Potrerillo, San Carlos Estrada, San Rafael, Villavisencio); Neuquén (Las Lajas); Río Negro (Choele Choel, Río Colorado); San Luis (Coralina) [IADIZA, Barriga-Tuñón, FIMLA, MACN].

Epicauta (Epicauta) proscripta Pinto, 1980

Epicauta proscripta Pinto, 1980: 71; 1991: 279.

Terra typica. Holotype male, Jackson, Mississippi; USNM.

Distribution. United States.

Location. United States: Kansas, Mississippi, Tennessee.

***Epicauta (Epicauta) pruinosa* LeConte, 1866**

Epicauta pruinosa LeConte, 1866: 158; Horn 1873: 98; Maybell 1934: 327; Denier 1940: 422; Werner 1945: 471; Hatch 1965: 106; Werner et al. 1966: 44; Pinto 1991: 317.

Lytta immertia Walker, 1866: 330.

Cantharis pruinosa: Gemminger and Harold 1870: 2153.

Epicauta piceiventris Maydell, 1934: 327; Werner 1945: 472; Hatch 1965: 106.

Epicauta elongatocalcarata Maydell, 1934: 328.

Epicauta lupini Selander, 1952: 131.

Epicauta wernerii Hatch, 1965: 105.

Terra typica. *E. pruinosa*, Lectotype female (designated by Werner 1945) Colorado Territory; MCZC. *E. immerita*, Holotype female, British Columbia; BMNH. *E. piceiventris*, Holotype male, Utah; MCZC. *E. elongatocalcarata*, Holotype female, Atlanta, Idaho; MCZC. *E. lupini*, Holotype male, Tygh Valley, Oregon; USNM. *E. wernerii*, Holotype female

Distribution. Canada, United States.

Location. Canada: Alberta, British Columbia, Manitoba. United States: Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming.

***Epicauta (Epicauta) pullata* (Berg, 1889)**

Lytta pullata Berg, 1889: 121; Bruch 1914: 405; Borchmann 1917: 97.

Epicauta pullata: Denier 1935b: 158; Blackwelder 1945: 484; Campos-Soldini et al. 2009: 5.

Terra typica. Syntypes (sex?) Chacabuco, Mendoza.

Distribution. Argentina.

Location. Argentina: Buenos Aires, Mendoza.

New records (Figure 7): Argentina: Buenos Aires: Chacabuco; Mendoza (Province labeled only) [MLPA].

***Epicauta (Epicauta) puncticollis* Mannerheim, 1843**

Epicauta puncticollis Mannerheim, 1843: 288; LeConte 1851: 162; Horn 1873: 97; 1885: 111; Gibson 1912: 87; Wickham 1914: 492; Maydell 1934: 327; Denier 1935: 158; Moore 1937: 42; Werner 1945: 474; Parker and Wakeland 1957: 27; Middlekauff 1958: 9; Gupta 1965: 453; Hatch 1965: 106; Church 1967: 757; Pinto 1973: 968; 1975: 451; Rees 1973: 202; Cohen and Pinto 1977: 741; Ballmer 1980: 78; Pinto and Mayor 1986: 602; Pinto 1991: 333.

Cantharis puncticollis: Gemminger and Harold 1870: 2153.

Epicauta oblita: LeConte 1853: 339; Horn 1873: 97; 1885: 111; Fall 1901: 184; Maydell 1934: 327; Moore 1937: 41; Rees 1973: 198; Pinto 1977: 141; Werner 1945: 475.

Lytta oblita: LeConte 1853: 339.

Lytta puncticollis: LeConte 1853: 339.

Epicauta barberi: Werner 1944: 69; 1945: 475.

Epicauta (Epicauta) oblita: MacSwain 1956: 64.

Epicauta (Epicauta) puncticollis: MacSwain 1956: 62; Pinto 1974: 5.

Terra typica. *E. puncticollis*, Holotype male, “Calif. Bor.”; UZMH; *E. oblita* Lectotype female (designated by Werner 1945) San Francisco, California; MCZC. *E. barberi*, Holotype male, La Panza, California; USNM.

Distribution. México, United States.

Location. Mexico: El Sauzi, Ensenada, San Antonio del Mar, Santo Tomás. United States: British Columbia, California, Montana, Nevada, San Francisco, Utah, Wyoming.

***Epicauta (Epicauta) punctipennis* Werner, 1944**

Epicauta punctipennis Werner, 1944: 68; Dillon 1952: 391; Pinto 1975: 437; 1991: 119.

Epicauta pallidilabra Dillon, 1952: 390.

Terra typica. Holotype male, Victoria, Texas; USNM.

Distribution. Canada, United States.

Location. Canada: British Columbia east to Manitoba. United States: Missouri, Nevada, New Mexico, South Dakota, Washington.

***Epicauta (Epicauta) purpureiceps* (Berg, 1889)**

Lytta purpureiceps Berg, 1889: 123; Bruch 1914: 405; Borchmann 1917: 97.

Cantharis purpureiceps: Chmapion 1899: 186.

Epicauta purpureiceps: Borchmann 1917: 97.

Epicauta kraussi var. *purpureiceps*: Denier 1935: 156; 1940: 156.

Terra typica. Holotype female (?) Cordoba, Argentina; MLPA.

Distribution. Argentina, Brazil.

New records (Figure 7): Argentina: Córdoba, Santa Fe (provinces labeled only) [MLPA].

***Epicauta (Epicauta) rebni* Maydell, 1934**

Epicauta rebni Maydell, 1934: 329; Denier 1940: 422; Werner 1945: 485; 1949: 107; 1955: 5; Werner et al. 1966: 41; Pinto 1972: 254; 1991: 153.

Terra typica. Holotype female, Schaeffer Canyon, Bobaquivari Mts., Arizona; ANSP.

Distribution. United States.

Location. United States: Arizona, New Mexico.

***Epicauta (Epicauta) rileyi* Horn, 1874**

Epicauta rileyi Horn, 1874: 43; 1891: 43; Van Dyke 1929: 129; Maydell 1934: 329, 330; Denier 1935: 159; Pinto 1991: 154.

Terra typica. Lectotype female: (designated by Werner 1945) Arizona; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Sonora. United States: Arizona.

***Epicauta (Epicauta) riojana* (Fairmaire, 1892)**

Cantharis griseonigra var. *riojana* Fairmaire, 1892: 252.

Lytta griseonigra var. *riojana*: Bruch 1914: 405.

Epicauta griseonigra var. *riojana*: Borchmann 1917: 76; Denier 1935b: 156; Blackwelder 1945: 483.

Epicauta riojana: Campos-Soldini 2011: 582.

Terra typica. Unknown.

Distribution. Argentina.

Location. Argentina: Córdoba; Entre Ríos, La Rioja, Salta, Tucumán.

New records (Figure 8): Argentina: Córdoba (Mansilla); Entre Ríos (Villa Elisa); Salta (Santa Salta Forestal); Tucumán (Gobernador Garmendia) [IADIZA, Barriga-Tuñón].

***Epicauta (Epicauta) rubella* Denier, 1940**

Epicauta rubella Denier, 1940: 182; Blackwelder 1945; Campos-Soldini et al. 2009: 6; Campos-Soldini and Roig-Juñent 2015: 35.

Terra typica. Holotype male, Paraguay: Puerto Max; MLPA. Allotype female, Salta: Esteco (MLPA).

Distribution. Argentina, Paraguay.

Location. Argentina: Salta: Departamento Salta Forestal. Paraguay: Puerto Max.

***Epicauta (Epicauta) rufipennis* (Chevrolat, 1834)**

Cantharis rufipennis Chevrolat, 1834: 80; Dugès 1870: 127.

Cantharis ocreaceipennis Dugès, 1870: 164.

Cantharis rufipennis: Gemminger and Harold 1870: 2153.

Cantharis ochreipennis Dugès, 1877: 57.

Epicauta rufipennis: Dugès 1889: 60; Champion 1892: 408; Denier 1935: 159; Blackwelder 1945: 484; Pinto 1991: 256.

Terra typica. *E. rufipennis* Holotype (sex?) Mexico; probably in UZMH.

Distribution. Guatemala, Mexico.

Location. Guatemala: Guatemala, Purulha, Baja Vera Paz. Mexico: Chihuahua, Distrito Federal, Guanajuato, Guerrero, Hidalgo, Jalisco, Mexico, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Sinaloa, Veracruz.

***Epicauta (Epicauta) rutilifrons* Borchmann, 1930**

Epicauta rutilifrons Borchmann, 1930: 91; Blackwelder 1945: 484; Martínez 1992: 8; Campos-Soldini et al. 2009: 6; Campos-Soldini and Roig-Juñent 2015: 40.

Terra typica. Syntypes, Ledesma, Jujuy and Senillosa; MACN.

Distribution. Argentina, Brazil.

Location. Argentina: Jujuy, Salta. Bolivia: Matto Grosso.

New records: Bolivia (country labeled only) (FIMLA, MACN).

***Epicauta (Epicauta) sanguinicollis* (LeConte, 1853)**

Lytta sanguinicollis LeConte, 1853: 344.

Cantharis sanguinicollis: Gemminger and Harold 1870: 2153.

Epicauta sanguinicollis: Horn 1873: 103; 1874: 37; Denier 1935: 159; Werner 1945: 473; Selander 1984: 3; Pinto 1991: 334.

Terra typica. Neotype female (designated by Pinto 1991) Florida; MCZC.

Distribution. United States.

Location. United States: Florida, Georgia, South Carolina.

***Epicauta (Epicauta) sanguinithorax* (Haag-Rutenberg, 1880)**

Lytta sanguinithorax Haag-Rutenberg, 1880: 34.

Epicauta sanguinithorax: Borchmann 1917: 82.

Terra typica. Holotype male, Peru; ZSBS.

Distribution. Argentina, Peru.

Location. Argentina: La Rioja. Peru.

New records (Figure 8): Argentina: La Rioja (Guayapa) (FIMLA).

***Epicauta (Epicauta) saopaloana* Kaszab, 1960**

Epicauta saopaloana Kaszab, 1960: 285.

Terra typica. Allotype and Paratype female, São Paulo, Brazil; Sammlung des Museums G. Frey. Holotype male, Quimadas, Brazil; SUNM.

Distribution. Brazil.

Location. Brazil: São Paulo.

***Epicauta (Epicauta) semivittata* (Fairmaire, 1875)**

Cantharis semivittata Fairmaire, 1875: 200.

Cantharis hemigramma Mäklin, 1875: 632.

Cantharis virgata Burmeister, 1881: 25.

Epicauta semivittata: Bruch 1914: 404; Borchmann 1917: 82; Denier 1935b: 159; Bosq 1934: 327; 1943: 12; Blackwelder 1945: 484; Viana and Williner 1974: 16; Di Iorio 2004: 171; Campos-Soldini and Roig-Juñent 2015: 40.

Pyrota virgata: Borchmann 1917: 69.

Terra typica. Unknown.

Distribution. Argentina, Chile, Uruguay.



Figure 8. New distribution records for: *E. riojana*; *E. sanguinithorax*; *E. semivittata*; *E. subvittata*; *E. suturalis*; and *E. talpa*.

Location. Argentina: Buenos Aires, Catamarca, Córdoba, Corrientes, Jujuy, La Pampa, Mendoza, Santa Fé, San Luis, Tucumán. Uruguay: Carrasco.

New records (Figure 8): Argentina: Buenos Aires (province labeled only); Córdoba (Calamuchita, El Sauce) [Barriga-Tuñón, MACN].

Epicauta (Epicauta) senilis Werner, 1949

Epicauta senilis Werner, 1949: 102; Werner et al. 1966: 44; Pinto 1991: 155.

Epicauta candidata: Dillon 1952: 395.

Terra typica. Holotype male, Luna Co., New Mexico Pinto (1991) indicates that the type is unknown.

Distribution. Mexico, United States.

Location. Mexico: Chihuahua, Durango. United States: Arizona, New Mexico, Texas.

Epicauta (Epicauta) sericans LeConte, 1866

Lytta sartorii Haag-Rutenberg, 1880: 56.

Epicauta sericans LeConte, 1866: 158; Horn 1873: 98; 1891: 43; Blair 1921: 281; Milliken 1921: 6; Carruth 1931: 52; Denier 1935: 159; Werner 1945: 469; Vau-

rie 1950: 29; Dillon 1952: 385; Parker and Wakeland 1957: 26; Burke 1963: 53; Werner et al. 1966: 44; Church 1967: 756; Goeden 1971: 42; Rees 1973: 205; Arnold 1976: 26; Selander 1952: 131; 1982: 427; Capinera et al. 1985: 1054.

Cantharis sericans: Gemminger and Harold 1870: 2153.

Epicauta (*Epicauta*) *callosa*: MacSwain 1956: 56.

Terra typica. *E. sericans*, Lectotype female (designated by Werner 1945) Kansas; MCZC. *E. sartorii*, types from “Mexico, Mirador”, location of syntypes is unknown.

Distribution. Canada, Mexico, United States.

Location. Canada: Alberta, Saskatchewan. Mexico: Chihuahua, Coahuila, Durango, Hidalgo, Jalisco, Mexico, Nuevo León, Puebla, Querétero, San Luis Potosí, Tamaulipas, Veracruz. United States: Alabama, Arkansas, Colorado, Georgia, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Tennessee, Wyoming.

