The Canadian Entomologist (2020), **152**, 601–612
doi:10.4039/tce.2020.23

Published on behalf of the Entomological Society of Canada

ARTICLE

Review of the parasitoid genus *Synosis* Townes, 1959 (Hymenoptera: Ichneumonidae: Metopiinae) in the Neotropical region, with a key to species

M. Alvarado*

Departamento de Entomología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Avenida Arenales 1256 Jesús María, Lima 14, Peru and Bosque Llaqta, Avenida Confraternidad Internacional Este N° 364, Huaraz, Peru
*Corresponding author. Email: malvaradog@unmsm.edu.com

(Received 17 August 2019; revised 2 December 2019; accepted 5 March 2020; first published online 29 May 2020)

Abstract

The genus *Synosis* Townes, 1959 (Hymenoptera: Ichneumonidae: Metopiinae) currently comprises 18 described species. A redescription of the genus is presented and three new species are described and illustrated: *S. diaguita* new species, *S. nigra* new species, and *S. zezei* new species. Two previously known species, *Synosis rubinus* Alvarado and Rodriguez-Berrios, 2013 and *S. townesi* Alvarado and Rodriguez-Berrios, 2013 are recorded for the first time in Ecuador. The genus is recorded for the first time for Ecuador and Argentina. An identification key to the New World species is presented.

Introduction

The genus *Synosis* Townes, 1959 (Hymenoptera: Ichneumonidae: Metopiinae) presently includes 18 described species (Broad and Shaw 2005; Herrera *et al.* 2011; Alvarado and Rodriguez-Berrio 2013). The bulk of its diversity is in the Palaearctic and Neotropical regions; a single species and type of the genus, *Synosis clepsydra* Townes, 1959, is distributed in the Nearctic region.

The Neotropical fauna was recently documented (Gauld and Sithole 2002; Herrera *et al.* 2011; Alvarado and Rodriguez-Berrio 2013) and includes six species from three countries: Brazil (*S. jundiaiensis* Herrera, 2011), Costa Rica (*S. ugaldei* Gauld and Sithole, 2002), and Peru (*S. rubinus* Alvarado and Rodriguez-Berrio, 2013, *S. cosnipatensis* Alvarado and Rodriguez-Berrio, 2013, *S. gauldi* Alvarado and Rodriguez-Berrio, 2013, and *S. townesi* Alvarado and Rodriguez-Berrio, 2013).

As part of a continuing revision of South American Metopiinae, more species were discovered. The aim of this paper is to present a more detailed description of the genus, describe three new species, illustrate them, and provide a key for Neotropical species.

Materials and methods

The type specimens were examined for all the Neotropical species, and the type species of the genus. *Synosis jundiaiensis* Herrera, 2011, was examined using photographs provided by Andrés Fabián Herrera (Department of Biology, Ludwig-Maximilians-University of Munich,

Subject editor: Chris Schmidt
Zoobank number: http://zoobank.org/urn:lsid:zoobank.org:pub:70FA89B950C1-4159-B241-598F977FC576

Bavaria, German). Specimens studied herein are deposited in the Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada (CNC); Entomological Museum Klaus Raven Buller, Lima, Peru (MEKRB); San Marcos Natural History Museum, Lima, Peru (MUSM); United States National Museum, Washington, District of Columbia, United States of America (USNM); and Utah State University, Logan, Utah, United States of America (USUC).

Morphological terminology and the format for the species descriptions mostly follow Alvarado and Rodriguez-Berrio (2013) except for face + clypeus that now is refers as face and clypeus and the ratio of length from flagellomeres 2 and 3 were added; for the genus redescription mostly follows Gauld and Sithole (2002) except for the tarsal claws that are referred as pretarsal claws and were added features found in the head, pronotum, mesoscutum, protibial spur, and metasomal tergites VI–VIII. The dissection of the female terminalia was performed by severing the metasomal tip. The severed section was cleared in a 10% solution of potassium hydroxide at room temperature for 24 hours and then transferred to water and 96% ethanol prior to long-term storage in glycerin. Photomicrographs were prepared using a Nikon (Tokyo, Japan) D1x digital camera attached to an Infinity (Centennial, Colorado, United States of America) K-2 long-distance microscopic lens (in the laboratories of the Snow Entomological Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, United States of America). Label data are noted verbatim, with notes in square brackets describing abbreviations, unique identifier labels, and dissections performed.

Genus *Synosis* Townes

Synosis Townes in Townes and Townes, 1959:168.

Type species. *Synosis clepsydra* Townes, 1965 by original designation.

Diagnosis. *Synosis* can be distinguished from all other genera of metopiines by the combination of the following characters: (1) upper part of face produced upwards between bases of antennae, this projection distally slightly concave or straight, dorsally lacking an inter-antennal lamella (Fig. 1A); (2) propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina (Fig. 1C) or close to each other (Fig. 1D–F) then divergent so area superomedia and area basalis are more or less triangular (Fig. 1C–F); (3) metapleuron with a band of setae along the dorsal periphery, elsewhere bare (Fig. 1B); (4) metasomal tergite VIII of female with a concavity centrally near base of tergite (Fig. 1F–G).

Comments. The characters mentioned in the diagnosis are uniquely found in *Synosis*, except for band of setae along its dorsal periphery that is also present in *Stethoncus* Townes, 1959 and *Hypsicera* Latreille, 1829 but in these genera is formed only by fine line of isolate setae.

