

Description of Five New Species of Inquiline Oak Gall Wasps of the Genus *Synergus* Hartig (Hymenoptera, Cynipidae: Synergini) with Partially Smooth Mesopleurae From Mexico

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Irene Lobato-Vila and Juli Pujade-Villar (2017) Here we describe five new species of *Synergus* Hartig with partially smooth mesopleurae that were obtained from oak cynipid galls on different species of *Quercus* L. in Mexico: *Synergus cibriani* sp. nov., *Synergus gilletti* sp. nov., *Synergus longimalaris* sp. nov., *Synergus longiscapus* sp. nov. and *Synergus striatifrons* sp. nov. To date, this trait has been observed in at least 18 American species, 16 recorded in North America (United States of America) and only 2 in Central America (Panama): *Synergus elegans* Nieves-Aldrey and Medianero and *Synergus laticephalus* Nieves-Aldrey and Medianero. The type material and additional material of *Synergus punctatus* Gillette from the United States have been examined and compared with *S. gilletti* sp. nov. The type material and additional material of *S. elegans* from Panama and *Synergus citrifomis* (Ashmead) from the United States have also been examined and compared. This study records *Synergus elegans* in Mexico for the first time and classifies it as a syn. nov. of *S. citrifomis*. Descriptions and diagnoses for the new species and a key to their identification and differentiation from their closest related species are given. Their distribution and host associations are also commented on.

Key words: Hymenoptera, Cynipidae, *Synergus*, New species, Mexico.

BACKGROUND

Most of the approximately 1400 described species of Cynipidae are true gall wasps (Ronquist 1999). However, only about 180 species, classified into 10 genera, develop as inquilines inside galls of other cynipids (Pujade-Villar et al. 2003; Nieves-Aldrey and Medianero 2010; Péntzes et al. 2012; Bozsó et al. 2014 2015; Schwéger et al. 2015a b; Ronquist et al. 2015). Unlike true gall wasps, which can induce the formation of complex galls in different plants, inquilines are not capable of inducing galls by themselves but instead develop as guests inside galls of other cynipids (except for one species described by Abe et al. (2011) from Japan, *Synergus itoensis* Abe, Ide

and Wachi, which can induce galls on *Quercus* (*Cyclobalanopsis*) *glauca* Thunberg, and also for *Synergus hupingshanensis* Liu, Yang and Zhu, which was inferred to be a gall maker because no gall maker was reared from the galls it emerged from in *Castanopsis carlesii* (Hemsl.) Hayata, according to Liu et al. (2012)). Inquilinism is a form of kleptoparasitism, usually considered to represent a unilateral advantageous relationship that benefits only the inquilines (Askew 1984; Ronquist 1994 1999).

Until recently, all inquilines were included in the Synergini tribe. However, Ronquist et al. (2015) internally restructured the Cynipidae family, and three genera of inquilines (*Ceroptres*, *Periclistus* and *Synphromorpha*) were separated from the

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tribe Synergini to be included in new tribes: the tribe Ceroptresini, composed only by the genus *Ceroptres* Hartig, and the tribe Diastrophini, which includes the genera *Periclistus* Förster and *Synophromorpha* Ashmead. Now, the Synergini tribe only includes genera whose first metasomal segment is ring-shaped and usually carinated (*Agastoroxenia* Nieves-Aldrey and Medianero; *Lithosaphonecrus* Tang, Melika and Bozsó; *Rhoophilus* Mayr; *Saphonecrus* Dalla Torre and Kieffer; *Synophrus* Hartig; *Synergus* Hartig; *Ufo* Melika and Pujade-Villar). All the species included in this tribe are related to galls that develop on Fagaceae (except for *Rhoophilus loewi* Mayr), mainly on *Quercus* L.

The genus *Synergus* includes 117 species (Pénzes et al. 2012; Schwéger et al. 2015a; Pujade-Villar and Lobato-Vila 2016a b; Pujade-Villar et al. 2016): 47 recorded in the Palearctic region (30 from the Western Palearctic and 17 from the Eastern Palearctic), 56 in the Nearctic region and 14 in the Neotropical region. Neotropical species have been addressed by Ritchie and Shorthouse (1987), Díaz and Gallardo (1998), Nieves-Aldrey (2005) and Nieves-Aldrey and Medianero (2011); for its part, most species recorded in the Nearctic region are addressed by Gillette (1896), but also by Fullaway (1911), McCracken and Egbert (1922) and Burnett (1976).

Among all known species in the genus *Synergus*, only four have been recorded in Mexico (Weld 1930; Pujade-Villar et al. 2008; Pujade-Villar and Lobato-Vila 2016a b; Pujade-Villar et al. 2016): *Synergus filicornis* Cameron (= *Synergus furnessana* Weld), *Synergus mexicanus* Gillette (= *Synergus dugesi* Ashmead; = *Synergus brevis* (Weld)), *Synergus equihuai* Pujade-Villar and Lobato-Vila and *Synergus estradae* Pujade-Villar and Lobato-Vila. *Synergus filicornis* was obtained from galls of *Andricus furnessae* (Weld) collected at Terecuato (Michoacán); *S. mexicanus*, from tuberous galls of the genus *Andricus* Hartig from different Mexican locations (Ashmead 1899; Pujade-Villar and Melika 2005; Pujade-Villar et al. 2008; Pujade-Villar et al. 2015); *S. equihuai*, from inconspicuous oak galls inside *Q. rugosa* Née acorns collected from Tepoztlán (Morelos) and *S. estradae*, from tuberous galls collected from *Q. obtusata* Bonpl. near Oaxtepec (Morelos) (Pujade-Villar et al. 2016).

Morphological and phylogenetical analyses of species from the Palearctic support that *Synergus* is a monophyletic group (Ács et al. 2010; Schwéger et al. 2015a). Nevertheless, only

Western and Eastern Palearctic *Synergus* species were involved in the analyses, and many species from both Nearctic and Neotropical regions show important morphological differences with respect to the Palearctic ones. Thus, the global monophyly of *Synergus* should not yet be assumed.

It is suggested that *Synergus* species from America should be classified into three morphological groups: 1) species with radial cell open, like *S. mexicanus* (closed in most of currently known species), 2) species with mesopleurae totally striated (the most part of currently known species) and 3) species with the speculum smooth or with mesopleurae almost totally smooth (mesopleurae always striated, with striae extended into the speculum, in species from other biogeographical regions). Discrimination of species based on the sculpture of mesopleurae was first defined by Nieves-Aldrey and Medianero (2011), and the third group of species mentioned above is the subject of this study.

Until now, there were known only two species of *Synergus* from Central America with partially smooth mesopleurae: *Synergus elegans* Nieves-Aldrey and Medianero and *Synergus laticephalus* Nieves-Aldrey and Medianero, both recorded for the first and only time in Panama (Nieves-Aldrey and Medianero 2011), which have the speculum smooth. In North America, at least 16 species belong to this group, but only *Synergus punctatus* Gillette is morphologically closely related to one of the new Mexican species described here: *Synergus gilletti* sp. nov. In this study, we describe five new species with partially smooth mesopleurae obtained from oak cynipid galls from Mexico: *Synergus cibriani* sp. nov., *Synergus gilletti* sp. nov., *Synergus longimalaris* sp. nov., *Synergus longiscapus* sp. nov. and *Synergus striatifrons* sp. nov. All of them lack pronotal carinae (usually present in *Synergus* from the Palearctic area) and all except *S. gilletti* sp. nov. do not have frontal carinae (always present in *Synergus* in the Palearctic area according to Schwéger et al. (2015b), short in *S. deqingensis* Pujade-Villar, Wang and Chen from China, and absent in some American species). In addition, *S. elegans*, previously only recorded in Panama, becomes a syn. nov. of *Synergus citrifomis* (Ashmead) from the United States and is for the first time recorded in Mexico, thus increasing its known distribution range.

MATERIALS AND METHODS

Adults of the species addressed in the present study were obtained from galls developed on different species of *Quercus* from both *Lobatae* and *Quercus* sections: *Q. affinis* Scheidw., *Q. candicans* Née, *Q. castanea* Née, *Q. conzattii* Trel., *Q. crassipes* Humb. et Bonpl., *Q. eduardii* Trel. and *Q. emoryi* Torr. and *Q. mexicana* Humb. et Bonpl. (*Lobatae* Section); *Q. glabrescens* Benth., *Q. greggii* Trel., *Q. laeta* Liebm., *Q. microphylla* Née, *Q. obtusata* Humb. et Bonpl. and *Q. rugosa* Née (*Quercus* Section). Galls were preserved inside breeding-boxes under environmental conditions until the emergence of all adults.

The type material of *S. citriformis*, *S. punctatus* (both deposited in the NMNH, Washington D.C., USA) and *S. elegans* (deposited in the MNCNM, Madrid, Spain) was requested and studied. The type material of *S. citriformis* was requested because, after checking the pictures of this species deposited in the online database of Hymenopteran Holotypes (Smithsonian Institution), we noticed it has partially smooth mesopleurae and a very similar morphology to that of *S. elegans* (and the original description of *S. citriformis* was insufficient to decide if they were different species or not). The type material of *S. elegans* was requested to compare it with that of *S. citriformis*. Finally, the type material of *S. punctatus* was requested because, according to its original description and pictures from the online database Hymenopteran Holotypes, it is morphologically closely related to some of the specimens obtained from the Mexican galls studied here and it was difficult to decide if they were different species without comparing them. *Synergus laticephalus* was not requested because it has some morphological traits that clearly separate it from the rest of species addressed in this study; also, because the quality of its original description and pictures (Nieves-Aldrey and Medianero 2011) are good enough to be compared with the new material under study.

For morphological descriptions, it has been used the current terminology of morphological structures as given in the following studies: Liljeblad and Ronquist (1998) and Melika (2006) for adult morphological structures, Ronquist and Nordlander (1989) for forewing venation terminology and Harris (1979) for patterns of cuticular sculpture. The following are measurements and abbreviations used in this paper: F1-F12, the first and the following

flagellomeres; POL (post-ocellar distance), the distance between the inner margins of the posterior ocelli; OOL (ocellar-ocular distance), the distance from the outer margin of the lateral ocellus to the inner margin of the compound eye; LOL (lateral-ocular distance), the distance between lateral and frontal ocellus; transfacial line, distance between inner margins of compound eyes measured across toruli; width of radial cell, measured as the distance between the upper margin of the forewing and the Rs vein.

Electron microscope images of adults were taken using a Scanning Electron Microscope (FEI Quanta 200 ESEM) at Universitat de Barcelona (Barcelona, Spain); specimens of the new species were previously dissected and covered with gold, except for those of *S. cibriani* sp. nov. Finally, pictures of the head in frontal view of *S. gilletti* sp. nov. were taken by Roca-Cusachs using a Leica DFC450 digital microscope camera coupled to a Leica MZ160A binocular microscope.

Type material of the new species is deposited in the second author's collection (JP-V col. in UB, Universitat de Barcelona, Barcelona, Spain), in the National Museum of Natural History of the Smithsonian Institution (NMNH, Washington D.C., USA) and in the American Museum of Natural History (AMNH, New York, USA).

RESULTS

The species are given in alphabetical order.

Synergus cibriani Pujade-Villar and Lobato-Vila sp. nov.

(Fig. 1)

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Type material: Holotype ♀ deposited in JP-V col. (UB) with the following labels: 'MEX: P201, Los Desmontes (Parástaco, MICH), 19°26'44"N, 102°22'40"W, 1416 m' (white label), 'Ex. *Disholcaspis* sp., *Quercus* sp., (23.ii.2013) 12.iii.2013, E. Estrada and A. Equihua leg.' (white label), 'Holotype ♀ *Synergus cibriani* Pujade-Villar and Lobato-Vila, Lobato-Vila 2017 desig.' (red label). Paratypes (6 ♂ and 6 ♀): same data as the Holotype: 4 ♂ and 3 ♀; MEX: P232, Tlaxco-Ciénaga Larga Highway (km 38) (PUE), 19°51'12"N, 98°06'32"W, 1832 m, Ex. *Disholcaspis* sp., *Quercus* sp. (25.vi.2016) vii.2016, JP-V leg.: 2 ♂ and 3 ♀.

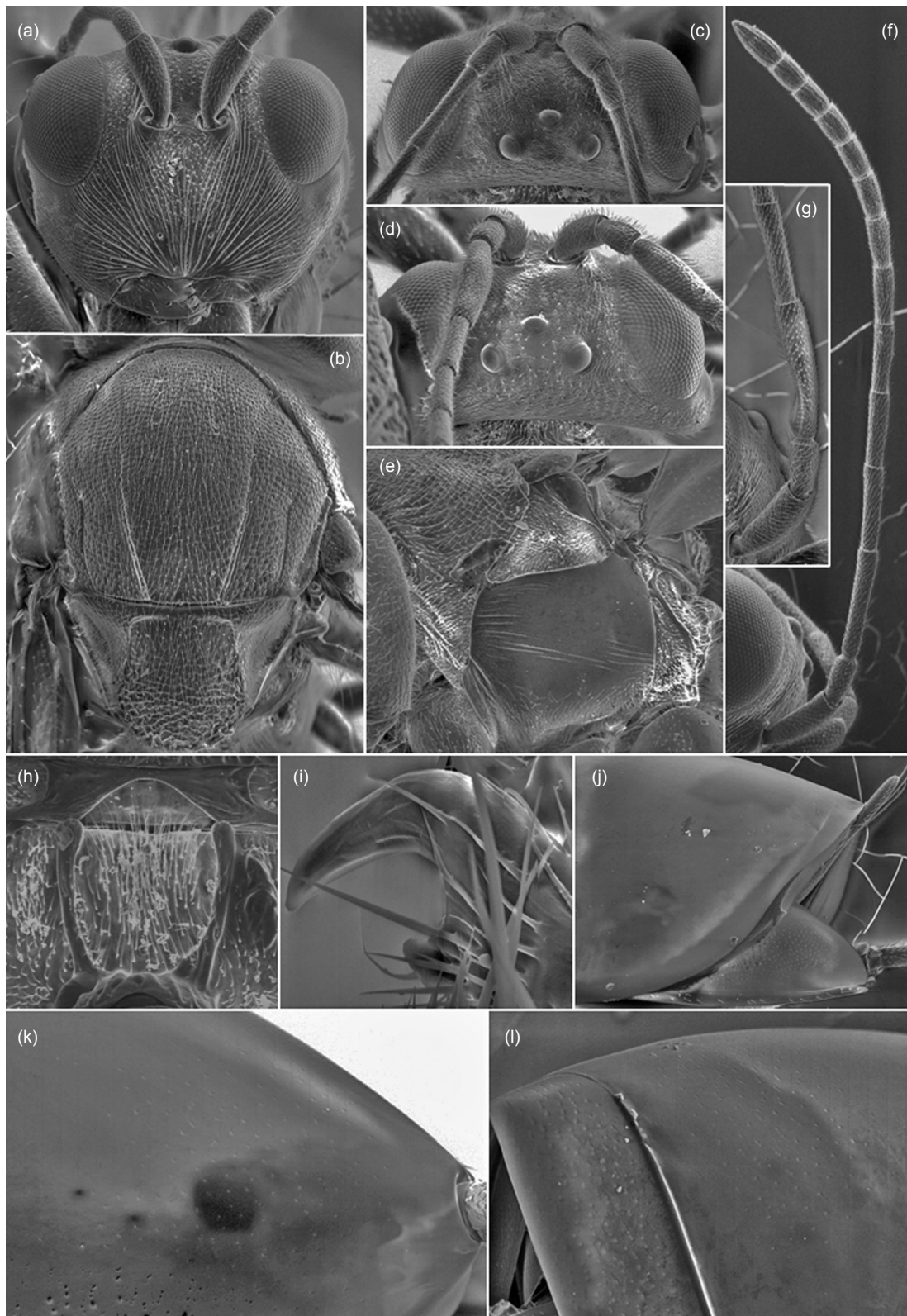


Fig. 1. *Synergus cibriani* Pujade-Villar and Lobato-Vila sp. nov.: (a) Female head in frontal view, (b) mesosoma in dorsal view, (c) female head in dorsal view, (d) male head in dorsal view, (e) mesosoma in lateral view, (f) female antenna, (g) first segments of male antenna, (h) propodeum, (i) tarsal claw, (j) female metasoma in lateral view, (k) detail of the metasomal micropunctures (female), (l) detail of the metasomal micropunctures (male).