Epicauta (*Epicauta*) *singularis* Champion, 1892

Epicauta singularis Champion, 1892: 427; Denier 1935: 159; Blackwelder 1945: 484; Vauri 1950: 30; Werner 1955: 5; Pinto 1982: 407; 1991: 157.

Terra typica. Lectotype male (designated by Pinto 1982) Monterrey, Nuevo León; BMNH.

Distribution. Mexico, United States.

Location. Mexico: Nuevo León, Texas.

Epicauta (*Epicauta*) *solaniperda* Denier, 1940

Epicauta solaniperda Denier, 1940: 422.

Terra typica. Holotype male and Allotype female, Huancayo, Peru; MLPA type locality unknown.

Distribution. Peru.

Epicauta (*Epicauta*) *straba* Horn, 1891

Epicauta straba Horn, 1891: 42; Fall 1901: 184; Van Dayke 1929: 129; Denier 1935: 159; Moore 1937: 42; Werner 1945: 483; 1955: 5; Pinto 1972: 254; 1991: 158.

Terra typica. *E. straba* Lectotype (designated by Werner 1945) San Bernardino California; MCZC. *E. foxi* Holotype female, Jacumba, San Diego Co., California.

Distribution. Mexico, United States.

Location. Mexico: Baja California Norte. United States: California.

Epicauta (*Epicauta*) *strigata* (Gyllenhal, 1817)

Lytta strigata Gyllenhal, 1817: 18.

Cantharis strigata: Fischer 1827: 19.

Epicauta strigata: Borchmann 1917: 83; Martínez 1955: 58.

Terra typica. Type (s?) from Brazil; ZMU, type location unknown.

Distribution. Brazil.

***Epicauta (Epicauta) strigosa* (Gyllenhal, 1817)**

Lytta strigosa Gyllenhal, 1817: 18; LeConte 1853: 314.

Cantharis strigosa: Fischer 1827: 19.

Cantharis nigricornis Melsheimer, 1846: 53.

Cantharis strigosa: Gemminger and Harold 1870: 2154.

Epicauta strigosa: Horn 1873: 97; 1875: 153; Blatchely 1910: 1361; Ulke 1902: 54; Sherman 1913: 246; Mutchler and Weiss 1924: 9, 18; Denier 1935: 159; Werner 1945: 467; 1957: 97, 98; Dillon 1952: 384; Selander 1952: 131; 1984: 3; Staines 1983: 48; Pinto 1991: 341.

Terra typica. *E. strigosa*, type (s?) presumably in ZUMU. *E. nigricornis* Lectotype (sex?) (designated by Werner 1945) Alabama; MCZC.

Distribution. United States.

Location. United States: Alabama, Connecticut, District of Columbia, Florida, Georgia, Louisiana, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Texas, Virginia.

***Epicauta (Epicauta) stuarti* LeConte, 1868**

Epicauta stuarti LeConte, 1868: 54; Horn 1873: 101; Maydell 1934: 333; Werner 1945: 462; 1955: 3,4; Selander 1954: 24; Werner et al. 1966: 42; Pinto 1991: 160.

Terra typica. Lectotype female (designated by Werner 1945) Ft. Union, New Mexico; MCZC.

Distribution. United States.

Location. United States: Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, Wyoming.

***Epicauta (Epicauta) subatra* Dugès, 1889**

Epicauta subatra Dugès, 1889: 72; Champion 1892: 421; Denier 1935: 159; Blackwelder 1945: 484; Pinto 1991: 205.

Terra typica. Holotype female, Mexico (Pinto 1991) indicates that the types is probably lost).

Distribution. Mexico.

Location. Mexico: Hidalgo, Nuevo León, Puebla.

***Epicauta (Epicauta) subvittata* (Erichson, 1848)**

Lytta (Epicauta) subvittata Erichson, 1848: 566.

Lytta sublineata: Haag-Rutenberg 1880: 53.

Epicauta subvittata: Borchmann 1917: 84.

Terra typica. Type (s?) Guayana (=British Guaiana); ZMHU, type location unknown.

Distribution. Brazil, Guayana.

Location. Brazil: São Paulo.

New records (Figure 8): Brazil: São Paulo (state labeled only) [MLPA].

Epicauta (Epicauta) suturalis (Haag-Rutenberg, 1880)

Lytta albicincta Haag-Rutenberg, 1880: 23. **New Synonymy.**

Cantharis suturalis Germar, 1821: 247; Gemminger and Harold 1870: 2154.

Epicauta suturalis: Bruch 1911: 405; Borchmann 1917: 84; Denier 1935: 159; Blackwelder 1945: 484.

Epicauta albicincta: Borchmann 1917: 70; Denier 1935: 152; Blackwelder 1945: 482.

Diagnosis. *Epicauta sutralis* is phenetically alike to *E. albicincta* by the combination of the following characters: body length large (> 17mm). Tegument black. Body vestiture cinereous, setae short, decumbent, dense (28–34 setae along one mm long line). Antenna flattened dorsoventrally in both sexes; ratios length (L_{Ant}) vs. width (W_{Ant}) of antennomere (L_{Ant}/W_{Ant}) in female: 3.75 (I), 2.33 (II), 6 (III), 4.6 (IV) 4 (V-X) 4.3 (XI); in male 3 (I), 2 (II), 5 (III), 3.3 (IV), 3 (V-VIII), 5 (IX-XI).

Terra typica. Type (s?) Merida, Venezuela; ZSBS.

Distribution. Argentina, Bolivia, Brazil, Paraguay, Venezuela, Uruguay.

Location. Argentina: Buenos Aires, Misiones, Jujuy, Salta, Tucumán. Chile: Valparaíso. Bolivia: Chiquitos; Cuatro Ojos. Brazil: Campo Bello; Goyaz (Río Verde, Yathay); Matto Grosso; Río de Janeiro; São Paulo. Paraguay: Asunción. Uruguay: Canelones (La Floresta). Uruguay: Cerro Largo.

New records (Figure 8): Argentina: Buenos Aires (Cerro Largo); Misiones (Alto Paraná, Puerto Victoria); Sante Fe (Casilda, Rosario); Tucumán. Chile: Valparaíso (province labeled only). Bolivia: Santa Cruz (Chiquitos, Cuatro Ojos). Brazil: Goyaz (Río Verde,); Matto Grosso (state labeled only); Río de Janeiro (Río de Janeiro). Paraguay: Asunción. Uruguay: Cerro Largo (Cuhilla de Melo) [MLPA, FMILA, MACN].

Epicauta (Epicauta) talpa (Haag-Rutenberg, 1880)

Lytta talpa Haag-Rutenberg, 1880: 32.

Cantharis talpa: Berg 1881: 306.

Epicauta talpa: Beauregard 1890: 511; Bruch 1911: 404; Borchmann 1917: 85; Denier 1935: 160; Blackwelder 1945: 484; Martínez 1992: 8.

Terra typica. Type (s?) Cordoba; presumably in ZSBS.

Distribution. Argentina, Bolivia, Brazil, Paraguay, Uruguay.

Location. Argentina: Chaco, Córdoba, Corrientes, Misiones, Salta, Santiago del Estero. Bolivia: Andrés Ibáñez (Santa Cruz de la Sierra). Brazil: Mato Grosso (Rancho Grande, San Antonio das Barras, Utariti); Paraná (Prudentópolis). Paraguay: Concepción (Río Aquidabán); San Pedro (Cororo). Uruguay: Tacuarembó (San Gregorio de Polanco).

New records (Figure 8): Argentina: Córdoba (Alta Gracia, Cruz del Eje, La Merced); Corrientes (Ituzaingó); Misiones (Dos de Mayo); Salta (Capiazutí, La Viña); Santiago del Estero (Río Salado). Bolivia: Andrés Ibáñez (Santa Cruz de la Sierra). Brazil: Mato Grosso (San Antonio das Barras, Utariti); Parana (Prudentópolis). Paraguay: San Pedro (Cororo). Uruguay: Tacuarembó (San Gregorio de Polanco) [MLPA, MACN].

***Epicauta (Epicauta) tamara* Adams & Selander, 1979**

Epicauta dugesi: Werner, 1957: 107.

Epicauta tamara Adams & Selander, 1979: 246; Pinto 1991: 349.

Terra typica. Holotype male, Culicán, Sinaloa, Mexico; AMNH.

Distribution. Mexico.

Location. Mexico: Sinaloa, Sonora.

***Epicauta (Epicauta) tarasca* Pinto, 1991**

Epicauta tarasca Pinto, 1991: 207.

Terra typica. Holotype male, 3 km E Quiroga, Michoacán, Mexico; CASC.

Distribution. Mexico.

Location. Mexico: Jalisco, Michoacán, Morelos, Oaxaca.

***Epicauta (Epicauta) temexa* Adams & Selander, 1979**

Epicauta vittata: Dugès 1889: 87.

Epicauta lemniscata: Champion 1892: 415; Snow 1906: 149; Dillon 1952: 398 (in part).

Epicauta temexa Adams & Selander, 1979: 248; Ray et al. 1989: 187.

Terra typica. Holotype male, Pearsall, Frio Co., Texas; AMNH.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, Nuevo León, San Luis Potosí, Tamaulipas, Veracruz. United States: Texas.

***Epicauta (Epicauta) tenebrosa* Werner, 1949**

Epicauta pedalis: Horn 1894: 356 (in part); Werner 1945: 440 (in part).

Epicauta tenebrosa Werner 1949: 93; Werner et al. 1966: 38; Pinto 1991: 259.

Terra typica. Holotype male, Tucson, Arizona; MCZC.

Distribution. Mexico, United States.

Location. Mexico: Sonora. United States: Arizona.

***Epicauta (Epicauta) teresa* Mathieu, 1983**

Epicauta (Epicauta) teresa Mathieu, 1983: 156.

Epicauta teresa: Pinto 1984: 378; 1991: 268.

Terra typica. Holotype male, 10 km northesast of Cintalapa, Chiapas, Mexico; CASC.

Distribution. Mexico.

Location. Mexico: Chiapas, Oaxaca.

***Epicauta (Epicauta) tricostata* (Werner, 1943)**

Pleuropompha tricostata Werner, 1943: 32; 1945: 426; Vaurie 1950: 39; Dillon 1952: 379; MacSwain 1956: 66; Werner et al. 1966: 54; Pinto 1973: 957; 1977: 136; Selander 1981: 780.

Epicauta tricostata: Pinto 1984: 381; 1991: 231; Pinto and Mayor 1986: 602.

Terra typica. Holotype male, Presidio, Texas; USNM.

Distribution. Mexico, United States.

Location. Mexico: Coahuila, San Luis Potosí. United States: Arizona, New Mexico, Texas.

***Epicauta (Epicauta) tristis* (Mäklin, 1875)**

Cantharis tristis Mäklin, 1875: 630.

Lytta lugubris Haag-Rutenberg, 1880; Borchmann 1917: 95.

Epicauta tristis: Beauregard 1890: 512; Denier 1935: 160; Blackwelder 1945: 484; Di Iorio 2004: 172.

Epicauta lugubris: Denier 1935: 156; Blackwelder 1945: 483 (Nudum erat nomen)

Epicauta luguberrima Denier, 1935: 156 **New Synonymy**.

Diagnosis. *Epicauta tristis* and *E. lugubris* are alike regarding several features, such as: body length 10–12 mm. Tegument black; head with reddish patch on front. Superficial nonparallel sculpturing: head and pronotum punctuate. Body vestiture dorsally black, marginal and ventrally cinereous; setae dense (28–34 setae along one mm long line). Antenna similar in both sexes; ratios length (L_{Ant}) vs. width (W_{Ant}) antennomere (L_{Ant}/W_{Ant}): 2.3 (I), 1.6 (II), 3.5 (III-XI), in male 2.3 (I), 1.6 (II), 3.6 (III), 2.3 (IV-XI). For this reason, we consider these species (*E. tristis* and *E. lugubris*) as a single specific entity whose valid name is *E. tristis* by priority.

Terra typica. *Lytta lugubris* Type (s?) Brazil; ZSBS.

Distribution. Argentina, Bolivia, Brazil.

Location. Argentina: Córdoba, Jujuy, Misiones, Mendoza, San Juan, San Luis, Salta. Bolivia: Santa Cruz de la Sierra. Brazil.

New records (Figure 9): Argentina: Salta (province labeled only) [FIMLA].

***Epicauta (Epicauta) unilineata* Champion, 1892**

Epicauta unilineata Champion, 1892: 415; Denier 1935: 160; Blackwelder 1945: 484; Adams and Selander 1979: 250.

Terra typica. Lectotype male (designated by Admas and Selander 1979) San Jerónimo, Guatemala; location unknown.

Distribution. El Salvador, Guatemala, Mexico.

Location. El Salvador: La Unión, San Salvador, Santa Ana, Guatemala: Baja Verapaz, Guatemala. Mexico: Guerrero, Veracruz.

***Epicauta (Epicauta) ventralis* Werner, 1945**

Epicauta ventralis Werner, 1945: 444; Pinto 1975: 430; 1980: 48.