Redescription. *Head.* Mandibles weakly tapering towards apex, ventrally straight, without ventral flange; apex not twisted, with upper tooth longer than lower tooth; labrum not conspicuously exposed when mandible closed; palp formula 5:4, maxillary palpomeres slender; clypeus transverse, its apical margin weakly convex; face and clypeus moderately convex (tentorial pit not located in a raised area); without subocular sulcus; upper part of face produced upwards between bases of antennae, this projection distally slightly concave or straight (Figs. 1A, 2C, 3C, 4C), dorsally lacking an inter-antennal lamella (Fig. 3B); frons without a carina surrounding toruli; without striations between toruli and compound eyes; occipital carina absent or present only dorsally; postgenal bridge not projected.

Mesosoma. Pronotum polished with band of setae along upper margin, with a longitudinal concavity parallel to anterior margin, upper edge with a shallow submarginal groove, with a ventral pronotal pit, epomia close to and parallel to anterior margin of pronotum with its upper end divergent; propleurae not swollen; mesoscutum rather flat, with notauli impressed, with concavity along lateral margin (between notauli and distal end of mesoscutum); scutoscutellar groove broad,

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

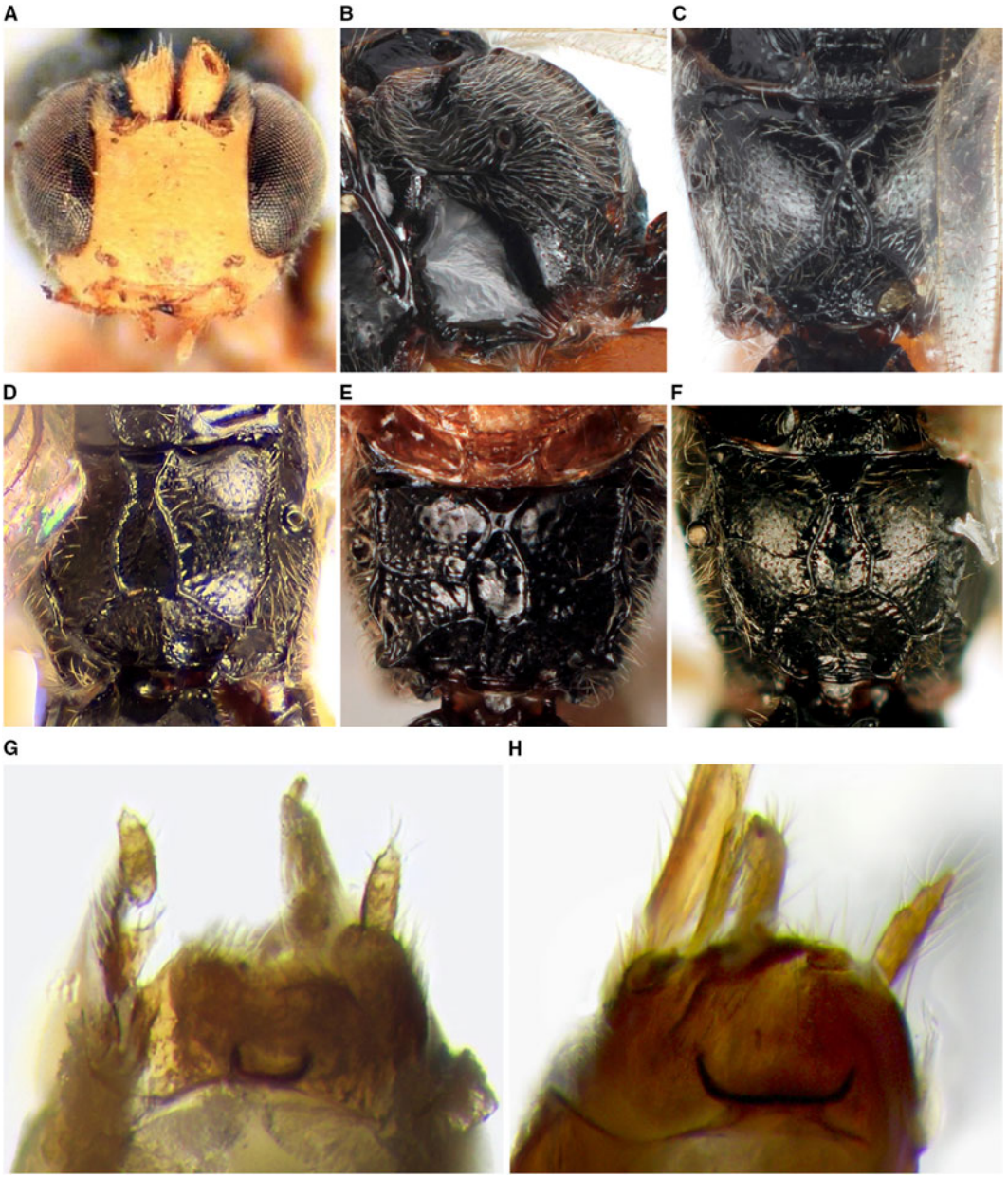

Fig. 1. Details of *Synosis*. **A**, Facial view, *S. clepsydra*; **B**, metapleuron, *S. clepsydra*; **C**, propodeum, *S. clepsydra*; **D**, propodeum, *S. gauldi*; **E**, propodeum, *S. rubinus*; **F**, propodeum, *S. townesi*; **G**, metasomal tergite VIII of female, *S. clepsydra*; **H**, metasomal tergite VIII of female, *S. zezei*.