Additional material: MEX: P243, Ejido Santa María Nativitas (Texcoco, EDO. MÉX), 19°27'41.3"N, 98°47'22.2"W, 2703 m, Ex. undetermined gall, *Q. glabrescens*, (27.i.2015) 19.ii.2015, A. Equihua and E. Estrada: 3 ♂ and 4 ♀.

Etymology: Named in honor of Dr. David Cibrián Tovar (Universidad Autónoma Chapingo, Mexico), who collected galls from Mexico for our studies.

Diagnosis: This species is morphologically related to *S. citriformis* (Ashmead) (= *S. elegans* Nieves-Aldrey and Medianero syn. nov.) and *S. laticephalus* Nieves-Aldrey and Medianero. The new species differs from *S. laticephalus* by the width of the head in dorsal view, which is much shorter (2.7 times wider than long in *S. laticephalus*); also, by the presence of metasomal micropunctures (no micropunctures in *S. laticephalus*) and the absence of rugae in the scutellum (with some transverse rugae in *S. laticephalus*). *Synergus cibriani* sp. nov. mainly differs from *S. citriformis* by having the malar space about 0.8 times as long as the height of the compound eye (0.6 in *S. citriformis*), frons and vertex with some scattered little punctures (no punctures in *S. citriformis*), metasomal syntergite with a posterodorsal patch of micropunctures (no micropunctures in *S. citriformis*), and F1 of males slightly expanded basally and straight apically (slightly expanded apically in *S. citriformis*).

Female

Length: Body length 3.0-3.4 mm ($n = 4$).

Color: Head yellowish to brown; frons and vertex medially black, chestnut laterally; occiput black; antennae yellowish to brown; mesosoma generally black, tegulae pale yellow; metasoma black dorsally, light chestnut basally; legs yellow, the base of metacoxae with a more or less extended brownish to blackish coloration; wings hyaline, veins light brown to yellow.

Head: in frontal view (Fig. 1a) more or less quadrangular, about 1.2 times wider than high, genae slightly expanded behind compound eye. Face faintly pubescent, lower face and genae with thin, dense and regular striae irradiating from clypeus and reaching basal margin of compound eye and basal margin of antennal toruli; medial carina inconspicuous. Clypeus indistinct, ventral margin not projected over mandibles. Malar space about 0.8 times as long as the height of the compound eye (4.2:5). Anterior tentorial pits

visible; pleurostomal and epistomal sulcus absent. Transfacial line longer than the height of the compound eye (1.3). Toruli situated mid-height of the compound eye; distance between torulus and compound eye as long as the diameter of toruli; distance between toruli shorter than the diameter of toruli. Frons finely coriaceous to reticulated with some scattered little punctures; frontal carinae absent. Head in dorsal view (Fig. 1c) is about two times wider than long. Vertex finely coriaceous with some scattered and little piliferous punctures between the ocelli. POL:OOL:LOL = 2.4:1.6:1.2; OOL about 1.5 times longer than the diameter of lateral ocellus. Occiput coriaceous, with some scattered piliferous punctures.

Antennae (Fig. 1f): 14-segmented (2.7: 1.3: 3.4: 2.6: 2.4: 2.2: 1.9: 1.6: 1.3: 1.2: 1.1: 0.9: 0.9: 1.7); filiform not broadened apically; pubescence dense and short; placodeal sensilla little visible on flagellar segments F3-F12. Pedicel about 2.2 times longer than wide; F1 1.3 times longer than F2, F2 slightly longer than F3. Last flagellar segment 2.8 times longer than wide and 1.9 times longer than F11.

Mesosoma: Slightly longer than high in lateral view (including nucha), with short and not dense pubescence (Fig. 1e). Ratio of length of pronotum medially/laterally: 0.26. Pronotal plate absent. Lateral pronotum sculpture coriaceous to imbricated; lateral margins of pronotum rounded, without lateral carina. Mesoscutum (Fig. 1b) about as long as wide, strongly coriaceous to imbricated; anterior grooves weak, occupying about 1/4 of mesoscutum length. Notauli complete but faint in the anterior 1/3, wider and convergent posteriorly. Median groove weakly impressed, almost inconspicuous. Parapsidal grooves visible, reaching the anterior margin of tegulae. Scutellum (Fig. 1b) rounded, as long as wide, coriaceous anteriorly, imbricate posteriorly; circumscutellar carina visible but not projected; scutellar foveae inconspicuous. Mesopleurae (Fig. 1e) with a few transversal striae located medially and anteriorly, smooth dorsally and basally, speculum also smooth; interspaces alutaceous, little pubescent basally. Metapleural sulcus well defined, reaching about 3/4 parts of mesopleurae height. Propodeum (Fig. 1h) pubescent and with a weak sculpture; propodeal carinae slightly curved and convergent basally, central area with a weak sculpture and pubescent. Nucha sulcated dorsally and laterally.

Legs (Fig. 1i): Tarsal claws with a small basal tooth.

Wings: Forewings pubescent with short

marginal setae, about as long as mesosoma plus metasoma. Radial cell closed, 2.4 times longer than wide; areolet absent. Rs + M inconspicuous, not reaching basal vein. Basal cell faintly pubescent.

Metasoma: About as long as head plus mesosoma, longer than high in lateral view. First metasomal segment sulcated dorsally and laterally. Syntergite smooth, anterolateral pubescence composed of a group of 4-5 setae, with a few weak micropunctures forming a posterodorsal patch; not incised dorso-distally (Figs. 1j, k). Following segments and hypopygium clearly punctured. Hypopygial spine about as long as wide and with a few lateral setae; without apical setae.

Male

Similar to female, except for the morphological traits that follow: body length 2.9-3.1 mm ($n = 4$). POL:OOL:LOL = 2.5: 1.6: 1.4 (Fig. 1d). Antennae 15-segmented (2.4: 1.3: 3.7: 2.7: 2.5: 2.2: 2.0: 1.8: 1.6: 1.4: 1.3: 1.2: 1.1: 1.0: 1.4); F1 slightly curved, medial excavation weak, slightly expanded basally, almost straight apically (Fig. 1g). Syntergite punctuation slightly extended laterally but not forming a complete band (Fig. 1l).

Distribution: State of Michoacán (Mexico).

Biology: The studied material was obtained from soft galls developed on some undetermined species of *Quercus* and from *Q. glabrescens* Benth. (*Quercus* section), related to the genera *Disholcaspis* and to one undetermined gall, respectively.

Synergus citrifformis (Ashmead, 1885)

Ceroptres citrifformis Ashmead, 1885. Trans. Amer. Ent. Soc., 12: 300

Synergus citrifformis (Ashmead) Weld, 1922. Proc. U. S. Nat. Mus., 61 (18): 26

Synergus elegans Nieves-Aldrey and Medianero, 2011. Zootaxa, 2774: 4 syn. nov.

Type material of *Ceroptres citrifformis* Ashmead, 1885 (examined): Lectotype ♀ deposited in the NMNH (Washington D.C., USA) with the following labels: 'Jacksnville, Fla' (white label) / 'Type No 14538 U.S.N.M.' (red label) / 'Collection Ashmead' (white label) / 'Synergus citrifformis ♀ Ashmead, Type' (white label, handwritten) / 'USNMENT 00779983' (white label, QR code) / 'Lectotype ♀ *Ceroptres citrifformis* Ashmead, 1885 IL-V desig-2017 (red label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 (= *S. elegans*)

IL-V det. 2017' (white label). Paralectotypes (1 ♂ and 3 ♀) deposited in the NMNH (Washington D.C., USA) with the following labels: 'Jacksnville, Fla' (white label) / 'Paratype No 14538 U.S.N.M.' (red label) / 'Collection Ashmead' (white label) / 'Paralectotype ♀ *Ceroptres citrifformis* Ashmead, 1885 IL-V desig-2017' (red label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 (= *S. elegans*) IL-V det. 2017' (white label) (2 ♀); 'Jacksnville, Fla' (white label) / 'Collection Ashmead' (white label) / 'Synergus (*Ceroptres*) citrifformis Ashm.' (white label, handwritten) / 'Paralectotype ♀ *Ceroptres citrifformis* Ashmead, 1885 IL-V desig-2017' (red label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 (= *S. elegans*) IL-V det. 2017' (white label) (1 ♀); 'Jacksnville, Fla' (white label) / 'Collection Ashmead' (white label) / 'Paralectotype ♂ *Ceroptres citrifformis* Ashmead, 1885 IL-V desig-2017' (red label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 (= *S. elegans*) IL-V det. 2017' (white label) (1 ♂).

Type material of *Synergus elegans* Nieves-Aldrey and Medianero, 2011 (examined): Paratypes (2 ♀) deposited in the MNCNM (Madrid, Spain) with the following labels: 'PANAMÁ, Prov. Chiriquí Boquete, El Salto, 1431 m, 8°47'32.8"N, 82°27'37.9"W, Quercus salicifolia S-ex-A1, 7-V-2008, E. Medianero leg.' (white label) / 'CYNIPIDAE *Synergus elegans* sp. nov., Nieves-Aldrey and Medianero det.' (white label) / 'Paratipo' (red label) / 'MNCN Cat. Tipos N° 2095' (red label) / 'MNCN_Ent N° Cat. 67238' (white label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 det. Lobato-Vila 2017' (1 ♀); 'PANAMÁ, Prov. Chiriquí Boquete, El Salto, 1431 m, 8°47'32.8"N, 82°27'37.9"W, Quercus salicifolia S-ex-A1, 7-V-2008, E. Medianero leg.' (white label) / 'CYNIPIDAE *Synergus elegans* sp. nov., Nieves-Aldrey and Medianero det.' (white label) / 'Paratipo' (red label) / 'MNCN Cat. Tipos N° 2095' (red label) / 'MNCN_Ent N° Cat. 67240' (white label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 det. Lobato-Vila 2017' (1 ♀).

Additional material: Non-type material of *Synergus elegans* (1 ♀) deposited in the MNCNM (Madrid, Spain) with the following labels (examined): 'PANAMÁ, Prov. Chiriquí Renacimiento, 1270 m, 8°49'58.7"N, 82°44'44.5"W, Quercus lancifolia S-ex-A55, 22-I-2009, E. Medianero leg.' (white label) / 'CYNIPIDAE *Synergus elegans* sp. nov., Nieves-Aldrey and Medianero det.' (white label) / 'MNCN_Ent N° Cat. 67515' (white label) / '*Synergus citrifformis* (Ashmead) Weld, 1922 det.

Lobato-Vila 2017'. New material from Mexico (147 ♂ and 236 ♀) obtained from the following localities: AGUASCALIENTES: MEX: P155, A. N. Protegida Los Alamitos (San José de Gracia, AGS), 22°10'26.4"N, 102°35'11.9"W, 2598 m, Ex. *Amphibolips hidalgoensis*, *Q. microphylla*, (01.iii.2012) 20.iii.2012, E. Estrada and A. Equihua leg.: 1 ♀. FEDERAL DISTRICT: MEX: P228, Santa Fe (D.F.), 19°21'14"N, 99°16'24.22"W, 2569, Ex. *Andricus protuberans*, *Q. laeta*, (21.vi.2013) ix.2013, JP-V leg.: 4 ♂ and 3 ♀; MEX: P224, Santa Fe (D.F.), 19°21'14"N, 99°16'24.22"W, 2569, Ex. *Amphibolips* sp., *Q. crassipes*, (21.vi.2013) 1-10. xii.2013, JP-V leg.: 1 ♂ and 7 ♀. GUANAJUATO: MEX: P012, Sierra de Santa Rosa (Santa Rosa de Lima, GTO), 21°07'44.1"N, 101°13'02.0"W, 2559 m, Ex. *Disholcaspis* sp., *Q. castanea*, (31.v.2012) 12.vii.2012, E. Estrada and A. Equihua leg.: 2 ♂. HIDALGO: MEX: 296, Barrio Tlacpac (Acaxochitlán, HGO), 20°09'16.4"N, 98°12'25.5"W, 2321 m, Ex. *Amphibolips hidalgoensis*, *Q. rugosa*, (08.vi.2010) 13.vii.2010, E. Estrada and A. Equihua leg.: 7 ♂ and 4 ♀; MEX: 290, El Arenal (Acaxochitlán, HGO), 20°13'29.9"N, 98°54'25.0"W, 2210 m, Ex. *Amphibolips hidalgoensis*, *Q. rugosa*, (10.vi.2010) 23.vi.2010, E. Estrada and A. Equihua leg.: 3 ♂; MEX: 293, Huasca (HGO), 20°12'05.3"N, 98°35'16.6"W, 2181 m, Ex. *Amphibolips hidalgoensis*, *Q. candicans*, (08.vi.2010) 15-30.vi.2010, JP-V leg.: 2 ♂; MEX: 283, Los Romeros (Santiago de Tulantepec de Lugo Guerrero, HGO), 20°01'45.9"N, 98°24'50.1"W, 2411 m, Ex. *Amphibolips hidalgoensis*, *Q. mexicana*, (03.vi.2010) 17.vii.2010, E. Estrada and A. Equihua leg.: 4 ♂ and 16 ♀; MEX: P050, Santiago de Tulantepec de Lugo Guerrero (HGO), 20°05'07.8"N, 98°17'50.0"W, 2510 m, Ex. *Andricus* nr *protuberans*, *Q. greggii*, (03.vi.2010) 23.vi.2010, E. Estrada and A. Equihua leg.: 3 ♂ and 11 ♀; MEX: 2784 (UACH Col.), Acaxochitlán (HGO), 20°10'17.59"N, 98°10'58.59"W, 2154 m, Ex. *Amphibolips damphi*, *Q. affinis*, (19.iii.2014) v.2014, D. Cibrián leg.: 1 ♂ and 6 ♀. MICHOACÁN: MEX: P203, Near Amealco (MICH), 20°10'30"N, 100°13'52"W, 2620m, Ex. Undetermined gall, *Q. mexicana*, (14.ii.2013) 05.iii-01.iv.2013, E. Estrada and A. Equihua leg.: 3 ♂ and 7 ♀; MEX: P205, Los Desmontes (Parástaco, MICH), 19°26'44"N, 102°22'40"W, 1.416 m, Ex. *Disholcaspis* sp., *Quercus* sp., (23.ii.2013) 03.iv-01.v.2013, E. Estrada and A. Equihua leg.: 1 ♂ and 1 ♀. MORELOS: MEX: 278, Felipe Neri (Tlalnepantla, MOR), 19°02'11.2"N, 98°56'38.8"W, 2512 m, Ex. *Amphibolips* sp., *Q. rugosa*, (29.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 13 ♀; MEX: P008, Tepoztlán (Tepoztlán, MOR), 18°59'04.2"N, 99°05'35.8"W, 2099 m, Ex. *Disholcaspis* sp., *Q. rugosa*, (29.v.2012) 12.vi.2012, E. Estrada and A. Equihua leg.: 1 ♂ and 2 ♀; MEX: P019, Tepoztlán (Tepoztlán, MOR), 18°59'04.2"N, 99°05'35.8"W, 2099 m, Ex. *Disholcaspis* nr *taumalipensis*, *Q. mexicana*, (20.iv.2012) 12.vi.2012, E. Estrada and A. Equihua leg.: 3 ♂ and 2 ♀. PUEBLA: MEX: 165, Ometépetl (Tetela de Ocampo, PUE), 19°50'16.2"N, 97°43'22.9"W, 1687 m, Ex. *Amphibolips* nr *nevadensis*, *Quercus* sp., (29.iv.2013) v.2013 (Alondra leg.): 1 ♂ and 3 ♀. STATE OF MEXICO: MEX: P120, Ixtapaluca (EDO. MÉX), 19°19'07"N, 98°52'56"W, Ex. *Amphibolips* sp., *Quercus* sp., (30.v.2012) vi.2012, E. Estrada and A. Equihua leg.: 4 ♀; MEX: 274, P. N. Zoquiapan y Anexas (Ixtapaluca, EDO. MÉX), 19°20'06.8"N, 98°41'30.6"W, 3046 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (30.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 41 ♂ and 39 ♀; MEX: 275, P. N. Zoquiapan y Anexas (Ixtapaluca, EDO. MÉX), 19°20'06.8"N, 98°41'30.6"W, 3046 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (30.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 3 ♂ and 5 ♀; MEX: 276, P. N. Zoquiapan y Anexas (Ixtapaluca, EDO. MÉX), 19°20'06.8"N, 98°41'30.6"W, 3046 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (30.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 1 ♂; MEX: 280, P. N. Zoquiapan y Anexas (Ixtapaluca, EDO. MÉX), 19°20'06.8"N, 98°41'30.6"W, 3046 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (30.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 47 ♂ and 64 ♀; MEX: 281, P. N. Zoquiapan y Anexas (Ixtapaluca, EDO. MÉX), 19°20'06.8"N, 98°41'30.6"W, 3046 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (30.v.2012) viii.2012, E. Estrada and A. Equihua leg.: 5 ♂ and 12 ♀; MEX: 196, Plateros-Arenales (San Felipe del Progreso, EDO. MÉX), 19°42'46.8"N, 99°57'05.6"W, 2576 m, Ex. *Andricus* group *tectucnarum*, *Q. candicans*, (05.ii.2014) 16.ii.2014, Delia leg.: 2 ♀; MEX: 235, Plateros-Arenales (San Felipe del Progreso, EDO. MÉX), 19°42'46.8"N, 99°57'05.6"W, 2576 m, Ex. *Dros* nr *picatum*, *Q. laeta*, (18.i.2014) 05.ii.2014, Delia leg.: 1 ♀; MEX: 255, San Juan Coajomulco (EDO. MÉX), 19°45'17.9"N, 99°58'10.2", 2655 m, W, Ex. *Andricus* group *georgei*, *Q. obtusata*, (18.i.2014) 16.ii-2.iv.2014, Delia leg.: 1 ♂ and 7 ♀. TLAXCALA: MEX: 291, San Marcos (Papalotla de Xicohténcatl, TLAX), 19°19'55.4"N, 98°18'13.4"W, 2342 m, Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (03.vi.2010) 04.vii.2010, E. Estrada