Epicauta normalis: Werner 1944: 65 (in part); 1945: 442 (in part); Hatch 1965: 105; Werner et al. 1966: 38 (in part).

Terra typica. Holotype male, Walsenburg, Colorado; FMNH.

Distribution. Canada, United States.

Location. Canada: Alberta, Saskatchewan. United States: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming.

***Epicauta (Epicauta) vicina* (Haag-Rutenberg, 1880)**

Lytta vicina Haag-Rutenberg, 1880: 27.

Epicauta vicina: Borchmann 1917: 85; Denier 1935: 160; Blackwelder 1945: 484.

Epicauta wagneri Pic, 1916: 10; Denier 1935: 160; Blackwelder 1945: 484 **New Synonymy.**

Diagnosis. The tegument color (pale brown with head and pronotum black); body vestiture dense (28–34 setae along one mm long line); and seate elongate, disheveled appearance and yellow of *E. vicina* are similar to *E. wagneri*. For this reason, we consider this species as a single specific entity whose valid name is *E. vicina* by priority.

Terra typica. Type (s?) Brazil; “Mus. Vind. and Haag-Rutenberg (in part); ZSBS.

Distribution. Argentina, Brazil, Paraguay.

Location. Argentina: Chaco; Corrientes; Entre Ríos; Misiones; Santiago del Estero. Brazil: Guaíaba. Paraguay: Villa Rica.

New records (Figure 9): Argentina: Entre Ríos (Concordia, Paraná); Corrientes (Chavarría); Misiones (Pindapoy); Santiago del Estero (Río Dulce). Paraguay: Guairá (Villa Rica) [MLPA].

***Epicauta (Epicauta) vidua* (Klug, 1825)**

Lytta vidua Klug, 1825: 11.

Causima luctuosa Dejean, 1837: 248.

Causima lugubris Dejean, 1837: 248.

Cantharis vidua: Burmeister 1881: 23; Berg 1881: 303; Gemminger and Harold 1870: 2155.

Causima vidua: Denier 1935: 161; Blackwelder 1945: 484; Di Iorio 2004: 165.

Distribution. Argentina, Bolivia, Brazil.

Location. Argentina: Córdoba, Corrientes, Misiones (General Belgrano, Puerto Aguirre, and Santa Ana). Bolivia. Brazil: Parana.

New records (Figure 9): Argentina: Córdoba (Salsacate); Misiones (Aristóbulo del Valle, Arroyo Cañapirú, Arroyo Uruguaí, Puerto Aguirre, Ruta Nac. 12, Santa Ana, Salto Encantado). Brazil: Parana (state labeled only) [IADIZA, MLPA, FIMLA, MACN].

Epicauta (Epicauta) vittata (Fabricius, 1775)

Typical race

Lytta vittata Fabricius, 1775: 260.

Meloe vittatus: Thunberg 1781–1791: 109.

Meloe chapmani: Woodhouse 1800: 214.

Cantharis vittata: Gemminger and Harold 1870: 2155.

Epicauta vittata: Horn 1873: 100; Denier 1935: 160; Staig 1940: 139; Werner 1945: 464; Admas and Selander 1979: 240; Pinto 1991: 352.

Epicauta lemniscata: Putnam 1876: 173; Werner 1945: 463 (in part); Blodgett and Higgins 1988: 1456.

Epicauta (Epicauta) vittata: MacSwain 1956: 49.

Lemniscate race

Lytta lemniscata Fabricius, 1801: 79.

Cantharis lemniscata: Fischer 1827: 19.

Epicauta lemniscata: Schwarz 1878: 464; Chitenden 1903: 115; Swingle and Mayer 1944: 141; Frost 1964: 140; Kirk 1969: 63 (in part).

Epicauta vittata: Watson 1917: 64.

Epicauta (Epicauta) vittata: Kirk 1970: 61 (in part).

Terra typica. *E. vittata*, Lectotype (sex?) (designated by Werner 1945) GUHC. *E. chapmani*, Types, Bucks Co., Pennsylvania (apparently destroyed). *E lemniscata*, Type male, “Carolina”; UZMH.

Distribution. Typical race: Canada, United States. Lemniscate race: United States.

Location. Typical race: Canada: Ontario, Quebec. United States: Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Virginia, West Virginia. Lemniscate race: United States: Florida, Georgia, South Carolina.

Epicauta (Epicauta) vitticollis (Haag-Rutenberg, 1880)

Lytta vitticollis Haag-Rutenberg, 1880: 52.

Epicauta canoi Dugès, 1889: 86.

Epicauta vitticollis: Champion 1892: 414; Denier 1935: 160; Blackwelder 1945: 484; Adams and Selander 1979: 250; Pinto 1991: 353.



Figure 9. New distribution records for: *E. tristis*; *E. vicina*; *E. vidua*; *E. xanthocephala*; *E. xanthopterus*; *E. yungana*; and *E. zebra*.

Terra typica. *E. vitticollis*, Lectotype male, “Guatimal./Samml. Haag-Rutenberg/” (designated by Pinto 1991) ZSMC. *E. canoi*, Types, Veracruz, Mexico; apparently lost.

Distribution. Belize, Guatemala, Honduras, Mexico, Nicaragua.

Location. Belize: Corazal, Orange Walk, Toledo. Guatemala: Alta Verapaz, Petén. Honduras: Atlantida, Colón, Francisco Morazán, Yoro. Mexico: Chiapas, Oaxaca, Quintana Roo, Tabasco, Yucatán, Veracruz. Nicaragua: Río San Juan.

Epicauta (Epicauta) weyrauchi Kaszab, 1960

Epicauta weyrauchi Kaszab, 1960: 402. Pinto and Bologna 2016: 206.

Terra typica. Holotype and Paratype male, Andahuaylas, Peru. SMB.

Distribution. Peru.

Location. Peru: Apurimac.

Epicauta (Epicauta) wheeleri Horn, 1873

Epicauta wheeleri Horn, 1873: 101, 107; Werner 1945: 486; 1949: 107; 1955: 5; Werner et al. 1966: 41; Pinto 1972: 256, 1973: 968; 1991: 161.

Terra typica. six syntypes, Arizona; MCZC.

Distribution. United States.

Records. United States: Arizona, California, Nevada, Utha.

***Epicauta (Epicauta) willei* Denier, 1940**

Epicauta willei Denier, 1940: 422; Campos-Soldini et al. 2009: 6; Pinto and Bologna 2016: 206.

Terra typica. Holotype male, Allotype female, Paratypes male and female, Huancayo, Peru; MLPA.

Distribution. Peru.

Location. Peru: Cuzco: Sicuani, Huancayo and Junín.

***Epicauta (Epicauta) xanthomera* (Fischer, 1827)**

Cantharis xanthomeros Fischer, 1827: 19; Geminnger and Harold 1870: 2155.

Epicauta xanthomera: Denier 1935: 169.

Terra typica. Unknown.

Distribution. Argentina, Brazil, Uruguay.

Location. Argentina: Córdoba, La Rioja. Brazil: Mina Gerais; Río de Janeiro. Uruguay: Cerro Largo.

New records (Figure 9): Argentina: Córdoba (Calamuchita, Unquillo); La Rioja (province labeled only). Brazil: Mina Gerais (Belo Horizonte); Río de Janeiro (state labeled only). Uruguay: Cerro Largo (Cañada de los Burros) [MLPA, MACN].

***Epicauta (Epicauta) xanthocephala* (Klug, 1825)**

Lytta xanthocephala Klug, 1825: 434.

Cantharis xanthocephala: Fischer 1827: 20.

Epicauta xanthocephala: Borchmann 1917; Adams and Selander 1979: 260.

Terra typica. Type (s?) Brazil; ZMHU, type locality unknown.

Distribution. Brazil.

Location. Brazil: Goiáz.

New records (Figure 9): Brazil: Goiáz (Jatahy, Río Verde) [MLPA].

***Epicauta (Epicauta) yungana* Denier, 1935**

Epicauta yungana Denier, 1935: 160; 1940: 422; Admas and Selander 1979: 260.

Terra typica. Holotype male, Coroico, 1300–1700 m, Nor Yungas, Bolivia; MLPA.

Distribution. Argentina, Bolivia, Brazil, Guayana.

Location. Argentina: Chaco; Córdoba; Misiones. Bogotá: Campobello. Bolivia: Coroico; La Paz; Puerto Aguirre. Brazil: Itatiaya. Guayana: Puerto Pariacabo.

New records (Figure 9): Argentina: Chaco (Resistencia); Misiones (Salto Iguazú). Bogotá: Campobello. Bolivia: Coroico, Puerto Aguirre. Brazil: Itaiaya. Guayana: Puerto Pariacabo [MLPA].

Epicauta (Epicauta) zebra (Dohrn, 1876)

Cantharis zebra Dohrn, 1876: 411.

Lytta albovittata Haag-Rutenberg, 1880: 29.

Cantharis albovittata: Burmeister 1881: 23; Berg 1881: 303.

Epicauta somnolenta Beauregard, 1890: 510; Bruch 1914: 404; Borchmann 1917: 83; Bosq 1934: 12, Viana and Williner 1974: 11.

Epicauta zebra: Denier 1935b: 161; 1940: 422; Hayward 1942: 23; Blackwelder 1945: 484; Adams and Selander 1979: 162; Martínez 1992: 8; Di Iorio 2004: 172; Campos-Soldini 2011: 583.

Terra typica. *Cantharis zebra*, Type (s?) Córdoba, Argentina, present location unknown. *Lytta albovittata*, Syntypes Córdoba, Argentina; presumably in ZSBS.

Distribution. Argentina.

Location. Argentina: Catamarca, Córdoba, La Rioja, Mendoza, Misiones, Salta, San Juan, San Luis, Santiago del Estero, Tucumán.

New records (Figure 9): Argentina: Catamarca (Andalgalá); Córdoba (La Falda, La Paz, San Javier); La Rioja (Chilecito, Tinogasta); Mendoza (Desaguadero, Ñacuñán, Santa Rosa); Misiones (Santa María); San Luis (Balde, San Gerónimo) [IADIZA, Barriga-Tuñón; FIMLA, MACN]

Epicauta (Epicauta) zischkai Martinez, 1955

Epicauta zischkai Martínez, 1955: 55; Kaszab 1960: 404; Di Iorio 2004: 172; Pinto and Bologna 2016: 206.

Terra typica. Holotype male, Allotype female, 15 Paratype male and nine Paratype female in FML. 15 Paratype male and three Paratype female in the Universidad de Vermont in Burlington, Vermont, USA. One Paratype (sex?) in Munich Muesum, Germany.

Distribution. Bolivia, Peru.

Location. Bolivia Chapare, Cochabamba. Peru: Lago Titicaca, Puno.

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A DNA barcode reference library of Neuroptera (Insecta, Neuropterida) from Beijing

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Abstract

Neuroptera (lacewings) is one of the ancient holometabolous insect groups, but some extant species stand as important natural enemies for biological control. As the capital city of China, Beijing has a rich fauna of Neuroptera, previously with 47 species recorded and sorted in 32 genera of seven families. In this study, DNA barcoding based on sequences of COI gene fragments is used to discriminate lacewing species from Beijing. 217 DNA barcode sequences belonging to 49 species were successfully obtained. The COI barcode data worked well for identification of almost all lacewing species herein examined except *Pseudomallada prasinus* (Burmeister), in which cryptic species may exist. Twenty species of Neuroptera are newly recorded from Beijing. Besides, Nothochrysinae is first recorded from Beijing. *Chrysopidia ciliata* (Wesmael) and *Drepanopteryx algida* (Erichson) are first recorded from China.

Keywords

China, cytochrome c oxidase subunit I, mitochondrial DNA, lacewings, taxonomy

Introduction

Neuroptera (lacewings) is the most species-rich order of the superorder Neuropterida. Hitherto, there are about 6000 described species worldwide in 16 families (Engel et al. 2018; Winterton et al. 2018). Adult lacewings in general are delicate insects, having two pairs of membranous wings with highly reticulate venation, while the lacewing

larvae are characterized by the specialized mandibles and maxillae that are combined into a pair of sucking jaws. The common groups of Neuroptera consist of Chrysopidae (green lacewings), Hemerobiidae (brown lacewings), Myrmeleontidae (antlions), and Coniopterygidae (dusty lacewings), while the other lacewing families each comprises much fewer species and some of these families (e.g., Nevorthidae, Rhachiberothidae, Ithonidae, Psychopsidae) have much narrower distributions. However, the diversification of Neuroptera in morphology as well as in biology is remarkable (Aspöck et al. 2012; Engel et al. 2018).

Because of the predatory feeding habits, some lacewing species, e.g., the species of Chrysopidae, Hemerobiidae, and Coniopterygidae, are economically important and have been used for the biocontrol of agricultural pest insects (Goolsby et al. 2000; McEwen et al. 2001; Sato and Takada 2004; Bezerra et al. 2006; Abdrabou 2008; Vidya et al. 2010; Messelink et al. 2016). However, the species identification of these lacewing groups is not easy to handle, particularly for people who are not the specialists of Neuroptera, because there are many morphologically similar species, which require examination of detail morphological characters, such as marking patterns on body and genitalia. Moreover, for some species-rich groups, such as Chrysopidae, the taxonomy still requires comprehensive revision (Henry and Wells 2010; Henry et al. 2013, 2014; Duelli et al. 2016; Dai et al. 2017).