more or less smooth or scrobiculate; scutellum tapering towards distal end, with lateral carinae only reaching over prescutellar ridge; mesopleuron moderately swollen, sternaulus distinct, and extending about 0.3–0.5 the length of the mesosternum; epicnemial carina complete, laterally convergent with anterior margin of pleuron until near upper end, where it turned backwards to reach subalar prominence; subalar prominence flattened (not forming a carina-like projection or a horn); mesopleural suture discernible, smooth bellow speculum; posterior transverse carina

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

present laterally and centrally (absent in front of coxae). Metapleuron (Fig. 1B) almost flat to weakly convex, polished, with a band of setae along its dorsal periphery, elsewhere bare (rarely with isolate setae in remaining surface); submetapleural lobe from weakly expanded to well developed and conspicuous. Propodeum (Fig. 1C–F) with lateral longitudinal carinae complete; lateromedian carinae strongly convergent anteriorly joining into a single carina (Fig. 1C) or, in some species, separated (Fig. 1D–F) but close to each other (in this case with (Fig. 1E–F) or without (Fig. 1D) transverse carina between them), then dividing more posteriorly so that area superomedia and area basalis are more or less triangular, posteriorly reaching back to posterior transverse carina; anterior transverse carina present or absent between pleural and lateral longitudinal carinae, in some species present between lateromedian longitudinal carinae; posterior transverse carina usually complete (except in *S. ugaldei*); propodeal spiracle round or oval. Protrochantellus and mesotrochantellus distinctly differentiated; protibial spur dorsoanteriorly with a comb and dorsoposteriorly with a velum; protarsomeres 2–3 slightly longer than wide, tarsomere 4 wider than long; pretarsal claws simple; mesotibia with two spurs, outer spur distinctly longer than inner spur; metatibia with inner margin apically with a curved comb, with two spurs, outer spur shorter than inner spur; metatarsomere 5 without a hooked lobe on inner side of female. Fore wing without a trace of an enclosed areolet, cua far distal to base of Rs&M; 2 m-cu with one bulla. Hind wing with distal abscissa of Cu1 joining cu-a closer to 1A than to M.

Metasoma. Tergite I with lateral and lateromedian longitudinal carinae well developed, spiracle at 0.3–0.4 anterior of tergite; sternum I short, ending anterior to spiracle; laterotergite II 0.1–0.5 times as wide as long; laterotergites of metasomal segments III and IV separated by a crease; metasomal tergites VI–VIII without setae on distal margin; metasomal tergite VIII of female not folded ventrally, not partly separated by crease, with concavity centrally near base of tergite (Fig. 1G–H); female with sternum VI wider than long, basal, and distal margins more or less straight; male with metasomal tergites VIII + IX medially divided; male with sternum VIII wider than long; paramere distally flat; apodemes of aedeagus shorter than aedeagus.

Natural history. Little is known about the natural history of *Synosis*, as other metopiine, they are koinobiont endoparasitoids of Lepidoptera, reared from the families Yponomeutidae, *Swammerdamia caesiella* (Hübner, 1796), and *Ypsolopha parenthesella* (Linnaeus, 1761) (Broad and Shaw 2005) and Geometridae, *Venusia pearsalli* (Dyar, 1906) and unidentified species of *Venusia* Curtis, 1839 (Lepidoptera: Geometridae) (Bradley 1974).

Synosis clepsydra Townes, 1959

Figure 1A–C, G.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina, or running close to each other, and anterior transverse carina present only next to lateral longitudinal carina; submetapleural lobe semicircular, scrobiculate; mesosoma predominantly black; and legs reddish brown.

Comments. This species occurs in North America, north of Mexico. It the only *Synosis* species recorded from Nearctic region. It was reared from *Venusia pearsalli* (Dyar, 1906) and *Venusia* species feeding on *Malus* Miller (Rosaceae) and the *Alnus rubra* Bongard (Belutaceae) and *Alnus* species (Bradley 1974).

Examined material. Holotype: 1♀ "United States of America: Camino, Califor. [California] 27 June 1948, MHG & D Townes" (USNM). **Paratype:** 1 ♀ "Auburndale, Mass., June 17 (Townes)" (USUC). **Nontype material.** 1♀ "Williamsville, MO 1-8.4.1972 J.T. Becker Malaise Trap [CNC493235]" (CNC), 1♂ "Highlands, N.C. 22.v.1957 W.R.M. Mason [CNC493236, male genitalia extracted]" (CNC), and 1♀ "Jumping Pd. Cr 20 mi. W. Calgary ALTA 19 July W.R.M. Mason′62 [CNC493237, female genitalia extracted]" (CNC).

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

Fig. 2. Details of *Synosis diaguita*, new species. **A**, Habitus of female, in lateral view (scale bar = 1 mm); **B**, habitus of male, in lateral view; **C**, facial view; **D**, head and mesosoma in dorsal view.

Synosis diaguita Alvarado, new species

http://zoobank.org/urn:lsid:zoobank.org:act:ECD42955-9AE8-4F43-92E6-A9DF297ADB2B
Figure 2.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina and anterior transverse carina present between longitudinal carinae; submetapleural lobe semicircular, smooth; mesosoma predominantly black; and female with all legs yellow testaceous and male with legs yellowish testaceous except for metacoxa brown.

