

Darwin wasps (Hymenoptera: Ichneumonidae) of Mexico: subfamily Rhyssinae

Дарвиновские наездники (Hymenoptera: Ichneumonidae) Мексики: подсемейство Rhyssinae

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КЛЮЧЕВЫЕ СЛОВА: паразитоиды, *Epirhyssa*, *Megarhyssa*, Неарктика, Северная Америка, фауна, синонимия, систематика, определительный ключ.

PALABRAS CLAVE. parasitoides, *Epirhyssa*, *Megarhyssa*, Región Neártica, Norteamérica, fauna, sinonimia, taxonomía, clave.

ABSTRACT. Mexican species of the subfamily Rhyssinae are reviewed. Two genera, *Epirhyssa* Cresson with five species and *Megarhyssa* Ashmead with three species, are recorded from Mexico. Costa Rican species *E. corralesi* Gauld, 1991 was found to be a junior synonym of the Mexican species *E. oaxaca* Porter, 1978, **syn.n.** *Epirhyssa frohbergi* Gauld and *E. theloides* Porter are recorded from Mexico for the first time, and *E. theloides* is also newly recorded from Guatemala. Identification keys to genera and species of Rhyssinae occurring in Mexico are provided.

РЕЗЮМЕ. Дан обзор мексиканских видов подсемейства Rhyssinae. Отмечены из Мексики род *Epirhyssa* Cresson с пятью видами и род *Megarhyssa* Ashmead с тремя видами. Установлено, что *E. corralesi* Gauld, 1991 из Коста-Рики является младшим синонимом мексиканского вида *E. oaxaca* Porter, 1978, **syn.n.** *Epirhyssa frohbergi* Gauld и *E. theloides* Porter отмечены впервые из Мексики, а *E. theloides* также впервые указан для Гватемалы. Даны определительные ключи обитающих в Мексике родов и видов подсемейства Rhyssinae.

RESUMEN. Se revisaron las especies mexicanas de la subfamilia Rhyssinae. Se registran para México dos géneros: *Epirhyssa* Cresson con cinco especies y *Megarhyssa* Ashmead con tres. La especie *E. corralesi* Gauld, 1991 de Costa Rica es un sinónimo junior de *E. oaxaca* Porter, 1978, **syn.n.** *Epirhyssa frohbergi*

Gauld y *E. theloides* Porter son registradas para México por primera vez; *E. theloides* se registra para Guatemala. Se elaboraron claves para la determinación taxonómica de géneros y especies de los Rhyssinae de México.

Introduction

Rhyssinae is a worldwide subfamily of Darwin wasps — the name suggested for the Ichneumonidae by Klopstein et al. [2019] — that comprises eight genera and about 260 species [Yu et al., 2016; Broad et al., 2018] and is most species-rich in the Oriental region [Kamath, Gupta, 1972]. Historically, rhyssines were treated as a tribe within the Pimplinae [Townes, Townes, 1960; Townes, 1969; Fitton, Gauld, 1976], but subsequently were raised to subfamily level [Gauld, 1991; Wahl, Gauld, 1998]. Species of the subfamily, especially the genus *Megarhyssa* Ashmead, 1900, are the largest and most spectacular insects among the Ichneumonidae with body length (including ovipositor) up to 150 mm. Females possess a long and thin ovipositor, and both sexes have a mesoscutum with transverse rugae.

Four genera, *Epirhyssa* Cresson, 1865, *Megarhyssa* Ashmead, 1900, *Rhyssa* Gravenhorst, 1829 and *Rhyssella* Rohwer, 1920, occur in the New World, but only *Epirhyssa* is species-rich in the Neotropical region. Two genera, *Epirhyssa* and *Megarhyssa*, with three species in each genus, were known to occur in Mexico

hitherto [Ruíz-Cancino et al., 2002; Kasparyan, 2002; Khalaim, Ruíz-Cancino, 2013].

Rhyssinae are idiobiont ectoparasitoids of larvae of xylophagous insects, i.e. families Siricidae, Xiphydriidae (Hymenoptera: Symphyta) and Cerambycidae (Coleoptera). Several rhyssine species were introduced into South Africa [Tribe, Cillié, 2004], Australia [Taylor, 1976] and New Zealand [Nuttall, 1974] to control siricid pests in pine forests.

This study aims to review the Mexican species of the subfamily Rhyssinae, provide new faunistic records and give identification keys to genera and species.