DNA barcoding has become the most popular approach for the species identification and the assignment of specimens throughout all life stages to described species (Hebert et al. 2003a, b). In animals, including insects, an app. 660 base pair (bp) fragment of the mitochondrial cytochrome *c* oxidase subunit I (COI) gene has been chosen as standardized barcode marker (Hebert et al. 2003a, b). As a molecular marker for efficient species identification, DNA barcoding with COI yields excellent results across a broad spectrum of insects, and even reveals unknown cryptic species diversity of certain groups (Smith et al. 2006; Burns et al. 2008; Huemer et al. 2014; Song et al. 2018). Besides, DNA barcoding based on COI with the Automatic Barcode Gap Discovery and the Bayesian Poisson Tree Processes model was also used to separate some new antlion species (Pantaleoni and Badano 2012; Badano et al. 2016). Notwithstanding, there is still limited number of works on DNA barcoding of Neuroptera (Morales and Freitas 2010; Morinière et al. 2014; Choi et al. 2015; Price et al. 2015).

Beijing, as the capital city of China, is located at northern China and surrounded by Hebei Province, belonging to the eastern Palaearctic region. To the west of Beijing is Mt. Xishan, forming the eastern flank of the Taihang Mountains range, which runs north-south up the spine of Hebei province. Mt. Xishan covers nearly all of Fangshan and Mentougou Districts west of the city. The mountains north of Beijing including Mt. Wulingshan, Mt. Jundushan, and Mt. Fenghuanling all belong to the Yanshan range, which runs east-west, across northern Hebei Province. Climate of Beijing is typical humid continental monsoon climate with hot and rainy summers, cold and dry winters. The majority flora of Beijing is temperate deciduous forest. Despite high-speed increase of economic development and population, relatively well-

preserved natural environment still remains in Beijing, particularly in the aforementioned mountainous areas.

Concerning Neuroptera, Beijing has relatively rich fauna of lacewing species, currently with 47 species recorded based on the recently published catalogue of the Chinese Neuropterida (Oswald 2018; Yang et al. 2018). Remarkably, the lacewing fauna of Beijing appears still not to be thoroughly explored considering recent findings of new species from this area (Zhao et al. 2013; Zhang et al. 2014).

Here we present a preliminary DNA barcode library for the lacewing species from Beijing. A total of 217 barcode sequences were amplified, and this dataset comprises the barcodes of 49 species (including seven undetermined species). Twenty species are newly recorded from Beijing, and two of them are first recorded from China (Figures 2–4; Suppl. material 1–3: Figures S1–3). An updated checklist of species of Neuroptera from Beijing is provided (Suppl. material 6: File S2).

Material and methods

Sampling of specimens

The lacewing specimens herein studied were collected between 2013 and 2017 using sweeping net and light trap. The collecting areas mainly comprise the Xiaolongmen Forestry Park, Mentougou District, northwestern Beijing, the Wulingshan National Nature Reserve that is located across Miyun District in northeastern Beijing and Xinglong County in Hebei Province, an organic orchard in Wangjiayuan Village, Changping District, northern Beijing, and the Olympic Forest Park, Chaoyang District in the metropolitan area of Beijing. The specimens were preserved in ethanol (95%) and identified based on the morphological characteristics using the keys to the species (Aspöck et al. 1980; Liu 2003; Yang et al. 2005; Zhao 2016; Wang et al. 2018). The number of specimens per species ranged from 1 to 26. All specimens herein studied are deposited in the Entomological Museum of China Agricultural University (CAU), Beijing, China.

DNA extraction

Total genomic DNA was isolated from mid legs using the TIANamp Genomic DNA Kit (TIANGEN Inc., Beijing, China) according to the manufacturer's instructions. The barcoding fragments of COI were amplified by Polymerase chain reactions (PCR). The reaction was conducted in a final volume of 25 µL consisting of 14.5 µL of ddH₂O, 1 µL (10 µM) of each of the primers, 2 µL of dNTP, 0.5 µL of polymerase and 1 µL DNA template (~30 ng). For Chrysopidae, the COI gene fragments were amplified with specific primers, i.e., COIa-F (5'-TACAATTATCGCCTAACTTCAGCC-3') and COIa-R (5'-CCCGGTAAAATTAAAATATAAACCTTC-3') because the univer-

sal primers (i.e., LCO1490 and HCO2198; see Folmer et al. 1994) did not work well for this group in our study. For the other groups, the COI gene fragments were amplified with the aforementioned universal primers, i.e., LCO1490 (5'-GGT-CAACAAATCATAAAGATATTGG-3') and HCO2198 (5'-TAAACTTCAGGGT-GACCAAAAAATCA-3'). The PCR amplifications were run under the following conditions: initial denaturation at 95 °C for a half minute, followed by 40 cycles of 10 seconds at 95 °C, 50 seconds at 47 °C, and 2 minutes at 65 °C; a final extension phase of 65 °C for 10 minutes. The PCR products were subjected to electrophoresis in 1% agarose gel and stained with GoldView (1ng/mL) to confirm amplification. Amplicons were sequenced bidirectionally, using the BigDye® Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems, Foster City, CA, USA) on an ABI 3730XL Genetic Analyzer (PE Applied Biosystems, San Francisco, California, USA).

Data analysis

The final consensus COI sequences were obtained after overlapping both forward and reverse sequences by ContigExpress. All sequence data are deposited in GenBank (see Accession number in File S1). All sequences were aligned using Clustal W (Thompson et al. 1994) and analyzed using a neighbor-joining cluster analysis (NJ; Saitou and Nei. 1987) based on the Kimura-2-Parameter (K2P; Kimura 1980) distances with MEGA v. 5.0 (Tamura et al. 2011). The consequence of NJ tree was explored the Newick tree file and subsequently modified with FigTree v1.4.3. (<http://tree.bio.ed.ac.uk/software/figtree/>, Andrew 2006). Nucleotide composition and the K2P distances between and within species were also calculated by MEGA v. 5.0. Additional species-delimitation methods were also included in our study, i.e., the Automatic Barcode Gap Discovery (ABGD; Puillandre et al. 2012) and the Bayesian Poisson Tree Processes model (bPTP; Zhang et al. 2013). ABGD is an automatic procedure that sorts the sequences into hypothetical species based on the threshold of pairwise genetic distances. The ABGD analyses were performed on the web interface (<http://wwwabi.snv.jussieu.fr/public/abgd/>). The K2P distance was selected for the datasets, and other parameters were set to default except the default values of steps=50 and relative gap width (X)=0.5. bPTP is an updated version of the original PTP with bayesian posterior probability, providing more accurate results, maximal likelihood solution and bayesian supported solution, for species delimitation i.e., bPTP_ML and bPTP_BS. For the bPTP analyses, the ML trees were constructed using RAxML v8.2.10 under the GTRGAMMA evolutionary model and performed on the bPTP web server (<http://species.h-its.org/>), with 0.25 burn-in and 500,000 MCMC generations. To test the reliability of results, each run was checked for convergence by visualizing the likelihood plot. The COI sequence of *Lepicerus inaequalis* (Coleoptera: Lepiceridae; GenBank: KJ871320) and *Nebria formosana* (Coleoptera: Carabidae; GenBank: KT306091) were selected as outgroups because of the close relationship between Coleoptera and Neuroptera (Misof et al. 2014).

Results

The present study generated 217 sequences of 639 bp each, with an average nucleotide composition of 39.5% thymine (T), 15.8% cytosine (C), 28.4% adenine (A), and 16.3% guanine (G). Base frequencies analysis revealed low GC-contents (average: 31.1%) for the barcode fragment. The above COI barcode sequences were found to belong to 49 species of Neuroptera. A full list of these species and their collecting information are presented in the Suppl. material 5: File S1. A threshold of the COI genetic distance $\geq 2\%$ was applied for a rough differentiation between intraspecific and interspecific distances based on Hebert et al. (2003b). Intraspecific distances ranged from zero to 2.7% (see *Pseudomallada prasinus* (Burmeister, 1839); Suppl. material 8: Table S2. Interspecific distances ranged between 2.9% (see species of *Pseudomallada*) and 25.3% (see *Semidalis aleyrodiformis* (Stephens, 1836) and *Coniopteryx plagiotropa* Liu & Yang, 1997; Suppl. material 7: Table S1). The number of recovered clusters ($= 49$), each of which can be clearly separated from all neighboring species (Figure 1), is identical to the number of species identified based on morphological characters, suggesting that the species in question can be identified unambiguously by DNA barcoding.

Coniopterygidae

Seven species of Coniopterygidae from Beijing were studied, including two species newly recorded from Beijing, i.e., *Conwentzia sinica* Yang, 1974 and *Semidalis bicornis* Liu & Yang, 1993, and two undetermined species of *Coniopteryx* with a minimum mean distance 10.9% (Suppl. material 7: Table S1). *Semidalis aleyrodiformis* and *Coniopteryx plagiotropa* possess a maximum mean distance 23.3%. Results of species delimitation based on ABGD and bPTP_{ML} are congruent with our identification based on morphology (Figure 5A). However, bPTP_{BS} divided *Semidalis aleyrodiformis* into five Molecular Operational Taxonomic Units (MOTUs; $n = 5$) with low posterior probabilities (< 60%). It is probably overestimated because the intraspecific variation within the specimens of *Semidalis aleyrodiformis* is 0.

Chrysopidae

The present analysis resulted in 18 species of Chrysopidae from Beijing. Three of them could not be identified to species. Among them, there are 10 species newly recorded from Beijing, including *Chrysopa intima* McLachlan, 1893, *Chrysoperla furcifera* (Okamoto, 1914), *Chrysopidia ciliata* (Wesmael, 1841), *Mallada flavimaculus* Yang & Yang, 1991, *Pseudomallada cognatellus* (Okamoto, 1914), *Pseudomallada prasinus* (Burmeister, 1839), *Pseudomallada qinlingensis* (Yang & Yang, 1989), *Nineta grandis* Navás, 1915, *Nineta shaanxiensis* Yang & Yang, 1989 and *Nothochrysa sinica* Yang, 1986. Fur-

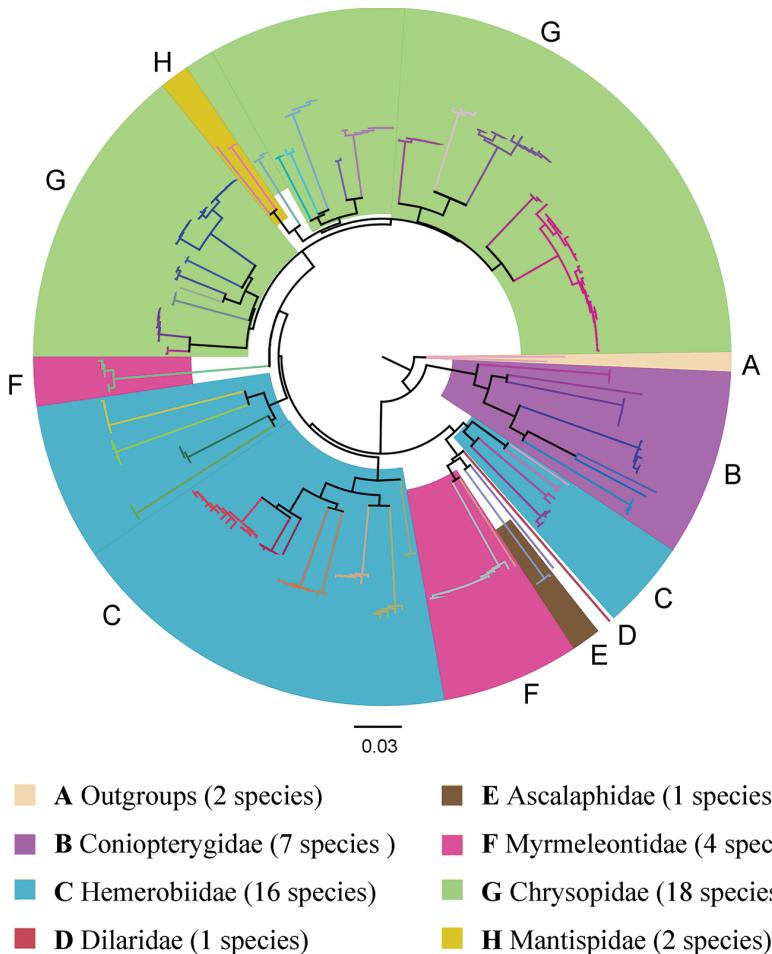


Figure 1. Neighbor-joining tree based on the COI sequence dataset of the lacewing species from Beijing. Different color of clades represents different species.