Comments. *Synosis diaguita* is most similar to *S. jundiaiensis*, from which it can be differentiated by having the scape ventrally yellow (versus black), antenna with 29–31 flagellomeres (versus 27 flagellomeres), and flagellomeres brown (versus black). It is the first *Synosis* species recorded from Argentina.

Description. *Female*. Fore wing length 3.4 mm.

Head. Face and clypeus 0.9 times as long as wide (Fig. 2C); malar space 0.9 times as long as basal mandibular width; lateral ocellus separated from compound eye by 1.0 times ocellar diameter (Fig. 2D); distance between lateral ocelli 1.5 times their own maximum diameter; head posteriorly behind ocellar triangle, strongly declivous, and concave; gena, on lateral view 0.7 times as long as compound eyes; occipital carina absent; antenna with 31 flagellomeres, ratio of length from second to fourth flagellomeres: 1.4:1.4:1.4, subapical flagellomere 1.4 times as long as centrally wide.

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

Mesosoma. Mesoscutum with notaulus extending 0.6 times length of mesoscutum; scutellum flat; scutoscutellar groove smooth (Fig. 2D); metapleuron bare at centre; submetapleural lobe smooth, semicircular. Propodeum with lateromedian longitudinal carinae anteriorly converging but never in contact, with space between them thinner than thickness of both carinae; area basalis and superomedia without setae; area superomedia pentagonal; anterior transverse carina present only between lateral and lateromedian longitudinal carinae. Fore wing with vein cua distal to base of Rs&M by about 0.5 times its own length; Cu1 between 1 m-cu and Cu1a 1.4 times as long as Cu1b; Cu1a between Cu1b and 2 m-cu 1.5 times as long as Cu1 between Rs&M and 1 m-cu; 2 rs-m 0.7 times as long as abscissa of M between 2 rs-m and 2 m-cu. Hind wing with distal abscissa of M not sclerotised; Cu1 faint, but discernible.

Metasoma. Tergite I 1.3 times as long as posteriorly wide, lateromedian carinae extending 0.4 times length of tergite without punctures present between lateromedian carina; tergite II 0.7 times as long as posteriorly wide; laterotergite II 0.2 times as long as wide.

Colour. Head black except extensively yellow on face, malar space, palpi, ventral part of scape, and mandible and brown flagellomeres. Mesosoma (Fig. 2A) predominantly black, except for tegula testaceous, and legs testaceous, metacoxa light brown. Wings hyaline; pterostigma brown.

Variation. The female paratype (fore wing length 3.5 mm) varies in having: lateral ocellus separated from compound eye by 1.1 times ocellar diameter; distance between ocelli 1.6 times its own maximum diameter; antenna with 29 flagellomeres, ratio of length from second to fourth flagellomeres: 1.7:1.7:1.7, subapical flagellomere 1.3 times as long as centrally wide; propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina; metasomal tergite I 1.4 times as long as posteriorly wide; metacoxa testaceous.

Male. Fore wing length 3.3 mm. Similar to the female except: antenna with 29+ flagellomeres, ratio of length from second to fourth flagellomeres: 1.6:1.5:1.5; propodeum with anterior transverse carina complete between longitudinal carinae; metasoma with tergite I 1.4 times; metacoxa light brown (Fig. 2B).

Holotype. ♀ "Amaicha del Valle XII-31–65 Argent. [Argentina] H. & M. Townes" (USUC).

Paratypes. ♀ "Amaicha del Valle XII-31–65 Argent. [Argentina] H. & M. Townes", and ♂ "Amaicha del Valle XII-29–65 Argent. [Argentina] H. & M. Townes", left antenna missing and tip of right antenna broken (USUC).

Etymology. The species epithet *diaguita* refers to the Diaguita people, a group of South American indigenous people native to the Chilean Norte Chico and the Argentine Northwest. It is treated as a noun in apposition.

Synosis gauldi Alvarado and Rodriguez-Berrios, 2013

Figure 1D.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging but never in contact and anterior transverse carina present only between lateromedian longitudinal carinae; submetapleural lobe thin, triangular, smooth; mesosoma predominantly black; and legs yellow but metathoracic leg with coxa, basal and distal ends of tibia, and tarsomeres black.

Comments. *Synosis gauldi* was only known from the holotype, collected in Cuzco, Peru, at 2052 m (Alvarado and Rodriguez-Berrios 2013), a second specimen for the species is recorded in Amazonas department. This species occurs in rain forest along the eastern slope of the Peruvian Andes between 2050–2362 m.

Examined material. Holotype: ♀ "PERU: CU, Valle del Qosñipata, Rocotal, 13°06′48″S, 71°34′13″W, 2052 m. 07 January 2008. Malaise trap 10. C. Castillo" (MUSM). **Nontype material:** ♀, "PERÚ: AM. Abra Patricia Trocha Mono 17.xi.2012 05°41′36″S/ 77°48′41.9″W 2362 m Malaise Trap J. Suárez & P. Sánchez" (MUSM).