Material and Methods

This work is primarily based on the ichneumonid collection of the Universidad Autónoma de Tamaulipas, Cd. Victoria, Mexico (UAT). Additional material was examined from the following world collections: Townes and Dasch collections (former American Entomological Institute), recently moved to the Utah State University, Logan, Utah, USA (AEIC); California Academy of Sciences, San Francisco, California, USA (CAS); Essig Museum of Entomology, University of California, Berkeley, USA (EMEC); Florida State Collection of Arthropods, Gainesville, Florida, USA (FSCA); Instituto de Biología, Universidad Nacional Autónoma de México, Ciudad de México, Mexico (UNAM); Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (INBio); and Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZISP). Other abbreviations used in this study: ANSP (Academy of Natural Sciences of Philadelphia, Pennsylvania, USA), AMNH (American Museum of Natural History, New York, New York, USA), USNM (National Museum of Natural History, Washington D.C., USA) and LS (Linnean Society, Burlington House, Picadilly, London, UK).

Morphological terminology generally follows that of Gauld [1991]. Photographs were taken with an Olympus OM-D digital camera attached to an Olympus SZX10 stereomicroscope; partially focused images were combined using Helicon Focus 7.6.6 Pro software; all photographs were taken in ZISP. Identification key to the species of *Epirhyssa* is based on that by Gauld [1991], and the key to the species of *Megarhyssa* is based on that by Khalaim and Ruíz-Cancino [2013].

Results

Subfamily Rhyssinae

Two genera, *Epirhyssa* with five species and *Megarhyssa* with three species, are recorded here from Mexico. The genus *Rhyssa* occurs in the USA and Canada, and one species, *R. neotropicae* Porter, 2002, was described from Honduras [Porter, 2002]. We suppose that *Rhyssa* can be found in Mexico and therefore this genus is included to the generic key below.

KEY TO GENERA

1. First tergite free from its sternite, with glymma. Mid leg with apical trochanter unspecialized, without ventral longitudinal ridge. Predominantly Holarctic genus with seven species in the Nearctic region [Townes, Townes, 1960: 396] and one species in Honduras [Porter, 2002: 130]; not recorded from Mexico *Rhyssa* Gravenhorst
- First tergite fused with its sternite, without glymma (Fig. 20). Mid leg with apical trochanter with a ventral longitudinal ridge (Fig. 21, arrow) 2
2. Fore wing without areolet (Fig. 6) .. *Epirhyssa* Cresson
- Fore wing with areolet *Megarhyssa* Ashmead

Genus *Epirhyssa* Cresson, 1865

Epirhyssa Cresson, 1865: 39. Type species: *Epirhyssa speciosa* Cresson, 1865, by subsequent designation [Viereck, 1914: 52].

= *Hierax* Tosquinet, 1903.

= *Rhyssonota* Kriechbaumer, 1890.

= *Sychnostigma* Baltazar, 1961.

REFERENCES. Cresson, 1865: 39 [2 species (both described as new) in Cuba]; Rohwer, 1920: 422 [description; key to 3 species described by Cresson]; Townes, Townes, 1960: 413 [description; 1 species in USA (Arizona)]; 1966: 38 [catalogue; 6 species in Neotropical region; 1 species in Mexico]; Townes, 1969: 141 [description; remarks]; Porter, 1978 [revision of 38 Neotropical species (25 described as new); key]; Carlson, 1979: 355 [catalogue; 1 species in America north of Mexico]; Gauld, 1991: 113 [description; review of 10 species (5 described as new) from Costa Rica; key]; Gauld, Wahl, 1997: 448 [addition to key; 2 new species from Costa Rica]; Ruíz-Cancino et al., 2002: 646 [checklist; 3 species in Mexico]; Graf, Kumagai, 2004 [1 new species from Brazil]; Gómez et al., 2015 [review of 24 species (10 described as new) from Peruvian Amazonia; key]; Varga, 2020 [1 new species from Kenya].

