

## NEW RECORDS OF RARE GENERA OF THE SUBFAMILY Doryctinae (Hymenoptera: Braconidae) WITH DESCRIPTION OF FIVE NEW SPECIES FROM VIETNAM

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**ABSTRACT:** Three small genera of the subfamily Doryctinae are newly recorded for the Braconidae fauna of Vietnam, viz. *Euscelinus* Westwood, 1882; *Leptospathius* Szépligeti, 1902 and *Sonanus* Belokobylskij & Konishi, 2001. Five new species of these genera are described and illustrated, namely *Euscelinus vietnamicus* Long, sp. n.; *Leptospathius langsoni* Long, sp. n.; *Leptospathius phamvanluci* Long, sp. n.; *Leptospathius simulatus* Long, sp. n. and *Sonanus mocchaui* Long, sp. n.. The checklist and distribution of the already known species of three genera are provided. Keys to species of the genera are also given.

**Keywords:** Braconidae, Doryctinae, new record, new species, rare genera, Australian, Oriental, Palaearctic, Pacific, Vietnam.

**Citation:** Khuat Dang Long, Dang Thi Hoa, Nguyen Van Duong, 2017. New records of rare genera of the subfamily Doryctinae (Hymenoptera: Braconidae), with description of five new species from Vietnam. Tap chi Sinh hoc, 39(4): 383-397. DOI: 10.15625/0866-7160/v39n4.10897.

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Received 19 September 2017, accepted 12 December 2017

### INTRODUCTION

Braconidae is one of the largest families of the Hymenoptera, however, the braconid fauna of Vietnam is poorly studied yet. Recently, the available information on braconid wasps in Vietnam was summarized by Long & Belokobylskij (2003) and Long & van Achterberg (2014). This paper deals with three small genera of the subfamily Doryctinae, one of the most diverse subfamily of Braconidae: *Euscelinus* Westwood, 1882; *Leptospathius* Szépligeti, 1902 and *Sonanus* Belokobylskij & Konishi, 2001, from Vietnam.

*Euscelinus* Westwood is a rather rarely collected genus, that was named by Westwood in 1882 (type species: *Euscelinus sarawacus* Westwood, 1882), and up to now a single species was known from the Oriental, South Palaearctic and Pacific regions.

The another rare genus, *Sonanus* Belokobylskij & Konishi, was coined by Belokobylskij & Konishi in 2011 (Type: *Sonanus senzuensis* Belokobylskij & Konishi,

2001), this genus is originally described from Japan, and comprises four species, of which one species is recorded from the Australian and three species from the Oriental regions (Belokobylskij & Chen, 2005).

*Leptospathius* Szépligeti, is a small genus, that was named by Szépligeti in 1902 (Type: *Leptospathius formosus* Szépligeti, 1902; monotype), and the genus comprises seven species, of which three species are recorded from the Australian and five species from the Oriental regions (Yu et al., 2016).

In the paper, five new species of the above mentioned genera from Vietnam are described and illustrated, keys to the species of the genera are given.

### MATERIALS AND METHODS

The braconid specimens were mainly collected in Malaise traps, partly by sweeping nets and light trap. The material was stored in 96% ethanol, prepared with the AXA method (van Achterberg, 2009; van Achterberg et al.,

2010) and glued on card points. Observations were made with an Olympus® SZ61 stereomicroscope and fluorescent lamps. Measurements were made with a binocular microscope (Olympus® SZ40), and photographs were taken with a Canon G15 camera attached to an Olympus® SZ61 binocular microscope connecting to a computer at IEBR. The scale-lines of the plates indicate mm. For the description, sculpture terms are based on Harris (1979), terminology used in this paper follows the modified Comstock-Needham system (van Achterberg 1993, 1997). For the identification of the genera of Doryctinae see Belokobylskij & Maetô (2009).

Abbreviations used in this paper are as follows: OD=diameter of posterior ocellus; OOL=ocular-ocellar line; POL=postocellar line; MT: Malaise trap; “Doryc.+number”/“Spath.+number”: code number indexing for specimens of the subfamily Doryctinae in the collection; NC: North Central; NE.: Northeast; NW.: Northwest.

The examined specimens (holotypes and paratypes) are kept in the parasitoid collections of Department of Insect Ecology (IEBR); Vietnam National Museum of Nature (VNMN) at Ha Noi, Vietnam, Academy of Science and Technology (VAST).

**RESULTS AND DISSCUSION**

**Systematics**

**Checklist and distribution of *Euscelinus*, *Leptospathius* and *Sonanus***

***Euscelinus* Westwood, 1882**

*Euscelinus sarawacus* Westwood, 1882; Oriental, Pacific, Palaeartic, Australasian:

Australia, India, Israel, Malaysia (Sarawak), Myanmar, Pakistan, Philippines, Thailand, U.S.A. (Hawaii).

*Euscelinus vietnamicus* Long, sp. n., Oriental: Vietnam.

***Leptospathius* Szépligeti, 1902**

*Leptospathius formosus* Szépligeti, 1902; Australasian: Australia (New South Wales, Queensland); *Leptospathius hunanensis* Tang, Wu, Belokobylskij & Chen, 2012; Oriental: China; *Leptospathius iridescens* (Schletterer, 1890); Australasian: Australia (New South Wales, Queensland); *Leptospathius kipyatkovi* Belokobylskij, 2013; Oriental: Cambodia; *Leptospathius petiolatus* (Cameron, 1905); Australasian, Oriental: Malaysia (Sarawak); Papua New Guinea; *Leptospathius striatus* (Cameron, 1910); Oriental: Sri Lanka; *Leptospathius triangulifera* Enderlein, 1914; Oriental: China; *Leptospathius langsoni* Long, sp. n., Oriental: Vietnam; *Leptospathius phamvanluci* Long, sp. n., Oriental: Vietnam; *Leptospathius simulatus* Long, sp. n., Oriental: Vietnam.

***Sonanus* Belokobylskij & Konishi, 2001**

*Sonanus bamagaus* Belokobylskij, Iqbal & Austin, 2004; Australasian: Queensland; *Sonanus chinensis* Belokobylskij & Chen, 2005; Palaeartic: China; *Sonanus indicus* Belokobylskij, 2005; Oriental: India; *Sonanus senzuensis* Belokobylskij & Konishi, 2001; Palaeartic: China, Japan; *Sonanus mocchaui* Long, sp. n.; Oriental: Vietnam.