and A. Equihua leg.: 3 ♂ and 7 ♀; MEX: P079, San Marcos (Papalotla de Xicohténcatl, TLAX), 19°19'55.4"N, 98°18'13.4"W, 2342 m, Ex. *Amphibolips* sp., *Q. crassipes*, (03.vi.2010) 05.ix.2010, E. Estrada and A. Equihua leg.: 6 ♀; MEX: P083, San Marcos (Papalotla de Xicohténcatl, TLAX), 19°19'55.4"N, 98°18'13.4"W, 2342 m, Ex. *Amphibolips* sp., *Q. crassipes*, (03.vi.2010) 12.vii.2010, E. Estrada and A. Equihua leg.: 2 ♂ and 5 ♀; MEX: P091, San Marcos (Papalotla de Xicohténcatl, TLAX), 19°19'55.4"N, 98°18'13.4"W, 2342 m, Ex. *Amphibolips* sp., *Q. crassipes*, (03.vi.2010) 12.vii.2010, E. Estrada and A. Equihua leg.: 1 ♀; MEX: P167, Calpulalpan-Tlaxcala Federal Highway (Calpulalpan, TLAX), 19°35'24.6"N, 98°33'24.1"W, 2572 m, Ex. *Andricus* group *georgei*, *Q. microphylla*, (31.viii.2012) 10.ix.2012, A. Equihua and E. Estrada: 1 ♀; MEX: P077, San Diego Recoba (Hueyotlipan, TLAX), 19°29'05.1"N, 98°22'24.7"W, 2632 m, Ex. Undetermined gall, *Q. crassipes*, (03.vi.2010) 15.vi.2010, E. Estrada and A. Equihua leg.: 1 ♂. VERACRUZ: MEX: P180, Perote-Puebla Federal Highway (VER), 19°32'30"N, 97°16'23"W, 2410 m, Ex. *Antron* sp., *Quercus* sp. (31.viii.2012) 10.ix.2012, E. Estrada and A. Equihua leg.: 1 ♀. ZACATECAS: MEX: 285, Las Guacamayas (Monte Escobedo, ZAC), 21°42'21"N 103°02'39"W, 1631 m, Ex. *Amphibolips zacatequensis*, *Q. eduardii*, (25.v.2012) Before x.2012, JP-V leg.: 1 ♂; MEX: 277, Monte Escobedo (ZAC), 22°25'06.32"N, 103°28'38.82"W, 2031 m, Ex. *Amphibolips zacatequensis*, *Q. eduardii*, (31.v.2012) vi.2012, C. Carrillo leg.: 2 ♀; MEX: P065, Monte Escobedo (ZAC), 22°25'06.32"N, 103°28'38.82"W, 2031 m, Ex. *Amphibolips* sp., *Q. eduardii*, (31.v.2010) vi.2010, C. Carrillo leg.: 1 ♀; MEX: 020, Sierra de Nochistlán (Jérez, ZAC), 21°20'19.3"N, 102°58'50.2"W, Ex. Undetermined gall, *Q. eduardii*, (10.ii.2011) 16.ii.2011, A. Equihua and E. Estrada leg.: 2 ♀; MEX: P123, La Cuchilla (Concepción del Oro, ZAC), 24°37'00.3"N, 101°24'48.8"W, 2048 m, Ex. *Amphibolips* sp., *Q. conzattii*, (25.05.2012) 13.vii.2012, E. Estrada and A. Equihua leg.: 1 ♂.

Comments: According to Ashmead (1885: 300), this species was described based on numerous specimens. We studied 4 females and 1 male deposited in the NMNH from Ashmead's collection, of which 1 ♂ and 1 ♀ have identical labels to Lectotype's but the 'type' label is missing. So, we assume these two specimens also belong to the typical series. Based on the original description, there are probably more paralectotypes in Ashmead's collection without a

'type' label.

Synergus citriformis and *S. elegans* have the head finely reticulated, without frontal carinae and 2.0 wider than long from the dorsal view; antennae 14-segmented and F1 1.3 times longer than F2; mesoscutum and scutellum finely coriaceous to imbricated, notauli inconspicuous in the anterior 1/3, mesopleurae partially smooth (the horizontal sculpture not extended into the speculum), scutellum laterally and postero-dorsally margined (circumscutellar carina clearly visible) and scutellar foveae inconspicuous or absent; metasoma not incised dorso-distally and no micropunctured (or at least with some scarce and inconspicuous posterodorsal micropunctures in some specimens). Since the rest of morphological traits are coincident and that *S. citriformis* was described from numerous specimens bred from a gall related to *Amphibolips* sp. (Ashmead 1885) like most of *S. elegans*, we conclude these are the same species. So, we propose *S. elegans* as syn. nov. of *S. citriformis*.

The type material of *S. citriformis* from the USA and some specimens from Mexico show a lighter body tonality than thus of *S. elegans*. Moreover, some of the Mexican specimens show morphological variations related to the ratio of F1/F2 (F1 usually 1.3 times longer than F2 in this species; ratio longer in some specimens) and the length of POL and OOL (POL usually 1.5 times longer than OOL in this species; POL 1.1 times longer in some specimens). However, since these subtle variations are already contemplated in the original description of *S. elegans* (Nieves-Aldrey and Medianero 2011), we don't doubt they are the same species.

According to Nieves-Aldrey and Medianero (2011), *S. citriformis* (= *S. elegans*) and *S. laticephalus* form a distinctive group mainly characterized by having partially smooth mesopleurae (with striae not extended into the speculum), absence of frontal carinae, scutellum laterally and postero-dorsally margined, mesoscutum finely coriaceous to alutaceous or finely imbricate, and metasoma not dorso-distally incised and not micropunctured. All Mexican species described here which are related to these species have a posterodorsal patch of micropunctures in the metasomal syntergite (see also the diagnosis of the new Mexican species).

Distribution: This is the first record of this species in Mexico. This species was previously only known from Panama (Nieves-Aldrey and Medianero 2011) and Florida, USA (Ashmead

1885; Péntzes et al. 2012). The new material presented here was collected from different states of Mexico (Aguascalientes, Federal District, Guanajuato, Hidalgo, Michoacán, Morelos, Puebla, State of Mexico, Tlaxcala, Veracruz and Zacatecas).

Biology: The original material described by Ashmead (1885) was bred from a gall related to *Amphibolips citrifomis* Ashmead. The Panamanian specimens studied by Nieves-Aldrey and Medianero (2011) were obtained from a wide variety of cynipid galls from different genera, being very common in galls of the Panamanian species of *Amphibolips* and frequent in galls of species of *Disholcaspis*, *Cynips* and other cynipid genera on different species of *Quercus* both from *Quercus* and *Lobatae* sections (Nieves-Aldrey and Medianero 2011). The studied material from Mexico presented here was also obtained from a wide variety of cynipid galls, including *Amphibolips*, *Disholcaspis*, *Andricus*, *Dros* and *Antron*'s galls. These galls were also collected from different species of *Quercus* belonging to both *Quercus* and *Lobatae* sections.

***Synergus gilletti* Pujade-Villar and Lobato-Vila
sp. nov.**

(Figs. 2, 3, 8b)

urn:lsid:zoobank.org:act:407A7BC3-CBF9-485B-86B1-0472D7C442CD

Type material: Holotype ♀ deposited in JP-V col. (UB) with the following labels: 'MEX: 101, Charco de la Rana (ZAC), 24°14'23.6"N, 103°25'08.4"W, 1960 m' (white label); 'Ex. *Andricus* sp., *Q. laeta*, (19.xii.11) 28.i.12, O. Cabral, R. Treto, L.G. Landa and C. Carrillo leg.' (white label); 'Holotype ♀ *Synergus gilletti* Pujade-Villar and Lobato-Vila, Lobato-Vila 2017 desig.' (red label). Paratypes (35 ♂ and 8 ♀): same data as the Holotype: 1 ♂; MEX: 068, Sierra el Alicante (Monte Escobedo, ZAC), 22°30'41.6"N, 103°21'57.2"W, 2360 m, Ex. *Atrusca* sp., *Q. laeta*, (19.x.2011) xi.2011, O. Cabral, R. Treto, L.G. Landa and C. Carrillo leg.: 34 ♂ and 8 ♀ (5 ♂ and 1 ♀ deposited in the NMNH; 5 ♂ and 1 ♀ deposited in the AMNH).

Additional material: 3 ♂ and 3 ♀ with the same data as MEX: 068 dissected and covered with gold; MEX: 112, La Cumbre (ZAC), 22°19'00.89"N, 103°38'53.43"W, 2315 m, Ex. *Atrusca* sp., *Q. rugosa*, (05.xii.2011) xii.2011, O. Cabral, R. Treto, L.G. Landa and C. Carrillo leg: 12 ♂.

Etymology: Named in honor to Clarence Preston Gillette (1859, Ionia County, Michigan-1941, Fort Collins, Colorado), the American entomologist who described the closest related species *Synergus punctatus*.

Diagnosis: Species morphologically closely related to *Synergus punctatus* Gillette of which is distinguished by the following combination of morphological traits: in males, head black except for a reddish-brown to chestnut colored halo around the mouth (head yellow except for a black spot in the vertex in *S. punctatus*); in females, colored halo around the mouth less conspicuous and reddish-brown to chestnut (yellow and clearly defined in *S. punctatus*) (Figs. 8a, b); F1/F2 ratio in males about 1.15 (about 1.4 times in *S. punctatus*); notauli complete and visible along their entire length (inconspicuous in the anterior third of the scutum in *S. punctatus*); syntergite punctuation not forming a complete band, less widespread and shorter (forming a complete band, occupying the distal half of the syntergite and reaching the ventral part of metasoma in *S. punctatus*).

Female

Length: Body length 1.5-2.2 mm ($n = 14$).

Color: Head black, except for face surfaces surrounding the oral foveae (sometimes in a small area), which are reddish-brown to chestnut (Fig. 8b); frons and vertex black, occiput black; antennae testaceous; mesosoma black, tegulae yellowish; metasoma black, reddish basally; legs yellow, including coxae; forewings hyaline, light veins.

Head: in frontal view (Fig. 2a) quadrangular with genae convergent, 1.2 times wider than high, genae not expanded behind compound eyes. Face faintly pubescent, lower face and gena with striae irradiating from clypeus and reaching basal margin of compound eye and basal margin of antennal toruli; medial carina also present. Clypeus indistinct, ventral margin slightly projected over mandibles. Malar space around 0.5 times as long as the height of the compound eye (10:18). Anterior tentorial pits visible; pleurostomal and epistomal sulcus absent. Transfacial line about as long as the height of the compound eye. Toruli situated mid-height of the compound eye; distance between torulus and compound eye shorter than diameter of toruli; distance between toruli slightly shorter than the diameter of torulus. Frons finely coriaceous to reticulated without punctures; frontal carinae weak, but visible, not

branched and not reaching lateral ocelli (Figs. 2a, c). Head in dorsal view (Fig. 2c) is about two times wider than long. Vertex finely coriaceous, without punctures. POL:OOL:LOL = 8:3.5:3; OOL as long as the diameter of lateral ocellus. Occiput (Fig. 2b) coriaceous, with neither rugosities nor punctures.

Antennae (Fig. 2f): 14-segmented (7: 4: 9: 8: 8: 8: 7: 7: 5: 5: 5: 5: 4: 7.5); filiform, not broadened apically; pubescence dense and short; placodeal sensilla little visible only on flagellar segments F7-F12. Pedicel 1.3 times longer than wide; F1 slightly longer than F2, F2 as long as F3. Last flagellar segment 3.0 times longer than wide and 1.9 times longer than F11.

