

A taxonomic account of the genus *Labus* de Saussure, 1867 (Hymenoptera, Vespidae, Eumeninae) with descriptions of three new species

Ting-Jing Li¹, James M. Carpenter²

1 Chongqing Key Laboratory of Vector Insects, Chongqing Key Laboratory of Animal Biology, Institute of Insect and Molecular Biology, Chongqing Normal University, Chongqing 401331, China **2** Division of Invertebrate Zoology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA

Corresponding author: James M. Carpenter (carpente@amnh.org)

Academic editor: M. Ohl | Received 1 June 2018 | Accepted 7 August 2018 | Published 27 August 2018

<http://zoobank.org/CA564E05-1B39-449D-B854-B0C133539BFC>

Citation: Li T-J, Carpenter JM (2018) A taxonomic account of the genus *Labus* de Saussure, 1867 (Hymenoptera, Vespidae, Eumeninae) with descriptions of three new species. Journal of Hymenoptera Research 65: 23–46. <https://doi.org/10.3897/jhr.65.26976>

Abstract

Three new species, namely *Labus edentatus* **sp. n.** from China, *L. sparsipunctus* **sp. n.** from Thailand and *L. robustus* **sp. n.** from Indonesia are described and illustrated. Both *L. amoenus* van der Vecht, 1935 and *L. pusillus* van der Vecht, 1963 are newly recorded from China and Vietnam, and *L. angularis* van der Vecht, 1935 is also firstly recorded from China. An updated key to the world species of the genus *Labus* is provided.

Keywords

Hymenoptera, Vespidae, Eumeninae, *Labus*, new species

Introduction

The genus *Labus* de Saussure is an Oriental genus containing 13 species (Girish Kumar et al. 2014) each of which is relatively slender with a petiolate metasoma and body length mainly 6.0–8.0 mm. De Saussure (1855, 1867), van der Vecht (1935, 1963), Giordani Soika (1960, 1973, 1986, 1991), Gusenleitner (1988), and Girish Kumar et al. (2014) made important contributions to the taxonomy of the genus. During this study of the genus *Labus* collections from Vietnam, Thailand, Malaysia, China, Philippines, Sri Lanka and Indonesia which are deposited in American Museum of Natural History in New York, three new species are confirmed by comparison with known species. In addition, both *L. amoenus* van der Vecht, 1935 and *L. pusillus* van der Vecht, 1963 are newly recorded from China and Vietnam, and *L. angularis* van der Vecht, 1935 is also firstly recorded from China. In the present paper, these three new species are described and illustrated in detail, and some main characters of other known species are provided with some related figures. In addition, an updated key to the world species of *Labus* is also given.

Materials and methods

The specimens examined are deposited in the American Museum of Natural History (USA), Chongqing Normal University (China), Queen Sirikit Botanic Garden (Thailand), and Yunnan Agricultural University (China), respectively. Descriptions and measurements were made under a stereomicroscope (Nikon SMZ1500), and all figures were taken with Microptics-USA/Visionary Digital photomicrographic system developed by Roy Larimer and multiple layers stacked using Helicon Focus. The ratios used throughout the descriptions were measured in the same magnification of the stereomicroscope. All measurements were taken as the maximal length of body parts measured. Body length was measured from the anterior margin of the head to the posterior margin of metasomal tergum 2. For the density description of punctures, “sparsely” means that interspaces are larger than punctures diameter, “moderately” means equal to the diameter, and “densely” means less than the diameter. Terminology principally follows van der Vecht (1935, 1963) and Girish Kumar et al. (2014).

The abbreviations used in the text are shown as follows:

- A1** for antennal segment 1,
- A2** for antennal segment 2,
- T1** for metasomal tergum 1,
- T2** for metasomal tergum 2,
- S1** for metasomal sternum 1,
- S2** for metasomal sternum 2, and so on.
- AMNH** American Museum of Natural History, New York
- CQNU** Chongqing Normal University, Chongqing
- QSBG** Queen Sirikit Botanic Garden, Chiang Mai
- YNAU** Yunnan Agricultural University, Kunming

Taxonomy

Genus *Labus* de Saussure, 1867

Labus de Saussure, 1867: 3; van der Vecht 1935: 157; 1963: 5; Gusenleitner 1988: 174–177, 188–198; Girish Kumar et al. 2014: 29–30.

Type species. *Labus spiniger* de Saussure, 1867, by subsequent designation of Bingham (1897).

Diagnosis. Body slender; in female frons with fovea in front of the anterior ocellus; tegula not exceeding parategula posteriorly; pronotum usually without normal transverse carina; metanotum dentiform mesally; submarginal carina of propodeum produced posteriorly; propodeal valvula elongate, rectangular; second submarginal cell of forewing forming obtuse angle basally; midtibia with one spur; metasoma petiolate, petiole abruptly swollen apically (Girish Kumar et al. 2014).

Distribution. Oriental Region.

Labus edentatus Li & Carpenter, sp. n.

<http://zoobank.org/428573BE-C548-4186-B67A-50DC96182E51>

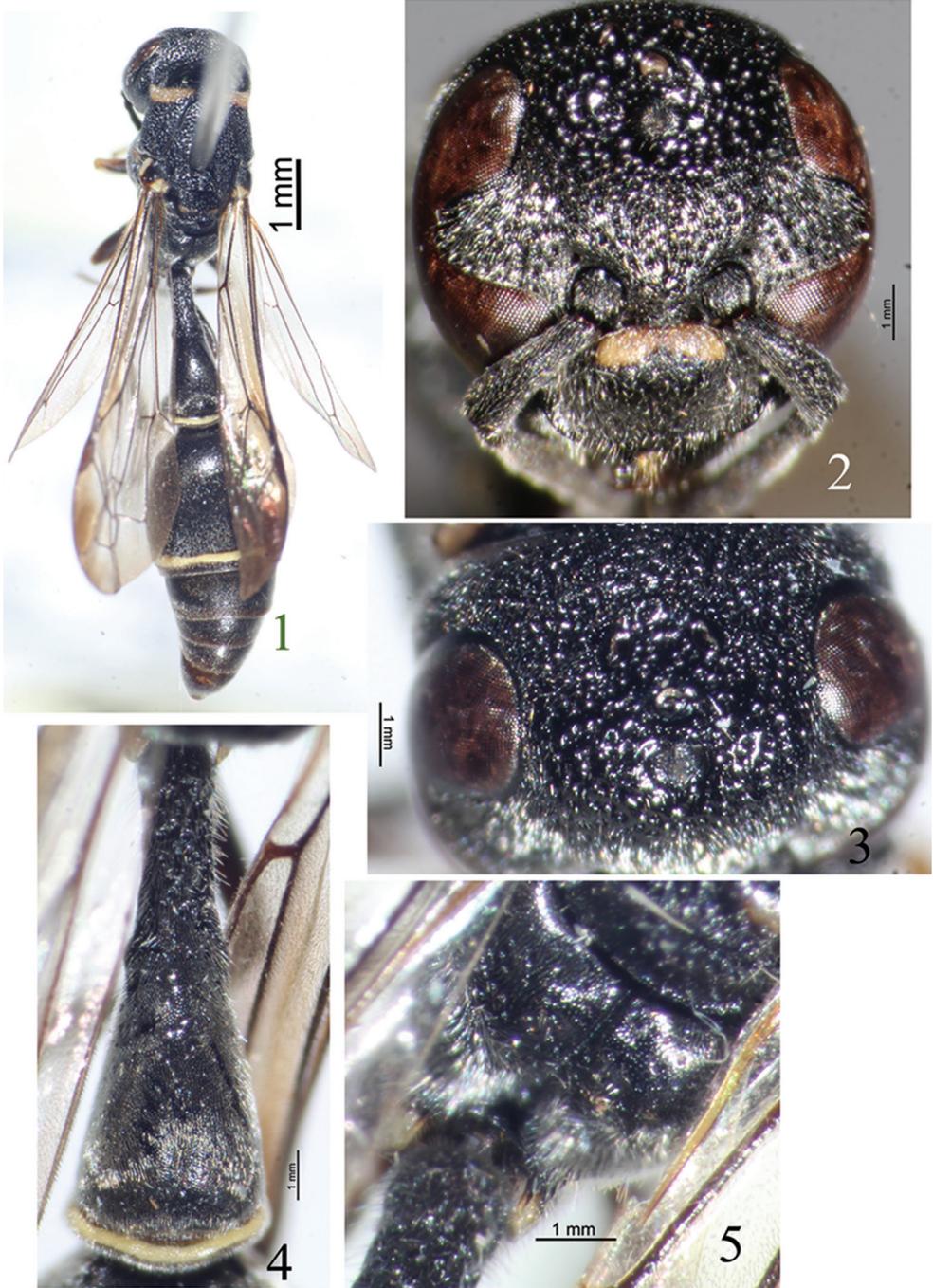
Figs 1–5

Material examined. Holotype, ♀, China: Hongkong, Hung Fa Leng, 50Q KK 108 854, 435m, 16.IV–16.V. 2014, Yiu Vor, HFL-Moo1.F.Hy.9, deposited in AMNH.

