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SYNERGUS CASTANOPSIDIS (BEUTENMÜLLER, 1918) AND *SYNERGUS MEXICANUS* GILLETTE, 1896, TWO CONFLICTIVE CYNIPID INQUILINE SPECIES FROM AMERICA (HYMENOPTERA, CYNIPIDAE: SYNERGINI)

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Abstract: The redescription of two cynipid inquiline species of *Synergus* from America is given and illustrated for the first time. Their taxonomic affiliation is discussed. Some conflictive characters are commented. *Synergus castanopsidis* comb. revised and *S. mexicanus* status verified are valid species.
Key words: Hymenoptera, Cynipidae, *Synergus*, America.

Introduction

The Synergini tribe within the Cynipidae is characterised by an obligatory relationship with gall inducers, being inquilines in these galls. This relationship is obligate and though the inquilines derive from herbaceous gall wasps (Ronquist, 1994), they have lost their gall induction capability. Nevertheless, few inquiline species can modify the gall tissues or its morphology. The condition of "inquiline" benefices only the Synergini group, and usually the Synergini larva competes with the gall-inducer larva and kills it. For this reason, this kind of relationship was named as agastoparasitism (Ronquist, 1994)

The Synergini includes eight genera: *Synophromorpha* Ashmead 1903 (Nearctic and Japan), *Rhoophilus* Mayr, 1881 (South Africa), *Synophrus* Hartig, 1843 (Palaearctic), *Periclistus* Foerster, 1869, *Ceroptres* Hartig, 1840, *Saphonecrus* Dalla Torre & Kieffer, 1910, *Synergus* Hartig, 1840 (Holarctic), and recently described genus *Ufo* Melika & Pujade-Villar, 2005 from Japan (Melika et al, 2005, *in press*). These genera are characterized by attacking rosid galls of *Diplolepis* (*Periclistus*), *Rubus* galls (*Synophromorpha*), Fagaceae galls principally *Quercus* (*Ceroptres*, *Synergus*, *Saphonecrus* and supposedly *Ufo*), and *Rhus* galls (*Rhoophilus*).

Species considered in this study have a very particular morphology what caused problems with the assignment of their generic status. *Synergus castanopsidis* (Beutenmueller, 1918) earlier was included into the *Periclistus* genus, until Weld (1926) transferred it to the *Synergus* genus; *Synergus mexicanus* Gillette, 1896 incorrectly was transferred to the *Synophrus* genus (Weld, 1952; Ritchie, 1984). The differences between the implicated genera of these species (*Synergus*, *Synophrus* and *Periclistus*) were mentioned in Pujade-Villar *et al.* (2003). On the other hand, the differences between *Synergus* and *Saphonecrus* are not clear in some species-groups (Pujade-Villar & Nieves-Aldrey, 1990; Pujade-Villar *et al.,* 2003) and for this reason we have to include *Saphonecrus* in the discussion of the proper status of these American species. In this paper we redescribed *Synergus castanopsidis* and *Synergus mexicanus* and discuss their generic and specific affiliation.

Material and Methods

The types examined are deposited in the collection of the National Museum of Natural History (NMNH) in Washington (USA).

We follow the current terminology of morphological structures as given in Gibson (1985), Ronquist & Nordlander (1989), and Fergusson (1995). Abbreviations for forewing venation follow Ronquist & Nordlander (1989). The measurements and abbreviations used herein include: F1 - F12, first and subsequent 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, the distance between lateral and frontal ocellus; transfacial line, distance between inner margins of compound eyes measured across toruli.

In order to preserve the specimens, the SEM pictures were taken under low voltage without coating with carbon or gold.

Synergus castanopsidis (Beutenmüller, 1918) comb. verified

Periclistus castanopsidis Beutenmüller, 1918
Synergus castanopsidis (Beutenmüller) Weld, 1952

TYPE MATERIAL. Female (deposited in NMNH) with the following labels: "13637 Hopk. U. S. (white label), "reared VI.14.16" (white label), Castanopsis chrysphylla" (White label), "Truchee col" (White label, "Dyar HG Volr" (white label), "Type" (red label), "female, Type nº 21788 USNM" (red label), "Periclistus castanopsidis, type, Beutm." (handwritten), *Synergus castanopsidis* (Beutenmüller, 1918) det JP-V.2005.