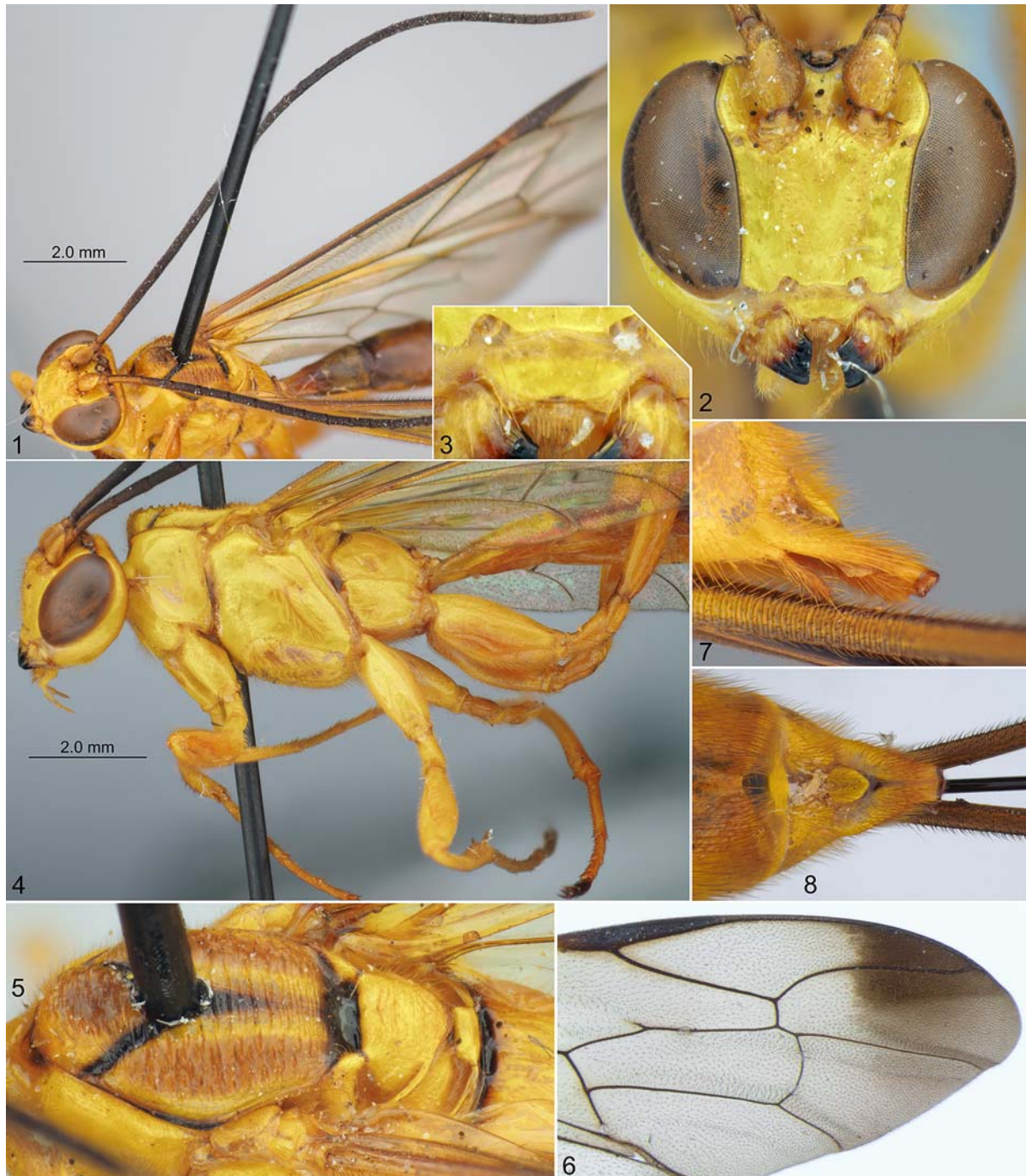
Epirhyssa is a large tropical genus with about 130 described species. Fifty five species are known in the New World, of them 12 occur in Costa Rica [Gauld, 1991; Gauld, Wahl, 1997]. Only the one widely distributed species, *E. mexicana* Cresson, 1874, is known from the Nearctic region (was recorded from Arizona, USA). Five species of *Epirhyssa* are found to occur in Mexico.

In China, species of the genus were recorded as parasitoids of wood-boring beetles and sawflies [Sheng, Sun, 2010], but nothing is known about hosts of this genus in the New World. Porter [1978] observed females of *Epirhyssa* boring into dead trees, especially old and partially rotten trunks, and Gauld [1991] reported *E. mexicana* probing standing dead trees infested with cerambycid larvae in Costa Rica.

KEY TO SPECIES OF *EPIRHYSSEA* OCCURRING IN MEXICO

1. Fore wing without blackish spot at distal apex, though sometimes with marginal cell brownish anteriorly (Fig. 16) 4. *E. theloides* Porter
- Fore wing with a distinct, discrete blackish spot at distal apex (Figs 6, 9) 2
2. Flagellum with median band and basal flagellomeres yellow or pale brown, remainder brownish black (Fig. 12). First tergite slender, in female 2.5–3.0 times and in male 3.1–3.6 times as long as posteriorly broad. Female with suranal cornus unusually long, cylindrical (Figs 14–15), with apical flattened area circular 3. *E. oaxaca* Porter
- Flagellum black, sometimes brownish at extreme base and apex, without median pale band (Fig. 1). First tergite in female 1.6–2.3 times and in male 2.5–2.7 times as long as posteriorly broad. Female with suranal cornus short, unspecialized (Figs 7–8), with apical flattened area depressed oval 3
3. Occipital carina completely absent. Mesosoma and metaso-