Description. Female (Figs 1–2): body length 7.0 mm. Black, with the following parts yellow: a narrow and transverse band of clypeus basally (Fig. 2), a widely interrupted band on pronotum anteriorly (interruption less than each marking), a small spot on upper part of mesepisternum; outer margin of tegula anteriorly and posteriorly, parategula, two transverse spots on scutellum posteriorly, apical lamellae of propodeum, a small apical spot of fore femur inside, a large spot at outer side of fore and mid tibiae, a small spot on hind tibiae basally, narrow apical bands of T1–T2 and S2; apex of mandible, A12 beneath, and fore and mid tibiae dark ferruginous with exception of yellow spots. Wings slightly infuscated.

Head. In front view head (Fig. 2) slightly wider than high, its sides rounded; clypeus sparsely punctate, clypeal width $1.35\times$ length, weakly convex at basal half, anterior portion less produced and with wide emargination in the middle, clypeal total width $4.6\times$ its apical width, apical width $2\times$ emargination depth, its teeth short and blunt; frons convex and densely punctate, inter-antennal carina continued on lower part of frons, frontal fovea deep, almost circular and distinctly defined (Fig. 3).

Mesosoma. Anterior angles of pronotum projecting only slightly, pronotal transverse carina obsolete; punctures on pronotum, mesoscutum, mesepisternum and scutellum slightly denser and their interspaces duller than those on frons; metanotum with an acute tubercle in the middle; propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina (Fig. 5); dorsal area of



Figures 1–5. *Labus edentatus* sp. n., holotype **1** habitus (dorsal view), ♀ **2** head in frontal view, ♀ **3** frontal fovea, ♀ **4** metasomal petiole, ♀ **5** propodeum in dorsal view, ♀.

propodeum sparsely punctate and the interspaces between punctures coriaceous, posterior area with dense setae, lateral area obviously coriaceous.

Metasoma. Metasomal petiole (Fig. 4) long and moderately slender, total length of petiole 6.19× basal width and 2.6× apical one, swollen part of metasomal petiole slightly longer than (1.07×) half of the length of the petiole, linear part of petiole rugosely punctate, swollen part coriaceous and with scattered minute punctures; each of T2 and S2 with an apical translucent lamella, and microscopically sculptured, sparsely covered with extremely minute and shallow punctures.

Distribution. China (Hongkong).

Remarks. This species resembles *L. pusillus* van der Vecht, 1963 by propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina and swollen part of metasomal petiole as long as or longer than half of the length of the petiole. It differs from *L. pusillus* and all other members of the genus by the following character combination: the median portion of clypeus less produced, its emargination wide medially and lateral teeth slightly blunter (Fig. 2), frontal fovea (Fig. 3) much larger than the anterior ocellus and bigger than that in *L. pusillus* (Fig. 37).

Etymology. The specific name *edentatus* is derived from two Latin words: *e-* and *dentatus*, referring to propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina.

***Labus sparsipunctus* Li & Carpenter, sp. n.**

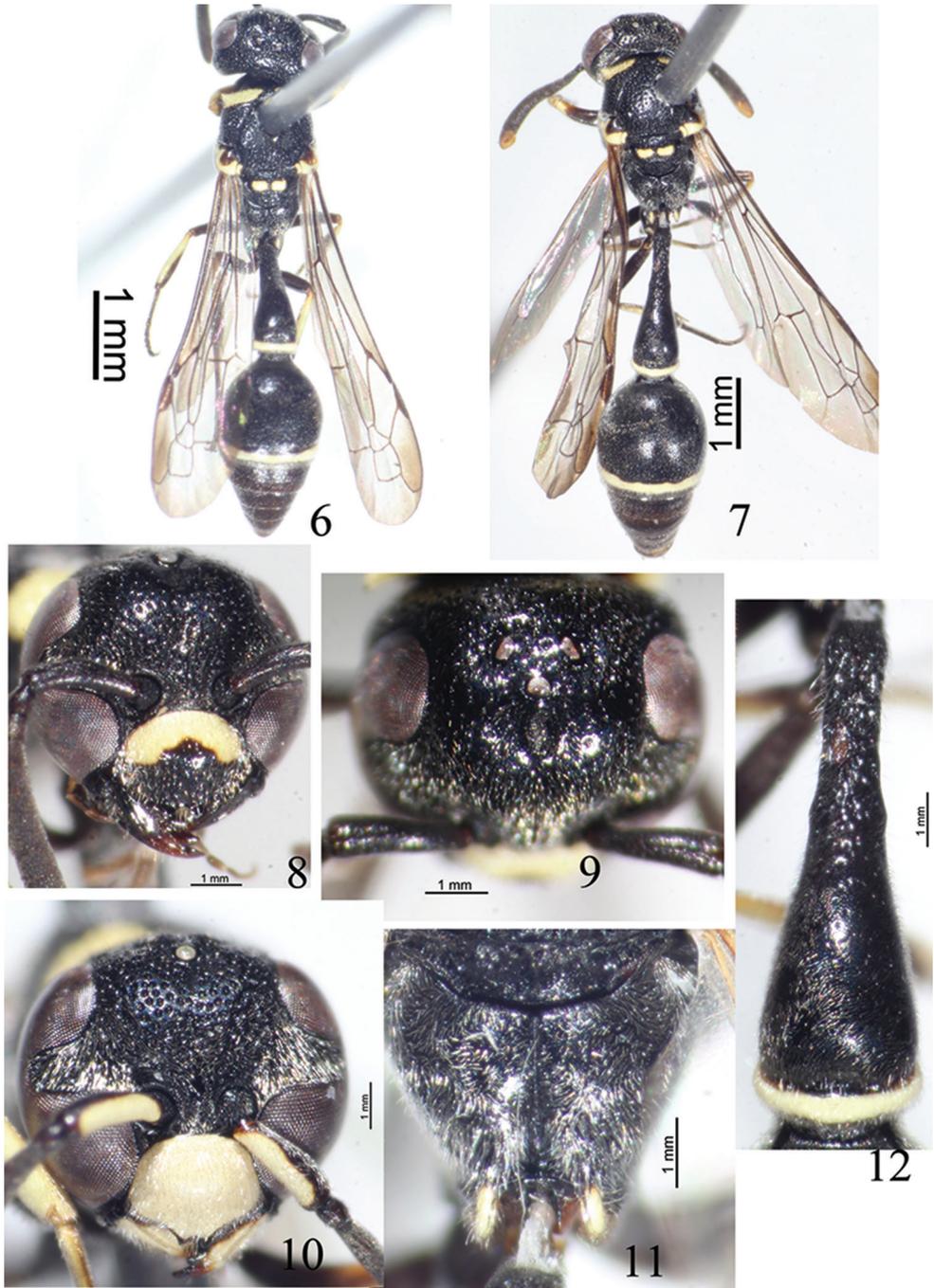
<http://zoobank.org/51004A96-11AB-4746-B93D-AB461BA2D5F9>

Figs 6–12

Material examined. Holotype, ♀, Thailand, Loei Phu Ruea NPPhaLonNoi, 17°30.502'N, 101°20.868'E, 1343m, Pan traps, 5–6.III.2007, Patikhom Tumtip, T2297, deposited in QSBG; 1♂, Thailand, Loei Phu Ruea NPPhaLonNoi, 17°30.502'N, 101°20.868'E, 1343m, Malaise trap, 12–19.III.2007, Patikhom Tumtip, T2307, deposited in AMNH.

Description. Female (Figs 6, 8): body length 6.0 mm. Black, with the following parts yellow: a curved and transverse band of clypeus basally (Fig. 8), a widely interrupted band on pronotum anteriorly (interruption less than each marking), a small spot on upper part of mesepisternum, outer margin of tegula, parategula, two transverse and nearly rectangular spots on scutellum posteriorly, apical lamellae of propodeum, small apical spots of fore and mid femora inside, outer side of fore and mid tibiae, basal half at outer side of hind tibiae, narrow apical bands of T1–T2 and S2; apex of mandible, inside part of tegula, fore and mid tibiae with exception of yellow spots, and tarsi dark ferruginous. Wings slightly infuscated.

