

Taxonomy of the genus *Peucobius* Townes (Hymenoptera, Ichneumonidae, Sisyrostolinae)

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Abstract

The genus *Peucobius* Townes previously comprised two species occurring in the Nearctic region: *P. fulvus* Townes and *P. piceus* Townes. In the current study we revise this genus, transfer it to the subfamily Sisyrostolinae (**comb. nov.**), and describe two new species – *P. bennetti* Khalaim & Ruíz-Cancino, **sp. nov.** from Central Mexico and *P. shimizui* Khalaim, **sp. nov.** from Japan. The genus *Lygurus* Kasparyan occurring in Russian Far East and Taiwan is morphologically similar to *Peucobius*; characters for distinguishing these two genera are provided for the first time with the use of colour photographs. Identification keys to four world species of *Peucobius*, and to species of *Lygurus* and *Peucobius* occurring in the East Palaearctic region, are provided. We suggest that species of *Peucobius* are associated with xyelid sawflies (Xyelidae) whose larvae feed in staminate pine cones.

Resumen

El género *Peucobius* Townes previamente incluía dos especies en la región Neártica: *P. fulvus* Townes y *P. piceus* Townes. En el presente artículo se revisa el género, se transfiere a la subfamilia Sisyrostolinae (**comb. nov.**) y se describen dos especies nuevas – *P. bennetti* Khalaim & Ruíz-Cancino, **sp. nov.** de la zona central de México y *P. shimizui* Khalaim, **sp. nov.** de Japón. El género *Lygurus* Kasparyan que ocurre en el Lejano Oriente Ruso y en Taiwán es similar morfológicamente a *Peucobius*; se señalan por primera vez las características que los distinguen, incluyendo fotografías a color. Se elaboraron las claves para las cuatro especies de *Peucobius* del mundo, y las de las especies de *Lygurus* y *Peucobius* que ocurren en la región Paleártica Oriental. Se sugiere que las especies de *Peucobius* están asociadas con moscas sierra (Xyelidae), cuyas larvas se alimentan en conos estaminados de pinos.

Keywords

Japan, key, *Lygurus*, Mexico, Nearctic region, new combination, new species, North America, parasitoids

Introduction

The genus *Peucobius* Townes was described in the subfamily Phrudinae for two Nearctic species (Townes 1971: 29), and no further works on this genus were published for almost the following forty years (Yu et al. 2016), until a phylogenetic revision of the family Ichneumonidae by Quicke with co-authors (Quicke et al. 2009: 1354) in which the genus *Peucobius* and six other “microphrudine” genera (*Astrenis* Förster, *Earobia* Townes & Townes, *Notophrudus* Porter, *Phaestacoenitus* Smits van Burgst, *Phrudus* Förster and *Pygmaeolus* Hellén) were transferred to Tersilochinae s.l. on the basis of a combined molecular and morphological analysis. Five other genera previously treated in Phrudinae (*Brachyscleroma* Cushman, *Erythrodoilius* Seyrig, *Icarionimus* Seyrig, *Lygurus* Kasparyan and *Melanodolius* Saussure) were placed within the resurrected subfamily Brachyscleromatinae Townes (Quicke et al. 2009: 1354), and one more genus, *Laxiareola* Sheng & Sun, was described afterwards from Oriental China (Sheng and Sun 2011). Subsequently, Bennett with co-authors (Bennett et al. 2013) revised the genus *Erythrodoilius* and established the subfamily name Sisyrostolinae Seyrig instead of Brachyscleromatinae Townes due to the priority of Seyrig’s name. They also pointed out that not all former phrudine genera were included in the analysis of Quicke et al. (2009), and therefore some of the omitted genera (e.g., *Notophrudus* and *Peucobius*) could end up being more closely related to Sisyrostolinae than the *Phrudus* group of genera (Bennett et al. 2013: 425–426).

Recently, Bennett with co-authors (Bennett et al. 2019) performed a combined morphological and molecular phylogenetic analysis of Ichneumonidae, and in both combined analyses *Peucobius fulvus* Townes was sister to *Erythrodoilius calamitosus* Seyrig (Sisyrostolinae), not *Phrudus* sp. (Tersilochinae s.l.) which would support the move of *Peucobius* to Sisyrostolinae (Bennett et al. 2019: 116–118). However, the monophyly of the subfamily Sisyrostolinae was not confirmed as *Brachyscleroma* did not cluster with *Peucobius*+*Erythrodoilius*.

The aims of this study are to revise new material of *Peucobius*, describe two new species from Mexico and Japan, and discuss the relationships of *Peucobius* to Sisyrostolinae and the *Phrudus* group of Tersilochinae. Identification keys to world species of *Peucobius*, and to East Palaearctic species of *Peucobius* and the morphologically similar genus *Lygurus* will be provided.

Materials and methods

The specimens examined in this study were borrowed from or deposited in the following collections: Instituto de Biología, Universidad Nacional Autónoma de México,

D.F., México (**UNAM**), the National Institute for Agro-Environmental Sciences, Tsukuba, Japan (**NIAES**), Canadian National Collection of Insects, Ottawa, Ontario, Canada (**CNC**), and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (**ZISP**). Photographs of *Lygurus* spp. (Figs 21–26) were taken from non-type females from the Russian Far East deposited in ZISP.

Morphological terms follow Broad et al. (2018). Wings of *P. shimizui* sp. nov. (Fig. 18) were slide-mounted using Solakryl BMX. Layer photographs were taken in ZISP, with a Canon EOS 70D digital camera attached to an Olympus SZX10 stereomicroscope. Partly focused images were assembled with Helicon Focus Pro 6 software. Contour map of North America (Fig. 27) was taken from D-maps (2018).

Results and taxonomy

The genus *Peucobius* is found to belong to the subfamily Sisyrostolinae (comb. nov.) as it shares the following important morphological features (see Quicke et al. 2009; Bennett et al. 2013): antenna with cylindrical scape, proboscis strongly narrowed, hind wing with vein M+Cu long relative to vein 1-M, metasoma with large laterotergites and mostly sclerotized sternites, and thin and long ovipositor which is slightly swollen before the apex and has neither notch nor nodus (Figs 11, 20).