**Taxonomy**

***Euscelinus* Westwood, 1882** (type species: *Euscelinus sarawacus* Westwood, 1882).

**Key to *Euscelinus* species**

- 1a. Median lobe of mesoscutum without median depression; median and lateral lobes of mesoscutum rugose; mesopleuron finely striate posteriorly; propodeum without basal median carina and without median areola with two transverse parallel carinae medially. Australia, India, Israel, Malaysia (Sarawak), Myanmar, Pakistan, Philippines, Thailand, USA. (Hawaii).....*Euscelinus sarawacus* Westwood
- b. Median lobe of mesoscutum with median depression (Fig. 5); median and lateral lobes of mesoscutum sparsely punctate (Fig. 5); mesopleuron smooth posteriorly; propodeum with basal median carina and median areola with two transverse parallel carinae medially (Fig. 4). Vietnam.....*Euscelinus vietnamicus*, sp. n.

**Description of new species**

*Euscelinus vietnamicus* Long, sp. n. (Figs 1-10)

**Material.** Holotype, female (IEBR), “Doryc.767”. NW. Vietnam: Son La, Moc Chau, fruit orchard, MT, 25°51'N 104°39'E, 1060m, 25.v-5.vi.2014, KDLong.

**Description.** Holotype, female, body length 2.7 mm, fore wing length 2.2 mm, antenna 2.3 mm, ovipositor sheath 1.7 mm (fig. 1).

**Head.** Antenna with 30 segments; third segment robust, as long as fourth segment; middle segment 3.0 times as long as its width; penultimate antennal segment 0.8 times apical segment; apical segment acuminate; length of maxillary palp 0.8 times as long as head height (15:31); face convex medially, largely rugose; width of face 1.2 times as long as length of face and clypeus combined (18:15); clypeus slightly concave; malar space 0.7 times mandible basal width (6:9); distance between tentorial pits as long as distance from pit to eye margin; stemmaticum finely punctate; vertex and temple smooth; in lateral view width of temple 1.4

times as long as width of eye (15:11) (fig. 3); in dorsal view, height of eye 2.0 times as long as temple (16:8); ocelli small, in high triangle, POL 1.2 times as long as OOL; POL:OD:OOL=7:2:6; distance between anterior and posterior ocelli 0.8 times as long as OOL (5:6) (fig. 2).



Figure 1. *Euscelinus vietnamicus* Long, sp. n. (habitus, lateral view).



Figures 2-10. *Euscelinus vietnamicus* Long, sp.n.

2. Head, dorsal view; 3. Head, lateral view; 4. Propodeum; 5. Mesonotum; 6. Mesopleuron; 7. Fore wing; 8. Hind wing; 9. Metasomal tergites 1-3; 10. Hind leg.

**Mesosoma.** Length of mesosoma 1.8 times as long as high (64:35); in lateral view mesoscutum almost perpendicularly raised above pronotum; mesoscutum and scutellum flat that at the same level; pronotal side crenulated medially, rugose dorsally and striate ventrally (fig. 6); mesopleuron transversely largely rugose anteriorly, smooth posteriorly (fig. 6); precoxal sulcus narrow and shallow, smooth (fig. 6); metapleuron areolate-rugose anteriorly, punctate posteriorly (fig. 6); median and lateral lobes of mesoscutum with sparse fine punctures; notauli deep, crenulate anteriorly, flat and rugose posteriorly (fig. 5); median lobe of mesoscutum with median

depression connecting median longitudinal carina fusing prescutellar sulcus (fig. 5); scutellar sulcus narrow, 0.3 times as long as scutellum (3:10), with 7 carinae; scutellum slightly flat, dull without punctures; propodeum with basal carina and median areola-like fusing with two transverse posterior carinae (fig. 4); propodeum rugose-punctate anteriorly.

*Wings.* Fore wing: length of wing 3.1 times as long as its maximum width (94:30); pterostigma 3.4 times as long as wide (27:8); vein r of fore wing obliquely arising before middle of pterostigma; vein r 0.4 times as long as vein 2-SR and 0.35 times vein 3-SR (r:2-SR:3-SR:SR1=5:12:14:31); vein 1-CU1 1.5 times vein cu-a; 1-CU1:cu-a:2-CU1=3:2:20; vein 3-CU1 interstitial to vein 3-CU1 (fig. 7); vein 2-SR+M strongly curved apically. Hind wing: length of wing 4.7 times as long as its maximum width (84:18); vein M+CU short, 0.4 times as long as vein 1-M; M+CU:1-M:1r-m=11:28:6; vein m-cu slightly antefurcal (fig. 8).

*Legs.* Hind femur wide and robust, with 6 teeth on apical ventral margin (fig. 10); length of hind femur, tibia and basitarsus 1.7, 6.4 and 3.0 times as long as their maximum width, respectively; outer side of fore tibia with 7 pegs; hind basitarsus 0.7 times as long as tarsal segments 2-5 (12:17); fourth hind tarsus short, 0.3 times hind telotarsus (2:7); inner hind tibial spur short, 0.33 times as long as basitarsus (4:12). Inner side of fore tibia with row of 7 pegs; dorsal side of hind tibia with row of 5 pegs (fig. 10); outer side of hind femur almost smooth.

*Metasoma.* Metasoma 0.97 times as long as head and mesosoma combined (60:62); length of first tergite 1.3 times as long as its apical width (28:21) and 1.55 times length of propodeum (28:18); median length of second metasomal tergite 1.6 times as long as third tergite (29:18) (fig. 9); second suture distinct; ovipositor sheath 0.8 times as long as fore wing (17:22). First metasomal tergite areolate-rugose medially, longitudinally rugose laterally (fig. 9); basal triangular area of second tergite with sparse striations, second tergite largely smooth; remaining tergites smooth; ovipositor sheath widened apically; ovipositor evenly curved upward.

*Colour.* Head reddish yellow but darker around occipital carina; antennae yellow, but four apical segments brownish yellow; palpi pale yellow; pronotum, mesopleuron dark brown to black; mesosternum reddish yellow; mesoscutum reddish yellow; scutellum dark brown to black; propodeum black; fore and middle legs, hind coxa pale yellow; hind femur dark brown, but ventral teeth ivory; basal half of hind tibia and hind tarsus ivory; apical half of hind tibia brown; fore veins light brown; pterostigma brown with yellow base; first metasomal tergite dark brown; second tergite and sternites pale yellow; tergites third-sixth tergites light brown; ovipositor sheath yellow, but dark brown apically.

*Male.* Unknown.

*Etymology.* The new species is named after country of origin (Vietnam).