Head. Head (Fig. 8) in front view wide almost as long as high, its sides rounded; clypeus sparsely setose and punctate, interspaces between punctures obviously shiny,



Figures 6–12. *Labus sparsipunctus* sp. n. **6** habitus of holotype (dorsal view), **7** habitus of paratype (dorsal view), **8** head of holotype (frontal view), **9** frontal fovea of holotype, **10** head of paratype (frontal view), **11** propodeum of paratype (dorsal view), **12** metasomal petiole of paratype, ♂.

clypeal width $1.25\times$ length, weakly convex at basal half, anterior and median portion narrowly produced (clypeal total width $7.0\times$ its apical width) and with U-formed emargination, lateral teeth acute, emargination width $1.25\times$ its depth; frons convex and sparsely punctate and interspaces between punctures obviously shiny, inter-antennal carina continued on lower part of frons, frontal fovea deep, elliptical and defined (Fig. 9).

Mesosoma. Anterior angles of pronotum projecting slightly, pronotal anterior and transverse carina obsolete, punctures on pronotum dense, interspaces less than punctures, mesoscutum and scutellum sparsely punctate, interspaces more than punctures, mesepisternum dull and coriaceous, with sparse punctures; metanotum with a small and blunt tubercle in the middle; propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina (Fig. 11); dorsal area of propodeum sparsely punctate and the interspaces between punctures shiny, posterior area with dense setae, lateral area dull and obviously coriaceous.

Metasoma. Metasomal petiole relatively long and slender, total length of petiole $7.53\times$ its basal width and $2.76\times$ apical one, swollen part of metasomal petiole almost as long as half of the length of the petiole and shiny with scattered minute punctures; linear part of petiole slightly rugosely punctate; each of T2 and S2 with an apical translucent lamella, and sparsely covered with extremely minute and shallow punctures.

Male (Figs 7, 10, 12). Body length 7.0 mm. Sculpture, punctuation, setae, and coloration as in female except as follows: clypeus except anterior margin (Fig. 10), scape ventrally and mandible except apex yellow; two apical flagellomeres yellowish brown; spots on legs larger than those in female; clypeal width $1.23\times$ its length, total width $7.4\times$ apical width, apical width $2.5\times$ emargination depth, emargination narrower and shallower than that in female; A13 backward reaching basal margin of A11; punctures on frons, pronotum and mesoscutum relatively denser than those in female; linear part of petiole (Fig. 12) narrower and longer than female, total length of petiole $8.07\times$ its basal width and $2.10\times$ apical one, swollen part less than ($0.8\times$) half of the length of the petiole; other characters same as those in female.

Distribution. Thailand.

Remarks. This species is allied to *L. clypeatus* van der Vecht, 1935 from Indonesia, with which it has the following characters in common: propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina, and swollen part of metasomal petiole less than half of the length of the petiole (Fig. 12). It differs from *L. clypeatus* and all other members of the genus by the following character combination: frons sparsely punctate and more shiny between these punctures in female (Fig. 8), anterior and median portion of clypeus narrowly produced (Figs. 8, 10), and total length of metasomal petiole at most $8.07\times$ its basal width, whereas in *L. clypeatus* the petiole length more than $9\times$ basal width (van der Vecht 1935).

Etymology. The specific name *sparsipunctus* is derived from two Latin words: *sparsus* and *punctus*, referring to frons sparsely punctate in female.

***Labus robustus* Li & Carpenter, sp. n.**

<http://zoobank.org/37E65494-9747-4DEA-8559-3F5B95F7C1EF>

Figs 13–16

Material examined. Holotype, ♂, Indonesia, W. Java, Kereteg, 10.VI.1965, J.E. Lukavsky, deposited in AMNH.

Description. Male (Figs 13–14): body length 7.0 mm. Body black, with the following parts yellow: clypeus except anterior margin (Fig. 14), basal part of mandible, two anterior angles of pronotum; a small spot on upper part of mesepisternum; outer margins of tegula, parategula; two transverse nearly elliptical spots on scutellum posteriorly; apical lamellae of propodeum, small apical spots of fore and mid femora inside, outer sides of fore and mid tibiae, basal half at outer side of hind tibiae, narrow apical bands of T1–T2 and S2; apex of mandible, and fore and mid tibiae with exception of yellow spots dark ferruginous; A13 yellowish brown. Wings slightly infuscated.

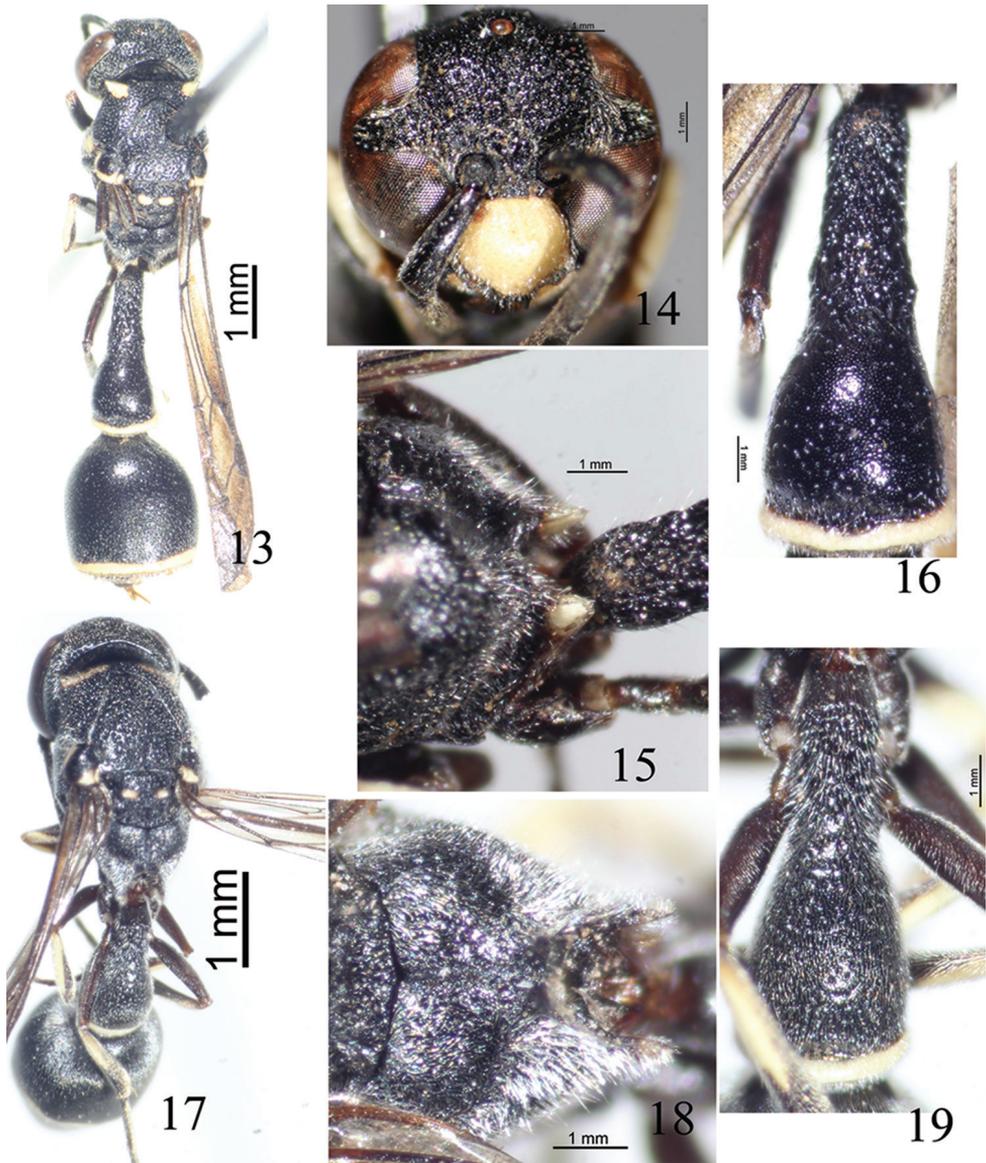
Head. Head in front view (Fig. 14) wide slightly longer than (1.09×) high, its sides somewhat flattened; clypeus sparsely setose and shiny, punctures indistinct, clypeal width as long as length, weakly convex at basal half, anterior and median portion produced and with U-formed emargination, the emargination width 1.75× its depth and teeth acute, clypeal total width 4.86× its apical width; frons convex, coarsely and densely punctate, and with a longitudinal furrow in the middle, inter-antennal carina not continued on lower part of frons.