Mesosoma: About 1.2 times longer than high in lateral view (including nucha), with short and not dense pubescence (Fig. 3b). Ratio of length of pronotum medially/laterally: 0.36. Pronotal

plate absent; pronotal foveae superficial, long and separated. Lateral pronotum sculpture imbricated, with some weak carinae medially and above pronotal foveae; lateral margins of pronotum rounded, without lateral carina. Mesoescutum (Fig. 3a) 1.3 times wider than long, imbricated to weakly but densely transversely carinated, the interspaces coriaceous; anterior grooves weak, occupying almost 1/3 of mesoescutum length. Notauli complete, wider posteriorly and slightly convergent. Median groove almost indistinct. Parapsidial grooves almost indistinct, slightly surpassing tegulae. Scutellum (Fig. 3a) rounded, almost as long as wide, wrinkled, circumscutellar carina not visible; scutellar foveae superficial, shallowly impressed, smooth, more or less oval-triangular-shaped, posterior margins almost indistinct and separated from each other by a

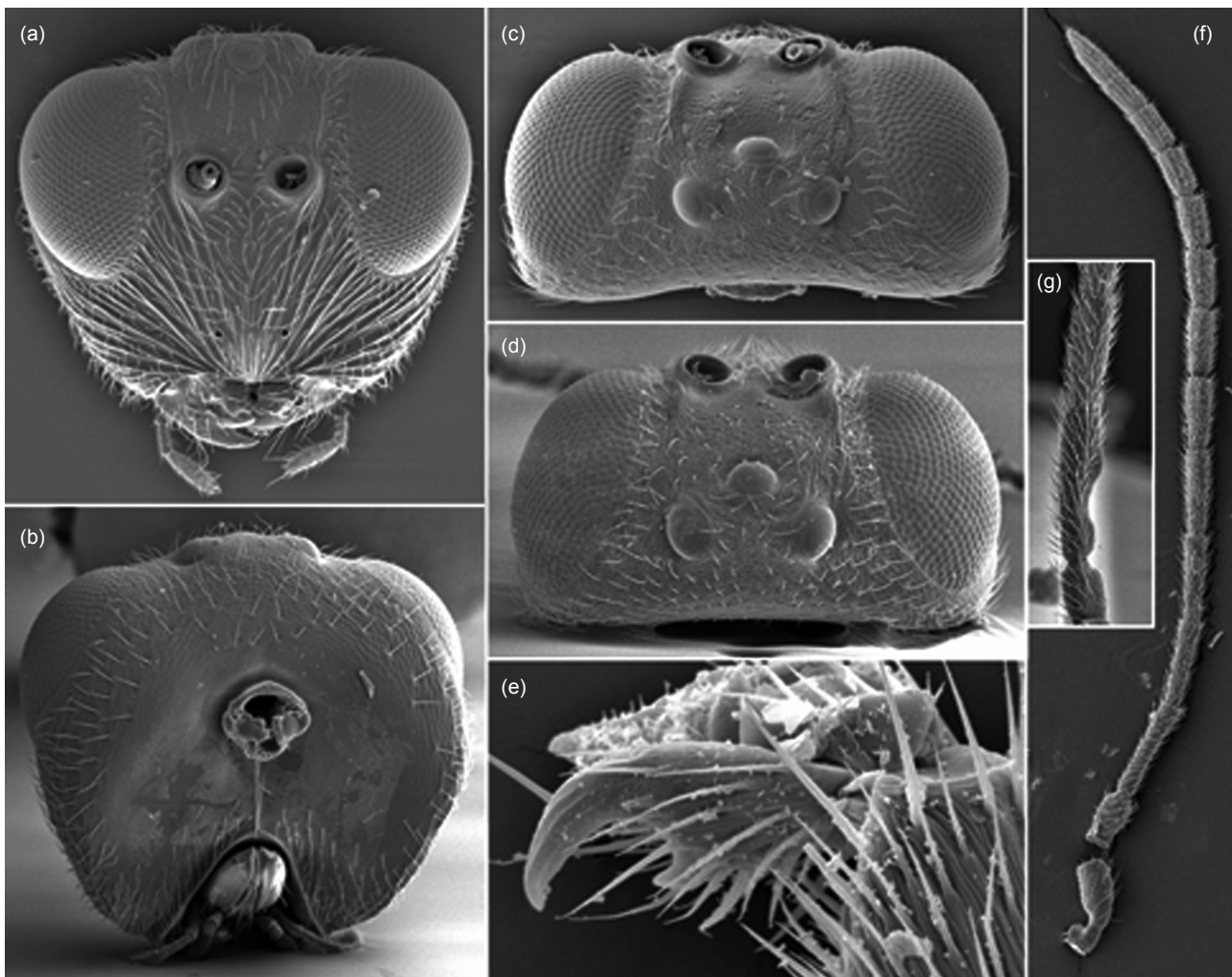


Fig. 2. *Synergus gilletti* Pujade-Villar and Lobato-Vila sp. nov.: (a) Female head in frontal view, (b) female head in ventral view, (c) female head in dorsal view, (d) male head in dorsal view, (e) tarsal claw, (f) female antenna, (g) F1 and F2 of male antenna.

narrow septum. Mesopleurae (Fig. 3b) transversely striated, speculum smooth; interspaces smooth, little pubescent basally. Metapleural sulcus well defined, reaching 4/5 parts of mesopleurae height. Propodeum (Fig. 3c) pubescent and weak sculptured, alutaceous with some transversal rugae; propodeal carinae straight and almost parallel, central area alutaceous and pubescent. Nucha sulcated dorsally and laterally.

Legs (Fig. 2e): Tarsal claws with a small basal tooth.

Wings: Forewings pubescent with marginal setae, longer than mesosoma plus metasoma. Radial cell closed, 2.5 times longer than wide; areolet indistinct but visible, small. Rs + M vein visible in almost 3/4 parts, not reaching basal vein.

Basal cell pubescent.

Metasoma (Fig. 3d): Shorter than head plus mesosoma length, slightly longer than high in lateral view. First metasomal segment sulcated dorsally and laterally. Syntergite smooth, anterolateral pubescence composed of a group of 4-5 setae, with a band of micropunctures extending a little more than 1/3 of the metasomal length; not incised dorso-distally. Hypopygial spine almost as long as wide and with a few lateral setae; apical setae not projected beyond the tip of the spine.

Male

Similar to female, except for the following morphological traits: body length 1.1-1.7 mm



Fig. 3. *Synergus gilletti* Pujade-Villar and Lobato-Vila sp. nov.: (a) Mesosoma in dorsal view, (b) mesosoma in lateral view, (c) propodeum, (d) female metasoma in lateral view.

($n = 43$). Transfacial line slightly shorter than the height of the compound eye (0.9). POL: OOL: LOL = 7: 5: 4 (Fig. 2d). Antennae 15-segmented (7: 5: 10.5: 9: 9: 9: 7: 6: 6: 5: 5: 5: 5: 6); F1 curved, medially excavated, more expanded distally (Fig. 2g). Metasoma shorter than females, and almost as long as mesosoma.

Distribution: State of Zacatecas (Mexico).

Biology: The material studied was obtained from soft galls developed on *Q. laeta* Liebm. and *Q. rugosa* Née (*Quercus* section) related to the genera *Atrusca* and *Andricus*.

***Synergus longimalaris* Pujade-Villar and Lobato-Vila sp. nov.**

(Fig. 4)

urn:lsid:zoobank.org:act:5DB91102-5D22-4144-93AF-96DE2962C23B

Type material: Holotype ♀ deposited in JP-V col (UB) with the following labels: 'MEX: P160, Sierra de Quila (Tecolotlán, JAL), 20°16'42.6"N, 104°05'26.7"W, 1916 m' (white label), 'Ex. *Amphibolips* sp., *Q. conzattii*., (04.xi.2011) 25.xi.2011, E. Estrada and A. Equihua leg.' (white label), 'Holotype ♀ *Synergus longimalaris* Pujade-Villar and Lobato-Vila, Lobato-Vila 2017 desig.' (red label). Paratypes: same data as the Holotype: 7 ♂ and 17 ♀ (1 ♂ and 4 ♀ deposited in the NMNH; 1 ♂ and 4 ♀ deposited in the AMNH).

Additional material: 2 ♀ with the same data as the Holotype dissected and covered with gold.

Etymology: Adjective related to its long malar space.

Diagnosis: This species is morphologically related to *S. cibriani*, *S. citriformis* (= *S. elegans*) and *S. laticephalus*. The new species differ from *S. laticephalus* by the width of the head in dorsal view, which is much shorter (2.7 times wider than long in *S. laticephalus*), the presence of metasomal micropunctures (no micropunctures in *S. laticephalus*) and the absence of rugae in the scutellum (with some transverse rugae in *S. laticephalus*). *Synergus longimalaris* sp. nov. mainly differs from *S. cibriani* and *S. citriformis* by having POL as long as OOL (POL usually 1.5 times longer than OOL in these species), F1 1.5 times longer than F2 (F1 usually 1.3 times longer in these species), notauli complete and visible along their entire length (inconspicuous in the anterior 1/3 in these species) and head coloration yellowish to brown, except for a dark spot in the area delimited by ocelli, in males (with more dark areas in these species). It also differs from *S. cibriani* by

having OOL 2.2 times longer than the diameter of the lateral ocellus (1.5 times longer in *S. cibriani*) and mesoscutum finely coriaceous to alutaceous, with some little punctures (strongly coriaceous to imbricated, without punctures, in *S. cibriani*). Finally, it also differs from *S. citriformis* by having the malar space about 0.8 times as long as the height of the compound eye (0.6 in *S. citriformis*), both frons and mesoscutum coriaceous with some little punctures (finely sculptured, no punctures, in *S. citriformis*) and metasoma with micropunctures (no micropunctures in *S. citriformis*).

Female

Length: Body length 2.3–3.4 mm ($n = 18$).

Color: Head yellowish to brown; frons and vertex medially black, orange laterally; occiput black; antennae yellowish; mesosoma black, tegulae pale yellow; metasoma black, chestnut basally; legs yellowish, metatarsi darker, the base of metacoxae with a more or less extended brownish or blackish coloration; forewings hyaline, yellow veins.

Head: in frontal view (Fig. 4a) quadrangular, 1.3 times wider than high, genae slightly expanded behind compound eye. Face faintly pubescent, lower face and genae with thin, dense and regular striae irradiating from clypeus and reaching basal margin of compound eye and basal margin of antennal toruli; medial carina inconspicuous. Clypeus indistinct, ventral margin not projected over mandibles. Malar space almost 0.8 times as long as the height of the compound eye (19:25). Anterior tentorial pits visible; pleurostomal and epistomal sulcus absent. Transfacial line longer than the height of the compound eye (1.3). Toruli situated under mid-height of the compound eye; distance between torulus and compound eye longer than diameter of toruli; distance between toruli shorter than the diameter of toruli. Frons finely coriaceous with some scattered little punctures; frontal carinae absent. Head in dorsal view (Fig. 4c) is about two times wider than long. Vertex finely coriaceous to alutaceous with neither punctures nor striae. POL:OOL:LOL = 10:10:4; OOL 2.2 times longer than the diameter of lateral ocellus. Occiput (Fig. 4b) finely coriaceous, with neither punctures nor striae.

Antennae (Fig. 4e): 14-segmented (15: 8: 19: 12: 11: 10: 8: 7.5: 6: 6: 6: 5: 4.5: 8); filiform not broadened apically; pubescence dense and short; placodeal sensilla little visible only on flagellar segments F5–F12. Pedicel about two times longer

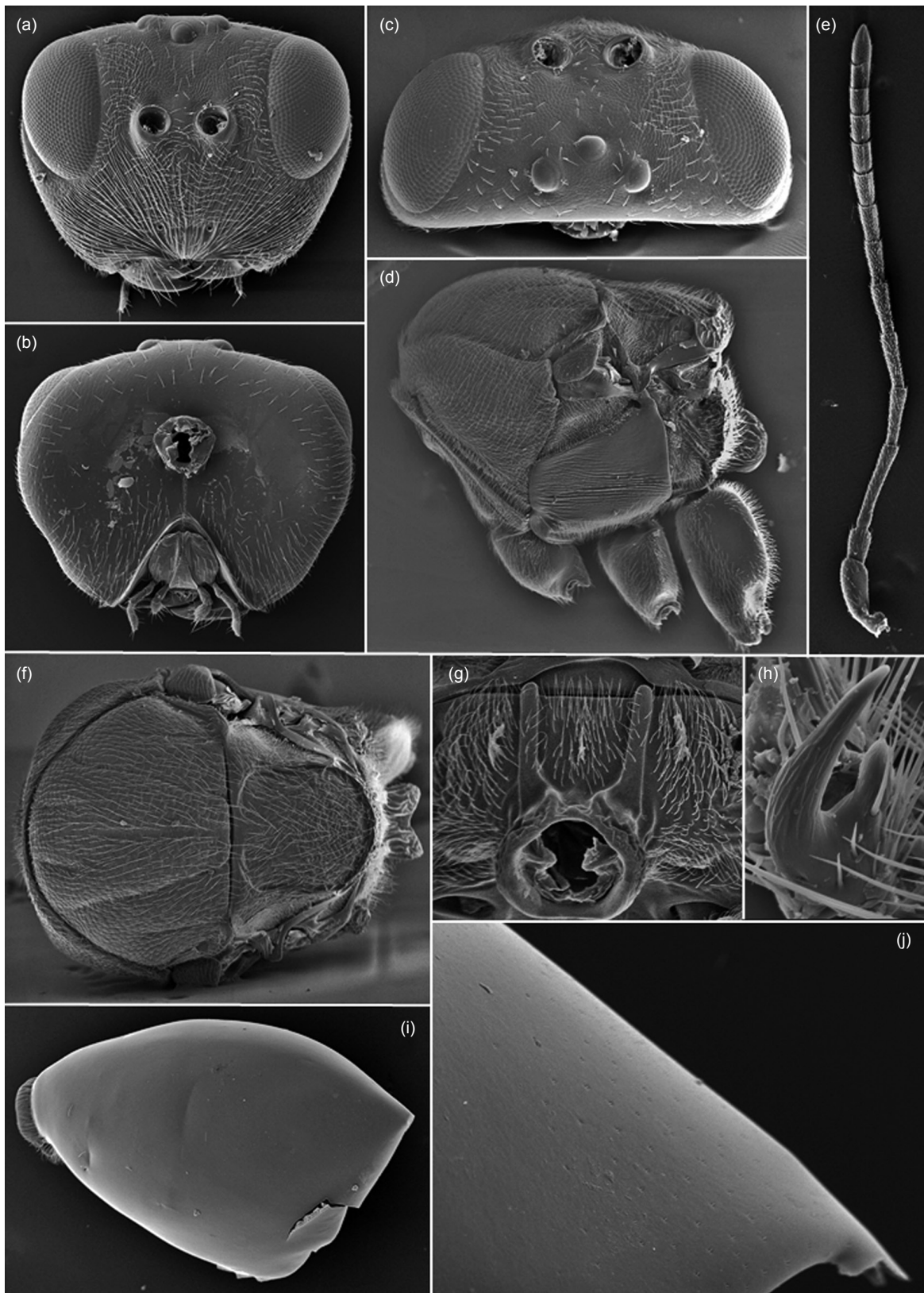


Fig. 4. *Synergus longimalaris* Pujade-Villar and Lobato-Vila sp. nov.: (a) Female head in frontal view, (b) female head in ventral view, (c) female head in dorsal view, (d) mesosoma in lateral view, (e) female antenna, (f) mesosoma in dorsal view, (g) propodeum, (h) tarsal claw, (i) female metasoma in lateral view, (j) detail of the metasomal micropunctures.

than wide; F1 about 1.5 times longer than F2, F2 slightly longer than F3. Last flagellar segment 2.7 times longer than wide and 1.8 times longer than F11.