Unlike Tersilochinae s.l., *Peucobius* possesses unspecialized flagellomeres (in Tersilochinae almost all species possess finger-shaped structures at least on several flagellomeres, see Vikberg, Koponen 2000; Khalaim pers. obs.), maxillary and labial palp formula 5+4 (in Tersilochinae this formula is usually 4+3, though in microphrudines genera it is 5+4) and fore tibia with a tooth on the distal outer side (in Tersilochinae distal end of fore tibia is unspecialized, i.e. without tooth).

Within Sisyrostolinae, *Peucobius* is very similar to the small East Palaearctic and Oriental genus *Lygurus* Kasparyan from which it can be distinguished by the following characters: laterotergite 2 not separated by a crease; clypeus weakly convex and without a transverse ridge (Fig. 15); and short second metasomal tergite which is about 0.7 times as long as anteriorly broad (Fig. 19). Further taxonomic study of these two genera is required to clarify their generic limits and phylogenetic relationships.

Thus, the subfamily Sisyrostolinae currently comprises seven genera: *Brachyscleroma* Cushman (Afrotropical and Oriental regions), *Erythrodolius* Seyrig (Afrotropical and Neotropical regions), *Icariomimus* Seyrig (Afrotropical region), *Laxiareola* Sheng & Sun (Oriental region), *Lygurus* Kasparyan (Eastern Palaearctic and Oriental regions), *Melanodolius* Saussure (Afrotropical) and *Peucobius* Townes (Holarctic region) (Yu et al. 2016).

Genus *Peucobius* Townes, 1971

Type species. *Peucobius fulvus* Townes, 1971, by original designation.

Comparative diagnosis. *Peucobius* can be distinguished from all other genera of Sisyrostolinae by the combination of the following characters: 1) fore wing without areolet, i.e. vein 3rs-m absent (Fig. 18) (areolet present in *Brachyscleroma*); 2) tarsal claws simple (pectinate in *Laxiareola*); 3) anterior transverse carina of propodeum present (Fig. 3) (carina absent in *Melanodolius* and some species of *Erythrodolius*); 4) clypeus unspecialized, evenly rounded in profile, without a transverse ridge, medial point or multiple or medial crenulations (Figs 5, 15) (transverse ridge present in *Lygurus*; medial point present in some species of *Erythrodolius*; medial crenulations present in some species of *Erythrodolius* and *Icariomimus*).

Within Sisyrostolinae, *Peucobius* has the smallest species with fore wing length 2.5–3.0 mm, while the genus with the next smallest species, *Lygurus*, has fore wing length 4.0–5.0 mm, and some other genera are much larger (e.g., 7.0–19.0 mm in *Erythrodolius* and 17.0–30.0 mm in *Melanodolius*).

Description. Small insects with fore wing length 2.5–3.0 mm. Head and mesosoma mostly finely granulate to subpolished, impunctate or partly with fine punctures. Head, in dorsal view, with gena strongly rounded posterior to eyes. Clypeus wide, 2.5–3.5 times as broad as long, lenticular, weakly convex, more or less flat medially, with a row of long fine setae on lower margin. Mouthparts short, unspecialized; maxillary and labial palp formula 5+4. Mandible bidentate, with teeth subequal by length or either upper or lower tooth somewhat longer than other. Malar space 0.8–1.0 times as long as basal mandibular width, with scabrous area between eye and mandibular base. Flagellum filiform, with 14–17 flagellomeres. Epomia absent. Notaulus short or absent. Scutellum with lateral longitudinal carinae very short. Sternaulus absent or as weak impression ventrolaterally in anterior part of mesopleuron. Epicnemial carina present. Posterior transverse carina of mesopleuron absent. Propodeum more or less fully carinate (as in Fig. 3), sometimes carinae partly obliterated. Fore wing as in Fig. 18; areolet absent, pterostigma relatively large, vein 2m-cu with one large bulla. Hind wing with nervellus (cu1&cu-a) intercepted below centre. Legs slender; fore tibia with a tooth-like projection on distal outer side; tarsal claws not pectinate. First metasomal tergite 1.8–2.5 times as long as posteriorly broad, with large glymma at base. Second tergite transverse; thyridum (if discernible) very small, oval, at base of tergite 2. Laterotergites 2 and 3 not separated by crease. Ovipositor long and slender, weakly upcurved, slightly swollen before apex (Fig. 11).

Remarks. In addition to two previously known Nearctic species of *Peucobius*, one species from Central Mexico and one from Japan are described. A distribution map (Fig. 27) of three North American species and identification key to the four species of *Peucobius* occurring in the world are given below. We also provide a key to a new species of *Peucobius* discovered from the East Palaearctic region and two species of the morphologically similar genus *Lygurus*.

The new species from Mexico differs well from two other North American species, *P. fulvus* and *P. piceus* (see the key below). *Peucobius fulvus* and *P. piceus* are known to us from their original descriptions (Townes 1971) and several specimens from USA and Canada. The length of mandibular teeth is found to work well for distinguishing these

morphologically very similar species from each other, while the two features provided by Townes (1971), i.e. sculpture of mesoscutum and colouration of hind coxa, are less reliable and therefore must be used with caution.