*Host.* Unknown.

*Notes.* *Euscelinus vietnamicus* sp. n. is similar to *E. sarawacus* Westwood, 1882; from Oriental region, but the new species can be distinguished by the following characters: a) propodeum with basal median carina and median areola with two transverse parallel carinae medially, rugose-punctate laterally (propodeum largely rugose in *E. sarawacus*); b) mesopleuron smooth posteriorly (finely striate in *E. sarawacus*); c) mesoscutum with median depression (without median depression in *E. sarawacus*), median and lateral lobes of mesoscutum with sparse fine punctures (rugose in *E. sarawacus*); d) second metasomal tergite with basal rugose triangular area; and e) propodeum and first tergite black, hind femur dark brown.

***Leptospathius Szépligeti, 1902*** (Type: *Leptospathius formosus* Szépligeti, 1902; monotypic).

**Key to *Leptospathius* species** (based on females)

The three new species of *Leptospathius* from Vietnam with hind tibia whitish yellow basally or basal ivory ring, so they can be separated from couplet 2b of the key to Oriental *Leptospathius* species by Belokobylskij (2013) as follows:

- 2b. Hind tibia whitish yellow basally (figs 10, 24, 38 in Belokobylskij, 2013); in dorsal view, transverse diameter of female eye 1.2-1.4 times longer than temple (figs 3, 22, 28 in Belokobylskij, 2013); triangular area of second tergite of female situated in basal 0.6-0.8 of tergite.....3
- b'. Hind tibia with basal ivory ring (figs 25, 50) or ivory dorso-basally (fig. 32); in dorsal view, transverse diameter of female eye 1.6-1.8 times longer than temple, if 1.4 times then second metasomal suture indistinct (fig. 47); triangular area of second tergite of female situated in basal 0.5 of tergite, if in basal 0.6 of second tergite, then length of hind femur 7.5 times as long as their maximum width.....6
- 3a. Head, prothorax and mesothorax light reddish brown to yellowish brown; dorsal lobe of pronotum mainly smooth (fig. 37 in Belokobylskij, 2013); metapleuron almost smooth in basal half (fig. 36 in Belokobylskij, 2013); tarsal claw with distinct basal lobe (fig. 35 in Belokobylskij, 2013). Cambodia.....*L. kipyatkovi* Belokobylskij
- b. Head at least dorsally, prothorax and mesothorax entirely dark reddish brown to black; dorsal lobe of pronotum distinctly sculptured (fig. 7 in Belokobylskij, 2013); metapleuron sculptured in basal half (fig. 8 in Belokobylskij, 2013); tarsal claw without distinct basal lobe.....4
- 4a. Hind tibia whitish yellow or brownish yellow in basal 0.5-0.6 (fig. 10 in Belokobylskij, 2013); middle lobe of mesoscutum with complete median longitudinal depression (fig. 7 in Belokobylskij, 2013); basal area of second metasomal tergite situated in basal 0.6 of tergite (fig. 13 in Belokobylskij, 2013); acrosternite of first metasomal segment 0.40-0.45 times first tergite (fig. 14 in Belokobylskij, 2013). Australia (Queensland, New South Wales).....*L. iridescens* (Schletterer) (*L. formosus* Szépligeti)
- b. Hind tibia whitish yellow in basal 0.2-0.3 of tibia; middle lobe of mesoscutum without complete median longitudinal depression; basal area of second metasomal tergite situated in basal 0.7-0.8 of tergite; acrosternite of first metasomal segment 0.3 times first tergite.....5
- 5a. Second submarginal cell 3.5 times as long as its maximum width; hind femur 4.5-4.6 times longer than wide; first metasomal tergite entirely rugulose, 3.0 times its apical width. China (Zhejiang, Hainan, Taiwan).....*L. triangulifera* Enderlein
- b. Second submarginal cell 2.6 times as long as its maximum width; hind femur 5.1 times longer than wide; first metasomal tergite mainly rugulose, almost smooth mediobasally, 3.7 times its apical width. China (Hunan).....*L. hunanensis* Tang, Wu, Belokobylskij & Chen
- 6a. Dorsal lobe of pronotum with transverse carina medially (fig. 17); surface of propodeum with carinae forming a median areola (fig. 18); hind wing with vein m-cu slightly postfurcal, and vein 2-SC+R of hind wing nearly quadrate (fig. 21). Northeast Vietnam (Lang Son).....*Leptopathius langsoni* sp. n.
- b. Dorsal lobe of pronotum rugose or transversely rugose; surface of propodeum largely or transversely rugose, without median areola (figs 36, 48); vein m-cu of hind wing interstitial; vein of hind wing 2-SC+R horizontal (figs 39, 52).....7
- 7a. Distance between tentorial pits 0.4 times distance from pit to eye margin; length of hind femur 7.5 times as long as their maximum width; second metasomal suture distinct (figs 34, 35); apex of second tergite striate laterally (fig. 34); vein 1-CU1 of fore wing 0.5 times as long as vein cu-a; vein M+CU of hind wing 1.2 times vein 1-M. Northwest Vietnam (Lai Chau).....*Leptopathius phamvanluci* sp. n.
- b. Distance between tentorial pits 0.8 times distance from pit to eye margin; length of hind femur 5.0 times as long as their maximum width; second metasomal suture indistinct (fig. 47); apex of second tergite smooth, setose medially (figs 46, 47); vein 1-CU1 of fore wing much shorter than vein cu-a, nearly quadrate; vein M+CU of hind wing as long as vein 1-M. North Central Vietnam (Quang Tri).....*Leptopathius simulatus* sp. n.