Mesosoma: About 1.2 times longer than high in lateral view (including nucha), with short and not dense pubescence (Fig. 4d). Ratio of length of pronotum medially/laterally: 0.2. Pronotal plate absent. Lateral pronotum sculpture strongly coriaceous; lateral margins of pronotum rounded, without lateral carina. Mesoescutum (Fig. 4f) about 1.3 times wider than long, finely coriaceous to reticulated, with piliferous punctures over all its surface; anterior grooves weak but visible, occupying almost 1/4 of mesoescutum length. Notauli complete and visible along their entire length, wider and convergent posteriorly. Median groove very shallowly impressed but visible, wider posteriorly, reaching the middle of the mesoescutum. Parapsidal grooves weak but visible, surpassing the anterior margin of tegulae. Scutellum (Fig. 4f) rounded, slightly longer than wide, coriaceous to alutaceous, with some punctures; circumscutellar carina visible, forming a slightly projected margin; scutellar foveae shallowly impressed, almost inconspicuous; triangular, separated by a wide septum. Mesopleurae (Fig. 4d) transversely striated, speculum smooth; interspaces alutaceous, little pubescent basally. Metapleural sulcus well defined, reaching about 3/4 parts of mesopleurae height. Propodeum (Fig. 4g) pubescent and almost smooth; propodeal carinae straight, just slightly convergent basally, central area with a weak sculpture and pubescent. Nucha sulcated dorsally and laterally.

Legs (Fig. 4h): Tarsal claws with a basal tooth.

Wings: Forewings pubescent with short marginal setae, slightly shorter than mesosoma plus metasoma. Radial cell closed, 2.4 times longer than wide; areolet indistinct but visible. Rs + M inconspicuous, not reaching basal vein. Basal cell faintly pubescent.

Metasoma: About as long as head plus mesosoma, longer than high in lateral view (Fig. 4i). First metasomal segment sulcated dorsally and laterally. Syntergite smooth, anterolateral pubescence composed of a group of 4-5 setae, with a few weak micropunctures forming a posterodorsal patch (Fig. 4j); not incised dorso-distally. Hypopygial spine almost as long as wide and with a few lateral setae; without apical setae.

Male

Similar to female, except for the following morphological traits: body length 2.6-3.4 mm ($n = 6$). Antennae 15-segmented (13: 7: 17: 12: 11: 10: 8.5: 7.5: 7: 6: 5: 5: 4.5: 4: 6.5), F1 1.4 times longer than F2; F1 slightly curved, medial excavation weak, faintly expanded apically and basally. Head coloration yellowish, except for a dark to black spot in the area delimited by ocelli; metacoxae entirely yellow, metatarsi yellow.

Distribution: State of Jalisco (Mexico).

Biology: The material studied was obtained from galls developed on *Q. conzattii* Trel. (*Lobatae* section) related to the genus *Amphibolips*.

Synergus longiscapus Pujade-Villar and Lobato-Vila sp. nov.

(Fig. 5)

urn:lsid:zoobank.org:act:F5EEAC91-B75E-4090-8341-60D1D91B4D65

Type material: Holotype ♀ deposited in JP-V col. (UB) with the following labels: 'MEX: 300, Santa Fe (D.F.), 19°21'14"N, 99°16'24.22"W, 2569 m' (white label), 'Ex. *Disholcaspis* sp., *Q. laeta*, (20.vi.2016) vii.2016, JP-V leg.' (white label), 'Holotype ♀ *Synergus longiscapus* Pujade-Villar and Lobato-Vila, Lobato-Vila 2017 desig.' (red label). Paratypes: same data as the Holotype: 10 ♂ and 36 ♀ (1 ♂ and 5 ♀ deposited in the NMNH; 1 ♂ and 5 ♀ deposited in the AMNH).

Additional material: MEX: 060, La Cuchilla (ZAC), 22°18'50.3"N 103°37'14.6"W, 2505 m, Ex. *Disholcaspis* nr *regina*, *Q. eduardii* c.f., (14.x.2011) 02.xi.2011, O. Cabral, R. Treto, L.G. Landa and C. Carrillo leg.: 1 ♀; MEX: 206, Plateros-Arenales (San Felipe del Progreso, EDO. MÉX), 19°42'31.5"N, 99°57'03.3"W, 2564 m, Ex. *Andricus tectucnarum* or *georgei* groups, *Q. candicans*, (21.i.2014) 19.ii.2014, Delia leg.: 4 ♂ and 1 ♀; MEX: P016, Monte Escobedo (ZAC), 22°18'07.9"N, 103°33'45.5"W, 2190 m, Ex. *Andricus sphaericus*, *Q. rugosa*, (25.v.2012) vi.2012, JP-V leg.: 2 ♀; MEX: P116, Cerro del Potosí (Los Galeana, NL), 24°52'18.9"N, 100°13'57.5"W, 3716 m, Ex. *Disholcaspis* c.f., *Q. emoryi*, (08.v.2012) 12-26.v.2012, E. Estrada and A. Equihua leg.: 2 ♂ and 2 ♀; MEX: P187, Perote-Puebla Federal Highway (VER), 19°32'30"N, 97°16'23"W, 2410 m, Ex. *Disholcaspis* sp., *Quercus* sp., (28.ix.2012) 15.x.2012, E. Estrada and A. Equihua leg.: 1 ♂ and 1 ♀; MEX: P228, Santa Fe (D.F.), 19°21'14"N, 99°16'24.22"W, 2569 m, Ex. *Andricus protuberans*,

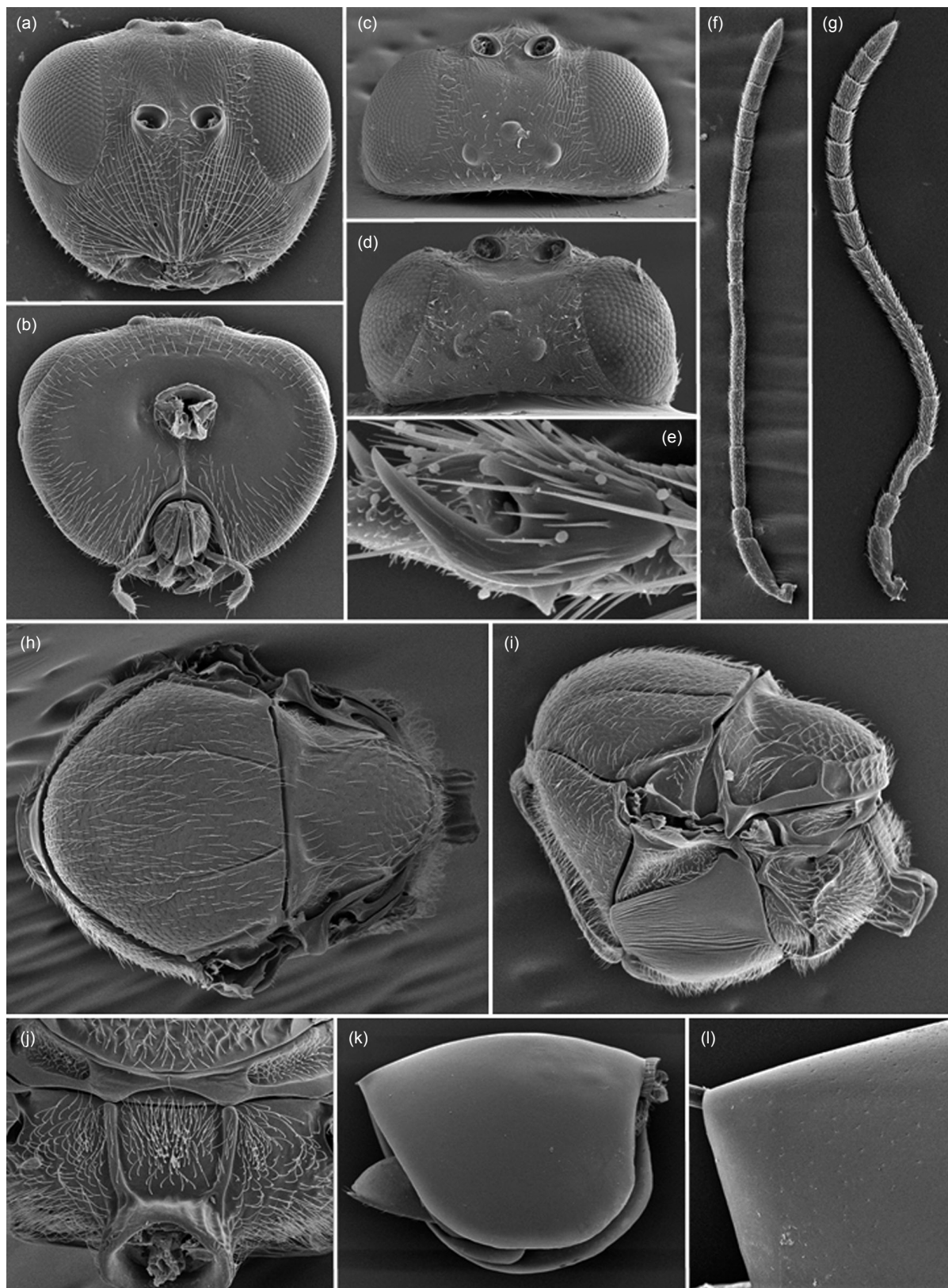


Fig. 5. *Synergus longiscapus* Pujade-Villar and Lobato-Vila sp. nov.: (a) Female head in frontal view, (b) female head in ventral view, (c) female head in dorsal view, (d) male head in dorsal view, (e) tarsal claw, (f) female antenna, (g) male antenna, (h) mesosoma in dorsal view, (i) mesosoma in lateral view, (j) propodeum, (k) female metasoma in lateral view, (l) detail of the metasomal micropunctures.

Q. laeta, (21.vi.2013) ix.2013, JP-V leg.: 3 ♀; MEX: 304, Ejido de San Miguel Tlaixpan (Texcoco, EDO. MÉX), 19°26'29.3"N, 98°46'02.6"W, 2995 m, Ex. *Andricus sphaericus*, *Q. rugosa*, (01.vii.2016) vii.2016, A. Equihua and E. Estrada: 2 ♀; MEX: 308, Ejido Santa María Nativitas (Texcoco, EDO. MÉXICO), 19°27'41.3"N, 98°47'22.2"W, 2703 m, Ex. *Andricus nievesaldreyi*, *Q. rugosa*, (13.i.2015) 19.ii.2015, J. Acuña leg.: 1 ♂; MEX: P238, Ejido de San Miguel Tlaixpan (Texcoco, EDO. MÉX), 19°26'29.3"N, 98°46'02.6"W, 2995 m, Ex. undetermined gall, *Q. glabrescens*, (08.ii.2016) 03.iv.2016, A. Equihua and E. Estrada: 1 ♀ and 1 ♂; MEX: P239, Ejido de San Miguel Tlaixpan (Texcoco, Estado de México), 19°26'29.3"N, 98°46'02.6"W, 2995 m, Ex. undetermined gall, *Q. glabrescens*, (08.ii.2016) 03.iv.2016, A. Equihua and E. Estrada: 1 ♀; MEX: P240, Ejido Santa María Nativitas (Texcoco, EDO. MÉXICO), 19°27'41.3"N, 98°47'22.2"W, 2703 m, *Andricus nr cylindratum*, *Q. glabrescens*, (27.i.2015) 09.iii.2015, A. Equihua and E. Estrada: 1 ♀; MEX: P242, Ejido Santa María Nativitas (Texcoco, EDO. MÉXICO), 19°27'41.3"N, 98°47'22.2"W, 2703 m, *Andricus nr cylindratum*, *Q. rugosa*, (13.i.2015) 09.iii.2015, J. Acuña leg.: 1 ♀; 1 ♂ and 2 ♀ dissected and covered with gold with the same data as MEX: 206.

Etymology: Adjective related to its long scapus.

Diagnosis: This species is morphologically related to *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus* and *S. longimalaris*. The new species differs from all these species and from *S. striatifrons* sp. nov. by having a long scapus, slightly longer than F1 (shorter than F1 in all the species addressed here). It also differs from *S. laticephalus* by the width of the head in dorsal view, which is much shorter (2.7 times wider than long in *S. laticephalus*), the presence of metasomal micropunctures (no micropunctures in *S. laticephalus*) and the absence of rugae in the scutellum (with some transverse rugae in *S. laticephalus*), and from *S. cibriani*, *S. citrifomis* and *S. longimalaris*, by having F1 and F2 subequal (F1 clearly longer than F2 in all these species) and the transfacial line about as long as the height of the compound eye (1.3 times longer in these species). *Synergus longiscapus* sp. nov. also differs from *S. cibriani* and *S. citrifomis* by having the scutum with some piliferous punctures (no punctures in these species) and head coloration yellowish to brown, except for a dark spot in the area delimited by ocelli, in males (males' head

with more dark areas in these species); from *S. cibriani* and *S. longimalaris*, by having the malar space about 0.6 times as long as the height of the compound eye (0.8 in these species); from *S. cibriani*, by having OOL 2.7 times longer than the diameter of the lateral ocellus in males (1.5 times longer in *S. cibriani* in both sexes); from *S. citrifomis*, by having the frons finely coriaceous with some scattered little punctures and the metasomal sytergite with a posterodorsal patch of micropunctures (no punctures in *S. citrifomis*); finally, from *S. longimalaris* by having POL 1.6 times longer than OOL (POL as long as OOL in *S. longimalaris*) and notauli inconspicuous in the anterior 1/3 (visible along their entire length in *S. longimalaris*).

Female

Length: Body length 1.4-2.9 mm ($n = 10$).

Color: Head yellowish to light brown; frons and vertex black medially, yellowish to light brown laterally; occiput black; antennae yellowish to light brown; mesosoma black, tegulae pale yellow; metasoma black dorsally, light chestnut basally; legs light yellow, metatarsi usually darker, the base of metacoxae with brownish or blackish coloration more or less extended; wings hyaline, veins yellow to light brown.

Head: in frontal view (Fig. 5a) more or less rounded, about 1.2 times wider than high, genae slightly expanded behind compound eye. Face faintly pubescent, lower face and genae with thin, dense and regular striae irradiating from clypeus and reaching basal margin of compound eye and basal margin of antennal toruli; medial carina inconspicuous. Clypeus indistinct, ventral margin slightly projected over mandibles. Malar space 0.6 times as long as the height of the compound eye (12:19). Anterior tentorial pits visible; pleurostomal and epistomal sulcus absent. Transfacial line just slightly longer than the height of the compound eye (1.1). Toruli situated mid-height of the compound eye; distance between torulus and compound eye shorter than diameter of toruli; distance between toruli shorter than the diameter of toruli. Frons finely coriaceous to alutaceous with some scattered little punctures; frontal carinae absent. Head in dorsal view (Fig. 5c) is about 1.8 times wider than long. Vertex finely coriaceous to alutaceous with neither punctures nor striae. POL:OOL:LOL = 8:5:4; OOL about 2.0 times longer than the diameter of lateral ocellus. Occiput (Fig. 5b) finely coriaceous, with neither punctures

nor striae.