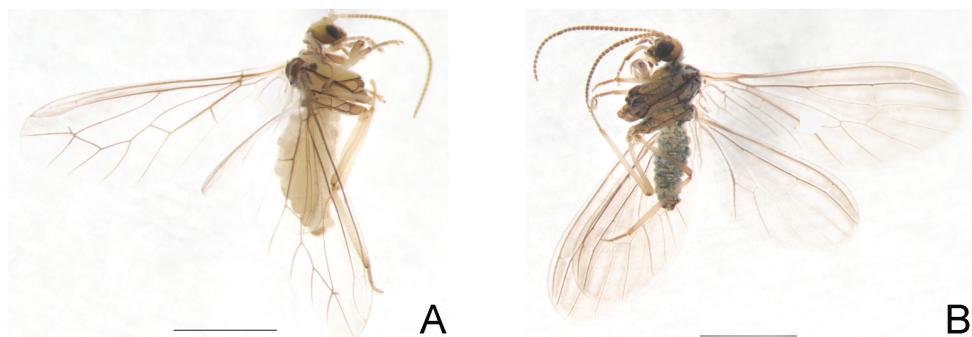


Figure 2. Habitus photographs of species of Coniopterygidae newly recorded from Beijing. **A** *Conwentzia sinica* Yang, 1974 **B** *Semidalis bicornis* Liu & Yang, 1993. Scale bar: 1 mm.

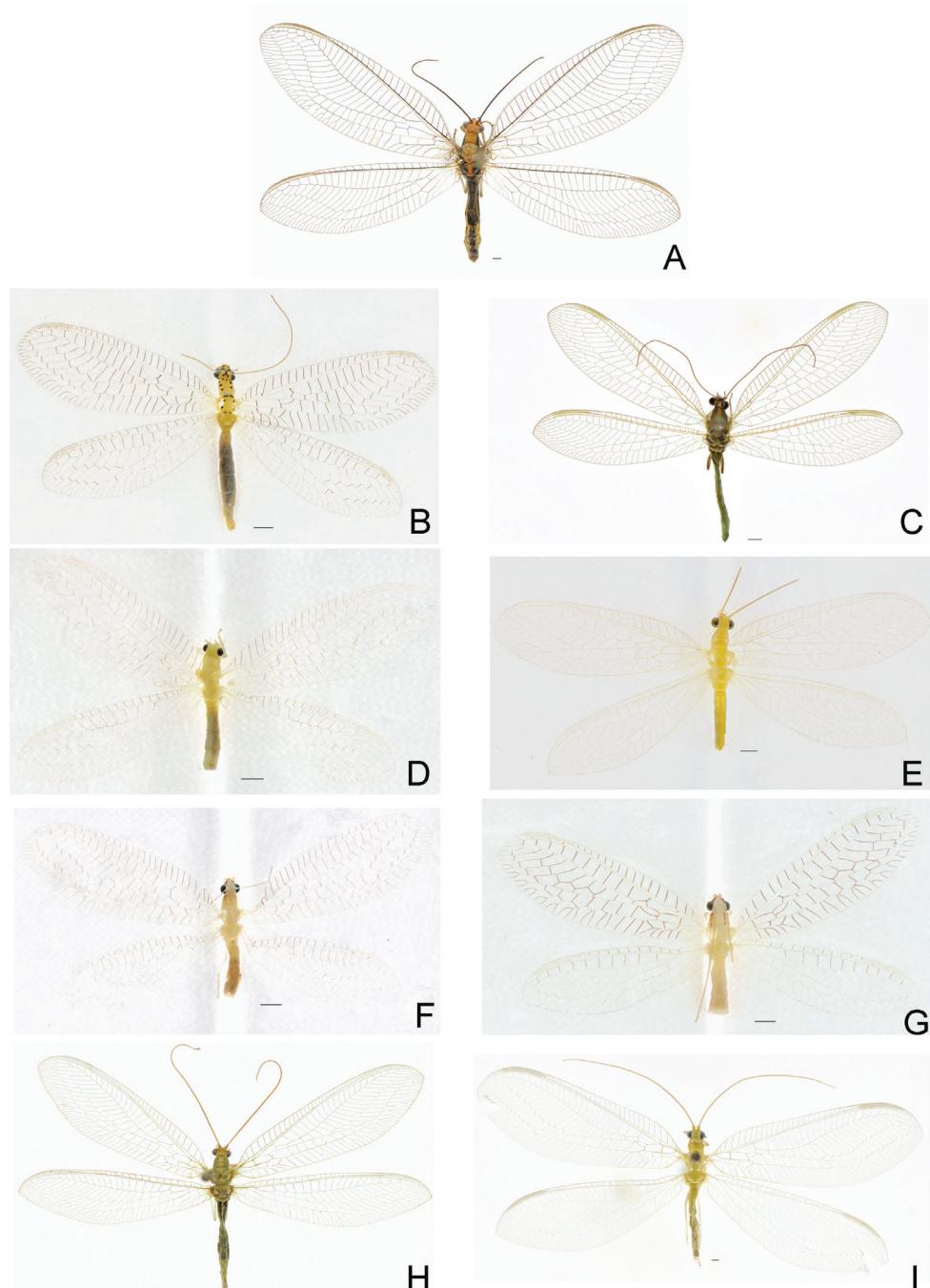


Figure 3. Habitus photographs of species of Chrysopidae newly recorded from Beijing. **A** *Nothochrysa sinica* Yang, 1986 **B** *Chrysopa intima* McLachlan, 1893 **C** *Chrysoperla furcifera* (Okamoto, 1914) **D** *Chrysopidia ciliata* (Wesmael, 1841) **E** *Mallada flavimaculus* Yang & Yang, 1991 **F** *Pseudomallada cognatellus* (Okamoto, 1914) **G** *Pseudomallada qinlingensis* (Yang & Yang, 1989) **H** *Nineta grandis* Navás, 1915 **I** *Nineta shaanxiensis* Yang & Yang, 1989. Scale bar: 1 mm.

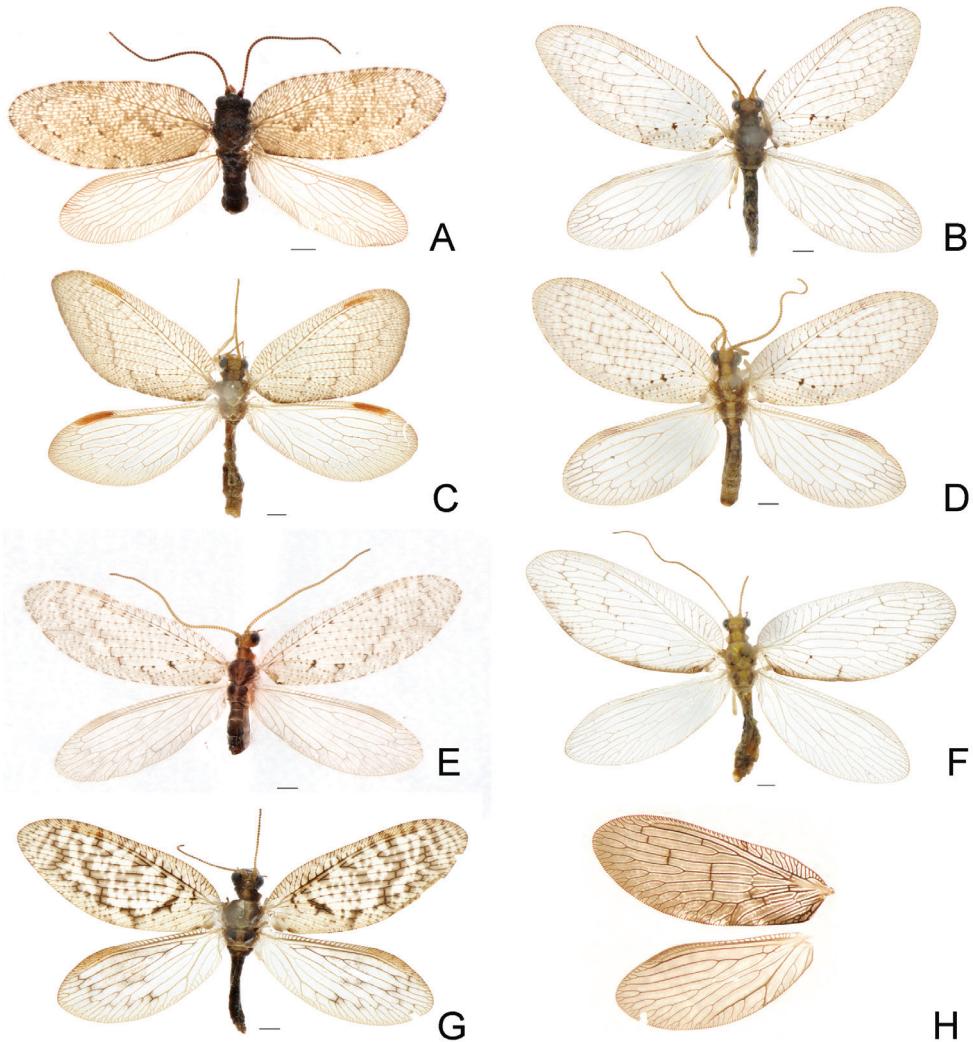


Figure 4. Habitus photographs of species of Hemerobiidae newly recorded from Beijing. **A** *Drepantopteryx algida* (Erichson, 1851) **B** *Hemerobius bispinus* Banks, 1940 **C** *Hemerobius exoterus* Navás, 1936 **D** *Hemerobius humulinus* Linnaeus, 1758 **E** *Hemerobius japonicus* Nakahara, 1915 **F** *Hemerobius marginatus* (Stephens, 1836) **G** *Hemerobius subtriangulus* Yang, 1987 **H** *Symppherobius manchuricus* Nakahara, 1960. Scale bar: 1 mm.

thermore, *Nothochrysa sinica* represents the first record of the subfamily Nothochrysinae from Beijing, while *Chrysopidia ciliata* is first recorded from China.

For testing the present identification, we also compare the barcode sequences of several green lacewing species [i.e., BINS: ACF7085 (*Chrysopa formosa*); AAB0373 (*Chrysoperla nipponensis*); AAJ3493 (*Chrysopidia ciliata*); ABU9179, ACF9046 (*Pseudomallada prasinus*); GenBank: KJ592516 (*Chrysopa pallens*)] obtained from the Barcoding of Life Data systems (BOLD, <http://www.barcodinglife.org/>) and the National

Center Biotechnology Information (NCBI, <https://www.ncbi.nlm.nih.gov/>) by using a neighbor-joining cluster analysis based on the K2P distances with MEGA v. 5.0. Most of these sequences were respectively clustered with those of same species herein sequenced, verifying our identification (Suppl. material 4: Figure S4). However, in *P. prasinus* specimens from Europe and from Beijing are clearly assigned into two clades. A similar result concerning *P. prasinus* from Europe and East Asia was also found in a phylogenetic analysis of *Pseudomallada* combining morphology, life-history traits, and nuclear DNA sequences (Duelli et al. 2017).

Among the green lacewing species herein studied, the bPTP_ML and bPTP_BS analyse resulted in 21 and 20 MOTUs, respectively (Figure 5B). Notably, bPTP_ML divided *P. cognatellus* (Okamoto, 1914) into two MOTUs (n=3) while the intraspecific distance is 0. Both solutions of the bPTP divided *Chrysopa pallens* (Rambur, 1838) into two MOTUs (n=12), but the intraspecific divergence is relatively lower (1.1%). Furthermore, the bPTP species delimitation sorted *P. prasinus* into two MOTUs (i.e., types A and B). Meanwhile, *P. prasinus* of high intraspecific divergence (2.7%) was detected using K2P distance analysis (Suppl. material 8: Table S2). We carefully differentiated the morphological characters between these two types, and we found difference of color patterns on every segment of maxillary and labial palps. Those palps in type A are almost entirely black except for joints that are yellow, but in type B they are largely yellow except for the terminal segments and several joints that are black. Besides, the number of blackish markings on pronotum is different between types A and B. Type A has only one pair of blackish markings on the middle of pronotum, while type B possesses three pairs of additional blackish markings on the lateral margins of pronotum beside the medial pair of markings. Moreover, the apex of male sternum 9 in type A is narrowed distad, while in type B it is broader and subquadrate in lateral view. Nevertheless, no morphological difference was detected concerning the shape of the complex of gonocoxites, gonapophyses, and gonostyli 9 as well as the gonocoxites 10 (Figure 6). Thus, cryptic species may exist in *P. prasinus*, as mentioned in Duelli et al. (2017). The ABGD analysis resulted in 17 MOTUs, within which two species (i.e., *Pseudomallada* sp. 2 and sp. 3) were assigned into a same species.

Hemerobiidae

The study resulted in 16 species of Hemerobiidae from Beijing although two species of them are undetermined. Eight species are newly recorded from Beijing, i.e., *Drepanopteryx algida* (Erichson, 1851), *Hemerobius bispinus* Banks, 1940, *Hemerobius exoterus* Navás, 1936, *Hemerobius humulinus* Linnaeus, 1758, *Hemerobius japonicus* Nakahara, 1915, *Hemerobius marginatus* (Stephens, 1836), *Hemerobius subtriangulus* Yang, 1987 and *Sympherobius manchuricus* Nakahara, 1960. Seven species of them, except *D. algida*, were recorded from Beijing in an unpublished doctoral thesis (Zhao 2016) but not listed with their distribution from Beijing in Yang et al. (2018). *Drepanopteryx algida* is also first recorded from China.