Key to world species of *Peucobius*

- 1 Frons with short but distinct ridge between antennal sockets. Propodeum with area basalis substituted by a single, longitudinal, median carina; areola pointed anteriorly (Fig. 10). Mesopleuron entirely black (Fig. 8). Mexico.....
..... ***P. bennetti* sp. nov.**
- Frons without longitudinal ridge between antennal sockets. Propodeum with area basalis distinct and more or less contiguous with areola (Fig. 3). Mesopleuron with subtegular ridge and area below sternaulus yellow or reddish orange (Figs 1, 2) **2**
- 2 Metacarpus (R1) of fore wing ending significantly behind radial cell (Fig. 18). Metasoma predominantly brownish black (Fig. 12). East Palaearctic region (Japan).....***P. shimizui* sp. nov.**
- Metacarpus (R1) of fore wing ending just beyond radial cell (Figs 1, 2). Metasoma predominantly reddish orange (Fig. 1) or brown (Fig. 2). Nearctic region **3**
- 3 Mandible with lower tooth subequal to, or slightly longer than the upper tooth. Mesoscutum centrally dull. Hind coxa yellow or pale brown (Fig. 1)....
..... ***P. fulvus* Townes**
- Mandible with lower tooth distinctly longer than the upper tooth. Mesoscutum centrally polished. Hind coxa darkened with brown or black (Fig. 2)
..... ***P. piceus* Townes**

Key to *Lygurus* and *Peucobius* species occurring in East Palaearctic region

- 1 Second tergite very short, 0.65 times as long as anteriorly broad (Fig. 19); laterotergite 2 not separated by crease (as in Fig. 8). Flagellum of female with 15 flagellomeres (Fig. 13). Clypeus weakly convex, without transverse ridge (Fig. 15). Ovipositor sheath 0.7 times as long as body (Fig. 12). Body yellowish orange and black (Fig. 12). Fore wing length about 2.6 mm ***P. shimizui* sp. nov.**
- Second tergite distinctly elongated, about 1.5 times as long as anteriorly broad; laterotergite 2 separated by sharp crease (Fig. 24). Flagellum of female with 19–24 flagellomeres. Clypeus with transverse ridge (Fig. 22). Ovipositor sheath longer than body (Fig. 21). Body almost entirely black (Fig. 21). Fore wing length 4.0–5.0 mm **2**
- 2 Propodeum with areola distinctly transverse. Ovipositor sheath 1.4 times as long as body. Russian Far East (Kasparyan 1983) ***L. townesi* Kasparyan, 1983**
- Propodeum with areola somewhat elongated. Ovipositor sheath 1.1 times as long as body (Fig. 21). Russian Far East and Taiwan (Chiu and Wong 1987: 4; Kasparyan and Khalaim 2007: 564)..... ***L. marjoriae* Chiu, 1987**

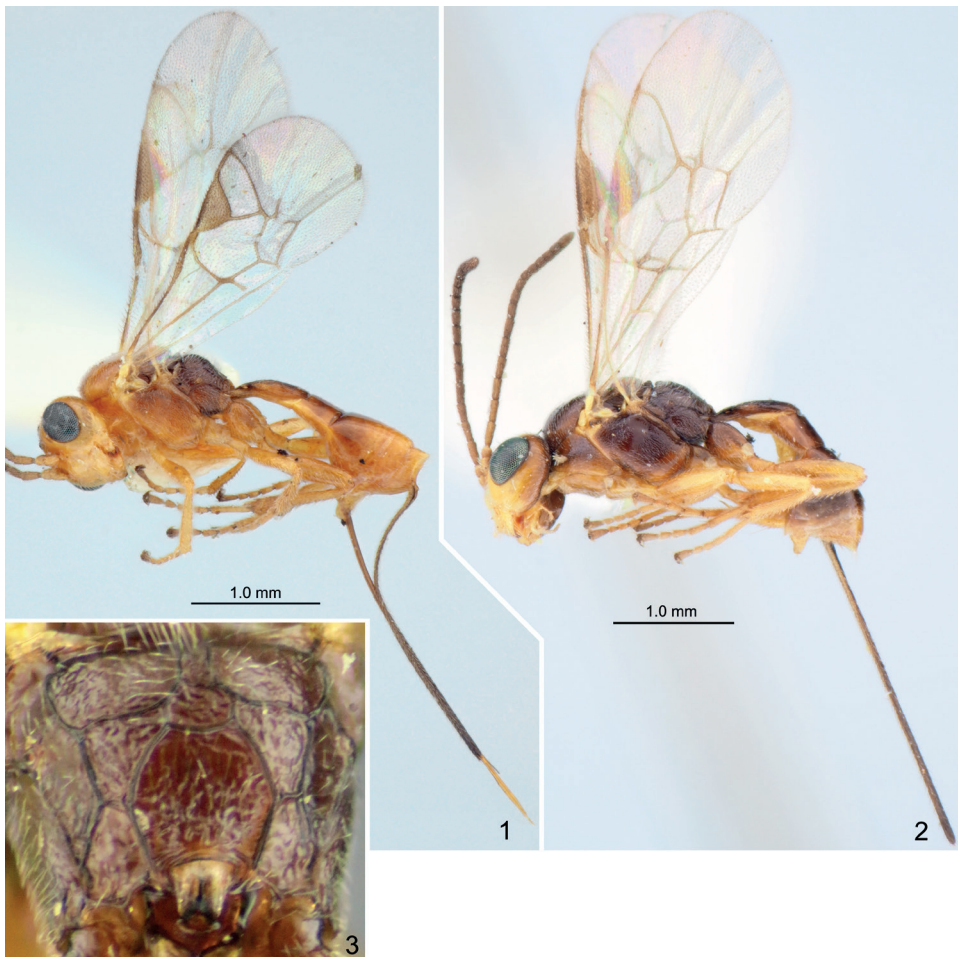
Peucobius fulvus Townes, 1971

Fig. 1

Remarks. The specimens from Maryland were swept from *Pinus virginianensis* [*P. virginiana* Mill.] with staminate cones (Townes 1971: 31).

Material examined. 1 female (CNC), CANADA, Ontario, Spencerville, Limerick Forest, 29.V.1956, coll. W.R.M. Mason (det. V. Vikberg, 2004). 1 female (paratype, ZISP), USA, Maryland, Takoma Park, 25.IV.1942, coll. H. & M. Townes.

Distribution. Canada (Ontario) (new country and provincial record for genus), USA (Maryland, Michigan, North Carolina) (Townes 1971).



Figures 1–3. *Peucobius fulvus*, female (Canada, Ontario) (1) and *P. piceus*, female (USA, Colorado) (2, 3). 1, 2 habitus, lateral view 3 propodeum, dorsal view.