**Description of new species**

*Leptospathius langsoni* Long, sp. n. (Figs 11-25)

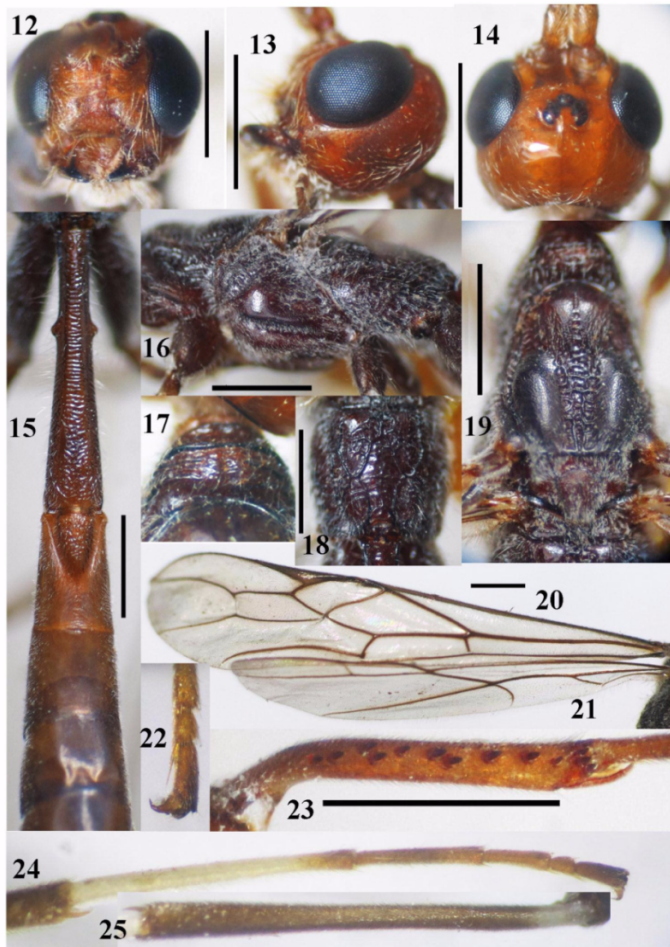
*Diagnosis.* Propodeum with areola, its surface largely areolate-rugose (fig. 18); basal triangular area of second metasomal tergite present on 0.5 of tergite (22:44) (fig. 15); second metasomal suture distinct (fig. 15); vein 1-CU1 of fore wing very short, nearly quadrate (fig. 20); vein m-cu of hind wing slightly postfurcal; vein M+CU subequal to vein 1-M; vein 2-SC+R quadrate (fig. 21).

**Material.** Holotype, female, “Doryc.038” (VNMN), NE. Vietnam: Lang Son, Bac Son, hill 600m, light trap, 01.vii.2003. TXLam.

**Description.** Holotype, female, body length 13.1 mm, fore wing length 8.3 mm, ovipositor sheath 12.2 mm (fig. 11).



Figure 11. *Leptospathius langsoni* Long, sp. n., habitus



Figures 12-25. *Leptospathius langsoni* Long, sp. n

12. Head, frontal view; 13. Head, lateral view; 14. Head, dorsal view; 15. Metasomal tergites 1-4; 16. Mesopleuron; 17. Pronotum; 18. Propodeum; 19. Mesonotum; 20. Fore wing; 21. Hind wing; 22. Hind tarsal claw; 23. Inner side of fore tibia; 24. Hind tarsus; 25. Hind tibia

*Head.* Antennae incomplete, with 61 segments remaining; third antennal segment shorter than fourth segment, 0.8 times as long as fourth (14:18); middle antennal segments 2.7 times longer than wide (8:3); maxillary palp long, 2.5 times as long as head height; width of face 1.4 times length of face and clypeus combined (28:20) (fig. 12); clypeus straight; malar space 0.6 times as long as mandible width (8:13); distance between tentorial pits 0.4 times distance from pit to eye margin (6:9); in dorsal view, height of eyes 1.6 times as high as temple (26:16) (fig. 14); in lateral view width of eye 1.2 times as long as temple (22:18) (fig. 13); ocelli medium-sized, in high triangle, POL 0.75 times as long as OOL; POL:OD:OOL=6:4:8; distance between anterior and posterior ocelli 0.5 times as long as OOL (4:8) (fig. 14).

*Mesosoma.* Length of mesosoma 2.4 times as long as high (85:36); pronotal side largely crenulate medially; dorsal lobe of pronotum with transverse carina medially (fig. 17); mesopleuron almost smooth medially, with sparse fine punctures (fig. 16); precoxal sulcus wide, sparsely crenulate (fig. 16); metapleuron transversely rugose posteriorly (fig. 16); notauli wide, crenulate anteriorly, coarsely transversally rugose posteriorly; medial lobe of mesoscutum with median crenulate depression (fig. 19); median and lateral lobes of mesoscutum finely punctate; scutellar sulcus 0.4 times as long as scutellum, rugose; scutellum flat, with sparse punctures; propodeum with short basal carina and median areola (fig. 18).

*Wings.* Fore wing: length of fore wing 4.8 times as long as its maximum width (100:21); pterostigma narrow, 6.7 times as long as wide (60:9); vein r of fore wing arising before middle of pterostigma (fig. 20); vein r 0.4 times as long as vein 2-SR (9:24) and 0.15 times vein 3-SR (r:2-SR:3-SR:SR1=9:24:36:46); vein 1-CU1 almost quadrate (fig. 20); vein cu-a:2-CU1=10:54. Hind wing: length of hind wing 7.5 times as long as its maximum width (83:11); vein M+CU slightly shorter vein 1-M (1.1 times) (55:50); M+CU:1-M:1r-m=55:50:40; vein 2+SC+R near quadrate; vein m-cu interstitial (fig. 21).

*Legs.* Inner side of fore tibia with row of robust pegs; apex of fore tibia with 4 pegs (fig. 23); length of hind femur, tibia and basitarsus 5.1, 11.5 and 16.7 times as long as their maximum width, respectively; hind tibia with basal ivory ring (fig. 25); hind basitarsus as long as tarsal segments 2-5; fourth tarsus 0.4 times hind telotarsus (4:9) (figs 22, 24); inner hind tibial spur short, setose, 0.1 times as long as basitarsus (5:50); hind tarsal claw widened basally with medium-sized basal lobe (fig. 22).

*Metasoma.* Length of metasoma 2.1 times as long as head and mesosoma combined (88:43); length of first tergite 4.5 times its apical width (54:12); length of first tergites 2.3 times length of propodeum (54:23); median length of second metasomal tergite 1.5 times third tergite (22:15) (fig. 15); second metasomal suture distinct; ovipositor sheath 1.5 times as long as fore wing (122:83). First tergite with transverse striae on basal two third, apical one third rugose (fig. 15); basal triangular area of second metasomal tergite present on 0.5 of tergite (22:44); basal triangular area of second tergite rugose; apex of second tergite with diverging fine striation laterally, with transverse fine striation medio-apically (fig. 15); remaining tergites smooth; apex of ovipositor sheath truncate apically; ovipositor with pre-apical serrations ventrally and tapering abruptly towards the tip.

*Colour.* Head reddish yellow; antennae yellow; palpi yellowish brown; fore and middle legs yellow, except coxae brownish yellow; hind coxa and femur; hind tibia light brown with ivory basal ring (fig. 25); hind basitarsus ivory, but darker apically; hind tarsus 2-5 brownish yellow; mesosoma reddish brown; fore and hind wings brownish yellow; first metasomal tergite yellowish brown; second-fourth tergites brownish yellow; fifth-sixth tergites light brown; ovipositor sheath brown.