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

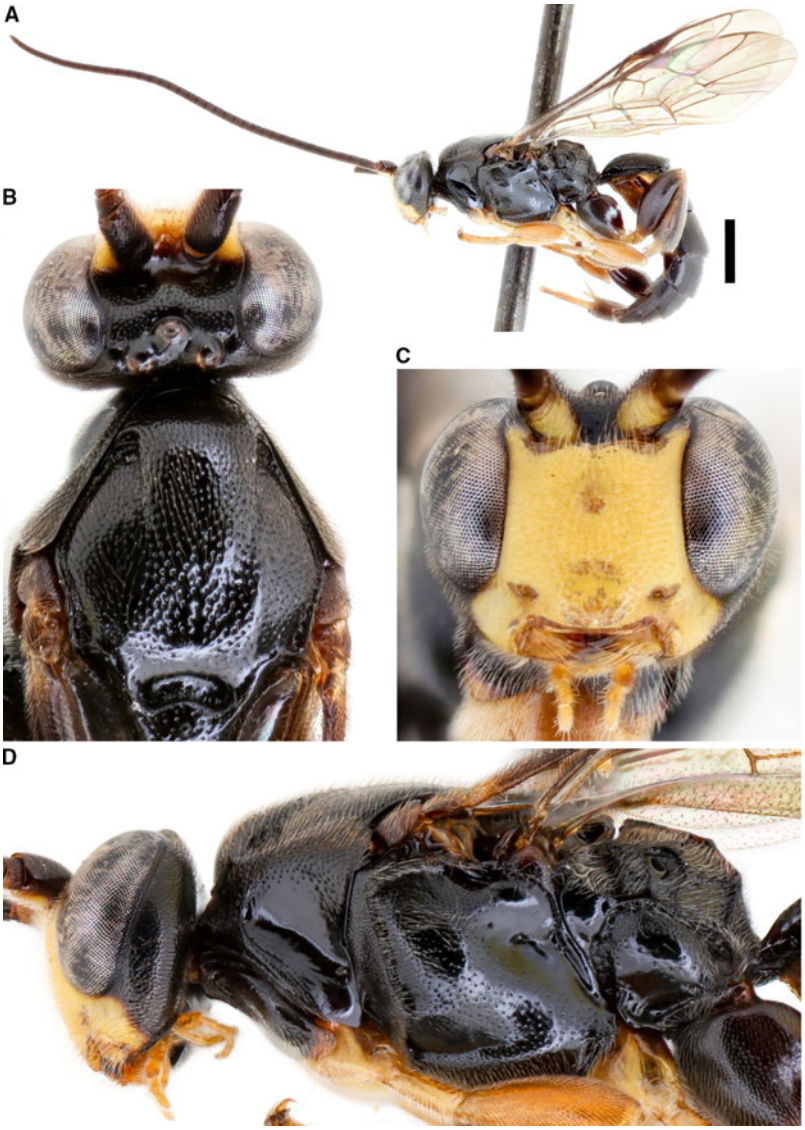

Fig. 3. Details of *Synosis nigra*, new species. **A**, Habitus of female, in lateral view (scale bar = 1 mm); **B**, head and mesosoma in dorsal view; **C**, facial view; **D**, head and mesosoma in lateral view.

Synosis nigra Alvarado, new species

http://zoobank.org/urn:lsid:zoobank.org:act:64E30CBB-343 E-41EF-9275-A3FB6BC7C05E
Figure 3.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina and anterior transverse carina present between longitudinal carinae; submetapleural lobe semicircular, smooth; mesosoma predominantly black; and prothoracic and mesothoracic legs testaceous and metathoracic leg with coxa, femur, and tibia (but ventrally reddish brown) black.

Comments. *Synosis nigra* is most similar to *S. townesi*, from which it can be differentiated by the submetapleural lobe semicircular (versus triangular) and distance between lateral ocelli 1.5 times

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

their own maximum diameter (versus 1.0–1.1 times). It is the second *Synosis* species recorded from Brazil.

Description. *Male*. Fore wing length 4.9 mm.

Head. Face and clypeus 0.9 times as long as wide (Fig. 3C); malar space 1.2 times as long as basal mandibular width; lateral ocellus separated from compound eye by 0.9 times ocellar diameter (Fig. 3B); distance between lateral ocelli 1.5 times their own maximum diameter; head posteriorly behind ocellar triangle, strongly declivous and concave; gena, on lateral view 0.5 times as long as compound eyes; occipital carina absent; antenna with 39 flagellomeres, ratio of length from second to fourth flagellomeres: 1.6:1.5:1.5, subapical flagellomere 1.6 times as long as centrally wide.

Mesosoma. Mesoscutum with notaulus extending 0.6 times length of mesoscutum; scutellum flat; scutoscutellar groove scrobiculate (Fig. 3B); mesopleuron with epicnemial carina ending at subalar prominence; metapleuron with isolate setae at centre; submetapleural lobe smooth, semicircular. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina; area basalis and superomedia bare; area superomedia pentagonal; anterior transverse carina present only between lateral and lateromedian longitudinal carinae. Fore wing with vein cua distal to base of Rs&M by about 0.6 times its own length; Cu1 between 1 m-cu and Cu1a 1.5 times as long as Cu1b; Cu1a between Cu1b and 2 m-cu 1.5 times as long as Cu1 between Rs&M and 1 m-cu; 2 rs-m 0.9 times as long as abscissa of M between 2 rs-m and 2 m-cu. Hind wing with distal abscissa of M not sclerotised; Cu1 sclerotised throughout.

Metasoma. Tergite I 1.3 times as long as posteriorly wide, lateromedian carinae extending 0.4 times length of tergite without punctures present between lateromedian carina; tergite II 0.7 times as long as posteriorly wide; laterotergite II 0.2 times as long as wide.