***Peucobius bennetti* Khalaim & Ruíz-Cancino, sp. nov.**

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Figs 4–11

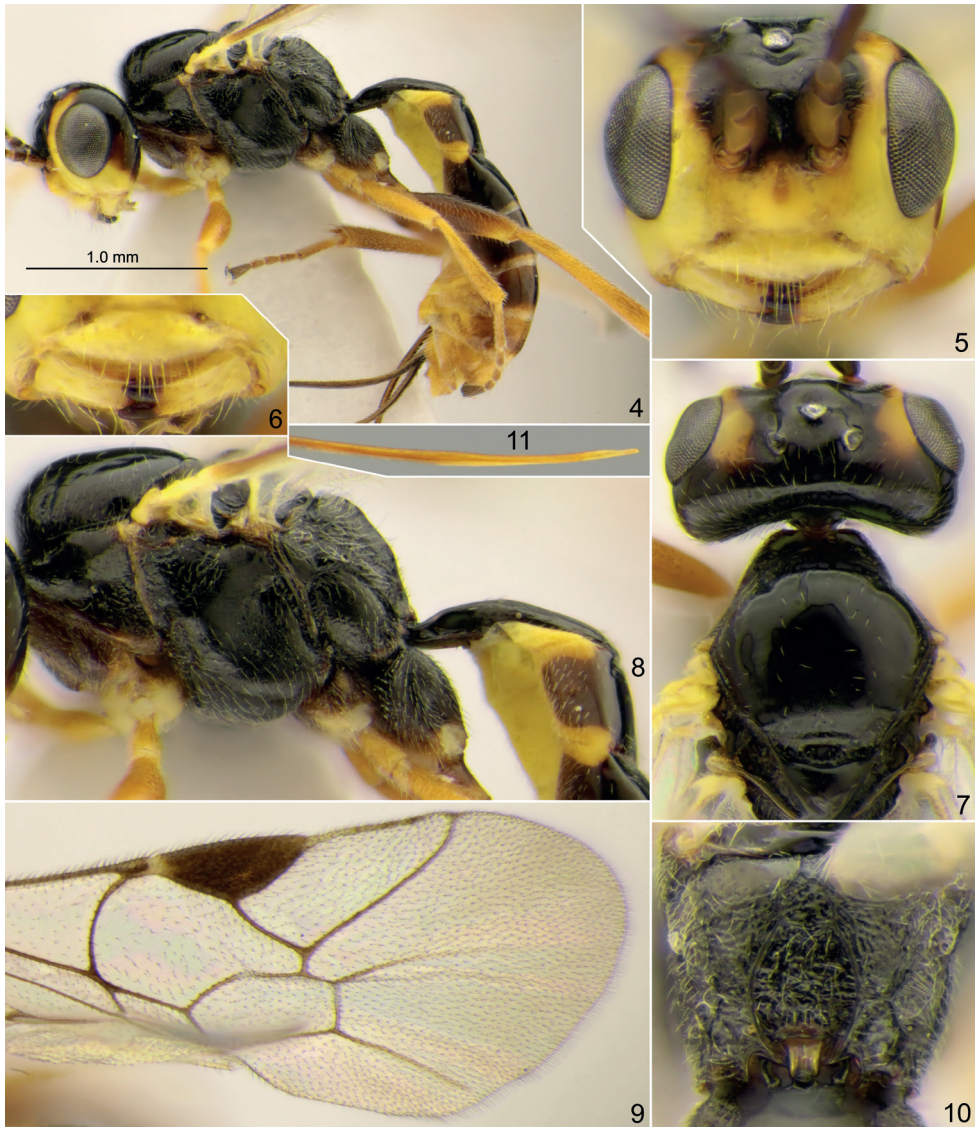
Comparison. *Peucobius bennetti* sp. nov. differs from the two other North American species, *P. fulvus* and *P. piceus*, by having the frons with a sharp longitudinal carina between the antennal sockets (weakly convex or with rounded longitudinal swelling in *P. fulvus* and *P. piceus*), the occipital carina completely absent in the lower half of the head (complete, or sometimes indistinct near the hypostomal carina in *P. fulvus* and *P. piceus*), deep notaulus (absent or very shallow in *P. fulvus* and *P. piceus*), area basalis of propodeum substituted by a longitudinal keel (Fig. 10) (distinct in *P. fulvus* and *P. piceus*, see Fig. 3), and black and yellow body (Fig. 4), while in *P. fulvus* and *P. piceus* the body is paler with yellowish markings less contrasting (Figs 1, 2).

Peucobius bennetti sp. nov. also differs from the Eastern Palaearctic *P. shimizui* sp. nov. by having a shorter metacarpus (R1) of the fore wing, ending just behind the radial cell (Fig. 9), while in *P. shimizui* sp. nov. the metacarpus (R1) extends well beyond the radial cell (Fig. 18).

Description. Female. Body length 4.1 mm. Fore wing length 3.0 mm.

Head with gena strongly rounded posterior to eyes (Fig. 7); gena in dorsal view 0.75 times as long as eye width. Clypeus 3.5 times as broad as long (Fig. 6), more or less flat medially and with rounded transverse ridge laterally, smooth, with fine punctures in upper half, with a row of long fine setae on lower margin. Mouthparts short; maxillary palp with 5 palpomeres, palpomeres 4 and 5 short, distinctly shorter than palpomeres 2 and 3; labial palp with 4 short palpomeres. Mandible with lower tooth slightly longer than the upper (Fig. 6). Malar space about 0.8 times as long as basal mandibular width, with broad scabrous area between eye and mandibular base. Flagellum with 17 flagellomeres, filiform; three basal flagellomeres 2.5–2.8 times as long as broad; subapical flagellomeres subsquare. Face with conspicuous median swelling, with short and narrow longitudinal furrow on this swelling, with fine and sharp punctures on smooth background laterally, and smooth and almost impunctate centrally on median swelling. Frons with short and sharp longitudinal carina between antennal sockets (just above groove on median swelling); polished and impunctate medially, with fine and sharp punctures laterally. Vertex and gena polished, with very fine setiferous punctures. Occipital carina thin and sharp in upper half of head, evenly convex medio-dorsally, and obliterated in lower part (completely absent below level of eye midline).