**Male:** Unknown.

**Etymology.** The new species named after type locality (Lang Son province, Northeast Vietnam).

**Host:** Unknown.

Notes: *Leptospathius langsoni* sp. n. is similar to *L. triangulifera* Enderlein, from China, but the new species can be distinguished by the following characters: a) dorsal lobe of pronotum with transverse carina medially; b) length of first metasomal tergite 4.5 times as long as its apical width; c) hind femur 5.1 times its maximum width; d) hind tibia with basal ivory ring; and e) head reddish yellow.

***Leptospathius phamvanluci*** Long, sp. n. (Figs 26-40)

**Diagnosis.** Propodeum largely rugose basally, areolate-rugose apically (fig. 36); basal triangular area of second metasomal tergite present on 0.6 of tergum (24:42) (fig. 35); second metasomal suture distinct (figs 34, 35); vein 1-CU1 0.5 times as long as vein cu-a (fig. 38); vein m-cu of hind wing interstitial; vein M+CU longer (1.2 times) vein 1-M; vein 2-SC+R horizontal (fig. 39).

**Material.** Holotype, female, "Spath.330" (VNMN), NW. Vietnam: Lai Chau, Muong Lay, Hat Tre, relict forest, 10.x.2004, KDLONG.

**Description.** Holotype, female, body length 14.4 mm, fore wing length 10.1 mm, antenna 19.1 mm; ovipositor sheath 12.5 mm (fig. 26).

**Head.** Antenna with 78 segments; third antennal segment 0.85 times as long as fourth; middle antennal segments 3.7 times longer than wide (11:3); penultimate antennal segment 0.7 times as long as apical segment (6:9); ultimate segment with spine apically; maxillary palp 2.2 times head height (84:38); width of face 1.6 times length of face and clypeus combined (32:20); clypeus slightly concave; mandible robust (figs 28, 29); malar space 0.8 times as long as mandible width (11:13); distance between tentorial pits 0.4 times distance from pit to eye margin (6:14); in dorsal view, height of eyes 1.8 times as high as temple (29:16); in lateral view width of eye 0.9 times as long as temple (20:23); ocelli medium-sized, in high triangle, POL 0.7 times as long as OOL; POL:OD:OOL=6:5:9; distance between anterior and posterior ocelli 0.4 times as long as OOL (4:9) (fig. 27).

**Mesosoma.** Length of mesosoma 2.7 times

as long as high (79:29); dorsal lobe of pronotum transversely rugose; pronotal side crenulated medially; mesopleuron and mesosternum finely punctate; episternal scrobe deep; metapleuron largely rugose (fig. 31); precoxal sulcus long, narrow, crenulate (fig. 31); medial lobe of mesoscutum with median crenulate groove; notauli wide, crenulate; notauli wide, crenulate anteriorly, coarsely transversally rugose posteriorly (fig. 30); median lobe of mesoscutum finely punctate, with crenulate median groove; lateral lobes of mesoscutum matt; scutellar sulcus with 3 carinae, 2.1 times as long as scutellum (15:7); scutellum finely punctate; propodeum coarsely foveate rugose (fig. 36).

**Wings.** Fore wing: length of fore wing 4.8 times its maximum width (101:21); pterostigma 4.4 times as long as wide (75:17); vein r of fore wing arising just before middle of pterostigma; vein r 0.85 times as long as vein 2-SR and 0.4 times vein 3-SR (r:2-SR:3-SR:SR1=17:30:44:78) (fig. 38); 1-CU1:cu-a:2-CU1=6:11:65; basal length of second submarginal cell 4.3 times as long as its maximum width (65:25). Hind wing: length of hind wing 6.15 times its maximum width (80:13); vein M+CU 1.2 times vein 1-M and 1.4 times vein 1r-m (M+CU:1-M:1r-m=62:53:44; vein 2-SC+R horizontal; vein m-cu interstitial (fig. 39).

**Legs.** Apex of fore tibia with 3 pegs; length of hind femur, tibia and basitarsus 7.5, 11.3 and 10.4 times as long as their maximum width, respectively; hind tibia whitish yellow dorso-basally (fig. 32); inner and outer hind tibial spurs short, 0.12 and 0.10 times as long as basitarsus, respectively (6:5:52); hind basitarsus 1.1 times as long as tarsal segments 2-5 (52:48); fourth tarsal segment 0.7 times hind telotarsus (9:13); hind tarsal claw widened basally with medium-sized basal lobe (fig. 37).

**Metasoma.** Length of metasoma 1.8 times as long as head and mesosoma combined (108:61); length of first tergite 4.8 times its apical width (63:13), and 3.0 times as long as length of propodeum (63:21); basal triangular area of second metasomal tergite present on 0.6



of tergite; median length of second metasomal tergite 0.95 times as long as third tergite (21:22); second metasomal suture distinct (figs 34, 35); ovipositor sheath 1.2 times as long as fore wing (125:101). First metasomal tergite transversely rugose on basal half, largely rugose on apical half (fig. 35); basal triangular area of second tergite rugose; second tergite with diverging striae latero-apically, with transverse fine striation medio-apically (fig. 34); remainder almost smooth; ovipositor sheath not truncate.

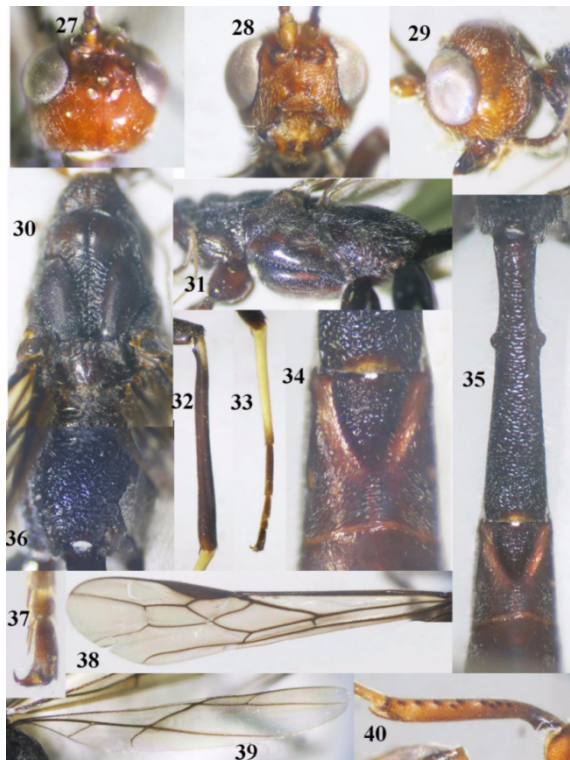
**Colour.** Head reddish yellow; scapus yellow, flagellum light brown; palpi yellowish brown; fore coxa brownish yellow; fore femur, tibia and tarsus yellow; middle coxa reddish brown; middle femur, tibia brownish yellow; middle tarsus yellow, except middle basitarsus ivory basally; hind coxa and femur brown; hind tibia brown but whitish yellow or ivory dorso-basally; hind basitarsus ivory but darker at apex; second-fourth hind tarsus brownish yellow; telotarsus light brown; mesosoma and first