Antennae (Fig. 5f): 14-segmented (12: 6: 10.5: 10: 9: 8: 7: 6.5: 5: 5: 5: 4.5: 4.5: 8.5); filiform not broadened apically; pubescence dense and short; placodeal sensilla little visible only on flagellar segments F7-F12. Pedicel about two times longer than wide; F1 and F2 subequal, F2 slightly longer than F3. Last flagellar segment 2.8 times longer than wide and 1.9 times longer than F11.

Mesosoma: Slightly longer than high in lateral view (including nucha), with short and not dense pubescence (Fig. 5i). Ratio of length of pronotum medially/laterally: 0.36. Pronotal plate absent. Lateral pronotal sculpture coriaceous to reticulated; lateral margins of pronotum rounded, without lateral carina. Mesoscutum (Fig. 5h) about 1.2 times wider than long, finely coriaceous, with some weak piliferous punctures over all its surface; anterior grooves weak, occupying about 1/4 of mesoscutum length. Notauli complete but faint in the anterior 1/3, wider and convergent posteriorly. Median groove almost indistinct but visible. Parapsidal grooves weak, reaching the anterior margin of tegulae. Scutellum (Fig. 5h) rounded, almost as long as wide, finely coriaceous, weakly imbricated posteriorly, circumscutellar carina visible but not projected; scutellar foveae inconspicuous. Mesopleurae (Fig. 5i) with medial and anterior areas transversely striated, smooth basally, speculum also smooth; interspaces alutaceous, little pubescent basally. Metapleural sulcus well defined, reaching about 3/4 parts of mesopleurae height. Propodeum (Fig. 5j) pubescent and with a weak sculpture; propodeal carinae almost straight, slightly convergent basally, central area with a weak sculpture and pubescent. Nucha sulcated dorsally and laterally.

Legs (Fig. 5e): Tarsal claws with a small basal tooth.

Wings: Forewings pubescent with short marginal setae, longer than mesosoma plus metasoma. Radial cell closed, 2.4 times longer than wide; areolet absent. Rs + M inconspicuous, not reaching basal vein. Basal cell faintly pubescent.

Metasoma: Slightly shorter than head plus mesosoma, longer than high in lateral view (Fig. 5k). First metasomal segment sulcated dorsally and laterally. Syntergite smooth, anterolateral pubescence composed of a group of 4-5 setae, with a few weak micropunctures forming a posterodorsal patch (Fig. 5l); not incised dorso-distally. Hypopygial spine as long as wide and with

a few lateral setae; without apical setae.

Male

Similar to female, except for the morphological traits that follow: body length 1.4-2.0 mm ($n = 7$). POL:OOL:LOL = 6.5: 4: 3; OOL 2.7 times longer than the diameter of lateral ocellus (Fig. 5d). Antennae (Fig. 5g) 15-segmented (9: 5: 9: 8: 7: 6: 6: 5: 5: 4.5: 4: 4: 4: 3.5: 5); F1 slightly longer than F2, F1 slightly curved, medial excavation weak, faintly expanded apically and basally. Head coloration yellowish, except for a black spot in the area delimited by ocelli; mesopleurae sometimes brownish to black; metacoxae usually entirely yellow or with dark coloration less extended; tarsi yellow.

Distribution: Federal District (D.F.), Nuevo León, State of Mexico, Veracruz and Zacatecas (Mexico).

Biology: The studied material was obtained from soft galls developed on *Q. candicans* Née, *Q. eduardii* c.f. and *Q. emoryi* Torr. (*Lobatae* section); *Q. glabrescens* Benth., *Q. laeta* Liebm. and *Q. rugosa* Née (*Quercus* section), related to the genera *Andricus* and *Disholcaspis*, as well as to some undetermined galls.

Synergus punctatus Gillette

(Figs. 6, 8a)

Synergus punctata Gillette, 1896: 90, 94 (♂ and ♀)

Type material: Lectotype ♀ deposited in NMNH (Washington D.C., USA) with the following labels: 'Colo. 841' (white label) / 'Biol. 116' (white label) / 'Type' (white label, handwritten) / Acc n° 71950, USNM to be loaned only to ColoAgCol' (white label) / '*Synergus punctata* Gill.' (white label bordered with two red lines, handwritten) / 'USNM 00802265' (white label, QR code) / 'Lectotype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label). Paralecototypes (3 ♂ and 6 ♀) deposited in NMNH (Washington D.C., USA) with the following labels: 'Colo. 841' (white label) / 'Biol. 116' (white label) / 'Type' (white label, handwritten) / 'Collection Ashmead' (white label) / '*Synergus punctata* Gill.' (red label, handwritten) / 'USNM 00960582' (white label, QR code) / 'Paralecototype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀); 'Colo. 1864' (white label) / 'Type' (white label, handwritten) / 'Collection Ashmead' (white label) / 'USNM 00960208' (white label, QR code)

/ 'Paralectotype of *Synergus punctatus* ♂ Gillette, 1896, JP-V desig-2017' (red label) (1 ♂); 'Colo. 841' (white label) / 'Biol. 116' (white label) / 'Type' (white label, handwritten) / 'Collection Ashmead' (white label) / 'USNM 00960641' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♂ Gillette, 1896, JP-V desig-2017' (red label) (1 ♂); 'Colo. 843' (white label) / 'Biol. 117' (white label) / 'Type' (white label, handwritten) / 'Collection Ashmead' (white label) / '*Synergus punctata* ♀ Gill.' (white label, handwritten) / 'USNM 00960471' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀); 'Colo. 843' (white label) / 'Biol. 117' (white label) / 'Type' (white label, handwritten) / Acc n° 71950, USNM to be loaned only to ColoAgCol' (white label) / 'USNM 00960234' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀); 'Colo. 1864' (white label) / 'Type' (white label, handwritten) / Acc n° 71950, USNM to be loaned only to ColoAgCol' (white label) / 'USNM 00960481' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀); 'Colo. 1864' (white label) / 'Type' (white label, handwritten) / Acc n° 71950, USNM to be loaned only to ColoAgCol' (white label) / 'USNM 00960708' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♀ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀); 'Colo. 1722' (white label) / 'Type' (white label, handwritten) / 'Coll. CF Baker' (white label), 'USNM 00960567' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♂ Gillette, 1896, JP-V desig-2017' (red label) (1 ♂); 'Colo. 1719' (white label) / 'Type' (white label, handwritten) / 'Coll. CF Baker' (white label), 'USNM 00960892' (white label, QR code) / 'Paralectotype of *Synergus punctatus* ♂ Gillette, 1896, JP-V desig-2017' (red label) (1 ♀).

Additional material: Col. CF Baker (1 ♂ and 5 ♀) with the following QR codes: 00960262 (♀), 00960464 (♀), 00960565 (♀), 00960598 (♀), 00960742 (♀) and 00960874 (♂); Col. Ashmead (1 ♀) with the following QR code: 00960652.

Comments: According to Gillette (1896: 94), this species was described based on 24 females and 22 males. We located 4 males and 10 females in the NMNH from Ashmead and Baker's collections; 3 ♂ and 6 ♀ have similar labels to the ones of the Lectotype and a handwritten label with the word 'type'. So, we assume these specimens belong to the typical series. Baker's material mentioned in 'Additional material' probably belongs

to the typical series too, but the 'type' label is missing.

Synergus punctatus has partially smooth mesopleurae (striae are not extended into the speculum) as all the species mentioned in this study. *Synergus punctatus* is closely related to *S. gilletti* because females of both species have head and body coloration entirely black, except for a light halo around the mouth; also, both sexes of these two species have frontal carinae, the mesoscutum with weak transverse carinae, the scutellum wrinkled with the circumscutellar carina not visible and the metasomal punctuation forming a wide band, amongst others (see the differences between these species in the diagnosis of *S. gilletti*). On the contrary, *S. punctatus* mainly differs from *S. cibriani*, *S. citriformis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris* and *S. striatifrons* sp. nov. by having frontal carinae (absent in all these species), the mesosoma with a few weak transverse carinae (coriaceous or weakly imbricated in all these species), the circumscutellar carina not visible (visible in all these species), a wide band of micropunctures in the metasomal syntergite (no punctures or only forming a posterodorsal patch in all these species), and body coloration entirely black in females, except for a yellow and well defined halo around the mouth (other coloration in all these species).

Short description: *Synergus punctatus* is characterized by the following combination of morphological traits: in females, body and head black, except for a yellow and well-defined halo around the mouth (Fig. 8a); in males, head yellow except for a black spot in the vertex. Frons and vertex coriaceous, without punctures (Figs. 6a, b, c). Frontal carinae weak but visible, incomplete and not branched (Figs. 6b, c). Female antennae 14-segmented, F1 just slightly longer than F2 (Fig. 6f); in males, F1 about 1.4 times longer than F2, curved, medially excavated, more expanded distally (Fig. 6b). Mesoescutum (Fig. 6d) weakly but densely transversely carinated; notauli inconspicuous in the anterior third of the scutum; mesopleurae (Fig. 6g) transversely striated, speculum smooth. Scutellum (Fig. 6d) wrinkled; circumscutellar carina not visible. Metasomal syntergite punctuation forming a band, occupying the distal half of the syntergite and reaching the ventral part of metasoma; not incised dorso-distally (Fig. 6h). Tarsal claws with a small basal tooth (Fig. 6e). Radial cell closed, 2.5 times longer than wide.

Distribution: USA: Manitou, Colorado (Gillette, 1896); Stanford, California (McCracken and Egbert

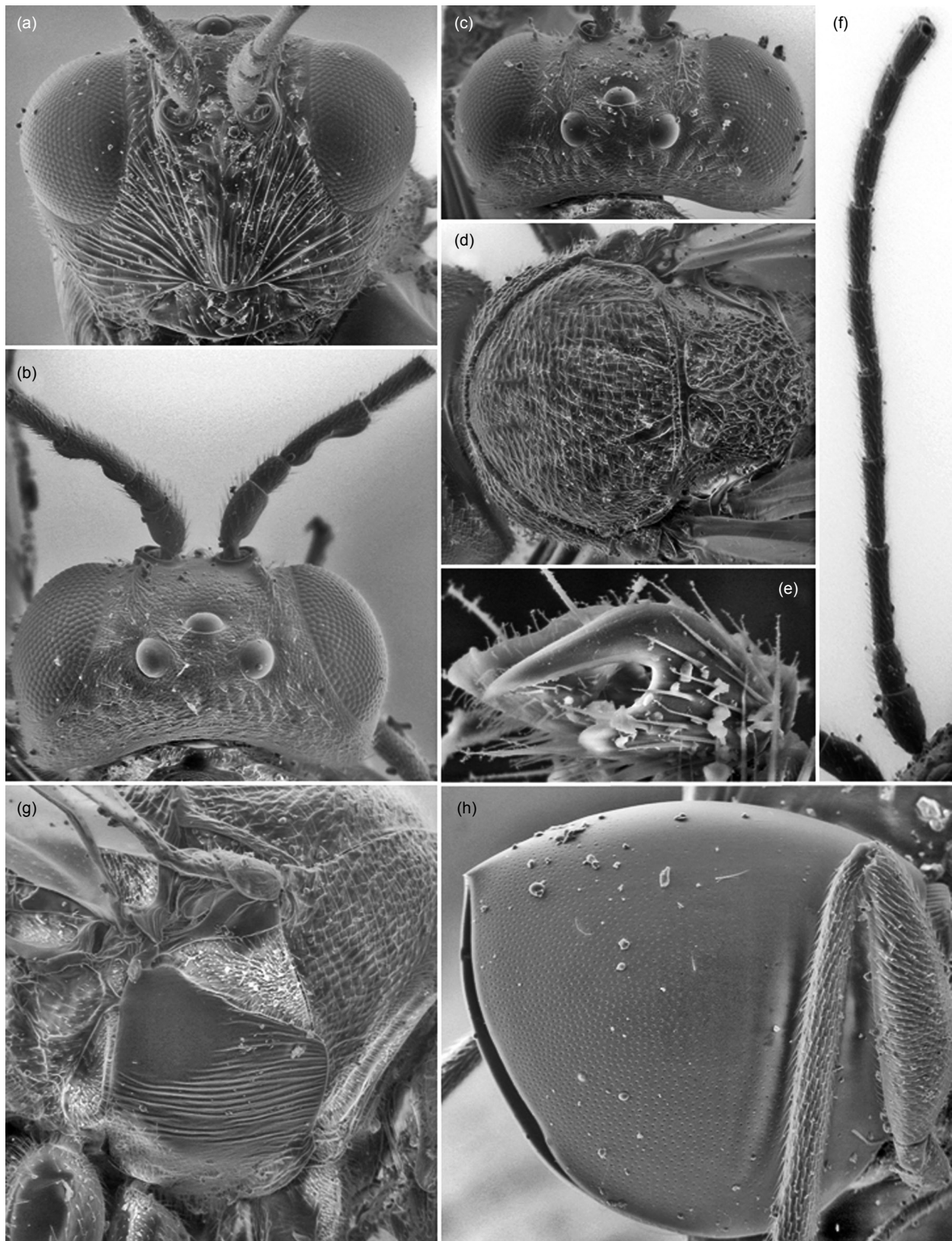


Fig. 6. *Synergus punctatus* Gillette, 1896: (a) Female head in frontal view, (b) male head and antennae in dorsal view, (c) female head in dorsal view, (d) mesosoma in dorsal view, (e) tarsal claw, (f) female antenna, (g) mesosoma in lateral view, (h) female metasoma in lateral view.

1922).

Biology: According to Gillette (1896) and McCracken and Egbert (1922), this species is related to the galls of *Disholcaspis rubens* (Gillette), *Disholcaspis eldoradensis* (Beutenmüller) and *Biorhiza eburnea* (Bassett) (= *Dryophanta glabra* Gillette), always reared from oak species from *Quercus* section: *Q. arizonica*, *Q. dumosa*, *Q. gambelii*, *Q. garryana*, *Q. lobata*, *Q. oblongifolia*, *Q. reticulata*, *Q. submollis*, *Q. toumeyii*, *Q. turbinella* and *Q. undulata*.

***Synergus striatifrons* Pujade-Villar and Lobato-Vila sp. nov.**

(Fig. 7)

urn:lsid:zoobank.org:act:96C806A3-E7F3-45A1-9AA2-5892F549CCBA

Type material: Holotype ♀ deposited in JP-V col. (UB) with the following labels: 'MEX: 292, San Marcos Contla (Papalotla de Xicohtécatl, TLAX), 19°11'54.2"N, 98°11'58.7"W, 2342 m' (white label), 'Ex. *Amphibolips hidalgoensis*, *Q. crassipes*, (03.vi.2010) 04.vii.2010, A. Equihua and E. Estrada' (white label), 'HOLOTYPE ♀ *Synergus striatifrons* Pujade-Villar and Lobato-Vila, Lobato-Vila 2017 desig.' (red label). Paratypes: same data as the Holotype: 2 ♂ and 49 ♀ (10 ♀ deposited in the NMNH; 10 ♀ deposited in the AMNH).