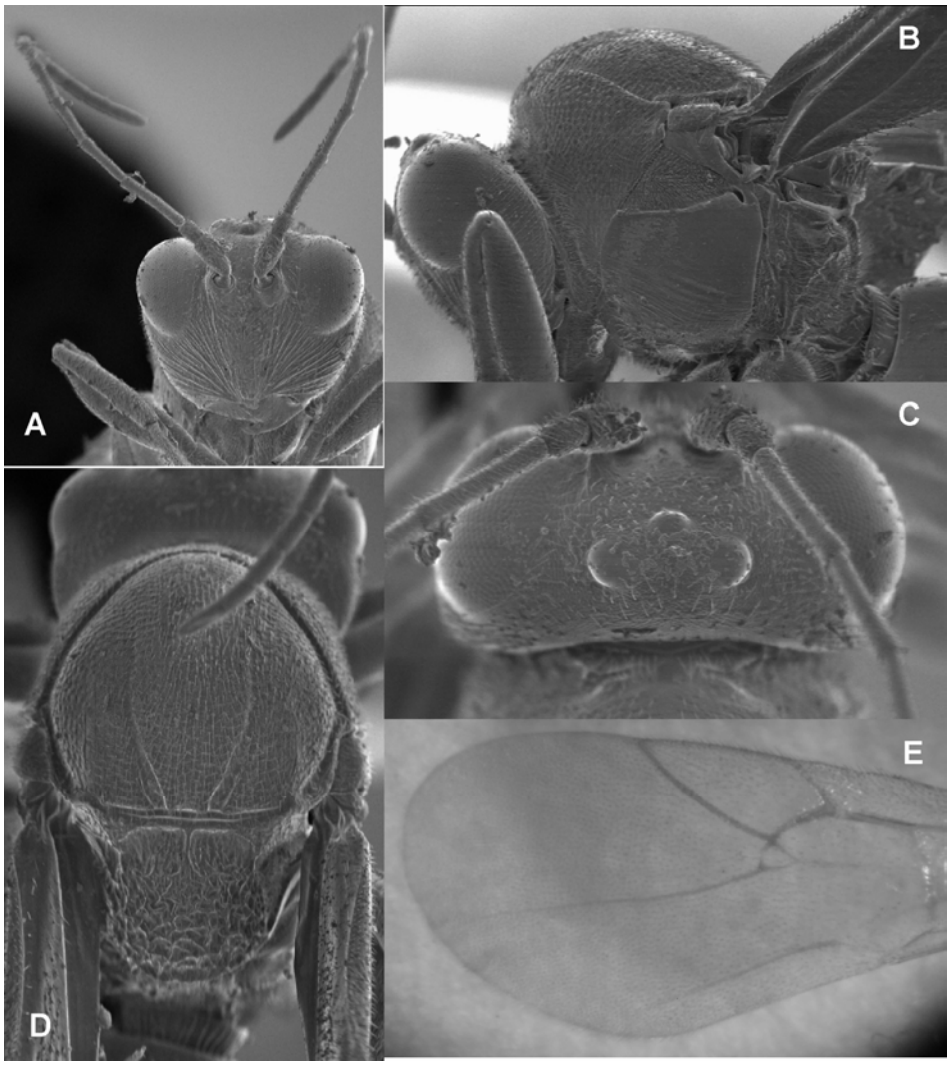

Fig. 1. *Synergus castanopsidis*: **A**: head in front view. **B**: mesosoma in lateral view. **C**: head in dorsal view. **D**: mesosoma in dorsal view and **E**: forewing.

REDESCRIPTION (fig. 1)