Mesoscutum polished, centrally almost impunctate, with scattered very fine punctures anteriorly and laterally (Fig. 7). Notaulus present on anterolateral side of mesoscutum, short and deep. Scutellum polished, almost impunctate. Mesopleuron sub-polished, dull, with very fine inconspicuous punctures in lower part. Sternaulus as weak impression ventrolaterally in anterior part of mesopleuron. Epicnemial carina extending somewhat above level of lower corner of pronotum, with upper end not



Figures 4–11. *Peucobius bennetti* sp. nov., holotype female **4** body, lateral view **5** head, front view **6** clypeus and mandibles, antero-ventral view **7** head and mesoscutum, dorsal view **8** mesosoma and base of metasoma, lateral view **9** fore wing **10** propodeum, dorsal view **11** apex of ovipositor, lateral view.

reaching anterior margin of mesopleuron and slightly curved backwards. Propodeal spiracle separated from pleural carina by almost one times its own maximum diameter. Propodeum almost entirely covered with weak irregular wrinkles, its carinae partly indistinct; area basalis substituted by a single, longitudinal carina; areola about as long as broad, pointed anteriorly, contiguous with area petiolaris posteriorly (Fig. 10).

Fore wing as in Fig. 9. Vein 2rs-m long, somewhat longer than abscissa of M between 2rs-m and 2m-cu. Metacarpus (R1) very short, ending just behind the distal end

of radial cell. Hind wing with nervellus (cu1&cu-a) intercepted in lower 0.45. Legs moderately slender. Fore tibia with long tooth on distal outer side. Hind tibia with two short spurs which are slightly curved at apex.

First metasomal tergite 1.8 times as long as posteriorly broad, with large glymma in basal half (Fig. 8); dorsally tergite 1 polished, finely striate in basal half. Second tergite distinctly transverse, 0.65 times as long as anteriorly broad. Tergites 2 to 6 dorsally highly polished and almost glabrous (with row of fine setae at hind margins), laterally tergites 2 and 3 with rather dense setae and following tergites laterally with sparse setae. Ovipositor slightly swollen before apex and tapered to a point posterior to swelling (Fig. 11); sheath as long as fore wing, or 3.0 times as long as hind tibia.

Head predominantly black; clypeus, face, frontal orbits (extending above to level of hind end of lateral ocelli) and lower third of gena yellow (Figs 4, 5, 7); median third of gena brownish. Mouthparts and mandible (except brownish black teeth) yellow. Antenna black, scape and pedicel ventrally brownish yellow. Mesosoma black; propleuron and front margin of pronotum dark brown (Fig. 8). Tegula yellow. Pterostigma brown with yellowish spot at base (Fig. 9). Fore leg with coxa and trochanters yellow (coxa slightly darkened at extreme base); femur, tibia and tarsus brownish yellow (femur apically yellowish). Mid leg predominantly brownish yellow with coxa extensively darkened with brown and tarsus infuscate. Hind leg with coxa almost entirely brownish black (except pale brown extreme apex), trochanters and femur brownish yellow with extensive dark brown markings on dorsal side, and tibia and tarsus more or less entirely brownish yellow. Tergite 1 black. Metasoma posterior to first tergite dorsally and laterally dark brown (anteriorly) to brown and yellow (posteriorly), ventrally and on hind margins of tergites yellow (Fig. 4). Ovipositor sheath dark brown basally to black apically.

Male. Unknown.

Etymology. The species is named in honour of the Canadian expert in Ichneumonidae, Andrew M.R. Bennett (CNC).

Material examined. *Holotype* female (UNAM), MEXICO, Tlaxcala, Nanacamilpa, Ejido Los Búfalos, 19°28'N, 98°35'W, bosque pino-encino (*Pinus* + *Quercus* forest), 2830–2900 m, Malaise trap, 4.IV–3.V.2016, coll. Y. Marquez & A. Contreras.

Distribution. Mexico (Tlaxcala).

Peucobius piceus Townes, 1971

Figs 2, 3

Remarks. The specimens from Utah were swept from *Pinus contorta* Douglas bearing staminate cones, and the specimens from California were probably swept from *Pinus monophylla* Torr. & Frém. (Townes 1971: 30).

Material examined. 1 female (CNC), USA, Colorado, Nederland, 8500 ft (= 2590 m), 18.VI.1961, coll. W.R.M. Mason (det. V. Vikberg, 2004).

Distribution. USA (California, Colorado, New Mexico, Utah).

***Peucobius shimizui* Khalaim, sp. nov.**

<https://zoobank.org/98ACA320-4515-4FAA-9419-B542B04C0154>

Figs 12–20

Remarks. The species was collected on *Pinus densiflora* in spring period together with a large quantity of individuals of *Gelanes* spp. (Tersilochinae).

Comparison. This species differs from the three Nearctic species in having a longer metacarpus (R1) of the fore wing (Fig. 18) (ending just behind the radial cell in all other species, see Figs 1, 2, 9).