- ma reddish yellow, without black markings; metasomal tergites weakly and narrowly darkened posteriorly 5. *E. xoutha* Porter
- Occipital carina distinct laterally and ventrally. Mesosoma and metasoma usually with conspicuous brown or black markings 4
4. Apex of clypeus without median tubercle (Fig. 3). Lateral lobe of mesoscutum yellow, sometimes pale brown centrally (Fig. 5) 2. *E. mexicana* Cresson
- Apex of clypeus with small median tubercle (as in Fig. 11, arrow). Lateral lobe of mesoscutum with longitudinal black stripe centrally 1. *E. frobergi* Gauld



Figs 1–8. *Epirhyssa mexicana*, female: 1 — head with antennae, dorso-lateral view; 2 — head, front view; 3 — clypeus, front view; 4 — head, mesosoma and base of metasoma, lateral view; 5 — mesoscutum and scutellum, dorso-lateral view; 6 — apex of fore wing; 7 — apex of metasoma, lateral view; 8 — apex of metasoma, dorsal view.

Рис. 1–8. *Epirhyssa mexicana*, самка: 1 — голова с антеннами, сверху и сбоку; 2 — голова, спереди; 3 — клипеус, спереди; 4 — голова, мезосома и основание метасомы, сбоку; 5 — мезоскутум и скутеллум, сверху и сбоку; 6 — вершина переднего крыла; 7 — вершина метасомы, сбоку; 8 — вершина метасомы, сверху.

1. *Epirhyssa frohbergi* Gauld, 1991

Epirhyssa frohbergi Gauld, 1991: 124 [holotype female (IN-Bio), Costa Rica, Guanacaste Prov., Guanacaste National Park, Santa Rosa Sector, coastal forest, 10 m, VI.1988, coll. I.D. Gauld].

MATERIAL EXAMINED. Mexico, State of Veracruz:

San Andrés, Biological Station Los Tuxtlas, 210 m, selva alta perennifolia, Malaise trap, 31.III–16.IV.2014, coll. M. Madora, 1 ♂ (UNAM).

DISTRIBUTION. Mexico (Veracruz), Costa Rica. First record from Mexico.



Figs 9–15. *Epirhyssa oaxaca*, female: 9 — habitus (without antennae and ovipositor), lateral view; 10 — head, front view; 11 — clypeus, front view; 12 — head with antennae, lateral view; 13 — mesosoma and base of metasoma, lateral view; 14 — apex of metasoma, lateral view; 15 — apex of metasoma, dorsal view.

Рис. 9–15. *Epirhyssa oaxaca*, самка: 9 — габитус (без антенн и яйцеклада), вид сбоку; 10 — голова, вид спереди; 11 — клипеус, вид спереди; 12 — голова с антеннами, вид сбоку; 13 — мезосома и основание метасомы, вид сбоку; 14 — вершина метасомы, вид сбоку; 15 — вершина метасомы, вид сверху.

2. *Epirhyssa mexicana* Cresson, 1874

Figs 1–8.

Epirhyssa mexicana Cresson, 1874: 394 [females (ANSP), Mexico, Veracruz, Orizaba, Córdoba].