Female. Head yellowish brown, frons and vertex black, teeth of mandibles brown black. In front view subquadrate (fig. 1a), 1.3 times as broad as high, slightly narrower than mesoscutum. Gena not broadened behind eye, coriaceous with some disperse points. Margin of clypeus projected and rounded (fig. 1a). Malar space nearly 0.6 times as long as height of eye. Lower face and gena with striae irradiating from clypeus to compound eye and antennal toruli; central part without carinae, coriaceous (fig. 1a). Vertex and frons coriaceous without punctures (fig. 1c). Frontal carinae weak and short, not reaching the lateral ocelli (fig. 1c). Medial frontal carinae absent. Nearly 2.0 times as wide as long in dorsal view (fig. 1c). POL 1.6 times as long as OOL. OOL 1.6 times as long as the diameter of lateral ocellus. LOL as long as the diameter of lateral ocellus. Transfacial line slightly longer than eye height (fig. 1as). Antenna 14-segmented (8:4:13:11:11:10:9:8:7:6:5:5:4:7), filiform not broadened apically; sensilla not visible; F1 (fig. 1a) nearly 7.0 times as long as broad, 3,25 times as long as pedicel and 1.2 times as long as F2. Mesosoma black, 1.25 times as long as high in lateral view (including nucha). Pronotum short dorsally, ratio of median distance between dorsal and ventral margins to shortest lateral distance between anterior margin and anteroventral corner of mesopleural triangle around 0.33; dull and coriaceous in the lateral inferior one third, interrupted above by weak carinae; interspace aluta-ceous; lateral pronotal carina absent (fig. 1b). Mesopleuron (fig. 1b) with transverse striae in the inferior half, the superior half smooth. Metapleural sulcus poorly defined (fig. 1b), located at 0,7 of the height of mesopleuron. Scutum (fig. 1d) coriaceous with some irregular and weak transversal carinae; notauli complete, less impressed anteriorly; median mesoscutal line indicated by a short basal sulcus. Scutellum (fig. 1d) slightly longer than broad, irregularly wrinkled; scutellar foveae superficial, subquadrate, pubescent, shiny and alutaceous, separated by a weak carina. Propodeum delicately carinated and shiny laterally; lateral propodeal carinae broad, parallel; central area rugose. Forewing with pale brown veins and marginal setae. Radial cell closed (fig. 1e), around 2.4 times as long as broad; second abscissa of Rs slightly curved; areolet distinct, closed. Legs yellowish; tarsal claws with a short basal lobe. Metasoma reddish laterally, brown dorsally, longer than mesosoma; first metasomal tergum sulcated (fig. 1b); terga 2+3 with posterior minute punctures, forming a small dorsal patch limited to the apical part; distal dorsal part invaginated. Length 3.4 mm. **Male** unknown.

BIOLOGY. It attacks staminate galls of *Dryocosmus castanopsidis* (Beutenmüller, 1917) on *Castanopsis chrysophylla* (Fagaceae) (Beutenmüller 1918).

DISTIBUTION. Known from Truckee (California, USA) (Beutenmüller 1918).

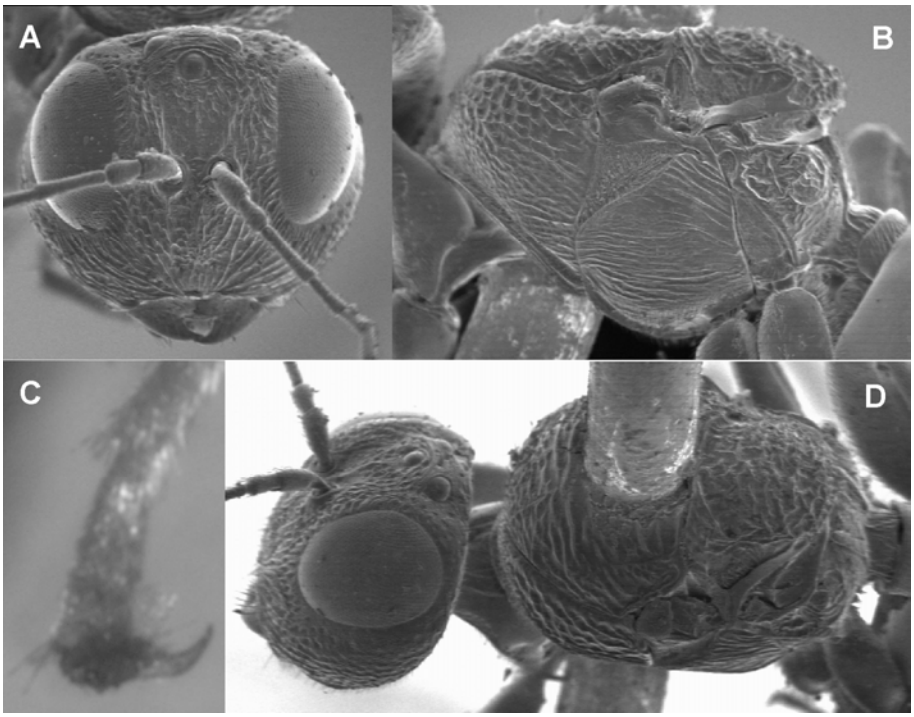

Fig. 2. *Synergus mexicanus*:
A: head in front view.
B: mesosoma in lateral view.
C: tarsal claw and
D: head and mesosoma in latero-dorsal view.