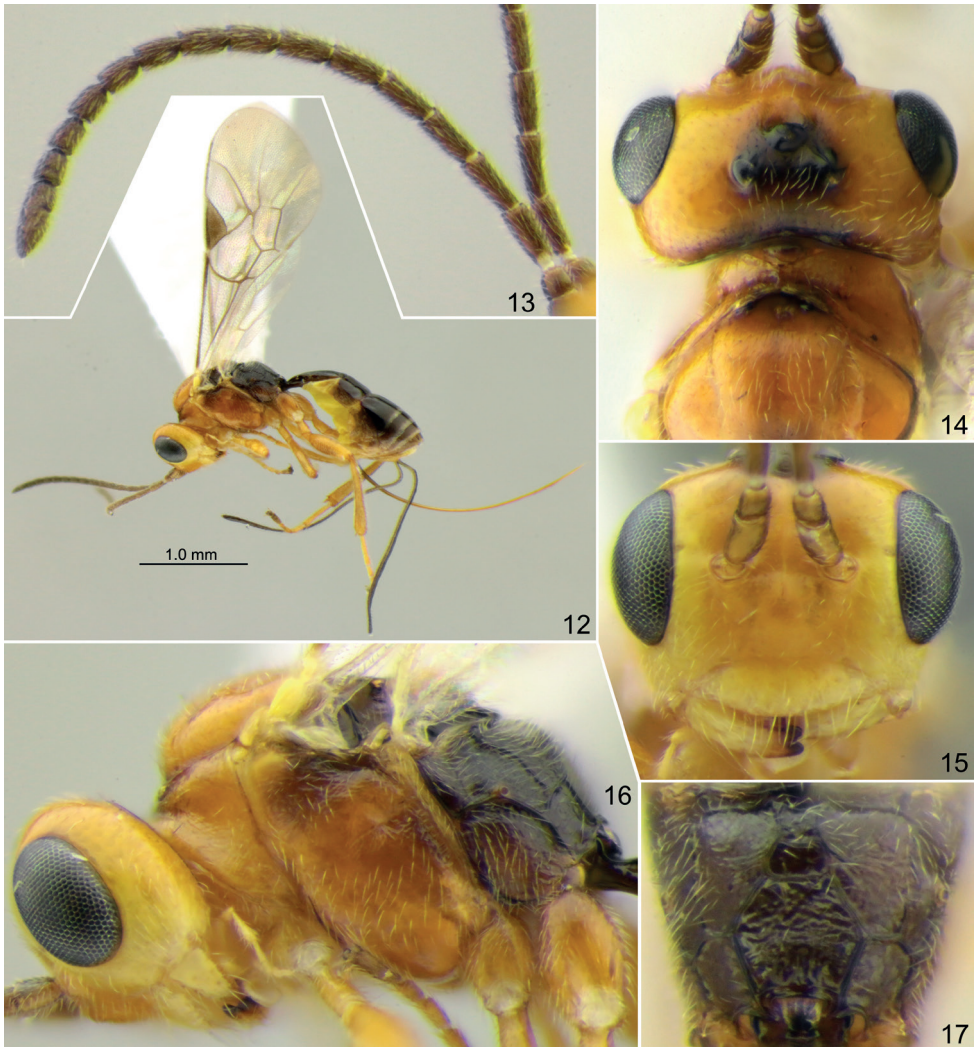
Description. Female. Body length 2.8 mm. Fore wing length 2.6 mm.

Head with gena strongly rounded posterior to eyes (Fig. 14); gena in dorsal view 0.65 times as long as eye width. Clypeus 3.3 times as broad as long (Fig. 15), very weakly convex, smooth, with fine punctures in upper 0.4, with a row of long fine setae on lower margin. Mouthparts short; maxillary palp with 5 palpomeres, palpomeres 4 and 5 short, distinctly shorter than palpomeres 2 and 3; labial palp with 4 short palpomeres. Mandible with lower tooth distinctly broader and somewhat longer than upper (Fig. 15); both teeth in holotype and paratype very obtuse (rounded apically), possibly abraded. Malar space as long as basal mandibular width, with broad scabrous area between eye and mandibular base. Flagellum with 15 flagellomeres, filiform; flagellomeres 2 to 4 about 2.6 times and subapical flagellomeres 1.1–1.3 times as long as broad. Face with weak median swelling and small median tubercle in upper part of this swelling, without longitudinal furrow; face with very fine punctures on smooth background, smooth and impunctate centrally on median swelling. Frons without ridge between antennal sockets, with very fine (partly indistinct) punctures on smooth background, laterally slightly scabrous. Vertex and gena polished, with very fine setiferous punctures. Occipital carina thin, complete, evenly convex mediodorsally.

Mesoscutum and scutellum subpolished, with very fine punctures. Notaulus present on anterolateral side of mesoscutum, weak, with more or less distinct longitudinal wrinkle. Mesopleuron scabrous, impunctate and dull in upper part; with fine punctures on more or less smooth background in lower part. Sternaulus absent. Epicnemial carina extending to about level of lower corner of pronotum, with upper end not reaching anterior margin of mesopleuron. Propodeal spiracle adjacent to pleural carina in holotype and separated from this carina by half diameter of spiracle in paratype. Propodeum scabrous, weakly shining; area basalis small, confluent with areola; areola separated posteriorly from area petiolaris by very weak wrinkle (Fig. 17).

Wings as in Fig. 18. Vein 2rs-m long, much longer than abscissa of M between 2rs-m and 2m-cu. Metacarpus (R1) short, projecting somewhat behind distal end of radial cell. Hind wing with nervellus (cu1&cu-a) intercepted in lower 0.35. Legs moderately slender. Fore tibia with distal outer end pointed (this tooth-like projection shorter than in *P. bennetti*). Hind tibia with two short straight spurs.