Mesosoma. Anterior angles of pronotum projecting moderately, pronotal anterior and transverse carina present, punctures on pronotum, mesoscutum and scutellum similar to those on frons; mesepisternum coarsely punctate and punctures slightly denser than that of other parts; metanotum with a small tubercle in the middle; propodeum posteriorly on each side with a moderate tooth above the apical spine formed by the submarginal carina (Fig. 15); dorsal area of propodeum sparsely punctate and the interspaces between punctures coriaceous, posterior area with dense setae, lateral area dull, coarse, and slightly rugose.

Metasoma. Metasomal petiole (Fig. 16) short and stout, total length of petiole 4.32× basal width and 2.16× apical width, swollen part of metasomal petiole as long as half of the length of the petiole and shiny with scattered minute punctures; linear part of petiole distinctly rugosely punctate and relatively wider and stouter than other species of the genus excluding *L. postpetiolatus* Gusenleitner; T2 and S2 with apical translucent lamellae, and sparsely covered with extremely minute and shallow punctures.

Distribution. Indonesia (Java).

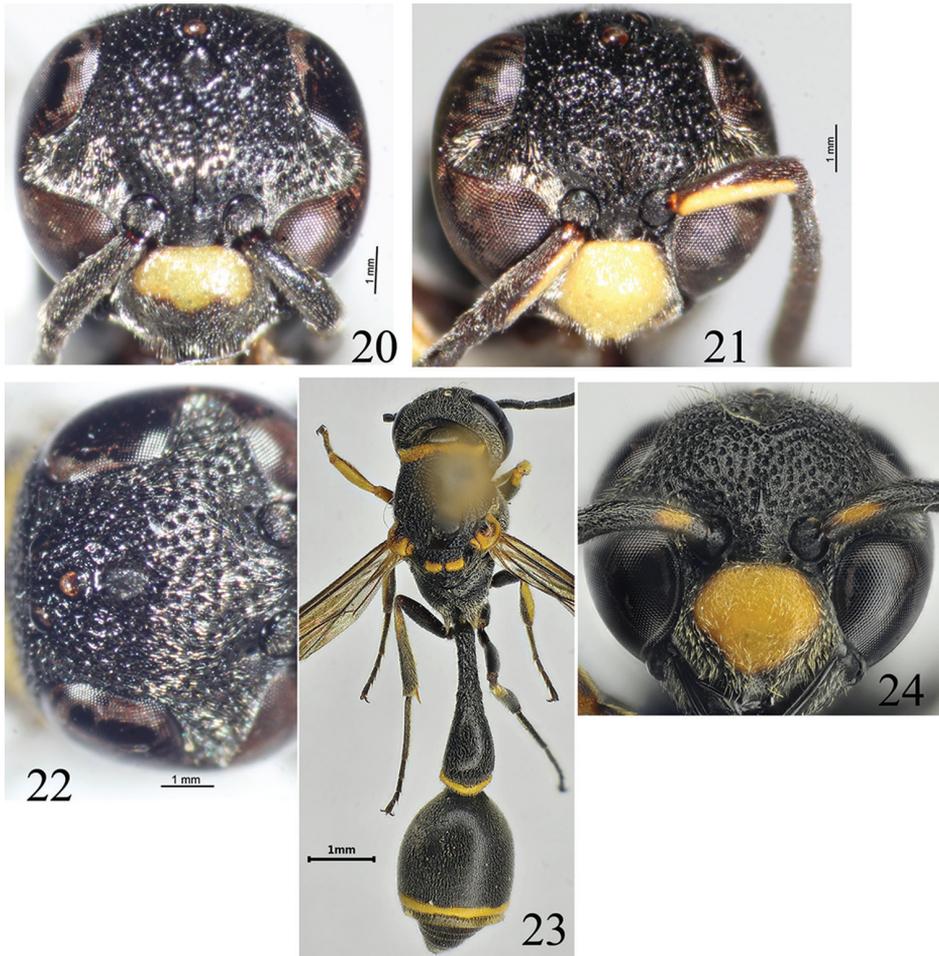
Remarks. This species resembles *L. postpetiolatus* Gusenleitner, 1988 from Thailand by metasomal petiole short and stout, its total length about 4.5× basal width, and its linear part distinctly rugosely punctate (Figs 16, 19). It differs from *L. postpetiolatus* and all other members of the genus by the following character combination: the tooth above the apical spine of propodeum comparatively blunter, lower, and closer to the



Figures 13–19. 13–16 *Labus robustus* sp. n., holotype 13 habitus in dorsal view, ♂ 14 Head in frontal view, ♂ 15 propodeum in lateral view, ♂ 16 metasomal petiole, ♂ 17–19 *Labus postpetiolatus* Gusenleitner, 1988. 17 habitus in dorsal view, ♀ 18 propodeum in lateral view, ♀ 19 metasomal petiole, ♀.

apical spine (Fig. 15); swollen part of metasomal petiole sparsely punctate (Fig. 16), in *L. postpetiolatus* punctures more densely punctate (Fig. 19).

Etymology. The specific name is derived from one Latin word: *robustus*, referring to metasomal petiole stout.



Figures 20–24. 20–22 *Labus amoenus* van der Vecht, 1935. 20 head in frontal view, ♀ 21 Head in frontal view, ♂ 22 frontal fovea, ♀ 23–24 *Labus angularis* van der Vecht, 1935. 23 habitus, ♀ 24 head in frontal view, ♀.

Labus amoenus van der Vecht, 1935

Figs 20–22

Labus armatus Cameron, 1900: 536; Dalla Torre 1904: 13; Kohl 1907: 242; van der Vecht 1935: 159; Gusenleitner 2011: 1358. Junior secondary homonym of *Labus armatus* (Gribodo, 1891).

Labus amoenus van der Vecht, 1935: 159, 161, 162; 1963: 9; Gusenleitner 1988: 189, 194; Girish Kumar et al. 2014: 29–37.

Material examined. 8♀♀2♂♂, Vietnam, Nghê An Prov. Khe Bo 19°3'N, 104°43'E, 123m, 25–28.IV.1998, James M. Carpenter (AMNH); 1♂, Vietnam: Hà Giang Prov. Cao Bô, Tham Ve River 22°45'N, 104°55'E, 295m, 24–25.IV.2000, James M. Car-

penter (AMNH); 2♀♀2♂♂, China, Yunnan Prov., Puer City, Lancang County, Mulan Town, 27.VII.2014, Pan Huang (CQNU); 2♂♂, Malaysia, Johor Pantl Forest Reserve 01°51.45'N, 103°53.10'E, 23m, 1. VI. 2009, James M. Carpenter (AMNH); 2♀♀, Malaysia, Johor Kota Tinggi Waterfalls, 01°49.45'N, 103°50.02'E, 16m, 1.VI.2009, James M. Carpenter (AMNH); 1♂, Malaysia, Johor Pantl Nature Park, 01°47.16'N, 103°56.33'E, 27m, 30.VII.2009, James M. Carpenter (AMNH); 1♂, Thailand, Phetchabun Khao Kho NP decid. Forest 16°39.587'N, 101°08.134'E, 220m, Malaise trap, 26.II–5.III.2007, Somchai Chachumnan & Saink Singtong leg. (AMNH); 1♂, Thailand, Phetchabun Khao Kho NP decid. Forest, 16°32.539'N, 101°2.483'E, 524m, Malaise trap, 12–19.XII.2006, Somchai Chachumnan & Saink Singtong leg. (AMNH); 1♂, Thailand, Ratchathani Pha Taem NPE. of ThungLuang Dipt. for 15°39.989'N, 105°30.468'E, 238m, Malaise trap, 1–7.I.2007, Thongkam & Pakdee leg. (AMNH); 1♀, Thailand, Chaiyaphum Tat Tone NP Nrsry at hd.wtr., 15°58.344'N, 102°2.169'E, 257m, Malaise trap, 19–26.II.2007, Tawit Jaruphan & Orawan Budsawong leg. (AMNH); 1♂, Singapore, under bank Felled trees New Road by Racecourse, 25.IV.1976 (AMNH).

Diagnosis. Body length 7.0–8.0 mm; head (Figs 20–21) in frontal view slightly longer than wide, its sides somewhat flattened; in female, frontal fovea (Fig. 22) elliptical; punctures on clypeus sparse and indistinct; clypeus in female basally with a yellow transverse band and in male almost totally yellow in some specimens; anterior angles of pronotum projecting strongly outwards; the raised area of the scutellum with slightly projecting posterior angles; propodeum posteriorly on each side with a moderate tooth above the apical spine formed by the submarginal carina; metasomal petiole long and slender, total length of petiole 7.93× its basal width and 3.31× apical one; swollen part of metasomal petiole less than (0.89×) half of the length of the petiole and irregularly punctate.