TAXONOMIC COMMENTS. This species was described in the *Periclistus* genus. Certainly, at the first sight it resembles a *Periclistus*; however, the structure of the the first metasomal segment is different. In the *Periclistus* genus the first metasomal tergum is dorsal crescent-shaped, reduced, with smooth and shiny margin; while in *Synergus* the first metasomal tergum has a form of a sulcate collar, as in *Synergus castanopsidis*. Moreover, some morphological peculiarities were observed in *S. castanopsidis*, which differ it from all the Palaearctic *Synergus* species: the face without radiating striae medially, the margin of clypeus is curved, with a central incision, and the mesopleuron in the upper part is shiny, without striae, while all the Palaearctic *Synergus* has the face entirely with radiating striae, the margin of the clypeus is straight and the mesopleuron is completely striate. The Nearctic *Synergus* species are very poorly studied. Nevertheless, we have some other unidentified *Synergus* species from North America with the margin of clypeus curved or projected. Ronquist (1994) mentioned the straight clypeus as a synapomorphy of the Synergini tribe, thus the different shape of the clypeus margin in some North American *Synergus* can change this statement. Also some Japanese *Synergus* species have more or less smooth and shiny areas on the mesopleuron, so the mesopleuron of *S. castanopsidis* could be an extreme of this variation. Finally, the uncarinated medial area of middle head, above the clypeus, could be a specific character of *S. castanopsidis*. All these peculiarities may due to the specifically evolved host relationship of *S. castanopsidis*: inquiline in *Dryocosmus* gall on *Castanopsis*, while all other known Holarctic *Synergus* species, including the well-studied European species, attacking gall wasps associated with *Quercus*. So, we consider that this species belongs to the *Synergus* genus as Weld (1952: 112) affirmed without comments.

Synergus mexicanus Gillette, 1896 status verified

Synophrus mexicanus (Gillette) Weld, 1952

TYPE MATERIAL. Female (deposited in NMNH) with the following labels: "1" (handwritten in a squared white label), "Type" (handwritten in a white label), "N. Mex." (white label), "Type nº 27952 USNM" (red label), "Acc Nº 71950 USNM to be loaned only to ColoAgCol" (white label), "*Synergus mexicana* n. sp" (handwritten), *Synergus mexicanus* Gillette, 1896 det JP-V.2005.

REDESCRIPTION (fig. 2)

Female. Head amber, front and vertex black, teeth of mandibles brown. In front view (fig. 2a) transversely ovate, 1.2 times as broad as high, slightly broader than mesoscutum. Gena (fig. 2d) broadened behind eye, coriaceous with some disperse points. Margin of clypeus straight (fig. 2a). Malar space nearly 0.6 times as long as height of eye (fig. 2a). Lower face and gena with striae irradiating from clypeus to compound eye and antennal toruli, sometimes interrupted and indistinct in the middle part of the head (fig. 2a). Vertex and frons coriaceous with some punctures, laterally rugose (fig. 2a, 2d); interocellar area with carinae concentric to frontal ocellus (fig. 2a). Frontal carinae weak and short, not reaching the lateral ocelli (fig. 2a, 2d). Medial frontal carinae present, weak and not reaching the frontal ocellus (fig. 2d). In dorsal view, around 2.1 times as wide as long. POL 1.3 times as long as OOL. OOL 2 times as long as the diameter of lateral ocellus. LOL equal in length to the diameter of lateral ocellus. Transfacial line slightly longer that eye height (fig. 2a). Antenna 14-segmented (8:5:10:6:6:6:6:6: 6:5:5:4:4:8), filiform, not broadened apically; sensilla not visible; F1 (fig. 2a) around 5.0 times as long as broad, 2.0 times as long as pedicel and 1.6 times as long as F2. Mesosoma laterally amber, dorsally black, 1.4 times as long as high in lateral view (including the nucha). Pronotum short dorsally, ratio of median distance between dorsal and ventral margins to shortest lateral distance between anterior margin and anteroventral corner of mesopleural triangle around 0.26 times; shiny, with strong transverse carinae in the lateral inferior one third, and interrupted with rugae superiorly (fig. 2b); interspaces between them are smooth; lateral pronotal carinae absent (fig. 2b). Mesopleuron with transverse striae (fig. 2b), interspaces alutaceous. Metapleural sulcus high (dig. 2b). Scutum with dense, coarse and transverse striae (fig. 2d); notauli superficially impressed.