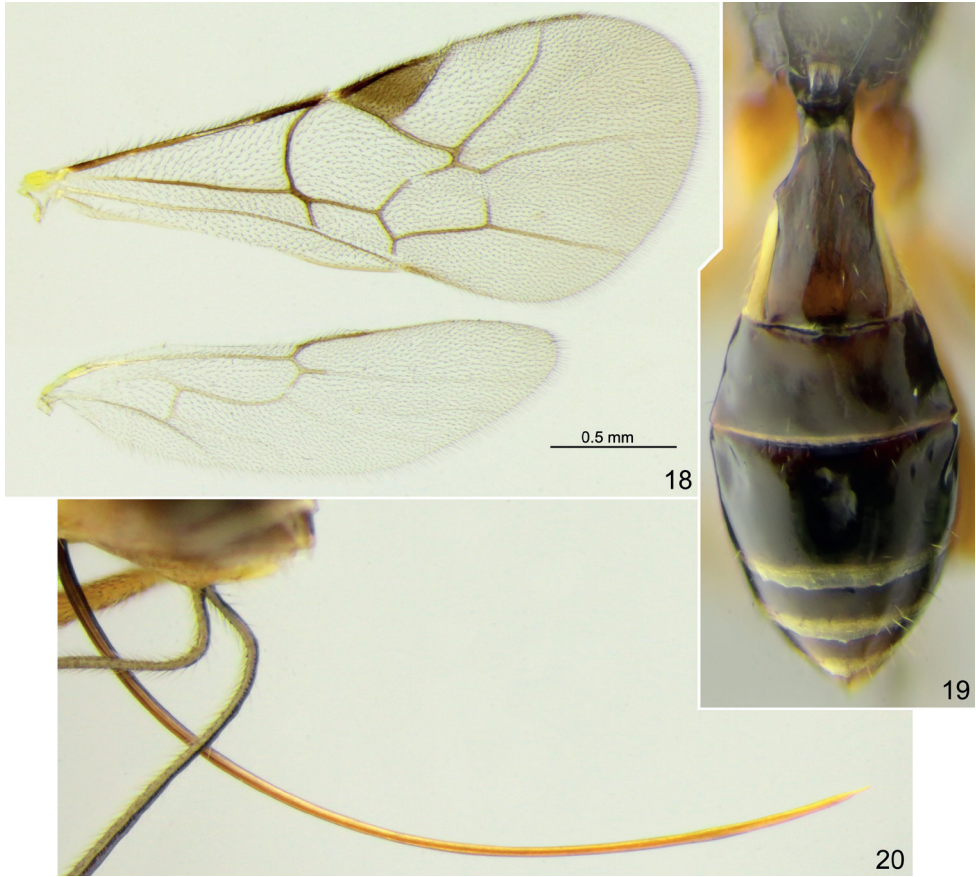
First metasomal tergite twice as long as posteriorly broad, with large glymma in basal half and spiracle in basal 0.4 (Fig. 19). Second tergite distinctly transverse, 0.7 times as long as anteriorly broad. All metasomal tergites dorsally polished and almost



Figures 12–17. *Peucobius shimizui* sp. nov., holotype (11, 13–15) and paratype (12, 16) females 12 habitus, lateral view 13 antenna 14 head, dorsal view 15 head, front view 16 head and mesosoma, lateral view 17 propodeum, dorsal view.

glabrous (with a row of fine setae at hind margins), tergite 2 and following tergites with setae laterally. Ovipositor slightly swollen before apex and tapered to a point posterior to swelling (Fig. 20); sheath 0.65–0.7 times as long as fore wing, or about 3.5 times as long as hind tibia.

Head predominantly yellow; face and frons medially, vertex and upper part of gena yellowish orange; intercellular area, vertex medially and upper part of occiput blackish (Figs 14, 15). Mouthparts and mandibles (except dark reddish-brown teeth) yellow. Antenna dark brown, scape and pedicel ventrally pale brown. Mesosoma



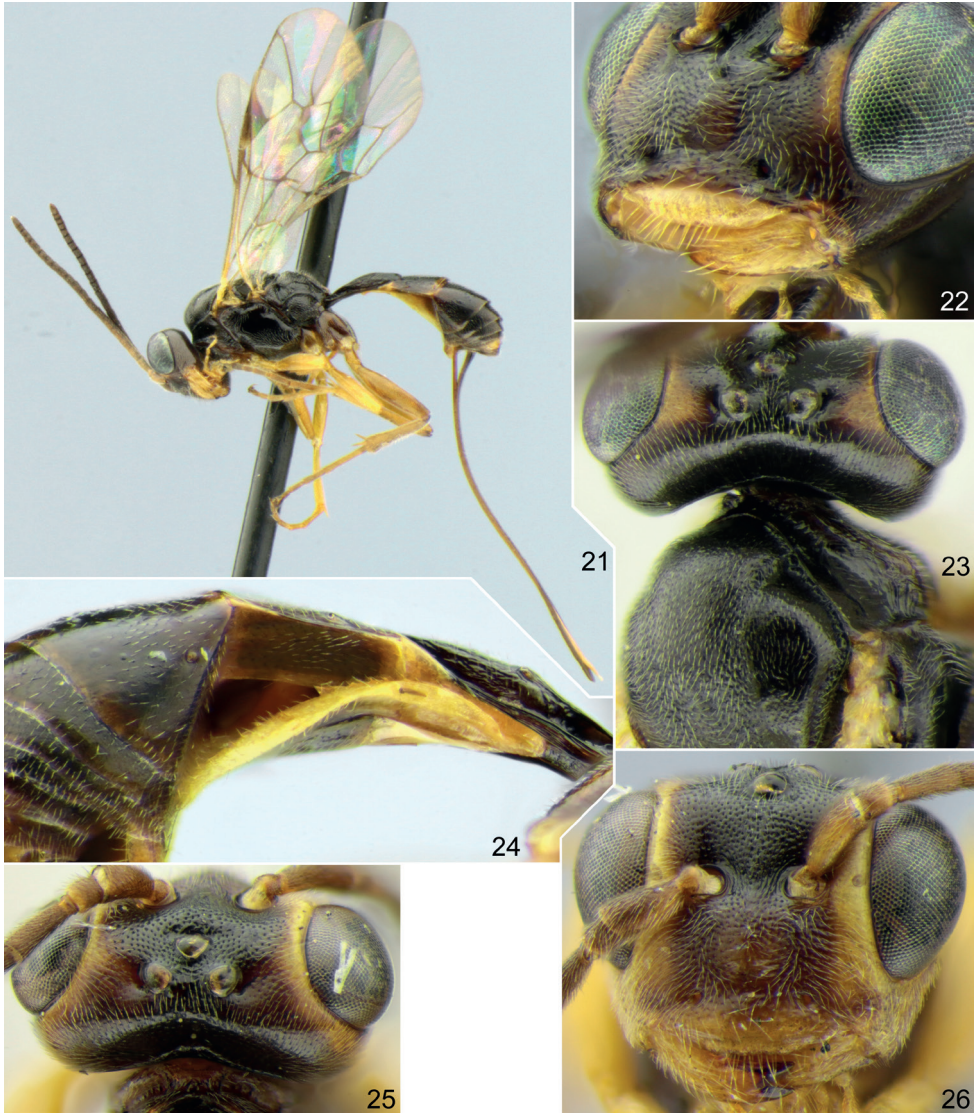
Figures 18–20. *Peucobius shimizui* sp. nov., holotype female **18** wings **19** metasoma, dorsal view **20** ovipositor, lateral view.