Distribution. Vietnam (new record), China (new record); India; Laos; Malaysia; Singapore; Indonesia.

Labus angularis van der Vecht, 1935

Figs 23–24

Labus angularis van der Vecht, 1935: 161, 164; Gusenleitner 1988: 174, 189, 190; Madl 1995: 398; Gusenleitner 2006: 687; Girish Kumar et al. 2014: 29–37.

Material examined. 2♀♀, China, Yunnan Prov., Xishuangbanna City, Mengla County, Shangyong Town, Longmen Village, 2011.VIII.3–5, Yong Zhou (CQNU).

Diagnosis. Head (Fig. 24) in frontal view approximately as long as wide, its sides rounded; anterior angles of pronotum projecting only slightly; median area of scutellum rounded posteriorly; propodeum posteriorly on each side with a moderate tooth above the apical spine formed by the submarginal carina; metasomal petiole long and slender, total length of petiole 8.3× basal width and 3.07× apical one, swollen part of metasomal petiole less than half of the length of the petiole (Fig. 23).

Distribution. China (new record); India; Myanmar; Thailand; Indonesia.

***Labus clypeatus* van der Vecht, 1935**

Labus clypeatus van der Vecht, 1935: 162, 166–167; Gusenleitner 1988: 188, 193; Girish Kumar et al. 2014: 36; Nguyen et al. 2014: 11.

Material examined. No specimens examined.

Diagnosis. Clypeus somewhat shorter, the median portion less produced, its teeth slightly blunter; spine of metanotum somewhat blunter; posterior excavation of propodeum not margined above, and propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina; apical lamellae sharp; metasomal petiole slender, its total length more than 9× basal width, the swollen part more than 3× as wide as the basal linear part, about 2/3× as long as the lineal part and more gradually swollen than in *L. spiniger* de Saussure, 1867; punctuation the same as in *L. spiniger* (van der Vecht 1935).

Distribution. Vietnam; Indonesia (Java).

***Labus exiguus* (de Saussure, 1855)**

Eumenes exiguus de Saussure, 1855: 150; Dalla Torre 1904: 22.

Labus exigua: Dover, 1925: 291; van der Vecht 1935: 158; Girish Kumar et al. 2014: 36.

Material examined. No specimens examined.

Diagnosis. The original description of the species gave insufficient detail to distinguish it from other species. Head wider than long, without indentation; metasomal petiole punctate and without bulging, widening a little back and forth, then truncated right to its articulation, and carrying two insensitive tubercles in front of its middle; S2 bell-shaped, but very short, appreciably wider than long, strongly swollen above and below, and offering at its posterior edge a strong duplication of the teguments; second cubital cell strongly narrowed towards the radial and prolonged at its posterior border, but at its external angle; antennal hooks very small; scape yellow beneath; pronotum anteriorly with a yellow, narrow, perfectly regular and medianly interrupted band, and each of T1–T2 and S2 with a yellow apical band; legs ferruginous, with some parts of femora and mid tibia black (de Saussure 1855; van der Vecht 1935).

Distribution. Malaysia; Singapore; China: Hong Kong.

***Labus humbertianus* de Saussure, 1867**

Labus humbertianus de Saussure, 1867: 4; Bingham 1896: 448, 1897: 349; van der Vecht 1935: 158; 1963: 5; Gusenleitner 1988: 189, 192; Girish Kumar et al. 2014: 30–32.

Material examined. No specimens examined.

Diagnosis. Body black, with yellowish white and brown markings. Yellowish white markings are as follows: anterior margin of horizontal portion of pronotum, parategula, at apical lamellar spine of the propodeum, fore tibiae on outer side, mid tibiae with a small yellow mark at base, a narrow thin transverse band at the posterior apex of T1, and a thin transverse band on T2 and S2. Brown markings are as follows: tegula (almost brownish black) except a small yellow mark at apex, propodeal valvula, and tarsi (partly); wings rather strongly infuscated; head and thorax densely and coarsely punctate; frontal fovea large, distinctly larger than the anterior ocellus, concavity of fovea divided by a blunt and low median ridge; pronotal spine rather short and conical; propodeum on each side with a long and sharp tooth above the apical lamellar spine; petiole coarsely and densely punctate, except on the swollen part which is sparsely and more finely punctate; swollen part as long as half of the length of the petiole (van der Vecht 1963; Girish Kumar et al., 2014).

Distribution. India; Sri Lanka; Myanmar.

Labus lofuensis Giordani Soika, 1973

Figs 25–31

Labus lofuensis Giordani Soika, 1973: 99; Gusenleitner 1988: 189, 193; Girish Kumar et al. 2014: 36; Nguyen et al. 2014: 11.

Material examined. 1♀1♂, China, Hainan Prov., Ta Hau, 4. VII. 1935, L. Gressitt (AMNH).

Diagnosis. Body (Figs 25–26) length 6.5–8.0 mm; head (Figs 27, 31) in frontal view slightly longer than wide, its sides flattened; in female, frontal fovea much deeper, distinctly defined, and rounded (Fig. 28); propodeum posteriorly on each side with a moderate tooth above the apical spine formed by the submarginal carina (Fig. 29); metasomal petiole long and slender (Fig. 30), total length of petiole 7.2× basal width and 2.57× apical width, swollen part slightly less than (0.98×) half the length of the petiole and with uniform punctures.

Distribution. China (first record from Hainan); Vietnam.

Labus philippinensis Giordani Soika, 1986

Figs 32–35

Labus philippinensis Giordani Soika, 1986: 78; Gusenleitner 1988: 196; Girish Kumar et al. 2014: 36.

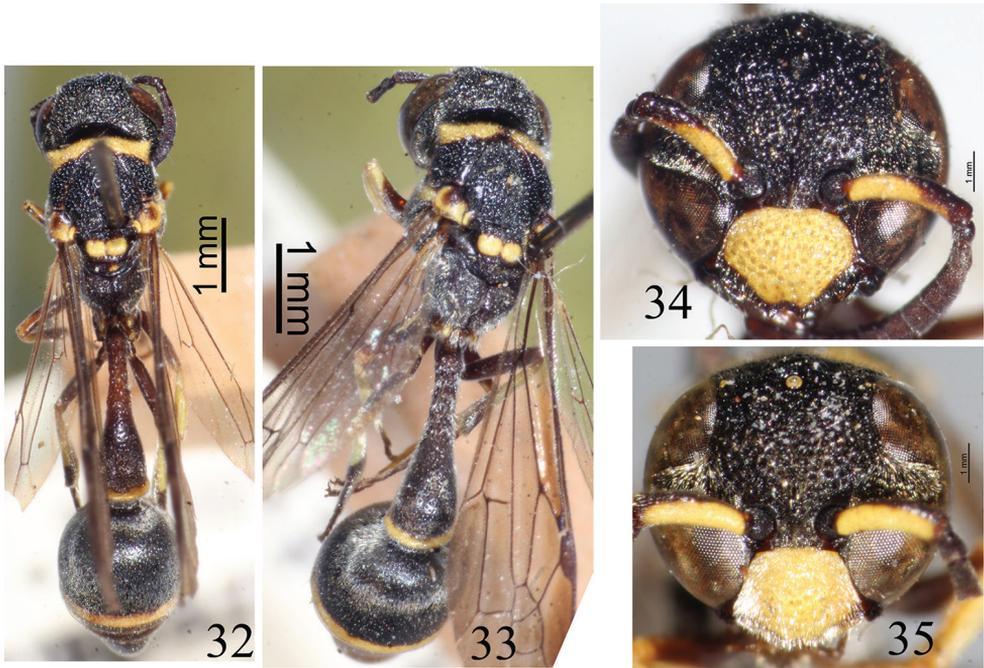
Material examined. 2♂♂, Philipphines, Laguna, I.R.R. I.Univ. Phil. Los Banos, 13.III.1980, J.Kojima (AMNH); 1♂, Philipphines, Bataan Prov. Luzon, Dinalupihan Municipality, 5.5 mi. w. of Culo, 16.IX.1945, P.I. Richard Dow (AMNH); 1♀, Philip-



Figures 25–31. *Labus lofuensis* Giordani Soika, 1973. **25** habitus, ♀ **26** habitus, ♂ **27** head in frontal view, ♀ **28** frontal fovea, ♀ **29** propodeum in lateral view, ♂ **30** metasomal petiole, ♂ **31** head in frontal view, ♂.

phines, Pampanga Prov. Luzon, Road west of Ft. Stotseburg, 4.X.1945, P.I. Richard Dow (AMNH).