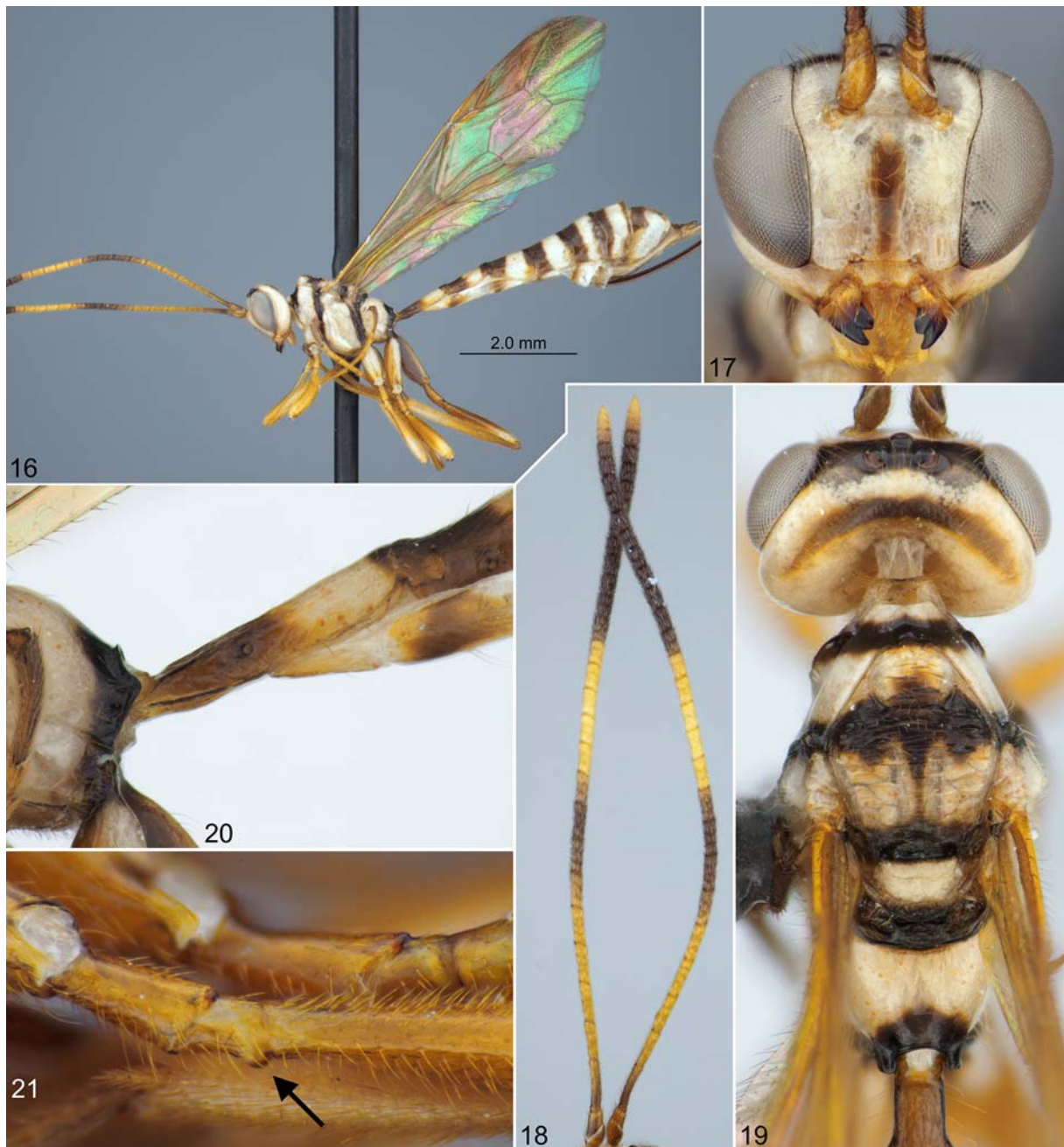
= *Epirhyssa dietrichi* Townes in Townes and Townes, 1960 [Gauld, 1991: 119].

= *Epirhyssa mexicana* var. *immaculata* Morley, 1913 [Porter, 1978: 393].

REFERENCES. Cameron, 1886: 262 [Mexico (Veracruz), Guatemala]; Morley, 1913: 4 [*E. mexicana* var. *immaculata*; Mexico (Guerrero)]; 8 [*E. mexicana*; Mexico (Guerrero)]; Cresson, 1916: 42 [lectotype female (ANSP) designated; Mexico, Veracruz]; Rohwer,

1920: 422 [key]; Townes, Townes, 1966: 38 [catalogue; Mexico]; Porter, 1978: 390 [*E. dietrichi*; description; USA (Arizona), Mexico (Morelos), Costa Rica], 392 [description; *Epirhyssa mexicana* var. *immaculata* (syn.); Mexico (Nuevo León, Sinaloa, Veracruz, Guerrero, Chiapas), Guatemala]; Carlson, 1979: 356 [*E. dietrichi*; catalogue]; Ruíz-Cancino, Tejada, 1986: 39 [Mexico (Tamaulipas)]; Maes, 1989: 33 [catalogue; Nicaragua]; Gauld, 1991: 119 [description; Mexico (Veracruz, Guerrero), Guatemala, Costa Rica]; Ruíz-Cancino et al., 2002: 646 [checklist; Mexico]; Quicke et al., 2009: 1415 [Belize]; Ruíz-Cancino et al., 2010: 65 [checklist; Mexico (Tamaulipas)].

MATERIAL EXAMINED. Mexico, Tamaulipas: Cd. Victoria, 3–4.VI.1981, coll. E. Ruíz C., 3 ♀♀, 1 ♂ (UAT). NW of Cd.



Figs 16–21. *Epirhyssa theloides*, female: 16 — habitus (without apices of antennae and ovipositor), lateral view; 17 — head, front view; 18 — antennae, dorsal view; 19 — head and mesosoma, dorsal view; 20 — first tergite, lateral view; 21 — trochanters of mid leg, lateral view.

Рис. 16–21. *Epirhyssa theloides*, самка: 16 — габитус (без вершин антенн и яйцеклада), сбоку; 17 — голова, спереди; 18 — антенны, сверху; 19 — голова и мезосома, сверху; 20 — первый тергит, сбоку; 21 — вертлуги средней ноги, сбоку.