metasomal tergite brown, except mesosternum reddish brown; second-sixth tergites brownish yellow; ovipositor sheath brownish yellow; ovipositor with pre-apical serrations ventrally and tapering evenly towards the tip.



Figure 26. *Leptospathius phamvanluci* Long, sp. n., habitus

Figures 27-40. *Leptospathius phamvanluci* Long, sp. n.



27. Head, dorsal view; 28. Head, frontal view; 29. Head, lateral view; 30. Mesonotum; 31. Mesopleuron; 32. Hind tibia; 33. Hind tarsus; 34. Second metasomal tergite; 35. Metasomal tergites 1+2; 36. Propodeum; 37. Hind tarsal claw; 38. Fore wing; 39. Hind wing; 40. Inner side of fore tibia

**Male:** Unknown.

**Etymology.** The new species named after Associate Prof. Dr. Pham Van Luc, parasitologist, the first Director of Vietnam National Museum of Nature (VNMN), Ha Noi, Vietnam.

**Host:** Unknown.

**Notes:** *Leptospathius phamvanluci* is similar to *L. hunanensis* Tang, Wu, Belokobylskij & Chen, from China, but the new species can be distinguished by the following characters: a) hind femur 7.5 times as long as its maximum width; b) first metasomal tergite 4.8 times as

long as its apical width; c) hind tibia with white ring; and d) head yellow.

*Leptospathius simulatus* Long, sp. n. (Figs 41-52)

**Diagnosis.** Propodeum without areola, its surface transversely rugose (fig. 48); basal triangular area of second metasomal tergite present on 0.55 of tergite (25:45) (fig. 46, 47); second metasomal suture indistinct (fig. 47); vein 1-CU1 very short, nearly quadrate; vein m-cu of hind wing interstitial (fig. 52); vein M+CU subequal to vein 1-M; vein 2-SC+R quadrate (fig. 52); fourth hind tarsus 0.6 times hind telotarsus (fig. 51).

**Material.** Holotype, female, "Doryc.761" (IEBR), NC. Vietnam: Quang Tri, Dak Rong, Huc Nghi, forest, 150-200m, 01.vi.2016, HTHCT.

**Description.** Holotype, female, body length 14.5 mm, fore wing length 9.0 mm, ovipositor sheath 15.3 mm.

**Head.** Antennae incomplete, with 15 segments remaining; third antennal segment 0.9 times as long as fourth segment (18:20); fifteenth antennal segment 6.3 times longer than wide (19:3); maxillary palp 2.2 times as long as head length; width of face 1.2 times length of face and clypeus combined (28:23); clypeus straight; mandible robust (figs 42, 43); malar space 0.5 times as long as mandible width (9:13); distance between tentorial pits as long as distance from pit to eye margin; in dorsal view, height of eyes 1.4 times as high as temple (25:18) (fig. 41); in lateral view width of eye 1.35 times as long as temple (23:17) (fig. 43); ocelli in high triangle, POL 0.9 times as long as OOL; POL:OD:OOL=7:4:8; distance between anterior and posterior ocelli as long as OOL (4:4) (fig. 41).

**Mesosoma.** Length of mesosoma 2.5 times as long as high (69:28); pronotal side crenulate medially, finely punctate ventrally; mesopleuron and mesosternum finely punctate (fig. 45); precoxal sulcus crenulate (fig. 45); median lobe of mesoscutum finely punctate with rugose-punctate median depression; lateral lobes of mesoscutum finely punctate; notauli

wide, crenulate anteriorly, coarsely transversally rugose posteriorly (fig. 44); scutellar sulcus with 3 faint carinae, 0.4 times as long as scutellum; scutellum narrowed apically, with sparse fine punctures; metapleuron areolate-rugose anteriorly and medially, punctate posteriorly, propodeum coarsely transversely rugose (fig. 48).

**Wings.** Fore wing: length of fore wing 4.4 times its maximum width (133:30); pterostigma 5.25 times as long as wide (63:12); vein r of fore wing arising before middle of pterostigma; vein r 0.6 times vein 2-SR and 0.3 times vein 3-SR (r:2-SR:3-SR:SR1=13:23:60); vein 1-CU1 very short, almost quadrate; vein cu-a 0.2 times vein 2-CU1 (9:55); basal length of second submarginal cell 2.8 times its maximum width (54:19). Hind wing: length of hind wing 7.6 times as long as its maximum width (107:14) (fig. 52); vein M+CU slightly longer vein 1-M and 1.4 times vein 1r-m (M+CU:1-M:1r-m=55:53:39); vein m-cu slightly antefurcal.