Colour. Head (Fig. 3C–D) black except extensively yellow on face, malar space, ventral part of scape, and mandibles, and palpi testaceous. Mesosoma predominantly black (Fig. 3D), except for tegula brownish black; prothoracic and mesothoracic legs testaceous; metathoracic leg with coxa, femur, and tibia (but ventrally reddish brown) black (Fig. 3 A), trochanter, trochantellus, and tibial spurs testaceous, and tarsomere brownish testaceous. Wings hyaline; pterostigma brown.

Female. unknown.

Holotype. ♂ "Nova Teutonia 27°11′S 52°23′W BRAZIL, 300–500 m I.1967 Fritz Plaumann [CNC493234]" (CNC).

Etymology. The specific epithet *nigra,* meaning "black", is a reference to the colour of the metathoracic leg. It is treated as an adjective in the nominative singular.

Synosis rubinus Alvarado and Rodriguez-Berrios, 2013

Figure 1E.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging but never in contact and anterior transverse carina present; submetapleural lobe triangular, smooth; mesosoma predominantly red except for propodeum and most of metapleuron (except for anterior and dorsal margins red) black; and legs predominantly yellow except for mesothoracic leg with tarsomeres 3–5, metathoracic leg with coxa anteriorly, tibia distally and basally (in the Ecuadorian individual), and tarsomere 5 black.

Comments. It is the first *Synosis* species recorded from Ecuador. *Synosis rubinus* was only known to occur in Peru (Alvarado and Rodriguez-Berrios 2013). It is recorded for the first time in Ecuador. This species occurs in rain forest along the eastern slope of the Andes Mountains between 800–1600 m.

Examined material. Holotype: ♂ "PERU: CU, La Convención, Quillabamba, Poromate, 1600 m. 11 November 2007. A. Rodriguez" (MEKRB). **Nontype material:** ♂ "Zamora, Ecuador XI.24.70 800 m Luis E. Peña" (USUC).

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

Synosis townesi Alvarado and Rodriguez-Berrios, 2013

Figure 1F.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging but never in contact and without anterior transverse carina between them; submetapleural lobe triangular, smooth; mesosoma predominantly black, and legs predominantly yellow except for metathoracic leg with coxa, tibia apically, and tarsomeres black.

Comments. It is the second *Synosis* species recorded from Ecuador. *Synosis townesi* was only known to occur in Cuzco, Peru (Alvarado and Rodriguez-Berrios 2013). It is recorded for the first time in Ecuador. This species occurs in rain forest along the slope of the Andes Mountains between 1500–2700 m.

Examined material. Holotype: ♀ "PERU: CU, C.I. Waiqecha, 13°03′21″ S, 71°35′04″ W/, 2662 m. 20 October 2007. Malaise trap 4. C. Castillo" (MUSM); **Paratype:** ♀ "PERÚ: CU, Cosñipata valley, Rocotal, 2052 m, 13°06′47.7″S/ 71°34′13.3″W 10.xii.2007 Malaise. C. Castillo" (MUSM). **Nontype material:** ♀, "ECUADOR: Napo, Sierra Azul (Hacienda Aragon), 0.67°S, 77.92°W, 2300 m 21–22.iii.1996; P. Hibbs yellow pan traps" (USUC).

Synosis zezei Alvarado, new species

http://zoobank.org/urn:lsid:zoobank.org:act:C01004C3-0416-4B14-9285-CFA0B7DEC0A4

Figures 1H, 4.

Diagnosis. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina and anterior transverse carina present between longitudinal carinae; submetapleural lobe semicircular, smooth; mesosoma predominantly black; and legs reddish brown.

Comments. *Synosis zezei* is most similar to *S. diaguita*, from which it can be differentiated by females with ratio of length from second to fourth flagellomeres: 1.2:1.1:1.1 (versus 1.4–1.7: 1.4–1.7:1.4–1.7) and lateral ocellus separated from compound eye by 0.6 times ocellar diameter (versus 1.0–1.1 times). It is the third *Synosis* species recorded from Brazil.

Description. *Female.* Fore wing length 6.1 mm.

Head. Face and clypeus 0.9 times as long as wide (Fig. 4C); malar space 1.1 times as long as basal mandibular width; lateral ocellus separated from compound eye by 0.6 times ocellar diameter; distance between lateral ocelli 1.3 times their own maximum diameter (Fig. 4E); head posteriorly behind ocellar triangle, strongly declivous and concave; gena, on lateral view 0.5 times as long as compound eyes; occipital carina absent; antenna with 29 flagellomeres, ratio of length from second to fourth flagellomeres: 1.2:1.1:1.1, subapical flagellomere 1.4 times as long as centrally wide.

Mesosoma. Mesoscutum with notaulus extending 0.7 times length of mesoscutum; scutellum flat; scutoscutellar groove scrobiculate (Fig. 4E); metapleuron bare at centre; submetapleural lobe smooth, semicircular. Propodeum with lateromedian longitudinal carinae anteriorly converging into a single carina (Fig. 4E); area basalis and superomedia without setae; area superomedia pentagonal; anterior transverse carina present between longitudinal carinae. Fore wing with vein cua distal to base of Rs&M by about 0.6 times its own length; Cu1 between 1 m-cu and Cu1a 1.5 times as long as Cu1b; Cu1a between Cu1b and 2 m-cu 1.4 times as long as Cu1 between Rs&M and 1 m-cu; 2 rs-m 0.8 times as long as abscissa of M between 2 rs-m and 2 m-cu. Hind wing with distal abscissa of M not sclerotised; Cu1 sclerotised throughout.