Victoria, Los Troncones (park), coll. A.I. Khalaim: 18.III.2008, 2 ♀♀, 1 ♂ (UAT); 25.IV.2009, 1 ♀ (ZISP); 13.X.2012, 1 ♀ (ZISP). Same data, but yellow pan trap, 18.III–13.IV.2008, 1 ♀ (UAT). 15 km SSW of Cd. Victoria, El Madroño, 23.XII.1987, coll. E. Ruíz C., 1 ♀ (UAT). Cd. Victoria, Cañón del Novillo, 6.X–17.XI.1984, coll. F. Lopez V., 6 ♀♀, 10 ♂♂ (UAT). Same locality, 15.VI.1985, coll. A. del Valle, 1 ♂ (UAT). Same locality, 5.VIII.1985, coll. H. Serna T., 1 ♂ (UAT). Gómez Farías, 350 m, 17.IX.2016, coll. A.I. Khalaim, 1 ♀ (UAT). Gómez Farías, 16.III.1989, coll. R. Thompson F., 1 ♀ (UAT). Gómez Farías, Altas Cimas, Malaise trap, 29.V–12.VI.1999, coll. S. Hernández A., 1 ♀, 1 ♂ (UAT). Gómez Farías, Los Cedros, Malaise trap, coll. S. Hernández A. (all in UAT): 6–13.III.1999, 1 ♀; 17.IV–1.V.1999, 3 ♂♂; 15–29.V.1999, 2 ♂♂. San Luis Potosí: El Bonito, 7 mi. S of Ciudad Valles, 300 ft. (= 90 m), 19.XII.1970, coll. P.H. & M. Arnaud, 1 ♀ (CAS). Yucatán: Sudzal Chico “SMSP”, XI.1999, coll. Hugo Delfin, 2 ♂♂ (UAT).

DISTRIBUTION. USA (Arizona), Mexico (Sinaloa, Nuevo León, Tamaulipas, San Luis Potosí, Veracruz, Morelos, Guerrero, Yucatán, Chiapas), Belize, Guatemala, Nicaragua, Costa Rica.

BIOLOGY. In Costa Rica, females of *E. mexicana* were observed probing standing dead trees infested with cerambycid larvae [Gauld, 1991: 114]. Maes [1989] in his catalogue of Nicaraguan insects mentioned *E. mexicana* as a parasitoid of coleopterous larvae in wood.

3. *Epirhyssa oaxaca* Porter, 1978

Figs 9–15.

Epirhyssa oaxaca Porter, 1978: 382 [holotype female (AEIC), Mexico, Oaxaca, 6 mi. S. Valle Nacional, 2000 ft. (= 610 m), 18.V.1971, coll. H. Howden].

= *Epirhyssa corralesi* Gauld, 1991, **syn.n.**

REFERENCES. Gauld, 1991: 125 [*E. corralesi* (description); Costa Rica]; Gauld, Wahl, 1997: 451 [*E. corralesi*; remarks; Costa Rica]; Ruíz-Cancino et al., 2002: 646 [checklist; Mexico]; Sánchez-García et al., 2015: 828 [checklist; Mexico (Oaxaca)].

MATERIAL EXAMINED. Mexico, Veracruz: San Andrés, Biological Station Los Tuxtlas, 150–250 m, selva alta perennifolia, Malaise trap, coll. M. Madora (all in UNAM): 14.IV–13.V.2013, 1 ♂; 16.VIII–17.IX.2013, 1 ♀; 31.III–16.IV.2014, 1 ♀; 28.V–16.VI.2014,

1 ♀. Same locality and trap, 4–8.X.2014, coll. A.I. Khalaim, 1 ♀ (ZISP). Oaxaca: 6 mi. S. Valle Nacional, 2000 ft. (= 610 m), 18.V.1971, coll. H. Howden, 1 ♀ (holotype of *E. oaxaca*; AEIC).

REMARKS. The holotype of *E. oaxaca* was examined by the senior author and was found to correspond well with the original description of the Costa Rican species *E. corralesi*, including such important features as long suranal cornus with flattened circular apical area (Figs 14, 15), flagellum with basal and submedian brownish bands (Fig. 12), and clypeus with a distinct median apical tooth (Fig. 11, arrow). Thus, we conclude that *E. corralesi* is a junior synonym of *E. oaxaca*, **syn.n.**

VARIATION. Examined specimens from Veracruz are conspicuously smaller than the holotype of *E. oaxaca*. Some Mexican specimens are rather pale with legs and first tergite only with pale brown markings and hind coxa predominantly yellow with brown marks on ventral and inner sides. Occipital carina is completely absent ventrally, or vestigial and more or less reaching the hypostomal carina in Mexican material, and complete ventrally and joining to the hypostomal carina in Costa Rican specimens, according to the description of *E. corralesi* by Gauld [1991].