Diagnosis. Body (Figs 32–33) length 6.5–7.5 mm; clypeus distinctly punctate (Figs 34–35); head in frontal view as long as wide, its sides rounded (Figs 34–35); propodeum posteriorly on each side with a moderate tooth above the apical spine formed by the submarginal carina; petiole long and slender, total length of petiole 7.88× basal



Figures 32–35. *Labus philippinensis* Giordani Soika, 1986. **32** habitus, ♀ **33** habitus, ♂ **34** head in frontal view, ♀ **35** head in frontal view, ♂.

width and $2.67\times$ apical width, swollen part of metasomal petiole much less ($0.83\times$) than half of the length of the petiole.

Distribution. Philippines.

***Labus postpetiolatus* Gusenleitner, 1988**

Figs 17–19

Labus postpetiolatus Gusenleitner, 1988: 174; Girish Kumar et al. 2014: 36.

Material examined. 1♂, Thailand, Chiang Mai Prov., Chiang Dao Farm, 24–25. IX.1999, M.I. Wibawa (AMNH).

Diagnosis. Body (Fig. 17) length 7.0 mm; propodeum (Fig. 18) posteriorly on each side with a sharply acute and high tooth above the apical spine formed by the sub-marginal carina, the tooth far away from apical spine; linear part of metasomal petiole (Fig. 19) short and stout, and distinctly rugosely punctate, total length of petiole $4.51\times$ basal width and $2.03\times$ apical width, swollen part of metasomal petiole longer than half of the length of the petiole and densely punctate.

Distribution. Thailand.

***Labus pusillus* van der Vecht, 1963**

Figs 36–41

Labus pusillus van der Vecht, 1963: 6; Gusenleitner 1987: 255; 1988: 188, 191; 2006: 687; Girish Kumar et al. 2014: 30–34.

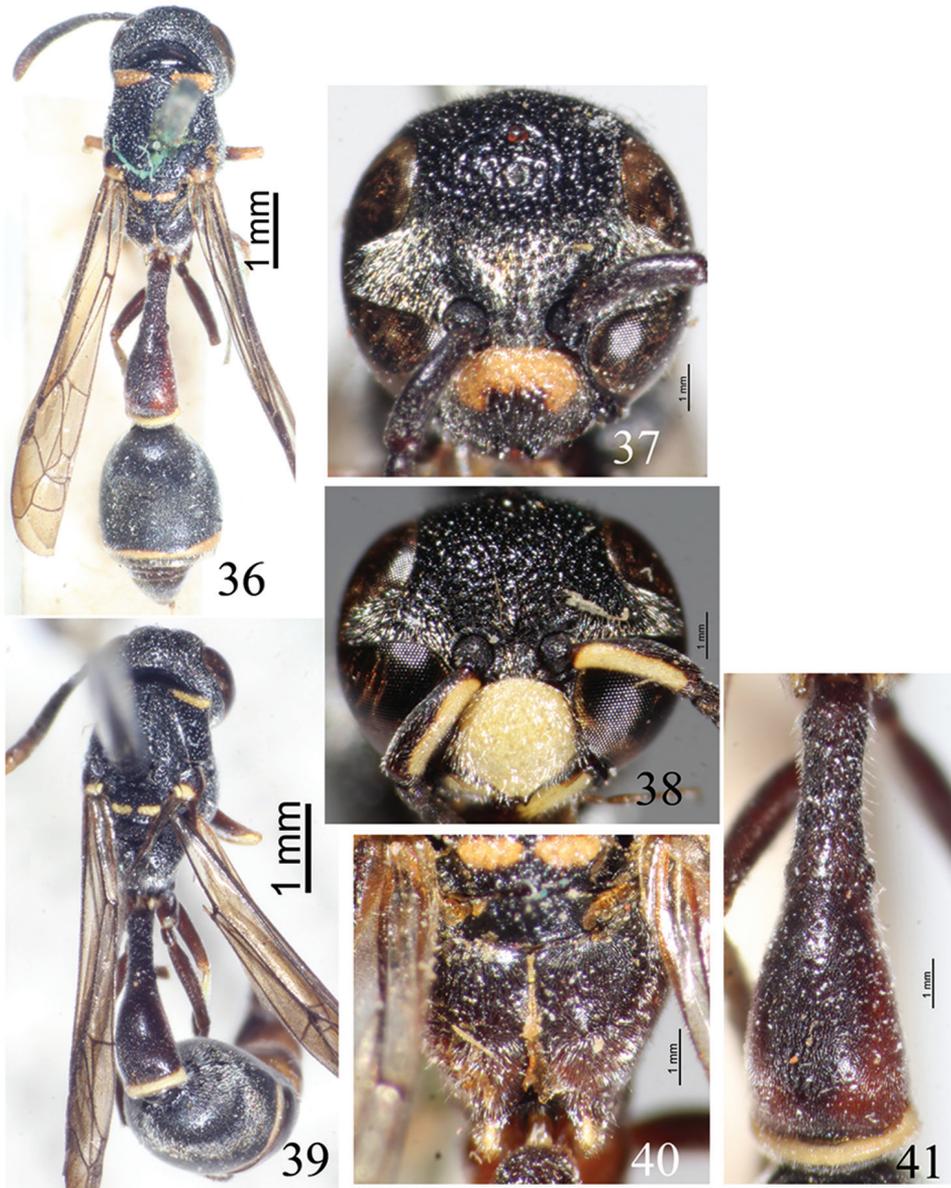
Material examined. 1♀1♂, Sri Lanka, Central Pro., Kandy Dist. Vic. Randenigala Rantembe Sanct. 07°13'N, 80°57'E, 13.VIII.1999, MT M. & J. Wasbauer (AMNH); 1♀, Sri Lanka, Central Prov., Kandy Dist. U. Peradeniya Gannoruwa Forest Area, 250 m, 07°17'N, 80°36'E, 13–14.VIII.1999, MT M. & J. Wasbauer (AMNH); 1♀, Sri Lanka, Central Prov., Kandy Dist. U. Peradeniya Hantana Mt., 7°15'N, 80°37'E, 10–14.VIII.1999, MT M. & J. Wasbauer (AMNH); 1♂, Sri Lanka, Nilgala Uva Prov., 1–14. VII. 1968, P. B. Karunaratne (AMNH); 1♀1♂, Vietnam, Nghê An Prov., Khe Bo, 19°03'N, 104°43'E, 123 m, 25–28.IV.1998, James M. Carpenter (AMNH); 1♀, Vietnam, Ha Giang Prov., Du Gia commune, 22°54'N, 105°14'E, 680 m, 29–30. IV.2000, James M. Carpenter (AMNH); 1♂, India: Cherangode, Nilgiri Hills 3500, V, 1950, P. S. Nathan; 1♀, Sri Lanka, Colomlo; 2♀1♂, China, Yunnan Prov., Lijiang City, Yulong County, Shudi valley, 4. V. 2004, Ting-Jing Li (CQNU); 1♀, China, Yunnan Prov., Kunming City, Ciba Town, Helongtan mountain, 19.VI.2002, Peng Wang (CQNU); 1♂, China, Yunnan Prov., Dali City, Gucheng Town, Yitasi, 19.VIII. 2003, Ming Luo (YNAU); 1♂, China, Yunnan Prov., Puer City, Jingdong County, nearby Chuan river, 28.IV.2004, Kai Wu (YNAU); 1♀, China, Yunnan Prov., Wenshan City, Qiubei County, Liulangdong, 3.V.2004, Peng Wang (CQNU); 1♀, China, Yunnan Prov., Puer City, Jingdong County, Xujiaba, 30.IV.2005, Li Ma (YNAU); 1♀, China, Yunnan Prov., Baoshan City, Lujiang Ba, Pumanshao, 17.VII.2006, Rui Zhang (YNAU); 2♀♀2♂♂, China, Sichuan Prov., Panzhihua City, Miyi County, Baima, 29.VII.2011, Ting-Jing Li (CQNU); 1♀, China, Sichuan Prov., Liangshan City, Dechang County, Yonglang Town, 1.VIII.2011, Tingjing Li (CQNU).

Diagnosis. Body (Figs. 36, 39) length 6.0–7.5 mm; the median portion of clypeus (Figs 37–38) slightly more produced, its emargination narrower medially and lateral teeth sharper; propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina (Fig. 40); the linear part of metasomal petiole (Fig. 41) moderately long and slender, and slightly rugosely punctate, total length of petiole 6.53× basal width and 2.45× apical width, swollen part of metasomal petiole longer than (1.06×) half of the length of the petiole; in some specimens swollen part of metasomal petiole apically ferruginous.

Distribution. China (new record); Vietnam (new record); India; Sri Lanka; Nepal.