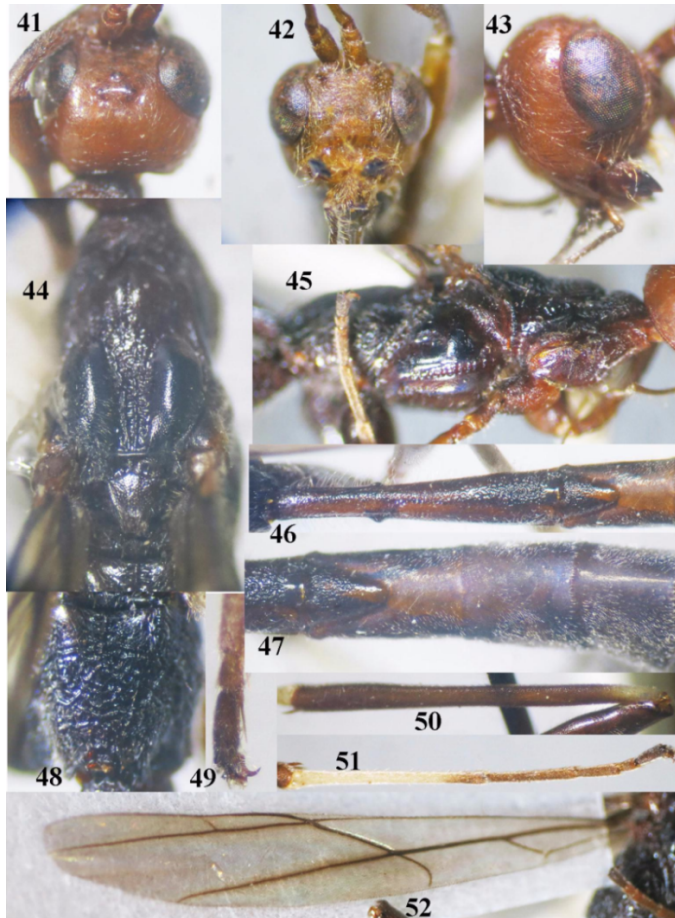
**Legs.** Apex of fore tibia with 4 pegs; length of hind femur, tibia and basitarsus 5.0, 14.4 and 13.6 times as long as their maximum width, respectively; hind tibia with basal ivory ring (fig. 50); inner and outer hind tibial spurs 0.11 and 0.10 times as long as hind basitarsus, respectively (8:7:68); hind basitarsus 1.1 times hind tarsal segments 2-5 (68:63); fourth tarsus 0.6 times hind telotarsus (6:10) (figs 49, 51); hind tarsal claw widened basally with medium-sized basal lobe (fig. 49).

**Metasoma.** Length of metasoma 2.1 times as long as head and mesosoma combined (121:58); length of first tergite 3.0 times its apical width (86:29) (fig. 46); length of first tergites 2.5 times as long as length of propodeum (86:34); second metasomal suture indistinct (fig. 47); basal triangular area of second metasomal tergite situated on 0.55 times of tergite (25:45) (fig. 47); median length of second metasomal tergite 1.4 times third tergite (36:26) (fig. 47); ovipositor sheath 1.7 times as long as fore wing (153:90). Most part of first tergite transversely punctate, subapical area largely rugose and smooth at apex (fig. 47); basal triangular area of second tergite rugose-

punctate basally, smooth apically; second tergite smooth apically, remainder smooth (fig. 47).

**Colour.** Head yellow; antennae brownish yellow; palpi yellowish brown; fore coxa and femur yellow; mesosoma brown, except mesosternum yellowish brown; propleuron reddish yellow; fore tibia and tarsus pale

yellow; middle leg yellow, except middle basitarsus yellowish basally; hind coxa brown; hind femur and tibia light brown, but ivory at extreme base; hind basitarsus ivory, but yellowish at apex; hind tarsal segments 2-4 yellow; hind telotarsus light brown; wing light brown; metasoma brown; ovipositor sheath brown.



Figures 41-52. *Leptospathius simulatus* Long, sp. n.

41. Head, dorsal view; 42. Head, frontal view; 43. Head, lateral view; 44. Mesonotum; 45. Mesopleuron; 46. Metasomal tergites 1+2; 47. Metasomal tergites 2+3+4; 48. Propodeum; 49. Hind tarsal claw; 50. Hind tibia; 51. Hind tarsus; 52. Hind wing

**Male:** Unknown.

**Etymology.** Named from “simulo” (Latin for “imitate, copy”), because the new species is similar to *Leptospathius phamvanluci* Long, sp. n.

**Host:** Unknown.

**Notes:** *Leptospathius simulatus* is similar to *L. kipyatkovi* Belokobylskij, from Cambodia, but the new species can be distinguished by the following characters: a) first metasomal tergite rugose apically; b) basal triangular area of

second metasomal tergite occupied in 0.55 basal of the tergite; c) third suture indistinct; and d) vein m-cu of hind wing slightly antefurcal.

**Sonanus Belokobylskij & Konishi, 2001** (Type: *Sonanus senzuensis* Belokobylskij & Konishi, 2001).

**Key to *Sonanus* species**

The new species can be separated from couplet 1a in the key by Belokobylskij & Maeto (2009) as follows:

- 1a. Length of fore wing 3.4 times its maximum width (fig. 121F in Belokobylskij & Maeto, 2009); precoxal sulcus crenulated (fig. 121J in Belokobylskij & Maeto, 2009); second metasomal tergite with fine lateral carinae; hind coxa densely sculptured at least on dorsal half (fig. 121H in Belokobylskij & Maeto, 2009). China (Beijing), Japan (Honshu).....*Sonanus senzuensis* Belokobylskij & Konishi
- a' Length of fore wing 5.5 times its maximum width (fig. 53); precoxal sulcus smooth (fig. 51); second metasomal tergite without fine lateral carinae (fig. 52); hind coxa coriaceous. Northwest Vietnam (Son La).....*Sonanus mocchaui* sp. n.

**Description of new species**

*Sonanus mocchaui* Long, sp. n. (Figs 53-61)

**Material.** Holotype, female, “Doryc.766” (IEBR), NW. Vietnam: Son La, Moc Chau, fruit orchard, MT, 25°51’N 104°39’E, 1060m, 15-25.v.2014, KDLong.

**Description.** Holotype, female, body length 4.2 mm, fore wing length 3.3 mm, antenna 5.4 mm; ovipositor sheath 3.2.mm.

**Head.** Antenna with 41 segments; third antennal segment as long as fourth; middle antennal segments 3.5 times longer than wide (7:2); penultimate antennal segment as long as apical segment; maxillary palp 1.4 times head length (37:26); face rather short, width of face 1.4 times length of face and clypeus combined (15:11) (fig. 55); clypeus straight; malar space as long as mandible width; distance between tentorial pits 0.6 times distance from pit to eye margin (4:7); in dorsal view, height of eyes 1.55 times as high as temple (14:9) (fig. 53); in lateral view width of eye 1.1 times as long as temple (12:11) (fig. 54); ocelli small, in high triangle (Fig. 53); POL 1.5 times as long as OOL (POL:OD:OOL=6:2:4); distance between anterior and posterior ocelli as long as OOL (fig. 53).