Additional material: Same data as holotype: 20 ♀; MEX: 286, Laguna de Gamboa (Monte Escobedo, ZAC), 22°16'57.04"N, 103°32'58.38"W, 2197 m, Ex. *Amphibolips zacatequensis*, *Q. eduardii*, (27.iv.2011) vi.2011, C. Carrillo leg.: 2 ♂ and 74 ♀; MEX: 287, Monte Escobedo (ZAC), 22°18'23.49"N, 103°32'47.56"W, 2188 m, Ex. *Amphibolips zacatequensis*, *Q. eduardii*, (22.iv.2011) 05.vii.2011, C. Carrillo leg.: 1 ♀; MEX: 299, Fracc. Bosques de Santa Fe (Cuajimalpa, D.F.), 19°21'09.78"N, 99°15'55.02"W, 2.543 m, Ex. *Amphibolips* sp., *Q. crassipes*, (10.vii.2014) vii.2014, D. Cibrián leg.: 2 ♂ and 20 ♀; 2 ♀ dissected and covered with gold with the same data as MEX: 286 and MEX: 287, respectively.

Etymology: Name in apposition related to weak striae present in its frons.

Diagnosis: This species is morphologically related to *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris* and *S. longiscapus*. The new species differs from all these species by having the frons covered by multiple weak striae extending from lower face and toruli (no striae in these species). It also differs from *S. laticephalus* by the width of the head in dorsal

view, which is much shorter (2.7 times wider than long in *S. laticephalus*), the presence of metasomal micropunctures (no micropunctures in *S. laticephalus*) and the absence of rugae in the scutellum (with some transverse rugae in *S. laticephalus*), and from *S. cibriani*, *S. citrifomis*, *S. longimalaris* and *S. longiscapus* by having OOL 3.0 times longer than the diameter of the lateral ocellus (much shorter in all these species, except in males of *S. longiscapus*), scutellar foveae shallow, but visible (inconspicuous in these species) and metasoma clearly longer than head plus mesosoma (about as long as head plus mesosoma in these species). *Synergus striatifrons* sp. nov. also differs from *S. cibriani*, *S. longimalaris* and *S. longiscapus* by the absence of punctures in the frons (frons with a few punctures in these species); from *S. cibriani*, *S. citrifomis* and *S. longiscapus*, by having POL about as long as OOL (POL about 1.5 times longer than OOL in these species) and F1 1.5 times longer than F2 (shorter in these species); from *S. cibriani* and *S. citrifomis*, by having the mesoscutum with a few piliferous punctures (no punctures in these species); from *S. citrifomis* and *S. longiscapus*, by having the malar space 0.8 as long as the height of the compound eye (0.6 in these species); from *S. longimalaris* and *S. longiscapus*, by having frons, vertex and occiput black in both sexes (head coloration yellowish to brown, except for a dark spot in the area delimited by ocelli in males of these species); from *S. citrifomis*, by the presence of metasomal micropunctures forming a posterodorsal patch (no punctures in *S. citrifomis*); finally, from *S. longimalaris* by having notauli inconspicuous in the anterior 1/3 (visible along its entire length in *S. longimalaris*).

Female

Length: Body length 2.9–4.3 mm ($n = 19$).

Color: Head black, except for the face and genae, which are yellowish orange; frons and vertex black, occiput black; antennae dark brown; mesosoma black, tegulae yellowish; metasoma black, reddish to chestnut basally; legs testaceous to yellow, metatarsi darker, basal half of metacoxae black; forewings hyaline, brownish veins.

Head: in frontal view (Fig. 7a) quadrangular, 1.2 times wider than high, genae slightly expanded behind compound eye. Face faintly pubescent, lower face and genae with thin, dense and regular striae irradiating from clypeus and reaching basal margin of compound eye and basal margin

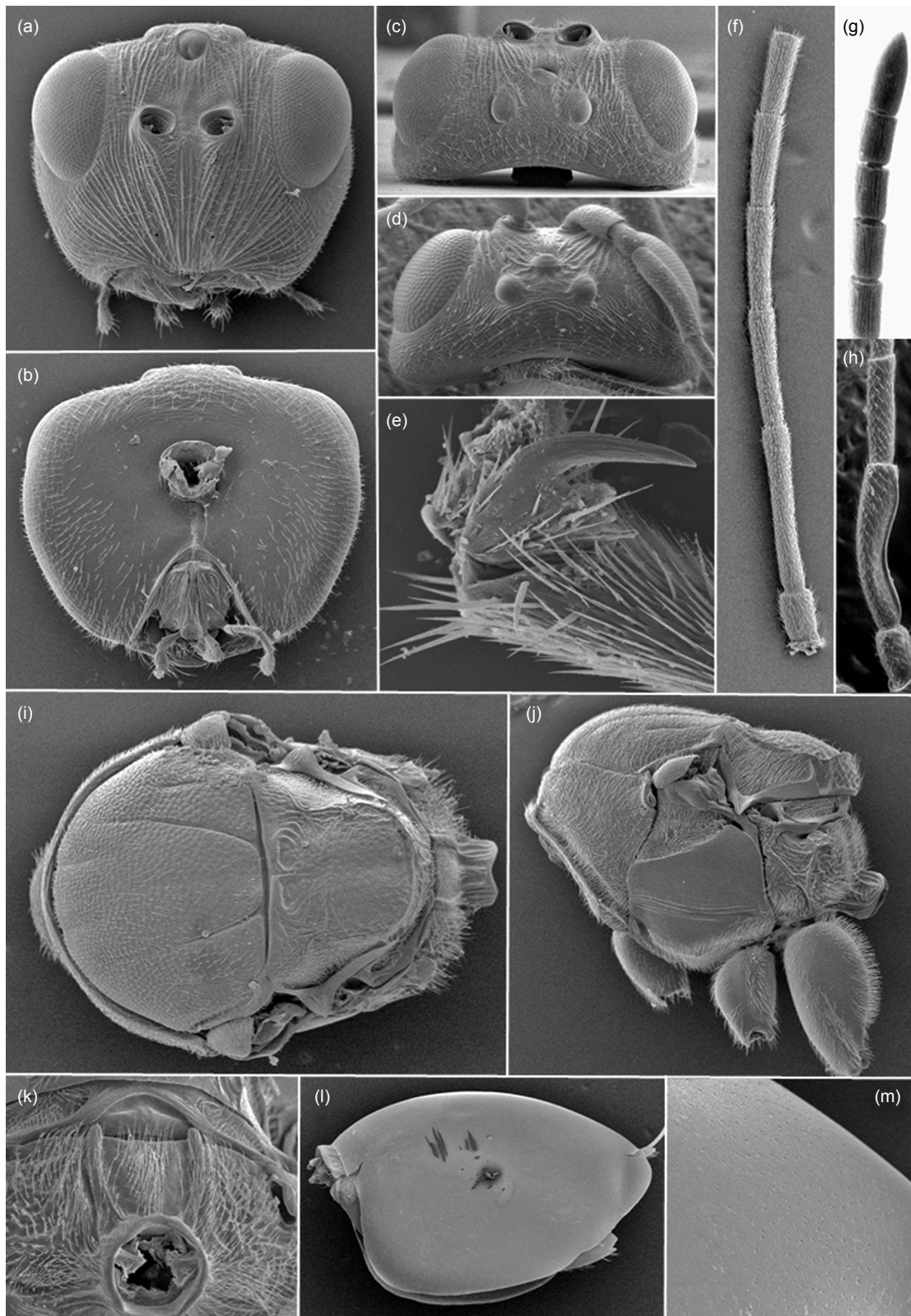


Fig. 7. *Synergus striatifrons* Pujade-Villar and Lobato-Vila sp. nov.: (a) Female head in frontal view, (b) female head in ventral view, (c) female head in dorsal view, (d) male head in dorsal view, (e) tarsal claw, (f) female antenna, (g) last segments of female antenna, (h) F1 and F2 segments of male antenna, (i) mesosoma in dorsal view, (j) mesosoma in lateral view, (k) propodeum, (l) female metasoma in lateral view, (m) detail of the metasomal micropunctures.

of antennal toruli; medial carina also present. Clypeus indistinct, ventral margin not projected over mandibles. Malar space about 0.8 times as long as the height of the compound eye (11:14). Anterior tentorial pits visible; pleurostomal and epistomal sulcus absent. Transfacial line longer than the height of the compound eye (1.3). Toruli situated under mid-height of the compound eye; distance between torulus and compound eye about as long as the diameter of toruli; distance between toruli shorter than the diameter of torulus. Frons finely coriaceous without punctures; absence of true frontal carinae, however, frons covered by multiple weak striae extending from lower face and toruli. Head in dorsal view (Fig. 7c) is about 1.8 times wider than long. Vertex finely coriaceous to imbricated, without punctures. POL:OOL:LOL = 10:9:5; OOL about 3.0 times longer than the diameter of lateral ocellus. Occiput (Fig. 7b) coriaceous, with a few inconspicuous piliferous punctures and a few weak striae.

Antenna (Figs. 7f, g): 14-segmented (17: 8: 25: 18: 15: 14: 13: 11: 9.5: 8: 8: 6: 6: 10); filiform not broadened apically; pubescence dense and short; placodeal sensilla little visible only on flagellar segments F3-F12. Pedicel about 1.5 times longer than wide; F1 about 1.4 times longer than F2, F2 longer than F3 (Fig. 7f). Last flagellar segment 2.5 times longer than wide and 1.7 times longer than F11 (Fig. 7g).

Mesosoma: About 1.2 times longer than high in lateral view (including nucha), with short and not dense pubescence (Fig. 7j). Ratio of length of pronotum medially/laterally: 0.3. Pronotal plate absent. Lateral pronotum sculpture finely coriaceous; lateral margins of pronotum rounded, without a lateral carina. Mesoscutum (Fig. 7i) 1.3 times wider than long, finely coriaceous, without carinae and with a few piliferous punctures between notauli and parapsidal grooves; anterior grooves weak, occupying almost 1/3 of mesoscutum length. Notauli indistinct in the anterior 1/3, wider and not strongly convergent posteriorly. Median groove almost indistinct but visible. Parapsidal grooves weak, reaching the anterior margin of tegulae. Scutellum (Fig. 7i) rounded, almost as long as wide, finely coriaceous, circumscutellar carina visible, forming a clear and projected margin; scutellar foveae weak, posterior margins indistinct, shallow, covered with some striae and separated from each other by a narrow septum. Mesopleurae (Fig. 7j) transversely striated medially, smooth and shiny dorsally and basally; interspaces alutaceous, little pubescent basally.

Metapleural sulcus well defined, reaching just over 3/4 parts of mesopleurae height. Propodeum (Fig. 7k) pubescent and weak sculptured, alutaceous with some rugae; propodeal carinae slightly convergent basally, central area alutaceous and pubescent. Nucha sulcated dorsally and laterally.

Legs (Fig. 7e): Tarsal claws with a small basal tooth.

Wings: Forewings pubescent with marginal setae, as long as mesosoma plus metasoma. Radial cell closed, 2.3 times longer than wide; areolet indistinct but visible. Rs + M inconspicuous, not reaching basal vein. Basal cell faintly pubescent.

Metasoma: Slightly longer than head plus mesosoma, clearly longer than high in lateral view (Fig. 7l). First metasomal segment sulcated dorsally and laterally; however, striae are incomplete in some specimens, in which case the anterior part is smooth. Syntergite smooth, anterolateral pubescence composed of a group of 6-7 setae, with a few micropunctures forming a posterodorsal patch (Fig. 7m); not incised dorso-distally. Hypopygial spine short, or almost as long as wide, with a few lateral setae; apical setae not projected beyond the tip of the spine.

Male

Similar to female, except for the following morphological traits: body length 2.8-2.9 mm ($n = 2$). Transfacial line as long as the height of the compound eye. POL: OOL: LOL = 10: 5: 4 (Fig. 7d). Antennae 15-segmented (12: 5: 18: 12: 10: 10: 8: 7: 7: 6: 5: 5: 5: 5.5: 7); F1 curved, slightly excavated medially, faintly expanded apically and basally (Fig. 7h).

Distribution: Federal District (D.F.), Tlaxcala and Zacatecas (Mexico).

Biology: The studied material was obtained from soft galls developed on *Q. eduardii* Trel. and *Q. crassipes* Humb. et Bonpl. (*Lobatae* section) related to the genus *Amphibolips* (*A. zacatequensis* and *A. hidalgoensis*).

For the identification of the *Synergus* species from Mexico with mesopleurae partially smooth and their closest related species, we propose the following key

1. Frontal carinae present, not branched (Figs. 2a, c, d; 6b, c). Mesoscutum with weak transverse carinae, scutellum wrinkled (Figs. 3a; 6d). Circumscutellar carina not visible (Figs. 3a, b; 6d). Syntergite punctuation occupying

- the distal half (Fig. 6h) or the distal 1/3 (Fig. 3d) of the syntergite. In females, body and head entirely black, except for a more or less extended pale halo around the mouth (Figs. 8a, b); males with the same color pattern as females or not 2
- Frontal carinae absent (Figs. 1c, d; 4a, c; 5a, c, d; 7a, c, d). Mesoescutum and scutellum finely coriaceous to finely imbricated, with neither carinae nor wrinkles (except in *S. laticephalus*, which presents some weak wrinkles in the scutellum) (Figs. 1b; 4f; 5h; 7i). Circumscutellar carina visible (Figs. 1b; 4d, f; 5h, i; 7i, j). Syntergite punctuation absent or only forming a posterodorsal patch (Figs. 1k, l; 4j; 5l; 7m). Body coloration of both females and males lighter; generally dark dorsally and light ventrally 3
 - 2. Colored halo around the mouth yellow and clearly defined (Fig. 8a). Notauli inconspicuous in the anterior 1/3 of mesoescutum (Fig. 6d). Syntergite punctuation forming a band, occupying the distal half of the syntergite and reaching the ventral part of metasoma (Fig. 6h). In males, F1 about 1.4 times longer than F2 (Fig. 6b) and head yellow except for a black spot in the vertex *S. punctatus* Gillette
 - Colored halo around the mouth less conspicuous and reddish-brown to chestnut (Fig. 8b). Notauli complete and visible along their entire length (Fig. 3a). Syntergite punctuation not forming a complete band, less widespread and short (Fig. 3d). In males, F1 just slightly longer than F2 (Fig. 2g) and head with the same color pattern as females *S. gilletti* sp. nov.
 - 3. Head strongly transverse in dorsal view, more than 2.5 times wider than long. Scutellum with some wrinkles. Syntergite not punctured posteriorly *S. laticephalus* Nieves-Aldrey and Medianero
 - Head in dorsal view less than 2.5 as wide as long. Scutellum finely coriaceous to finely imbricated, not wrinkled. Syntergite punctured posteriorly or not 4
 - 4. Frons and mesoescutum finely coriaceous to reticulated, with neither punctures nor striae. Malar space 0.6 times as long as the height of the compound eye. Metasomal syntergite smooth, not punctured (or at least with scarce and inconspicuous posterodorsal punctures) *S. citrifomis* (Ashmead) (= *S. elegans* Nieves-Aldrey and Medianero syn. nov.)
 - Frons finely coriaceous to reticulated, with some scattered piliferous punctures or with weak striae (Figs. 1a, c, d; 4a, c; 5a, c, d; 7a, c, d); mesoescutum with some weak punctures, except in *S. cibriani*. Malar space 0.8 as long as the height of the compound eye, except in *S. longiscapus*. Metasomal syntergite with punctures forming a posterodorsal patch (Figs. 1k, l; 4j; 5l; 7m) 5
 - 5. Frons covered by multiple weak striae extending from lower face and toruli, not forming true frontal carinae; without punctures (Figs. 7a, c, d). Scutellar foveae shallow and not delimited posteriorly, but visible (Fig. 7i). Metasoma longer than head plus mesosoma. In both sexes, head black, except for the face and genae, which are orange *S. striatifrons* sp. nov.
 - Frons without striae, but with some scattered little punctures (Figs. 1a, c, d; 4a, c; 5a, c, d). Scutellar foveae inconspicuous (Figs. 1b; 4f). Metasoma about as long as head plus mesosoma. In females, head yellowish to brown; frons and vertex medially black, orange to chestnut laterally; occiput black. In males, head coloration yellowish to brown, except for a dark spot in the area delimited by ocelli (except in *S. cibriani*) 6
 - 6. Scapus long, longer than F1 in females (Fig. 5f) and about as long as F1 in males (Fig. 5g). F1 as long as F2. Malar space 0.6 as long as the height of the compound eye (Fig. 5a). OOL 2.0 times the diameter of lateral ocelli in females (Fig. 5c) and 2.7 times in males (Fig. 5d) *S. longiscapus* sp. nov.
 - Scapus not as long, always shorter than F1 both in males and females (Figs. 1f, g; 4e). F1 clearly longer than F2 (Figs. 1f, g; 4e). Malar space 0.8 as long as the height of