***Labus rufomaculatus* van der Vecht, 1963**

Labus rufomaculatus van der Vecht, 1963: 8; Gusenleitner 1988: 195; Girish Kumar et al. 2014: 36.



Figures 36–41. *Labus pusillus* van der Vecht, 1963. **36** habitus, ♀ **37** head in frontal view, ♀ **38** head in frontal view, ♂ **39** habitus, ♂ **40** propodeum in dorsal view, ♀ **41** metasomal petiole, ♀.

Material examined. No specimens examined.

Diagnosis. Closely allied to *L. amoenus* van der Vecht, 1935 with the following characters in common: head higher than wide, the sides slightly flattened; anterior lateral angles of pronotum each produced into a sharp spine; metanotum with sharp median tooth; propodeum, as seen in profile, with short blunt tooth above the apical

tooth; metasomal petiole relatively long and slender (Van der Vecht 1935, fig. ia); the morphological characters separating the two species are as follows: frontal fovea deeper and slightly smaller, circular or even a little wider than long, distinctly defined; frons not carinate; median part of scutellum regularly rounded posteriorly, without prominent angles; punctures on head and thorax very slightly coarser than *L. amoenus*; body black, without yellow spots, and with the following parts red: an ill-defined transverse spot at base of clypeus, a rather wide transverse band at anterior margin of horizontal surface of pronotum, a small spot in upper part of mesepisternum below tegulae, a transverse band on scutellum, interrupted by the black median groove, and the greater part of the metasomal petiole (van der Vecht 1963).

Distribution. Indonesia.

Labus spiniger de Saussure, 1867

Figs 42–46

Labus spiniger de Saussure, 1867: 4; van der Vecht 1935: 162, 165; 1963: 10; Gusenleitner 1988: 189, 191; Girish Kumar et al. 2014: 36.

Material examined. 1♀, China, Hainan Prov., Ta Hau, 04.VII.1935, L. Gressitt (AMNH); 1♂, China, Hainan Prov., Ta Hian, 19.VI.1935, L. Gressitt (AMNH).

Diagnosis. Frons coarsely and densely punctate (Figs. 43, 45), inter-antennal carina continued on lower part of frons; propodeum posteriorly on each side with a tooth above the apical spine formed by the submarginal carina (Fig. 46); metasomal petiole dark ferruginous with exception of apical yellow band (Fig. 44), the linear part of petiole long and slender, and slightly rugosely punctate, total length of petiole $7.7\times$ basal width and $2.6\times$ apical width, swollen part of metasomal petiole less than $(0.47\times)$ half of the length of the petiole.

Distribution. China (new record); Indonesia.

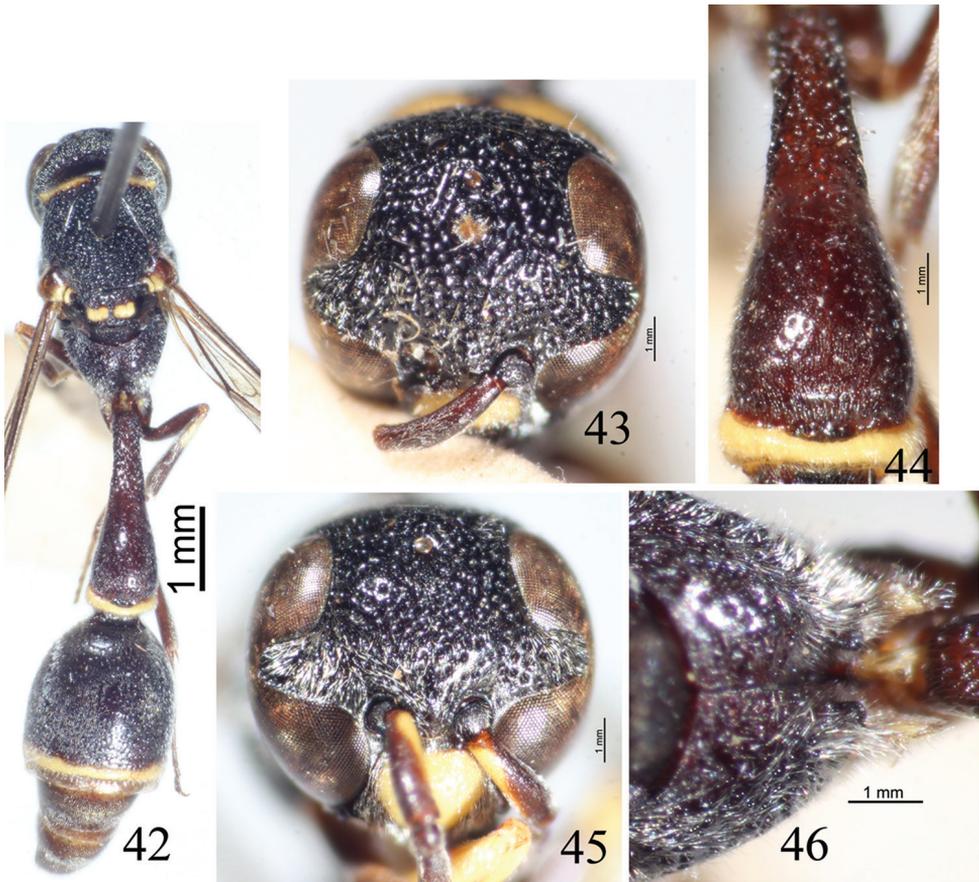
Labus sumatrensis Giordani Soika, 1991

Labus sumatrensis Giordani Soika, 1991: 163; Girish Kumar et al. 2014: 36.

Material examined. No specimens examined.

Diagnosis. Allied to *L. angularis* van der Vecht, 1935 mainly distinguished by the shape of clypeus which is very weakly marginalized at the apex, with apical teeth replaced by two undeveloped tubercles; punctures on frons thicker than those in *L. angularis* and on thorax visibly larger, punctuation of metasoma approximately as in *L. angularis* (Giordani Soika 1991).

Distribution. Indonesia.



Figures 42–46. *Labus spiniger* de Saussure, 1867. **42** habitus, ♂ **43** head in frontal view, ♀ **44** metasomal petiole, ♂ **45** head in frontal view, ♂ **46** propodeum in lateral view, ♂.

Labus vandervechti Giordani Soika, 1958

Labus vandervechti Giordani Soika, 1958: 83; van der Vecht 1963: 9; Gusenleitner 1988: 195, 197, 198; Girish Kumar et al. 2014: 36.

Material examined. No specimens examined.

Diagnosis. Very closely allied to *L. spiniger* de Saussure, 1867 (van der Vecht 1935: 165), but the horizontal part of the propodeum more distinctly punctate, the punctures not much closer, but slightly larger, and better defined; the sides of the propodeum more shiny between the punctures (rugose and rather dull in *L. spiniger*), the transverse ridge at apex of propodeum more pronounced, as seen in profile forming a more distinctly projecting tooth; swollen part of metasomal petiole relatively longer, nearly half as long as the petiole; second metasomal segment relatively longer (length: width = 1.2 : 1, in *L. spiniger* = 1.1: 1); metasomal petiole red, with narrow yellow apical band; legs ferrugi-

nous, coxae and trochanters dark brown to black, fore femur I with vague yellow spot at apex, mid and hind femora fuscous at base, hind tibiae fuscous at apex, tarsal segments 2–5 of mid legs and 1–5 of hind legs fuscous (van der Vecht 1963).

Distribution. Indonesia.

Key to the world species of *Labus* de Saussure

In the below key, information on *L. clypeatus* van der Vecht, *L. exiguus* (de Saussure), *L. humbertianus* de Saussure, *L. rufomaculatus* van der Vecht, *L. sumatrensis* Giordani Soika and *L. vandervechti* Giordani Soika is extracted from the original descriptions, and the characters of other species were studied on specimens.