**Mesosoma.** Length of mesosoma 1.7 times as long as high (57:33); pronotal side sparsely crenulate medially, rugose dorsally and ventrally (fig. 57); mesopleuron transversely rugose anteriorly and smooth posteriorly (fig.57); mesosternum smooth; precoxal sulcus rather deep, smooth (fig. 57); metapleuron transversely rugose; mesoscutum with rugose-punctate median depression (fig. 56); medial and lateral lobes of mesoscutum matt; notauli wide, rugose, flat posteriorly, largely rugose

(fig. 56); scutellar sulcus rugose, 0.4 times scutellum (3:7); scutellum finely granulate; propodeum with basal carina, largely rugose except latero-anterior corners finely granulate (fig. 58).

**Wings.** Length of fore wing 5.5 times its maximum width (166:30) (fig. 60); pterostigma 4.3 times as long as wide, and 0.8 times as long as metacarp (30:7:38); vein r of fore wing arising before middle of pterostigma; vein r 0.6 vein 2-SR and 0.5 times vein 3-SR (r:2-SR:3-SR:SR1=7:12:13:36); vein 1-CU1 as long as vein cu-a, 0.12 times vein 2-CU1 (1-CU1:cu-a:2-CU1=3:3:24); vein 2-SR+M S-sharped; basal length of second submarginal cell 2.2 times its maximum width. Hind wing: length of hind wing 5.0 times its maximum width (85:17) (fig. 61); vein M+CU distinctly shorter (0.4 times) vein 1-M and 2.4 times vein 1r-m (M+CU:1-M:1r-m=12:27:5); vein m-cuinterstitial (fig. 61).

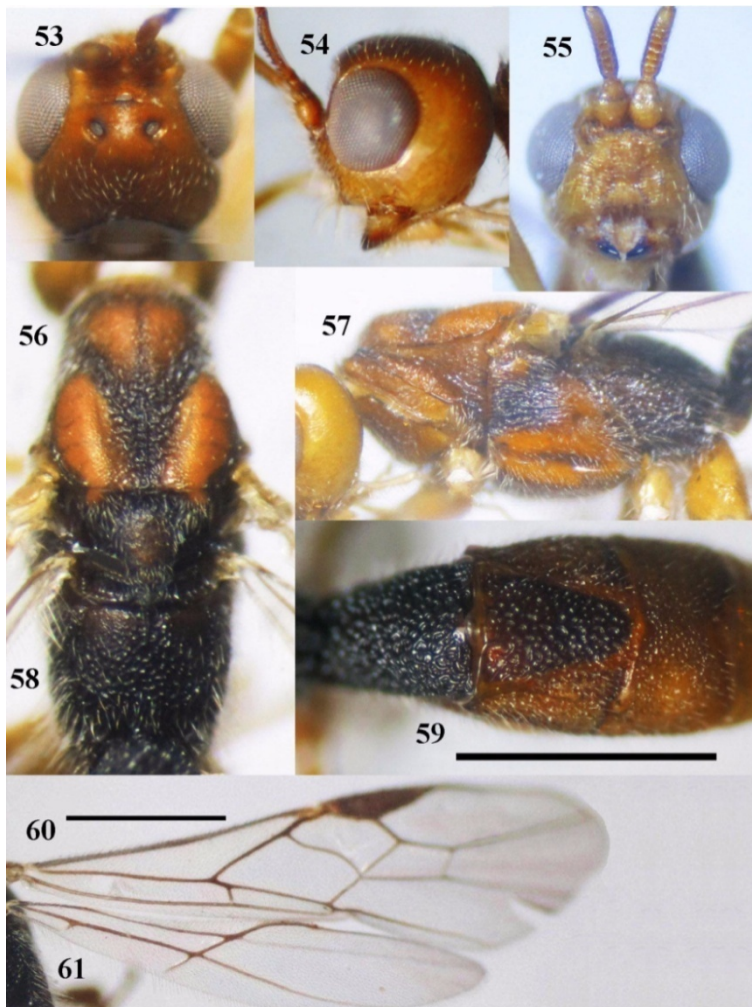
**Legs.** Outer side of fore tibia with 7 pegs; length of hind femur, tibia and basitarsus 3.8, 9.2 and 8.5 times as long as their maximum width, respectively; dorsal side of hind tibia with 5 pegs; inner hind tibial spur 0.3 times hind basitarsus (5:17); hind basitarsus 0.8 times hind tarsal segments 2-5 (17:21); fourth hind tarsal segment 0.7 times hind telotarsus.

**Metasoma.** Length of metasoma as long as head and mesosoma combined; length of first tergite 1.2 times its apical width (25:21); length of first tergites 1.5 times length of propodeum (25:17); median length of second metasomal tergite 2.5 times third tergite (25:10) (fig. 59); third metasomal suture curved (fig. 59); ovipositor sheath subequal to fore wing. First metasomal tergite rugose basally, foveate rugose apically (fig. 59); U-sharped area of

second tergite largely punctate, rugose-punctate laterally, third tergite rugose; remainder smooth.

**Colour.** Head yellow; antennae, except scapus, pedicel and third segment yellow, yellowish brown; palpi pale yellow; mesopleuron, notauli pale brown, scutellum; pronotum, mesosternum and lobes of

mesoscutum reddish yellow; propodeum, metapleuron brown; first metasomal tergite dark brown; U-shaped area of second tergite yellowish brown; second tergite laterally and third-sixth tergites brownish yellow; all legs yellow; ovipositor sheath light brown; fore and hind wing yellow, except pterostigma yellowish brown.



Figures 53-61. *Sonanus mocchaui* Long, sp. n.

53. Head, dorsal view; 54. Head, lateral view; 55. Head, frontal view; 56. Mesonotum; 57. Mesopleuron; 58. Propodeum; 59. Metasomal tergites 1+2+3; 60. Fore wing; 61. Hind wing

**Male:** Unknown.

**Etymology.** The new species named after type locality (Moc Chau highland, Son La province, Northwest Vietnam).

**Host:** Unknown.

**Notes:** The new species, *Sonanus mocchaui* sp. n. is close to *Sonanus senzuensis*

Belokobylskij & Konishi, from China, but differs from the later by the following characters: a) second metasomal suture curved; b) second metasomal tergite without lateral carinae; and c) fore wing longer, length of fore wing 5.5 times as long as its maximum width, pterostigma 4.3 times as long as wide.

**Acknowledgements:** This research is funded by the Vietnam National Foundation for Science and Technology Development (NAFOSTED), grant No.106-NN.05-2016.08. We express our thanks to Dr. Kees van Achterberg, Naturalis Biodiversity Center, Leiden, (The Netherlands) for critical comments. Our thanks are also due to Dr. Truong Xuan Lam (IEBR) and colleagues from the Department of Insect Systematics (IEBR) for providing several specimens.

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