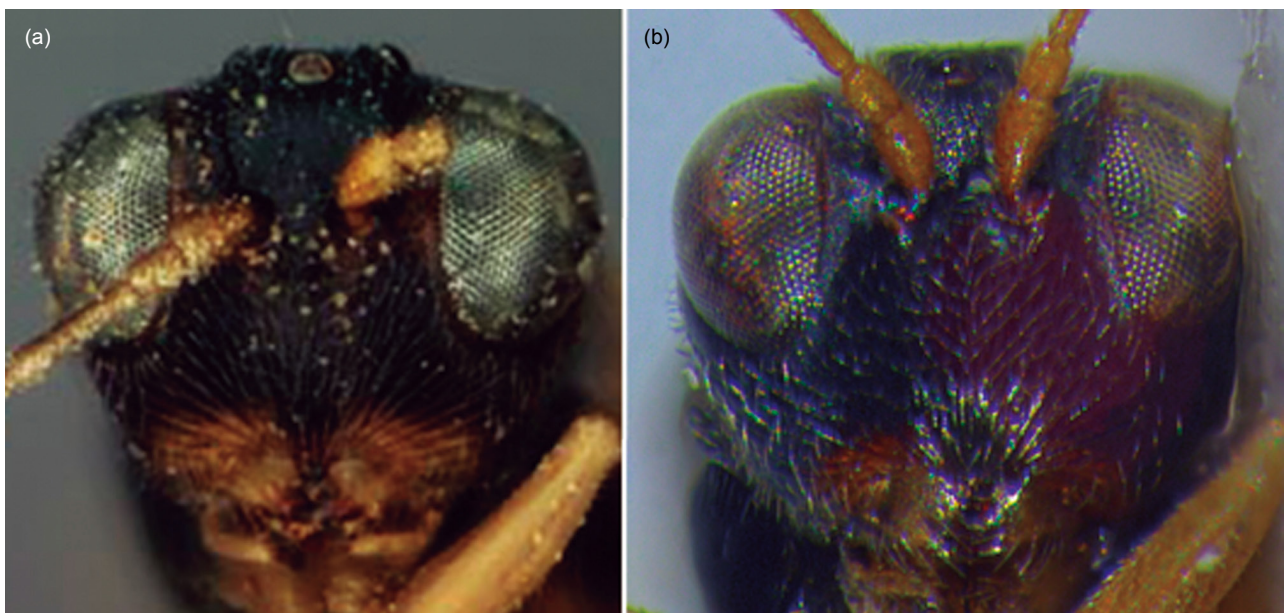


Fig. 8. Detail of the pale halo around the mouth: (a) *Synergus punctatus* female (picture extracted from the online database of Hymenopteran Holotypes (Smithsonian Institution): <http://bit.ly/2q3gV9G>), (b) *Synergus gilletti* female.

- the compound eye (Figs. 1a; 4a). OOL and diameter of lateral ocelli ratio not different between males and females, always much less than 2.7 (Fig. 1c, d; 4c) 7
7. F1 1.5 times longer than F2 (Fig. 4e). POL as long as OOL (Fig. 4c). OOL 2.2 times the diameter of lateral ocelli. Notauli visible along their entire length (Fig. 4f). In females, frons and vertex medially black, orange to chestnut laterally; in males, head coloration yellowish to brown, except for a dark spot in the area delimited by ocelli
..... *S. longimalaris* sp. nov.
- F1 1.3 times longer than F2 (Figs. 1f, g). POL 1.5 times longer than OOL (Figs. 1c, d). OOL 1.5 times the diameter of the lateral ocellus. Notauli inconspicuous in the anterior 1/3 (Fig. 1b). Frons and vertex medially black, orange to chestnut laterally both in males and females
..... *S. cibriani* sp. nov.

DISCUSSION

Morphological limits between genera *Synergus* and *Saphonecrus* are imprecise. According to the results presented in Schwéger et al. (2015a) about Palearctic species of *Synergus*, the only consistent morphological trait found to distinguish *Saphonecrus* from *Synergus* is the presence (*Synergus*) or absence (*Saphonecrus*) of lateral frontal carinae. Six of the species addressed in our study (*S. cibriani*, *S. citrifformis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons*) do not have frontal carinae; nevertheless, all of them have the radial cell of forewings closed (according to the same study, always open in *Saphonecrus* and usually closed in *Synergus*) and female antenna with 14 segments (usually with 13 segments in *Saphonecrus* and 14 segments in *Synergus*), so we do not doubt that they all belong to the genus *Synergus*. This is yet more evidence that *Saphonecrus* would be a polyphyletic or paraphyletic genus closely related to *Synergus*, as several authors have been suggested (Pénzes et al. 2012; Bozsó et al. 2014 2015).

Neither the new species described in our study nor their morphologically closest related species (*S. citrifformis* (= *S. elegans*), *S. laticephalus* and *S. punctatus*) have pronotal carinae. This trait is always present in the core or main group of Palearctic *Synergus* species and absent or weak in *Synergus plagiostrochi* Nieves-Aldrey and Pujade-Villar, *S. variabilis* Mayr, *S. flavipes* Hartig, *S. acsi* Melika and Pujade-Villar, and *S. consobrinus* Giraud in Houard, which are considered the most basal clades within the Palearctic *Synergus* close to the genera *Saphonecrus* and *Synophrus* (Ács et al. 2010;

Nieves-Aldrey and Medianero 2011). Like all the Neotropical species studied by Nieves-Aldrey and Medianero (2011), *Synergus* species described from Mexico to date (see Pujade-Villar et al. 2016) and several species from the USA (like *S. punctatus* and *S. citrifformis* (= *S. elegans*)) lack pronotal carinae. As Nieves-Aldrey and Medianero (2011) suggested, the absence of lateral pronotal carinae could be a plesiomorphic trait state in the Palearctic *Synergus* shared with the Neotropical species; so, it might be shared with some Nearctic species too.

Before this study, there were 18 recorded species with partially smooth mesopleurae in America. After the publication of this study, the total number of species with partially smooth mesopleurae reaches 22 (since *S. elegans* is now synonymous with *S. citrifformis*). This trait seems to be quite frequent among American *Synergus* species from both Nearctic and Neotropical regions; in contrast, it has not been observed among Eastern nor Western Palearctic species, which always have totally striated mesopleurae (see Pujade-Villar et al. 2014; Schwéger et al. 2015a).

Both the absence of frontal carinae and pronotal carinae, as well as the absence of striae covering all the mesopleuron in some American species, constitute further evidence that both Nearctic and Neotropical species of *Synergus* show important morphological differences with respect to the Palearctic ones. Thus, it will be necessary to include species from these biogeographical regions in future analyses to discuss the global monophyletism of the genus *Synergus*.

In this study, only one species described north of Mexico that belongs to this group (*S. punctatus*) has been included in the key due to its great morphological resemblance to one of the newly described species: *S. gilletti*. According to their original descriptions, the rest of the species with partially smooth mesopleurae described north of Mexico (*Synergus agrifoliae* Ashmead (= *Synergus maculatus* Fullaway, = *Synergus obscurus* McCracken and Egbert); *Synergus campanula* Osten Sacken; *Synergus castanopsidis* (Beutenmüller); *Synergus confertus* McCracken and Egbert; *Synergus flavens* McCracken and Egbert; *Synergus laeviventris* (Osten Sacken); *Synergus mendax* Walsh; *Synergus multiplicatus* Fullaway; *Synergus niger* Fullaway; *Synergus pacificus* McCracken and Egbert; *Synergus profusus* McCracken and Egbert; *Synergus stelluli*

Burnett; *Synergus varicolor* Fullaway; *Synergus variegatus* McCracken and Egbert and *Synergus walshii* Gillette (= *Synergus albipes* (Walsh)) can be easily separated from all of the species addressed in this study by the following traits:

Synergus agrifoliae differs from *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons* by having the mesoscutum finely carinated and the scutellum rugose (mesoscutum and scutellum finely coriaceous in these species). It differs from *S. gilletti* and *S. punctatus* by the presence of punctures in the head (no punctures in these species) and by the absence of metasomal micropunctures extending laterally (with micropunctures extending 1/3-1/2 of metasomal length in these species).

Synergus campanula differs from all the species addressed in this study by having the mesoscutum finely and densely carinated, the scutellum densely and deeply rugose and the metasoma as long as broad (mesoscutum and scutellum finely coriaceous and metasoma longer than broad in all the species addressed here). It also differs from *S. gilletti* and *S. punctatus* by the absence of metasomal micropunctures extending laterally (with micropunctures extending 1/3-1/2 of metasomal length in these species).

Synergus castanopsidis differs from all the species addressed in this study by having the metasoma dorsally incised (not incised in none of the species addressed here). It also differs from *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons* by having frontal carinae, the mesoscutum with weak carinae and the scutellum rugose (no frontal carinae and mesoscutum and scutellum finely coriaceous in these species).

Synergus confertus, *S. flavens*, *S. pacificus*, *S. profusus* and *S. varicolor* mainly differ from *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons* by having the mesoscutum carinated and the scutellum rugose (mesoscutum and scutellum finely coriaceous in these species), and from *S. gilletti* and *S. punctatus* by the absence of metasomal micropunctures extending laterally (with micropunctures extending 1/3-1/2 of metasomal length in these species).

Synergus mendax differs from all the species addressed in this study by having the mesoscutum with coarse transverse waving carinae and antennae nearly as long as the body (mesoscutum finely coriaceous and antennae not as long in all

the species addressed here).

Synergus multiplicatus differs from all the species addressed in this study by having the head rugose-punctate, and *Synergus stelluli*, by having the vertex wrinkled in the ocellar area (head coriaceous without rugae in all the species addressed here); moreover, *S. stelluli* has frontal carinae (absent in most of the species mentioned in this study) and a postero-dorsal patch of micropunctures in the metasoma (with micropunctures extending laterally in *S. gilletti* and *S. punctatus*).

Synergus niger mainly differs from *S. cibriani*, *S. citrifomis* (= *S. elegans*), *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons* by having the scutellum deeply rugose and the scutellar foveae large (scutellum finely coriaceous and with inconspicuous foveae in all these species), and from *S. gilletti* and *S. punctatus* by having the mesoscutum smooth and shining, coriaceous-reticulate (finely carinated, not shining, in these species).

Synergus variegatus mainly differs from *S. cibriani*, *S. elegans*, *S. laticephalus*, *S. longimalaris*, *S. longiscapus* and *S. striatifrons* by having the mesoscutum finely transversely carinated and the scutellum rugose (mesoscutum and scutellum finely coriaceous in these species), and from *S. gilletti* and *S. punctatus* by its lighter body coloration (head and body mainly black in these two species); moreover, this species has notauli incomplete (more or less visible but complete in all the species addressed in this study).

Finally, *Synergus walshii* and *S. laeviventris* differ from all the species addressed in this study by having the mesoscutum finely rugose-punctate (with a different sculpture in all the species addressed here) and from *S. gilletti* and *S. punctatus* by the absence of metasomal micropunctures extending laterally (with micropunctures extending 1/3-1/2 of metasomal length in these species). *Synergus walshii* also has the metasoma as long as broad (longer than broad in all the species addressed in this study).

Mexico is an area of *Quercus* diversification, since between 135 and 150 of the 450 worldwide estimated species of this genus are in this country (Pujade-Villar et al. 2009) and 86 of them are considered endemic (Nixon 1998; Zavala 1998). Of them, eight oaks with gall wasps belong to the *Lobatae* section, 23 to the *Quercus* section and two to the *Protobalanus* section.

It is generally assumed that there is a positive

correlation between the number of *Quercus* species and their associated host gall-inducers and inquiline fauna. According to this, the number of inquiline species from Mexico is poorly known, given that only nine species, all of them belonging to the genus *Synergus*, are currently known in front of the 135-150 estimated species of *Quercus*. The main reason for this is the little attention paid to this fauna by different researchers (Pujade-Villar et al. 2008). In this sense, for example, Alfred Kinsey (Hoboken, Nova Jersey 1894 - Bloomington, Indiana 1956) described more than 130 gall wasps in a few years after several biological expeditions in Mexico and Central America (1931-32 and 1935-36), but none of them were inquilines (Pujade-Villar et al. 2009). In contrast, 11 inquiline species have been described from Panama (1 *Agastoroxenia* and 10 *Synergus*) in front of nine species of *Quercus*; 75 species of inquiline gall wasps are known from North America (17 *Ceroptres*, 54 *Synergus* and 4 *Saphonecrus*) in front of 90 species of *Quercus*; finally, 45 species of inquiline gall wasps are known from Europe (2 *Ceroptres*, 34 *Synergus*, 6 *Saphonecus* and 3 *Synophrus*) in front of 14 species of *Quercus* (Tutin et al. 1993; Melika 2006; Nixon 2008; Nieves-Aldrey and Medianero 2011; Péntzes et al. 2012).

Mexico harbors a huge biodiversity of inquilines (Lobato-Vila and Pujade-Villar unpublished data), so the species addressed in this study represent only a fraction of the actual Mexican inquiline biodiversity. In this sense, much more samplings and use of sequencing DNA techniques (see techniques used by Schwéger et al. (2015b) with cynipids from the Eastern Palearctic) will be required to achieve a deeper understanding of this fauna in this country, and especially because Mexico includes two biogeographic areas: Nearctic and Neotropical.

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Authors' contributions: Both authors analyzed all the specimens addressed in this study, identified the new species, decided the new synonymy, structured the content of the manuscript and took the electron microscope images. IL-V wrote the manuscript, described the species and made the morphological key. Both authors participated in revising the manuscript. Both authors read and approved the final manuscript.

Competing interests: IL-V and JP-V declare that they have no conflict of interest.

Availability of data and materials: This work and the five new species name have been registered with ZooBank under: urn:lsid:zoobank.org:pub:DAB4D865-5183-4318-ADD6-80A7B7E09F66. Materials addressed in this study are deposited in collections of several research institutions, as stated in the manuscript.

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Ethics approval consent to participate: Not applicable.

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