Metasoma. Tergite I 1.3 times as long as posteriorly wide, lateromedian carinae extending 0.4 times length of tergite without punctures present between lateromedian carina; tergite II 0.7 times as long as posteriorly wide; laterotergite II 0.2 times as long as wide (Fig. 4A).

Colour. Head (Fig. 4A, C) black except extensively yellow on face, malar space, palpi, ventral part of scape, and mandible. Mesosoma (Fig. 4D) predominantly black, except for tegula

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

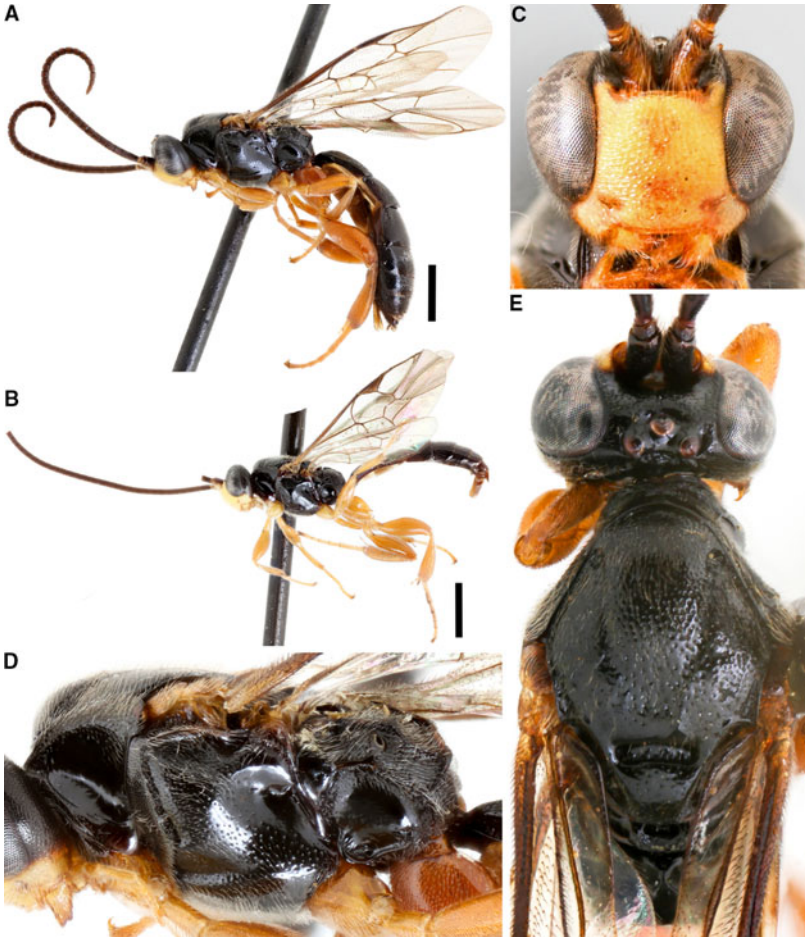

Fig. 4. Details of *Synosis zezei*, new species. **A**, Habitus of female, in lateral view (scale bar = 1 mm); **B**, habitus of male, in lateral view (scale bar = 1 mm); **C**, facial view; **D**, mesosoma in lateral view; **E**, head and mesosoma in dorsal view.

and legs (Fig. 4A) reddish testaceous except for metatibia apically brown. Wings hyaline; pterostigma brown.

Variation. The female paratype (fore wing length 5.0 mm.) varies in having: lateral ocellus separated from compound eye by 0.7 times ocellar diameter; distance between ocelli 1.4 times its own maximum diameter; antenna with 30 flagellomeres; subapical flagellomere 1.2 times as long as centrally wide; tergite II 0.6 times as long as posteriorly wide; fore wing with vein 2 rs-m 0.7 times as long as abscissa of M between 2 rs-m and 2 m-cu.

Male. Fore wing length 3.5 mm. Similar to the female except: malar space 1.2 times as long as basal mandibular width; ratio of length from second to fourth flagellomeres: 1.6:1.4:1.4; subapical flagellomere 1.4 times as long as centrally wide; tergite I 1.5 times as long as posteriorly wide, lateromedian carinae extending 0.5 times length of tergite without punctures present between lateromedian carina; tergite II 0.8 times as long as posteriorly wide; fore wing with vein cua distal to base of Rs&M by about 0.7 times its own length; Cu1 between 1 m-cu and Cu1a 1.4 times as long as Cu1b; Cu1a between Cu1b and 2 m-cu 1.45 times as long as Cu1 between Rs&M and 1 m-cu; 2 rs-m 0.6 times as long as abscissa of M between 2 rs-m and 2 m-cu.

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

Holotype. ♀ "Nova Teutonia 27°11′S 52°23′W BRAZIL, 300–500 m II.1966 Fritz Plaumann [CNC493232]" (CNC).
Paratypes. ♀ "Nova Teutonia 27°11′S 52°23′W BRAZIL, 300–500 m II.1966 Fritz Plaumann [CNC493233]", metasoma dissected and storage in a glass vial and pinned with the specimen (CNC), and ♂ "Nova Teutonia Santa Catarina III.31.54 Braz [Brazil] Fritz Plaumann" (USUC).
Etymology. The species epithet *zezei* in reference to the main character of "My Sweet Orange Tree", a novel by José Mauro de Vasconcelos. It is treated as a noun in apposition.