predominantly yellowish orange (Fig. 16); metanotum and propodeum dark reddish brown to black; scutellum laterally and metapleuron darkened with reddish brown; mesoscutum with more or less distinct reddish brown or dark brown marks anteriorly, centrally and posteriorly. Tegula yellow. Pterostigma pale brown (Fig. 18). Legs rather uniformly yellowish orange to brownish orange, hind coxa somewhat darker (with more intense brownish orange colouration). Tergite 1 dark brown. Metasoma posterior to first tergite dark brown dorsally, brown laterally and yellow ventrally; tergites with pale yellow bands on posterior margins dorsally, pale band very narrow on tergite 2 and broader on following tergites (Fig. 19). Ovipositor sheath blackish.

Male. Unknown.

Variation. The two specimens are almost identical in size, structure and colouration.

Etymology. The species is named in honour of the collector of the type material, Japanese expert in Ichneumonidae, So Shimizu (Kobe University, Japan).



Figures 21–26. *Lygurus marjoriae* (21–24) and *L. townesi* (25, 26), females **21** habitus, lateral view **22** lower part of head, antero-ventro-lateral view **23, 25** head, dorsal view **24** metasoma, lateral view **25** ovipositor, lateral view **26** head, front view.

Material examined. *Holotype* female (NIAES), JAPAN, Honshu I., Kantō Reg., Ibaraki Pref., Kasama City, Hizawa, 36°24'39.3"N, 140°15'6.8"E, ca. 90 m, sweeping on *Pinus densiflora*, 28.IV.2017, coll. So Shimizu.

Paratype. 1 female (NIAES), same data as holotype.

Distribution. Japan (Honshu I.).

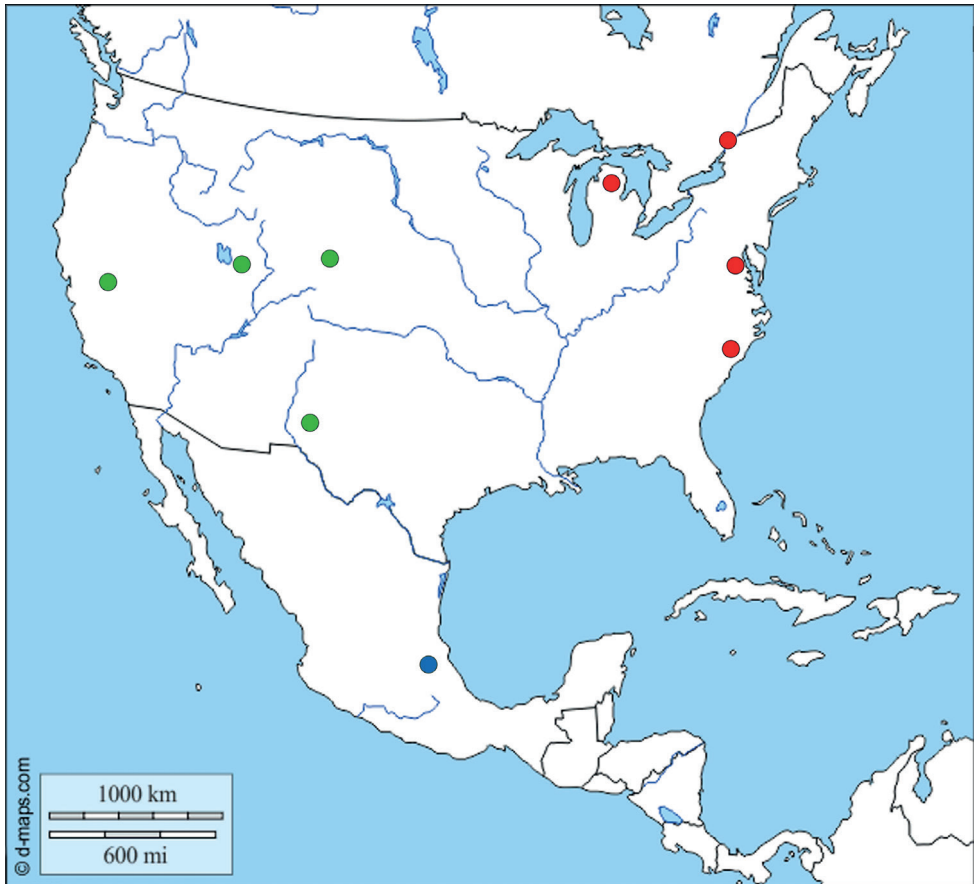


Figure 27. Distribution map of *P. fulvus* (red), *P. bennetti* sp. nov. (blue) and *P. piceus* (green) in North America.

Discussion

The two Nearctic species described by Townes were collected by sweeping branches of pines bearing staminate cones (Townes 1971: 29), and *P. bennetti* from Mexico was collected in pine-oak forest on the same dates and at the same locality as two other parasitoids, *Gelanes horstmanni* Khalaim (Tersilochinae) and *Idiogramma elbakyanae* Khalaim (Tryphoninae), were collected (Khalaim and Ruíz-Cancino 2017). The fourth species of the genus, *P. shimizui* from Japan, was also collected on *Pinus* in spring together with a large quantity of individuals of *Gelanes* spp. In the body habitus, yellow/orange and black colour pattern of the body, and possession of a long and thin ovipositor, *P. bennetti* and *P. shimizui* resemble species of *Gelanes* and *Idiogramma* very much.

There is no direct host record for any *Peucobius* species, but genera *Gelanes* Horstmann and *Idiogramma* Förster are typical parasitoids of xyelid sawfly larvae (Xyelidae) developing in staminate pine cones, and therefore we suggest that the genus *Peucobius*,

being frequently collected together with *Gelanes* and *Idiogramma* species on their host plants, and being morphologically very similar to these taxa, quite possibly parasitizes the same host.

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