DISTRIBUTION. Mexico (Veracruz, Oaxaca), Costa Rica.

4. *Epirhyssa theloides* Porter, 1978

Figs 16–24.

Epirhyssa theloides Porter, 1978: 370 [holotype female (FSCA), Costa Rica, Instituto Interamericano de Ciencias Agrícolas ca. Turrialba, VIII.1963, coll. C. Porter].

REFERENCES. Gauld, 1991: 131 [description; Costa Rica].

MATERIAL EXAMINED. Mexico, Veracruz: San Andrés, Biological Station Los Tuxtlas, 150–210 m, selva alta perennifolia, Malaise trap, coll. M. Madora: 10.III–14.IV.2013, 1 ♀ (UNAM); 13.V–16.VI.2013, 1 ♀ (UNAM); 30.XI–17.XII.2013, 1 ♀ (ZISP); 16–31.III.2014, 1 ♀ (UNAM); 14.VII–1.VIII.2014, 1 ♀ (ZISP). Guatemala: Guatemala Department, Fraijanes, Finca San Antonio, 1800 m, VI.1987, coll. Mauger, 2 ♀♀ (AEIC). Costa Rica: Heredia Prov., Braulio Carrillo National Park, 9 km E of El Tunel, 1000 m, IX.1990, coll. I.D. Gauld, 1 ♀ (det. I.D. Gauld; UAT).



Figs 22–24. *Epirhyssa theloides*, female: 22 — head with antennae, lateral view; 23 — head and mesosoma, lateral view; 24 — apex of metasoma, lateral view.

Рис. 22–24. *Epirhyssa theloides*, самка: 22 — голова с антеннами, сбоку; 23 — голова и мезосома, вид сбоку; 24 — вершина метасомы, сбоку.

VARIATION. Pale bands on antennal flagellum vary from bright and distinct (Fig. 18) to rather weak and inconspicuous (Fig. 22).

DISTRIBUTION. Mexico (Veracruz), Guatemala, Costa Rica. First records from Mexico and Guatemala.

5. *Epirhyssa xoutha* Porter, 1978

Epirhyssa xoutha Porter, 1978: 372 [holotype female (AMNH), Trinidad, Arima Valley, 31.I.1957; "Mexico"].

REFERENCES. Ruíz-Cancino et al., 2002: 646 [checklist; Mexico].

DISTRIBUTION. Mexico (no further details), Trinidad and Tobago.

Genus *Megarhyssa* Ashmead, 1900

Megarhyssa Ashmead, 1900: 368 (new name for *Thalessa* Holmgren, 1859). Type species: *Ichneumon clauatus* Fabricius, 1798.

= *Eurhyssa* Derksen, 1941.

= *Thalessa* Holmgren, 1859 (name preoccupied by Adams, 1853).

REFERENCES. Rohwer, 1920: 425 [description; review of 4 Nearctic species; key]. Townes, Townes, 1960: 415 [description; review of 4 Nearctic species; key]. Townes, Townes, 1966: 38 [catalogue; 1 species in Neotropical region; 1 species in Mexico]. Townes, 1969: 139 [description; remarks]. Carlson, 1979: 353 [catalogue; 4 species in America north of Mexico]. Ruíz-Cancino et al., 2002: 646 [checklist; 1 species in Mexico]. Kasparyan, 2002 [1 new species from Mexico (Mexico)]. Khalaim, Ruíz-Cancino, 2013 [review of 3 species from Mexico (1 described as new); key]. Pook et al., 2016 [key to 4 Nearctic species].

The genus *Megarhyssa* comprises 37 species occurring predominantly in the Holarctic and Oriental regions, with most species in tropical Asia [Kasparyan, 2002]. Four species occur in the USA and Canada, and one of them, *M. macrurus* (Linnaeus, 1771), is also known from northern Mexico. Two more species, *M. verae* Kasparyan, 2002 and *M. gratiosa* Khalaim et Ruíz-Cancino, 2013, were recently described from central and southern Mexico [Kasparyan, 2002; Khalaim, Ruíz-Cancino, 2013]. In Mexico, the genus is very rarely collected, but in the USA and Canada it seems to be more abundant in forests.

Species of *Megarhyssa* are idiobiont ectoparasitoids of xylophagous sawflies of the family Siricidae (Hymenoptera) on deciduous and sometimes on coniferous trees.