- 1 Propodeum posteriorly on each side without a tooth above the apical spine formed by the submarginal carina (Figs 5, 11, 40) **2**
- Propodeum posteriorly on each side with a tooth above the apical spine formed by the submarginal carina (Figs 18, 29, 46) **5**
- 2 Swollen part of metasomal petiole as long as or longer than half of the length of the petiole (Figs 4, 41) **3**
- Swollen part of metasomal petiole less than half of the length of the petiole (Fig. 12) **4**
- 3 The median portion of clypeus less produced, its emargination wide medially and lateral teeth slightly blunter (Fig. 2); frontal fovea big and rounded, much larger than the anterior ocellus (Fig. 3) ***L. edentatus* sp. n.**
- The median portion of clypeus slightly more produced, its emargination narrower medially and lateral teeth sharper (Figs 37, 38); frontal fovea smaller and not distinctly defined, slightly larger than the anterior ocellus (Fig. 37) ***L. pusillus* van der Vecht, 1963**
- 4 Frons sparsely punctate and more shiny between the punctures (Figs 8, 10); total length of petiole shorter, 7.53×its basal width in female and 8.07×its basal width in male ***L. sparsipunctus* sp. n.**
- Frons coarsely and densely punctate, and duller between the punctures; total length of petiole more than 9× basal width ... ***L. clypeatus* van der Vecht, 1935**
- 5 The linear part of metasomal petiole short and wide, and distinctly rugosely punctate, total length of petiole about or less than 4.51× basal width (Figs 16, 19) ... **6**
- The linear part of metasomal petiole long and narrow, and just slightly rugosely punctate, total length of petiole at least more than 6.5× basal width (Figs 23, 30, 32–33, 44) **7**
- 6 The tooth above the apical spine of propodeum sharply acute and high, and far away from apical spine (Fig. 18); swollen part of metasomal petiole more densely punctate (Fig. 19) ***L. postpetiolatus* Gusenleitner, 1988**
- The tooth above the apical spine of propodeum comparatively blunter and lower, and closer to the apical spine (Fig. 15); swollen part of metasomal petiole sparsely punctate (Fig. 16) ***L. robustus* sp. n.**

- 7 Swollen part of metasomal petiole half of the length of the petiole..... **8**
- Swollen part of metasomal petiole less than half of the length of the petiole (Figs 23, 30, 32–33, 44) **9**
- 8 Legs black, with the following parts yellow: fore tibiae on outside and mid tibiae with a small mark at base (van der Vecht 1963; Girish Kumar et al. 2014) ***L. humbertianus* de Saussure, 1867**
- Legs ferruginous, only with some parts of femora and midtibia black (van der Vecht 1935) ***L. exiguus* (de Saussure, 1855)**
- 9 Head in frontal view as long as wide, its sides rounded (Figs. 24, 34–35)... **10**
- Head in frontal view longer than wide, its sides somewhat flattened (Figs 20–21, 27, 31, 43, 45)..... **12**
- 10 Clypeus distinctly punctate, punctures larger and relatively denser (Figs 34–35)..... ***L. philippinensis* Giordani Soika, 1986**
- Clypeus less distinctly punctate, punctures sparser (Fig. 24)..... **11**
- 11 Punctures on frons thicker than in the *L. angularis* and those on mesosoma visibly larger..... ***L. sumatrensis* Giordani Soika, 1991**
- Punctures on frons sparser and those on mesosoma smaller than the above species..... ***L. angularis* van der Vecht, 1935**
- 12 Frons not carinate; body with red or ferruginous spots and without yellow marks..... ***L. rufomaculatus* van der Vecht, 1963**
- Inter-antennal carina continued on lower part of frons; body with distinct yellow spots or bands **13**
- 13 Metasomal petiole at least partly red or reddish brown, with yellow apical narrow band; frontal fovea relatively bigger (Figs 20, 28) **14**
- Metasomal petiole black, with narrow yellow apical band; frontal fovea smaller (Fig. 43)..... **15**
- 14 The horizontal part of the propodeum punctate, the punctures comparatively smaller; the sides of the propodeum rugose and rather dull between the punctures; the transverse ridge at apex of propodeum less pronounced ***L. spiniger* de Saussure, 1867**
- The horizontal part of the propodeum more distinctly punctate, the punctures not much closer, but slightly larger, and better defined; the sides of the propodeum more shiny between the punctures, the transverse ridge at apex of propodeum more pronounced, as seen in profile forming a more distinctly projecting tooth (Giordani Soika 1958; van der Vecht 1963)..... ***L. vandervechti* Giordani Soika, 1958**
- 15 In female, frontal fovea much deeper, distinctly defined, and rounded (Fig. 28); the swollen part of the metasomal petiole with uniform punctures ***L. lofuensis* Giordani Soika, 1973**
- In female, frontal fovea shallow, longer than wide, not distinctly defined (Fig. 22); the swollen part of the metasomal petiole irregularly punctate ***L. amoenus* van der Vecht, 1935**

Acknowledgements

We are very grateful to Christophe Barthélémy (Hongkong, China) for sending the specimen and allowing its deposition in AMNH. This study was funded by the National Natural Science Foundation of China (Nos: 31772490, 31372247, 31000976), Young Talent Incubation Programme of Chongqing Normal University (14CSDG07).

References

- Bingham CT (1896) A contribution to the knowledge of the hymenopterous fauna of Ceylon. *Proceedings of the Zoological Society, London*: 401–459. <https://doi.org/10.1111/j.1096-3642.1896.tb03051.x>
- Bingham CT (1897) *Fauna of British India, including Ceylon and Burma – Hymenoptera I – Wasps and Bees*. Taylor and Francis, London, 579 pp. <https://doi.org/10.5962/bhl.title.100738>
- Cameron P (1900) Descriptions of new genera and species of Hymenoptera. *Annals and Magazine of Natural History* (7)6: 410–419, 495–506, 530–539. <https://doi.org/10.1080/00222930008678422>
- Dalla Torre KW von (1904) *Vespidae*. *Genera Insectorum* 19: 1–108.
- Dover C (1925) Further notes on the Indian Diplopterous wasps. *Journal of Asiatic Society of Bengal*, NS 22: 289–305.
- Giordani Soika A (1960 [1958]) *Notulae vespilogicae* 4–9. *Bollettino del Museo Civico di Storia Naturale di Venezia* 11: 35–102.
- Giordani Soika A (1973) *Notulae vespilogicae* 35. *Descrizione di nuovi Eumenidi*. *Bollettino del Museo Civico di Storia Naturale di Venezia* 24: 97–131.
- Giordani Soika A (1986) *Eumenidi di Okinawa e delle Filippine raccolti da J. Kojima*. *Bollettino del Museo Civico di Storia Naturale di Venezia* 35: 67–89.
- Giordani Soika A (1991) *Eumenidi raccolti in Indonesia da G. Osella e J. Klapperich*. *Bollettino del Museo Civico di Storia Naturale di Verona* 15: 163–166.
- Girish Kumar P, Mohammed Shareef KP, Kishore L, Carpenter JM (2014) A taxonomic review of the Oriental genus *Labus* de Saussure, 1867 (Hymenoptera: Vespidae: Eumeninae) from the Indian subcontinent. *Biosystematica* 7(2): 29–37.
- Gusenleitner J (1987) *Über Eumenidae aus Nepal (Hymenoptera: Vespoidea)*. *Linzer Biologische Beiträge* 19(1): 255–270.
- Gusenleitner J (1988) *Über Eumenidae aus Thailand, mit einer Bestimmungstabelle für orientalischer Labus-Arten (Hymenoptera: Vespoidea)*. *Linzer biologische Beiträge* 20(1): 173–198.
- Gusenleitner J (2006) *Über Aufsammlungen von Faltenwespen in Indien (Hymenoptera: Vespidae)*. *Linzer biologische Beiträge* 38(1): 677–695.
- Gusenleitner J (2011) *Eine Aufsammlung von Faltenwespen aus Laos im Biologiezentrum Linz (Hymenoptera: Vespidae: Vespinae, Stenogastrinae, Polistinae, Eumeninae)*. *Linzer biologische Beiträge* 43(2): 1351–1368.

- Kohl FF (1907) Zoologische Ergebnisse der Expedition der K. Akademie der Wissenschaften nach Südarabien und Sokotra im Jahre 1898-1899. Denkschriften Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse 71(1): 170–302.
- Madl M (1995) Contribution to the Hymenoptera – Fauna of Thale Ban National Park. Linzer biologische Beiträge 27(1): 397–399.
- Nguyen LTP, Dang HT, Kojima J, Carpenter JM (2014) An annotated distributional checklist of solitary wasps of the subfamily Eumeninae (Hymenoptera: Vespidae) of Vietnam. Entomologica Americana 120(1/2): 7–17. <https://doi.org/10.1664/13-RA-010.1>
- Saussure H de (1855) Études sur la Famille des Vespides 2. La Monographie des Masariens et un supplément la Monographie des Euméniens. V. Masson, Paris & J. Kessmann, Genève, 49–288 pp.
- Saussure H de (1867) Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859., Zool. Teil, 2 Band 1. Abteil A. 2. Hymenoptera, Wien, 142 pp.
- Vecht J van der (1935) Notes on Oriental *Labus*, with descriptions of three new species from Java (Hymenoptera: Vespidae). Treubia 15(2): 157–167.
- Vecht J van der (1963) Studies on Indo-Australian and East Asiatic Eumenidae (Hymenoptera: Vespoidea). Zoologische Verhandlungen Leiden 60: 1–116.