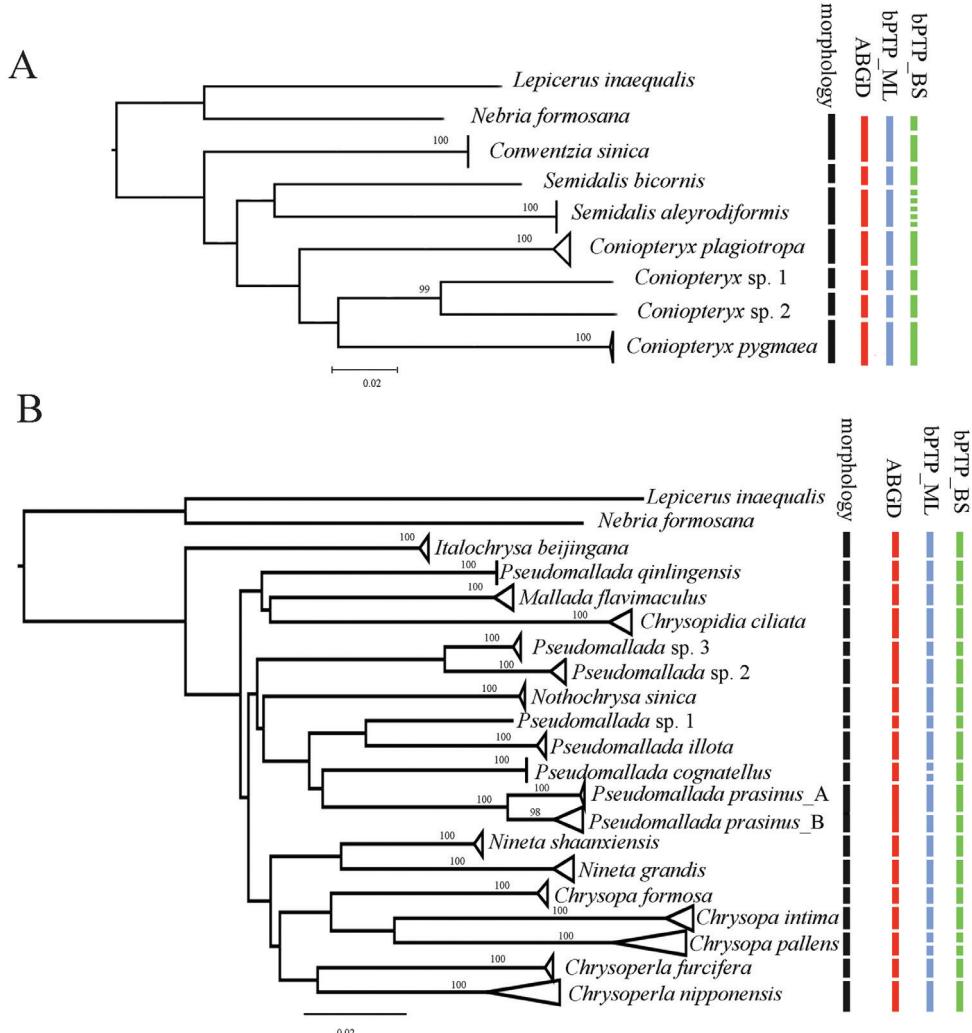


Figure 5. Neighbor-joining tree and result of molecular species delimitation based on COI barcodes. **A** Coniopterygidae **B** Chrysopidae **C** Hemerobiidae **D** Myrmeleontidae and Ascalaphidae. The terminal nodes in the tree are collapsed for each morphological species, the width of triangles shows the sequence divergence. Only bootstrap supports (1,000 replicates) > 0.95 are labelled.

Hemerobius humulinus and *Hemerobius japonicus* possess a minimum mean interspecific distance 5.3% (Suppl. material 9: Table S3). Meanwhile, *Hemerobius japonicus* and *Neuronema* sp. 1 demonstrate a maximum mean interspecific distance 21.8%. Results of species delimitation based on ABGD and bPTP_ML are consistent with our identification based on morphology. But in bPTP_BS analysis, all samples were sorted into 17 MOTUs, because *Neuronema* sp. 1 was divided into two MOTUs ($n = 3$; Figure 5C) even without any intraspecific divergence.

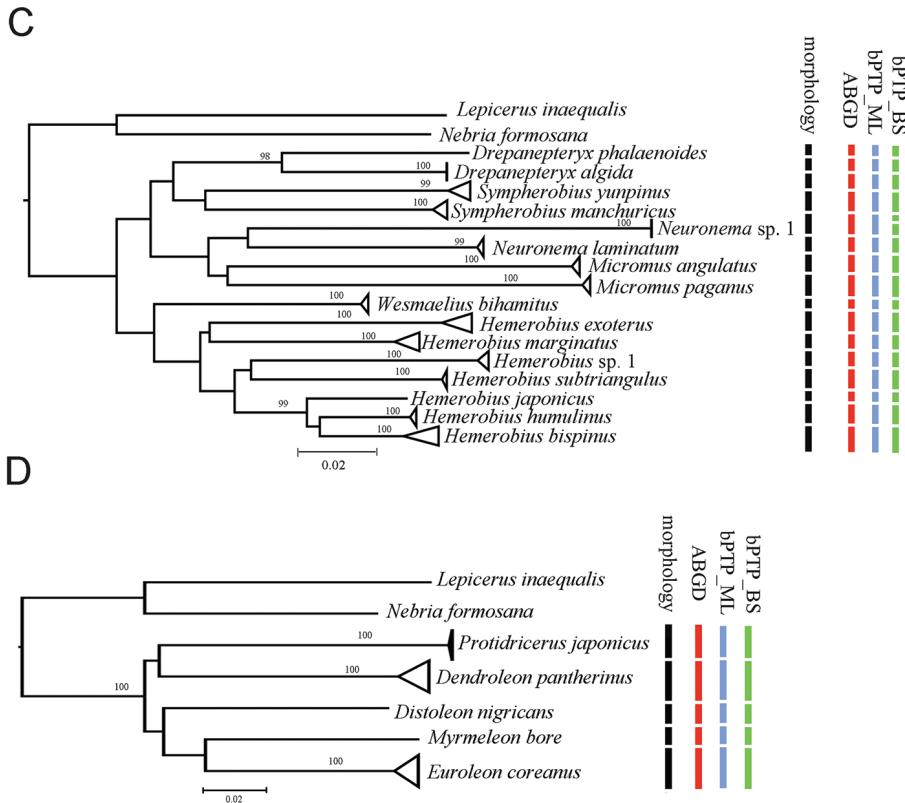


Figure 5. Continued.

Mantispidae and Dilaridae

The study obtained COI barcodes from two species of Mantispidae, i.e., *Eumantispa harmandi* (Navás, 1909) and *Mantispa styriaca* (Poda, 1761), and from one species of Dilaridae (*Dilar hastatus* Zhang, Liu, H. Aspöck & U. Aspöck, 2014; Wang et al. 2017).

Myrmeleontidae and Ascalaphidae

Four species of Myrmeleontidae, i.e., *Dendroleon pantherinus* (Fabricius, 1787), *Distoleon nigricans* (Matsumura, 1905), *Euroleon coreanus* (Okamoto, 1926) and *Myrmeleon bore* (Tjeder, 1941) and one species of Ascalaphidae [*Protidricerus japonicus* (McLachlan, 1891)] from Beijing were studied. The consequence of two species delimitation methods is consistent with our identification based on morphology.

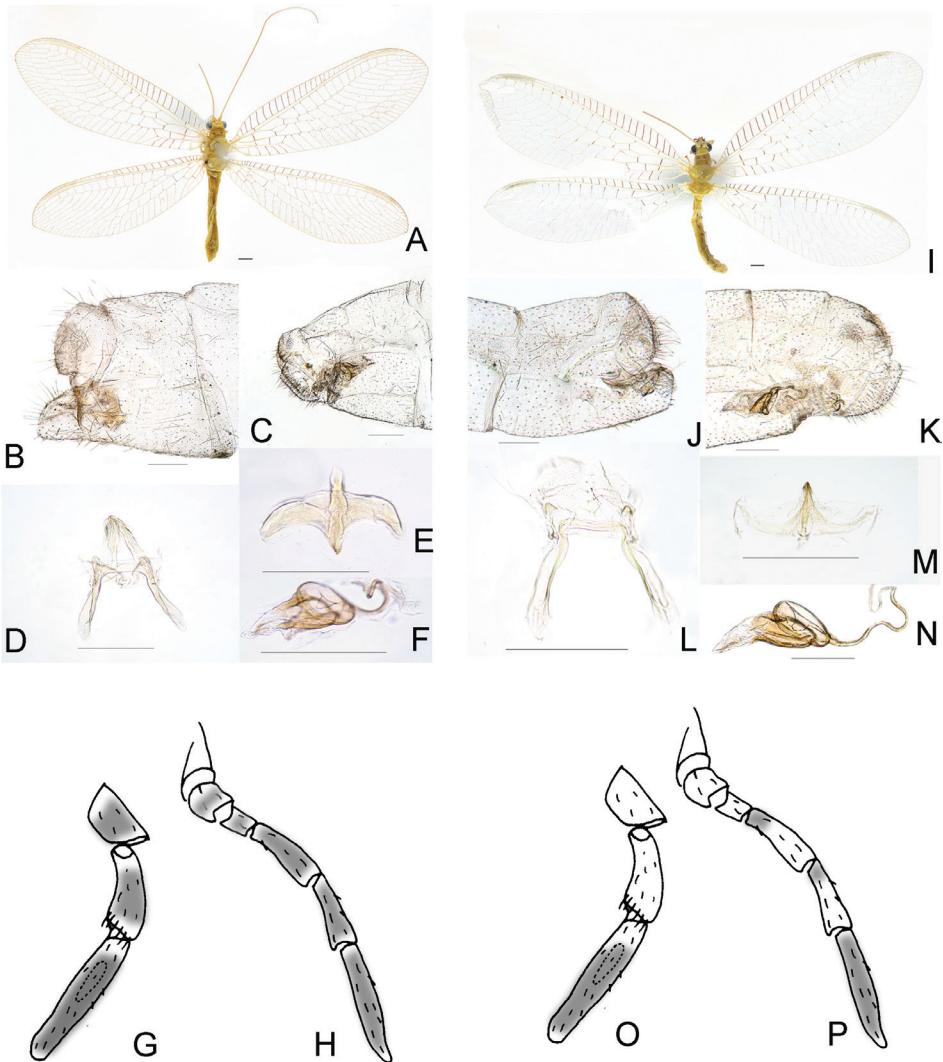


Figure 6. Photographs of habitus and genitalia of *Pseudomallada prasinus* (Burmeister, 1839). Type **A** (**A–H**); type **B** (**I–P**); photographs of habitus (**A, I**); apex of abdomen in male (**B, J**); apex of abdomen in female (**C, K**); the complex of gonocoxites, gonapophyses and gonostyli 9, dorsal view (**D, L**); gonocoxites 10, dorsal view (**E, M**); spermatheca, lateral view (**F, N**); labial palps (**G, O**); maxillary palps (**H, P**). Scale bar: 1mm (**A, I**); 0.25 mm (**B–F, J–N**).

Discussion

Within the past few years, DNA sequence-based approaches have become more and more popular for the assessment of biodiversity and identification of species, in particular where the traditional morphology-based identification is hard to apply (Taberlet et al. 2012). However, COI gene is known to be affected by several biases and is considered to better utilized in combination with, at least, other independent genes, but also with morphological, geographical or ecological data to clearly

delimit species (Will et al. 2005; Ahrens et al. 2007; Padial et al. 2010; Hajibabaei et al. 2011).

The present DNA barcode library of Neuroptera from Beijing stands an important step not only for the molecular identification of lacewing species from Beijing but also for the future construction of DNA barcode database of Neuroptera from China. In light of obvious gap between intraspecific and interspecific genetic distance, the present COI barcode data allow unambiguous identification of almost all lacewing species from Beijing herein examined. Nevertheless, it should be noted that some other methods we tested for species delimitation (i.e., ABGD and bPTP) based on present barcode data may result in some problematic identification (see above results on *Semidalis aleurodiformis*, *Pseudomallada* spp., and *Neuronema* sp. 1)

According to the updated catalogue of Neuroptera from China (Yang et al. 2018), 7 families, 12 subfamilies, 32 genera, and 47 species were recorded from Beijing. Here, Neuroptera from Beijing are composed of 7 families, 13 subfamilies, 37 genera, and 67 species (Suppl. material 6: File S2, excluding unidentified species).

Beijing is located at the eastern Palaearctic region. Among the 67 lacewing species from Beijing, 30 species (44.8% of total species) are distributed only from the Palaearctic region, while the remaining 37 species (55.2% of total species) occur in both Palaearctic and Oriental regions. The species of Chrysopidae and Hemerobiidae account for a great proportion (38.2% and 34.0% respectively) of Neuroptera in this study. They also represent substantial species numbers based on the checklist of Neuroptera from Beijing (28.4% and 25.4% respectively). Due to lack of specimens, species of Aleuropteryginae and many tribes of Myrmeleontidae were not studied here, but will be supplemented in our dataset in near future.