Scutellum slightly longer than broad, with coarse and irregular wrinkles (fig. 2d); scutellar foveae very superficial, separated by a point only, oblique, bottom with carinae (fig. 2d). Propodeum black, delicately striated laterally, lateral propodeal carinae broad, external margin parallel, convergent basally in the internal margin; central area delicately alutaceous, with some weak wrinkles. Legs yellowish brown; tarsal claws simple, without basal lobe (fig. 2c). Metasoma reddish brown, longer than mesosoma; first metasomal tergum sulcated, smooth in the dorso-anterior half (fig. 2d); terga 2+3 with posterior minute punctures, limited to a small apical dorsal patch. Length 3.5 mm. **Male** unknown.

BIOLOGY. Unknown.

DISTRIBUTION. Known only from the type material from Mexico.

TAXONOMIC COMMENTS. The type specimen is nailed through the mesosoma and, thus the medial mesoscutal line is not visible. Also the forewings are lost and some important characters in the radial cell are unknown. However, Gillette (1896: 85) mentioned that all the *Synergus* species described by him, have a closed radial cell, even so, he did not include the wing characters in the *S. mexicanus* description. Weld (1952) and later Ritchie (1984) affirmed that this species belongs to the *Synophrus* genus. This assumption is unjustified, because the *Synophrus* has the radial cell opened, the frontal carinae are absent, female antennae with 13 antennomeres and the metapleural sulcus reach the mesopleuron in a low position. *Synergus mexicanus* has the radial cell closed (Gillette, 1896: 85), female antennae with 14 antennomeres, a short frontal carinae present, and the metapleural sulcus reach medsopleuron in a high position. All these characters are typical (diagnostic) for the *Synergus* genus. Even so, some differences between *S. mexicanus* and Palaearctic *Synergus* have been observed. *Synergus mexicanus* has simple tarsal claws and the first tergum is partially smooth, while in all the Euro-Asian species the tarsal claws posses a basal lobe and the first metasomal tergite completely sulcated. In some Nearctic *Synergus* species the metasomal annulus incompletely sulcated (Melika & Pujade-Villar *umpublished data*). For all these reasons, though we do not know the biology and the forewing characters of *S. mexicanus*, we can assure that this species doesn't belong to *Synophrus* as Weld (1926) and Ritchie (1984) mentioned. Morphologically it is most closely related to *Synergus* and we consider this species as such belonging to the *Synergus* genus, even if the tarsal claws are simple, without basal lobe.

Discusion

The species involved in this study, no doubts, belong to the *Synergus* genus. *Synergus castanopsidis* has an essential aspect of *Periclistus* as the original description mentioned, but the shape of the first metasomal tergite invalidate this generic affiliation. *Synergus mexicanus* was transferred to the *Synophrus* genus (Weld, 1926), probably for the shape of the first metasomal tergite, what he never mentioned in his paper. Nevertheless, the number of antennomeres, the presence of frontal carinae and the shape of the radial cell invalidate it. Both studied species could not be included into the *Saphonecrus* genus, which is closely related to *Synergus*, because the radial cell of *S. castanopsidis* and *S. mexicanus* is closed (open in *Saphonecrus*) and the number of antennomeres in male antennae is 14 (13 in *Saphonecrus*). For all mentioned reasons, *S. castanopsidis* and *S. mexicanus* belong to the *Synergus* genus, even some morphological characters are not typical for *Synergus*: *S. castanopsidis* has the mesopleuron completely smooth superiorly and has no facial carinae in the middle of the head, and *S. mexicanus* has simple tarsal claws, without basal lobe. We don't discard also the possibility that these specimens belong to a new undescribed genus. In summary, *Synergus castanopsidis, S. mexicanus* and some Palaearctic species of *Synergus* (*S. variabilis*, *S. plagiotrochi*, 3 new species from Iran (Melika & Pujade-Villar, in prep.)) are characterized by the absence of the lateral pronotal carina, as the majority of *Saphonecrus* species. Studies of *Synergus* and *Saphonerus* species in the Nearctic area are necessary to establish the precise limits of these genera.

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