Key for New World species of *Synosis*

1. Mesosoma predominantly red except propodeum black; tergite I with lateromedian carina extending almost to posterior margin ..... ***Synosis rubinus* Alvarado and Rodriguez-Berrio, 2013**
– Mesosoma predominantly black, at most with tegulae and upper area of subalar prominence yellow; tergite I with lateromedian carina extending at most to middle of the tergite 2
2. Propodeum without anterior transverse carina between lateral and lateromedian longitudinal carinae (Fig. 1B, D) 3
– Propodeum with anterior transverse carina between lateral and lateromedian longitudinal carinae (Fig. 1F) 6
3. Malar space 0.9 times as long as basal mandibular width; metasoma with tergites predominantly black but with margins of tergite II reddish brown, in some individuals also tergites I and III–IV also distally reddish brown ..... ***Synosis clepsydra* Townes, 1965**
– Malar space 1.1–1.6 times as long as basal mandibular width; metasoma with tergites entirely black 5
4. Subalar prominence yellow; metacoxa black and metatibia basally and apically dark ..... ***Synosis gauldi* Alvarado and Rodriguez-Berrio, 2013**
– Subalar prominence black; metacoxa and metatibia entirely reddish brown 4
5. Malar space 1.1–1.3 times as long as basal mandibular width; gena on lateral view 0.8–0.9 times as long as compound eyes ..... ***Synosis cosnipatensis* Alvarado and Rodriguez-Berrio, 2013**
– Malar space 1.6 times as long as basal mandibular width; gena on lateral view 0.6 times as long as compound eyes ..... ***Synosis ugaldei* Gauld and Sithole, 2002**
6. Metacoxa black; antenna with 36–37 flagellomeres 7
– Metacoxa light brown, reddish brown, or testaceous; antenna with 27–32 flagellomeres 8
7. Metafemur and metatibia entirely black (Fig. 3A); metapleuron with isolated setae at the centre (Fig. 3D); malar space 1.1 times as long as basal mandibular width ..... ***Synosis nigra* Alvarado, new species**
– Metafemur predominantly yellow, metatibia yellow gradually changing to black apically; metapleuron bare at the centre (like, Fig. 4D); malar space 1.6–1.7 times as long as basal mandibular width ..... ***Synosis townesi* Alvarado and Rodriguez-Berrio, 2013**
8. Metasoma with tergite II 1.1 times as long as wide; malar space 1.5–1.6 times as long as basal mandibular width ..... ***Synosis jundiaiensis* Herrera, 2011**
– Metasoma with tergite II 0.7–0.8 times as long as wide; malar space 0.9–1.2 times as long as basal mandibular width 9

https://doi.org/10.4039/tce.2020.23 Published online by Cambridge University Press

9. Malar space 1.1 times as long as basal mandibular width (Fig. 4C); gena, on lateral view 0.5 times as long as compound eyes; scutoscutellar groove scrobiculate (Fig. 4E) .... ***Synosis zezei*** **Alvarado, new species**

–. Malar space 0.9 times as long as basal mandibular width (Fig. 2C); gena, on lateral view 0.7 times as long as compound eyes; scutoscutellar groove smooth (Fig. 2D) .... ***Synosis diaguita*** **Alvarado, new species**

Acknowledgements. I am grateful to two anonymous reviewers for their comments and suggestions that improved the manuscript. The author was supported by a fellowship from the Fondo para la Innovación, Ciencia y Tecnología, Peru. Andrés Fabián Herrera kindly sent pictures of the holotype of *S. jundiaiensis*.

References

Alvarado, M. and Rodriguez-Berrio, A. 2013. Four new species of the genus *Synosis* Townes (Hymenoptera: Ichneumonidae) from the eastern Andes of Peru and key for the New World species. Journal of Natural History, **47**: 1–14. http://doi.org/10.1080/00222933.2013.768912.

Bradley, G.A. 1974. Parasites of forest Lepidoptera in Canada, subfamily Metopiinae and Pimplinae (Hymenoptera: Ichneumonidae), part 1. Publication 1336. Canadian Forestry Service, Environment Canada, Ottawa, Ontario, Canada.

Broad, G.R. and Shaw, M.R. 2005. The species of four genera of Metopiinae (Hymenoptera: Ichneumonidae) in Britain, with new host records and descriptions of four new species. Journal of Natural History, **39**: 2389–2407.

Gauld, I.D. and Sithole, R. 2002. Subfamily Metopiinae. *In* The Ichneumonidae of Costa Rica 4, *Edited by* I.D. Gauld, C. Godoy, and J. Ugalde-Gómez. Memoirs of the American Entomological Institute, **66**: 11–262.

Herrera, A.F., Sobczak, J.F., and Penteado-Dias, A.M. 2011. First record and description of a new species of *Synosis* (Hymenoptera: Ichneumonidae: Metopiinae) from Brazil. Entomological News, **122**: 328–331. http://doi.org/10.3157/021.122.0405.

Townes, H. and Townes, M. 1959. Ichneumon-flies of America north of Mexico: 1. Subfamily Metopiinae. Bulletin of the United States National Museum, **216**: 1–318.

Cite this article: Alvarado, M. 2020. Review of the parasitoid genus *Synosis* Townes, 1959 (Hymenoptera: Ichneumonidae: Metopiinae) in the Neotropical region, with a key to species. The Canadian Entomologist, **152:** 601–612. https://doi.org/10.4039/tce.2020.23.