Conclusions

Our study provided the first DNA barcode library of Neuroptera from Beijing, including 49 species (73% of all lacewing species recorded in Beijing). It is clearly indicated that the use of DNA barcodes for the identification of lacewing species is promising. The present dataset will be the first step toward the DNA barcoding of Chinese Neuroptera. It is also useful for the identification of immature stages and/or females of the lacewing species from Beijing. In future study, the DNA barcoding could be applied for comparison and assessment of lacewing species diversity and its dynamic change among different types of ecosystems and regions in Beijing for understanding the effect of urbanization on this important insect group.

Acknowledgements

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Supplementary material I

Figure S1. Photographs of male genitalia of species of Coniopterygidae newly recorded from Beijing

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: multimedia

Explanation note: A. *Conwentzia sinica* Yang, 1974; B. *Semidalis bicornis* Liu & Yang, 1993. Scale bar 0.5 mm.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl1>

Supplementary material 2

Figure S2. Photographs of male genitalia of species of Chrysopidae newly recorded from Beijing

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: multimedia

Explanation note: A. *Nothochrysa sinica* Yang, 1986; B. *Chrysopa intima* McLachlan, 1893; C. *Chrysoperla furcifera* (Okamoto, 1914); D. *Chrysopidia ciliata* (Wesmael, 1841); E. *Pseudomallada cognatellus* (Okamoto, 1914); F. *Pseudomallada qinlingensis* (Yang & Yang, 1989); G. *Nineta grandis* Navás, 1915. Scale bar: 0.5 mm.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl2>

Supplementary material 3

Figure S3. Photographs of male genitalia of species of Hemerobiidae newly recorded from Beijing

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: multimedia

Explanation note: A. *Drepanepteryx algida* (Erichson, 1851); B. *Hemerobius bispinus* Banks, 1940; C. *Hemerobius exoterus* Navás, 1936; D. *Hemerobius humulinus* Linnaeus, 1758; E. *Hemerobius japonicus* Nakahara, 1915; F. *Hemerobius marginatus* (Stephens, 1836); G. *Hemerobius subtriangulus* Yang, 1987; H. *Sympherobius manchuricus* Nakahara, 1960. Scale bar: 0.5 mm.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl3>

Supplementary material 4

Figure S4. Neighbor-joining tree based on the COI sequence dataset of Chrysopidae

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: phylogenetic tree

Explanation note: Neighbor-joining tree based on the COI sequence dataset of Chrysopidae. Only bootstrap supports (1,000 replicates) > 0.95 are labelled.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl4>

Supplementary material 5

File S1. List of all specimens used in this study, including GenBank accession numbers

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: molecular data

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl5>

Supplementary material 6

File S2. Checklist of the species of Neuroptera from Beijing

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: species data

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl6>

Supplementary material 7

Table S1. Intraspecific and interspecific divergence of Coniopterygidae based on COI barcode sequences (%)

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: molecular data

Explanation note: The range of interspecific distance = means interspecific distance ± standard error. N/A indicates intraspecific distance not available because only one specimen was sequenced.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl7>

Supplementary material 8

Table S2. Intraspecific and interspecific divergence of Chrysopidae based on COI barcode sequences (%)

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: molecular data

Explanation note: The range of interspecific distance = mean interspecific distance ± standard error. N/A indicates intraspecific distance not available because only one specimen was sequenced.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl8>

Supplementary material 9

Table S3. Intraspecific and interspecific divergence of Hemerobiidae based on COI barcode sequences (%)

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: molecular data

Explanation note: The range of interspecific distance = mean interspecific distance ± standard error. N/A indicates intraspecific distance not available because only one specimen was sequenced.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl9>

Supplementary material 10

Table S4. Intraspecific and interspecific divergence of Myrmeleontidae and Ascalaphidae based on COI barcode sequences (%)

Authors: Pan Yi, Pei Yu, Jingyi Liu, Huan Xu, Xingyue Liu

Data type: molecular data

Explanation note: The range of interspecific distance = mean interspecific distance ± standard error. N/A indicates intraspecific distance not available because only one specimen was sequenced.

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Link: <https://doi.org/10.3897/zookeys.807.29430.suppl10>

Notes on *Glaucocharis* (Lepidoptera, Crambidae) from China, with descriptions of two new species

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Abstract

Two new species belonging to the genus *Glaucocharis* Meyrick, 1938 are described from southwest China: *Glaucocharis sperlingi* sp. n. and *G. nussi* sp. n. The female of *G. castaneus* Song & Chen, 2002 is described for the first time. The geographical distribution of the genus in China is analysed. The precipitation of the warmest quarter is revealed to be the strongest predictor affecting the present distribution pattern of the genus. A map showing the distribution of the known Chinese localities of *Glaucocharis* is provided.

Keywords

Pyraloidea, Crambinae, taxonomy, geographical distribution, China

Introduction

The genus *Glaucocharis*, one of the most species-rich genera of the subfamily Crambinae (Lepidoptera, Crambidae), was established by Meyrick (1938) with *Glaucocharis stella* Meyrick, 1938 as the type species. To date, the genus has 153 described species worldwide (Nuss et al. 2018). The main taxonomic contributions concerned the faunas of the Palaearctic and Oriental Regions (Bleszynski 1965; Gaskin 1974b; Wang and Song 1983; Ganev 1987; Wang et al. 1988; Song 1993; Chen et al. 2001, 2002, 2003; Sasaki 2007; Li and Li 2012; Park et al. 2018), followed by the Australian Region (Gaskin 1971, 1974a, 1974b, 1985) and the Ethiopian Region (Bleszynski 1966, 1970; Bassi and Mey in Mey 2011). In China, the first specimen of *Glaucocharis* was recorded as early as 1932 from Tianmushan, Zhejiang Province (Bleszynski 1965), and a total of sixty species have been recorded in the country prior to this study (Li and Li 2012).

Among them, forty-nine species have China as the type locality (Suppl. material 1: Table S1). To date, all known localities of Chinese *Glaucocharis* clearly indicate a mostly eastern distribution, but this geographical pattern was never previously mentioned.

Morphologically, the members of the genus can be recognized by characters of the forewing: the apex usually with an apical mark, the termen below the apex with an indentation reaching the tip of M_1 , and well-developed marginal spots. In the wing pattern, *Glaucocharis* is similar to *Roxita* Bleszynski, but can be distinguished by the forewing with a well-developed M_1 and the valva without a ventral fold in the male genitalia; in *Roxita*, M_1 in the forewing is absent and the ventral fold of the valva is often present (Li and Li 2012). Several species groups have been proposed based on external characters and genitalic structures within *Glaucocharis* by Gaskin (1985) and Wang et al. (1988). However, it is relatively difficult to assign some ambiguous members to any proposed group on morphological characters alone. There is a need for a more insightful classification of species groups in this large genus based on an integrative approach using molecular data and morphological characters.

In the present paper, two species of *Glaucocharis* are described from the Mabian Dafengding National Nature Reserve, southwest of China. The geographical pattern of distribution presented by the genus in China is also commented upon.

Material and methods

All specimens were collected at night with a mercury-vapour lamp. The specimens were hand-collected alive and killed by ammonium hydroxide just prior to mounting and spreading as shown in Landry and Landry (1994). The terminology for morphological structures follows Bleszynski (1965) and Gaskin (1985). Photographs of adults were taken with a Zeiss AxioCam Icc 5 digital camera attached to a Zeiss SteREO Discovery V12 microscope. Illustrations of the genitalia were prepared with a DV320 OPTPro2010-Chs digital camera attached to an Optec BK-DM320 microscope. All specimens examined are deposited in the Insect Museum, Jiangxi Agricultural University, Nanchang, China (JXAUM).

The distribution of *Glaucocharis* was analysed using MaxEnt (Phillips et al. 2006) and was based on distributional data extracted from previous studies (Bleszynski 1965; Wang and Song 1983; Wang et al. 1988; Song 1993; Chen et al. 2001, 2002, 2003; Li and Li 2012), the specimens examined in this study (Suppl. material 1: Table S1), and twenty environmental variables (Suppl. material 1: Table S2). Geographic coordinates were taken from Wu et al. (1997) and converted into decimal coordinates (Suppl. material 1: Table S1). MaxEnt was set with 10 000 as the maximum number of background points. The model's goodness-of-fit and the relative importance of each of the variables were evaluated by area under the receiving operator curve and the jackknife procedure, respectively. Climatic data were retrieved from the WorldClim database (<http://www.worldclim.org>) at a resolution of 10 arc-min (Hijmans et al. 2004). The cartographic illustration was created using *dismo* R package (Hijmans and Elith 2017).

Taxonomic account

Glaucocharis sperlingi sp. n.

<http://zoobank.org/AF440590-1E0A-4AD5-B7ED-AA21C1C75C58>

Figs 1, 2, 7

Type material. *Holotype* ♂: CHINA: Mabian Dafengding National Nature Reserve, Mabian (28°51'N, 103°31'E), Sichuan Province, 1100 m, 12.viii.2012, coll. Wei-Chun Li, prep. gen, WD16102 (JXAUM).

Paratype, 1 ♂, with same locality as holotype and collected on 10.viii.2012 (JXAUM).

Diagnosis. This new species is similar to *Glaucocharis electra* (Bleszynski) by having slender uncus and gnathos, and thin and long valva in the male genitalia. It can be distinguished by the basal process of the costa of the valva with two projections, the juxta ending with three spine-like projections, and the phallus with a line of tiny spine-like cornuti in the male genitalia (Fig. 7). In *G. electra*, the costa of the valva only has a single projection, the juxta is concave distally, and the phallus has only one cornutus (Bleszynski 1965: pl. 32 fig. 4).

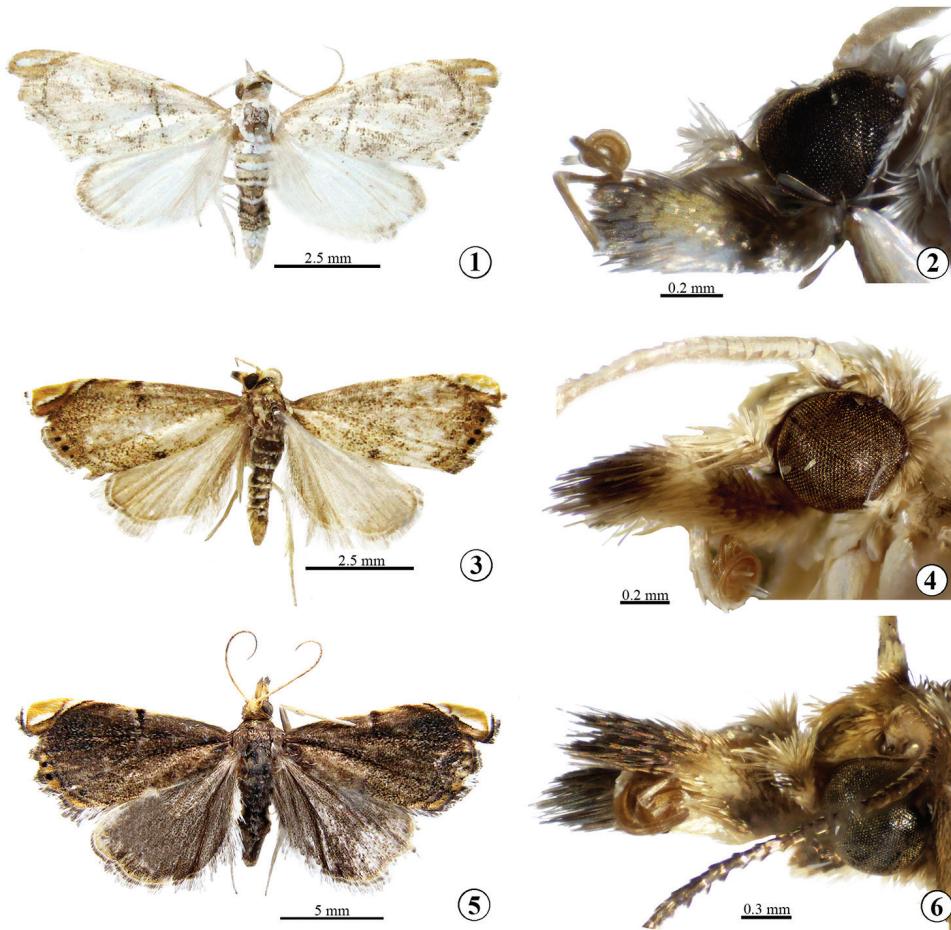
Description. *Male adult* (Figs 1, 2): Forewing length 5.5–6.0 mm. Frons and vertex pale brown. Labial palpus pale yellow on outer side except for brown base and tip, white ventrally. Maxillary palpus pale brown, white distally. Antenna pale brown and yellowish white in alternance on dorsal surface, pale yellow ventrally. Tegula and thorax white mixed with pale brown. Forewing white, sparsely covered with pale brown scales; antemedian line pale brown, straight except curved inward near costa; reniform stigma pale brown, small and ovate; postmedian line pale brown, arched outward; apex pale yellow, with white apical stripe; termen pale brown, with two black marginal spots; fringe pale brown mixed with white. Hindwing white, covered with pale brown scales along apex; fringe concolourous with forewing. Abdomen brown and white in alternance on dorsal surface. Legs white.

Male genitalia (Fig. 7): Uncus slightly concave at two-thirds, tapering to pointed apex. Gnathos curved upward slightly, apex with triangular projection and small spine on dorsal and ventral margin, respectively. Tegumen approximately as long as gnathos. Valva broad basally, narrowed towards blunt apex; ventral margin indented at about three-fourths; costa with adjacent triangular and spine-like projections at base. Saccus well-developed, gently narrowed towards distal tip. Juxta anteriorly convex, slightly broadened in basal one-third, then narrowed towards tip, ending with three spine-like projections. Phallus slightly shorter than valva; tiny cornuti spine-like, placed in one line.

Female unknown.

Distribution. China (Sichuan).

Natural history. Unknown except that the moths are in flight in early August and come to light. The habitat in which this species has been collected is located at 1100 m altitude, at the foot of the mountain. Most parts of the mountain are covered with trees belonging to families Lauraceae and Fagaceae (Fig. 10).



Figures 1–6. *Glaucocharis* spp. 1, 3, 5 Adult in dorsal view 2, 4, 6 Head in lateral view 1, 2 *G. sperlingi* sp. n., male, holotype 3, 4 *G. nussi* sp. n., male, holotype 5, 6 *G. castaneus* Song & Chen, female.

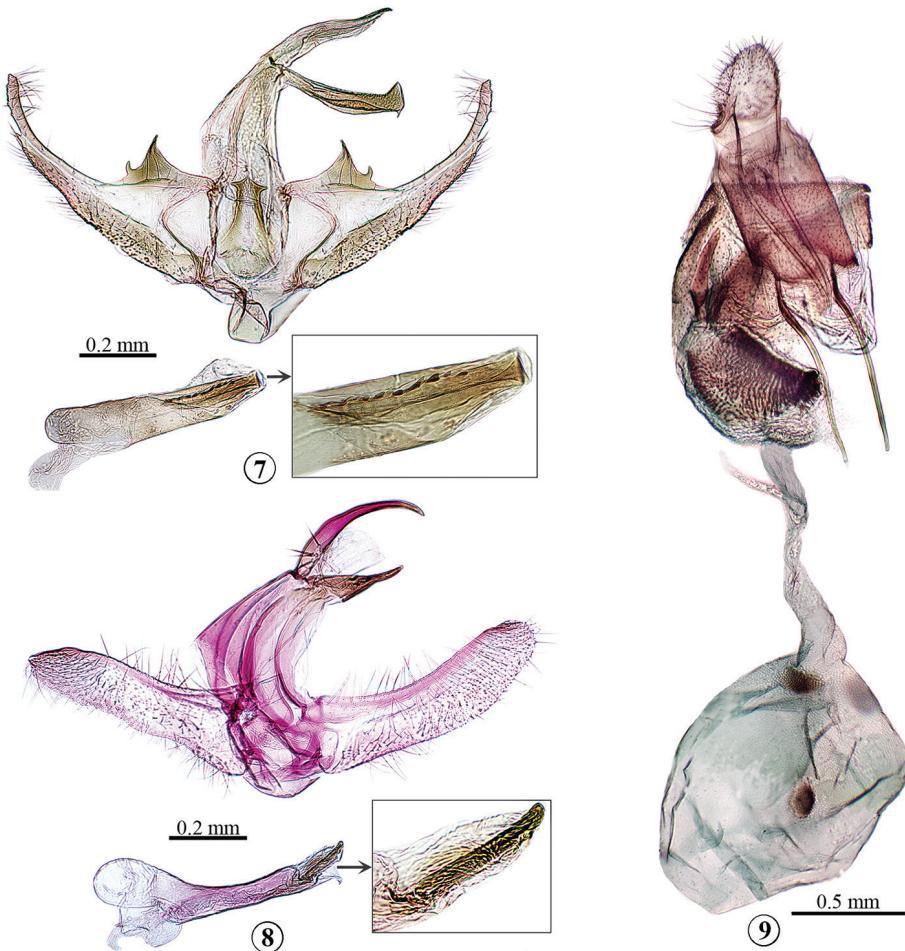
Etymology. In honour of Professor Felix Sperling of the University of Alberta, Canada, who contributed profoundly to systematic research in entomology, and who maintains long-standing achievements as curator of the E. H. Strickland Entomological Museum (<http://www.entomology.museums.ualberta.ca>).

Glaucocharis nussi sp. n.

<http://zoobank.org/0DAE5EE5-442C-4B77-B86A-486B68E7F89A>

Figs 3, 4, 8

Type material. Holotype ♂: CHINA: Mabian Dafengding National Nature Reserve, Mabian (28°51'N, 103°31'E), Sichuan Province, 1100 m, 11.viii.2012, coll. Wei-Chun Li (JXAUM).



Figures 7–9. Genitalia of *Glaucocharis* species. **7** *G. sperlingi* sp. n., male, holotype **8** *G. nussi* sp. n., male, holotype **9** *G. castaneus* Song & Chen, female.

Paratype, 1 ♂, with same locality as holotype and collected on 10.viii.2012, prep. gen. WD16100 (JXAUM).

Diagnosis. This species can be distinguished from its congeners by the unique characters in the male genitalia. The costal projection is absent and the phallus has a single strong spine-like cornutus (Fig. 8).

Description. Male adult (Figs 3, 4): Forewing length 5.5–6.0 mm. Frons and vertex pale brown mixed with yellowish white. Labial palpus basal half and distal one-fourth blackish brown on outer side, otherwise yellowish white. Maxillary palpus pale brown, yellowish white distally. Antenna yellowish white. Tegula and thorax pale brown. Forewing covered with pale brown scales; costa and dorsum with blackish spot near middle; antemedian line unrecognized; reniform stigma blackish brown, small and round; postmedian line brown, arched outward; apex orange, with white apical

stripe; termen orange mixed with pale brown, with four black marginal spots; fringe pale brown. Hindwing pale brown; fringe white mixed with grey. Abdomen blackish brown and white in alternance on dorsal surface. Legs pale brown.

Male genitalia (Fig. 8): Uncus curved downward, tapering to pointed apex. Gnathos nearly narrowly triangular, pointed distally. Tegumen approximately twice as long as gnathos. Valva broadened slightly at base, apex round; costa concave near middle. Saccus short and broad, convex distally. Juxta crescent-shaped. Phallus nearly as long as valva, basal one-third conspicuously thicker than distal two-thirds; single cornutus well-developed and spine-like.

Female unknown.

Distribution. China (Sichuan).

Natural history. See above under this heading for *Glaucocharis sperlingi* sp. nov.

Etymology. In honour of Dr Matthias Nuss, who contributed profoundly to systematic research on pyraloid moths, and who maintains and expands the most important tool for taxonomic information on the world pyraloid species: GlobIZ (www.pyraloidea.org).

Remarks. The generic assignment of *G. nussi* is primarily based on the external characters. However, its male genitalia are atypical for *Glaucocharis*. Characters of both sexes and molecular data would have to be analysed phylogenetically to provide a more insightful hypothesis concerning its classification.

Glaucocharis castaneus Song & Chen, 2002

Figs 5, 6, 9

Glaucocharis castaneus Song & Chen, in Chen et al. 2002: 1, figs 1–3. Type locality: Maoershan, Guangxi Province, China.

Specimens examined. 23 ♂♂, 12 ♀♀: CHINA: Mabian Dafengding National Nature Reserve, Mabian (28°51'N, 103°31'E), Sichuan Province, 1100 m, 9–10.viii.2012, coll. Wei-Chun Li (JXAUM).

Description. Female adult (Figs 5, 6): Forewing length 6.5–8.0 mm. Frons and vertex pale yellow. Labial palpus blackish-brown except second segment pale yellow. Maxillary palpus pale brown to blackish brown, pale yellow distally. Antenna blackish brown and pale yellow in alternance on dorsal surface, pale yellow ventrally. Tegula and thorax blackish brown. Forewing densely covered with blackish brown scales; antemedian line black, dorsal two-thirds inconspicuous; reniform stigma unrecognized; postmedian line blackish brown, arched outward; apex orange, with white apical stripe; termen orange mixed with pale brown, with two black marginal spots; fringe blackish brown. Hindwing blackish brown; fringe pale brown except blackish brown subbasally. Abdomen blackish brown on dorsal surface. Legs pale brown.

Female genitalia (Fig. 9): Papillae anales ovate, about one-third length of posterior apophyses. Tergite eight about two-thirds as long as anterior apophyses. Lamella postvaginalis roughly U-shaped. Antrum swollen and densely covered with small spines.



Figure 10. Collecting locality of the specimens treated here (Mabian Dafengding National Nature Reserve, Sichuan Province, China).

Ductus bursae long and thin. Ductus seminalis arising from approximately posterior one-third of ductus bursae. Corpus bursae rounded; signa double and ovate.

Distribution. China (Guangxi, Sichuan).

Remarks. The female of *G. castaneus* is described for the first time herein. The male of this species was described and figured adequately by Chen et al. (2002).

The geographical distribution of *Glaucocharis* in China

The geographical distribution of Chinese *Glaucocharis* was analysed using MaxEnt based on the known localities (Suppl. material 1: Table S1) and twenty environmental variables (Suppl. material 1: Table S2). The results clearly indicate that the precipitation of the warmest quarter (Bio18) was the strongest predictor of the geographical distribution of the genus in China, and the mean diurnal range (Bio2, mean of monthly maximum and minimum temperatures) and the minimum temperature of the coldest month (Bio6) were revealed to be the second and third most important factors respectively in the environmental variables (Suppl. material 1: Table S2).

At present, all *Glaucocharis* species in China occur in humid–semi-humid areas (pale blue to green), which can be separated from arid–semi-arid areas (dark blue) in

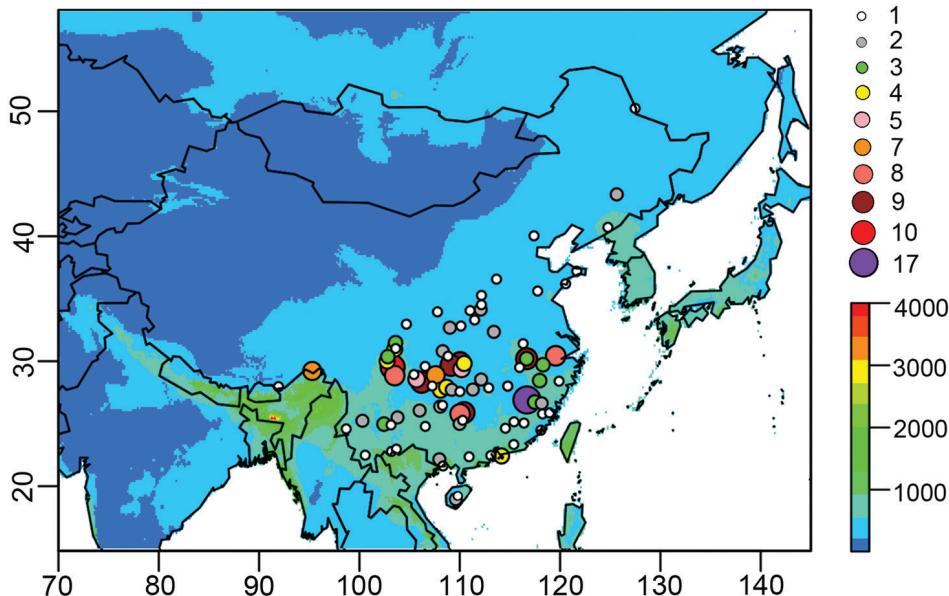


Figure 11. Geographical distribution of *Glaucocharis* in China and precipitation of the warmest quarter (Bio18). Circles indicate surveyed sites and numbers of species per site. Rainbow bar: precipitation (mm).

western China by using the climate data Bio18 (Fig. 11). Furthermore, based on all *Glaucocharis* species catalogued in China (Suppl. material 1: Table S1), most members of the genus occur south of 32°N (southern China) where the minimum temperature of the coldest month is above 0 °C. The precipitation and temperature have higher explanatory power for the occurrence of the genus in China in accordance with the analysis of MaxEnt. The available data suggest that precipitation limits the dispersal of known species. Meanwhile, temperature could have a significant influence on the exceptionally high species diversity of the genus in southern China. However, the species diversity pattern of *Glaucocharis* detected here does not precisely reflect the latitudinal gradient inasmuch as the unique species diversity between 25°N and 32°N is much higher than in the other areas, and many distribution gaps are found between the known localities (Fig. 11). In further research, it would be essential to explore more precisely the biotic and abiotic requirements for individual *Glaucocharis* species as well as to describe the largely unstudied diversity of the genus in eastern China.

Acknowledgments

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improve the manuscript throughout. Special thanks are given to the two anonymous reviewers for their insightful comments and suggestions on the manuscript. This project was supported by the National Natural Science Foundation of China (No. 31601885).

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Supplementary material I

Supplementary tables

Authors: Wei-Chun Li

Data type: species data

Explanation note: **Table S1.** Overview of Chinese localities where *Glaucocharis* species have been collected (administrative divisions are given in bold) with geographical coordinates in the decimal system; **Table S2.** Environmental variables used in the study and their contribution percentage and permutation importance.

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