KEY TO SPECIES OF *MEGARHYSSA* OCCURRING IN MEXICO

1. Metasoma laterally yellow, with broad dorsal longitudinal black stripe extending along entire length of metasoma. Fore wing hyaline with conspicuous subapical dark mark at apex of radial cell. Flagellum of antenna blackish with broad subapical pale band. Ovipositor sheath 3.4 times as long as fore wing 1. *M. gratiosa* Khalaim et Ruíz-Cancino
- Metasoma with variable amount of yellow, reddish orange and black; tergites often transversely banded or with dorsal and/or lateral marks, but never with continuous median black stripe extending along entire length of metasoma. Fore wing without apical dark mark, or with radial cell darkened only at base. Flagellum of antenna more or less entirely black, sometimes somewhat lighter in the apical half, never with contrasting pale band. Ovipositor sheath about 1.9–3.0 times as long as fore wing 2
2. Hind leg with coxa and tarsus entirely black, femur and tibia black in basal 0.8 and yellow in apical 0.2. Head and

mesosoma black with yellow markings. Metasoma extensively black, tergites 1 and 2 with pre-apical dorsomedian yellow marks, tergite 3 and following tergites with lateral yellow markings. Malar space 1.4 times as long as apical mandibular width. Ovipositor sheath almost twice as long as fore wing 3. *M. verae* Kasparyan

— Hind leg predominantly brownish orange with yellow marks. Head and mesosoma predominantly yellow and brown. Metasoma yellow to reddish brown, with more or less distinct transverse pre-apical yellow bands on tergites. Malar space 0.7 times as long as apical mandibular width. Ovipositor sheath 3.0 times as long as fore wing 2. *M. macrurus macrurus* (Linnaeus)

1. *Megarhyssa gratiosa* Khalaim et Ruíz-Cancino, 2013

Megarhyssa gratiosa Khalaim and Ruíz-Cancino, 2013: 197 [holotype female (EMEC), Mexico, Chiapas, 27 mi. (= 43.5 km) N of Ocozacoatlá [de Espinosa], 21.VII.1965, coll. D.R. Pauson].

REFERENCES. Ibarra-Garibay et al., 2015 [Mexico (Campeche)].

COMPARISON. This species may easily be recognized by the remarkable colour pattern of the metasoma which is yellow with broad dorsal black stripe extending along its entire length. *Megarhyssa gratiosa* also differs from the other two Mexican species by having a hyaline fore wing with a conspicuous dark spot at apex of the radial cell and the longer ovipositor, and from *M. verae* in having flagellum with 56 flagellomeres (vs 36 flagellomeres in *M. verae*) and a shorter malar space.

DISTRIBUTION. Mexico (Campeche, Chiapas).

2. *Megarhyssa macrurus* (Linnaeus, 1771)

Ichneumon macrurus Linnaeus, 1771: 540 [lectotype female (LS), USA, South Carolina, near Charleston].

= *Ichneumon georgicus* Megerle, 1802 [Townes, Townes, 1960].

= *Megarhyssa lunator phaeoptila* Michener, 1939 [Townes, Townes, 1960].

= *Thalessa? histrio* Kriechbaumer, 1890 (name preoccupied by *Ichneumon histrio* Christ, 1791).

REFERENCES. Rohwer, 1920: 428 [*Thalessa? histrio*; remarks]; Townes, Townes, 1960: 429 [description; review, key to 3 subspecies; biology], 434 [*Ichneumon georgicus* (syn.), *M. lunator phaeoptila* (syn.)]; Townes, 1961: 108 [notes on type]; Stillwell, 1967: 688 [host; Canada (New Brunswick)]; Fitton, 1978: 369 [lectotype female (LS) designated; USA, South Carolina, near Charleston]; Carlson, 1979: 354 [catalogue; 2 subspecies in America north of Mexico]; Ruíz-Cancino et al., 2002: 646 [checklist; Mexico]; Pook et al., 2016: 143 [diagnosis, photographs].

There are three Nearctic subspecies that differ from each other mostly by their colour pattern [Townes, Townes, 1960; Pook et al., 2016]. One subspecies occurs in the northern parts of Mexico.

BIOLOGY. Parasitoid of horntail sawfly *Tremex columba* (L.) (Hymenoptera: Siricidae) [Townes, Townes, 1960; Stillwell, 1967].

DISTRIBUTION. Canada, USA, Mexico (Chihuahua, Nuevo León).

Megarhyssa macrurus macrurus s.str.

REFERENCES. Townes, Townes, 1960: 434 [description; Mexico (Chihuahua)]. 1966: 38 [catalogue; Mexico]. Carlson, 1979: 354 [catalogue].

MATERIAL EXAMINED. Mexico, Nuevo León: Monterrey, La Estanzuela, II.1986, coll. L.O. Tejada, 1 ♀, 1 ♂ (UAT). USA, Texas: Mason Country, 2 mi. E of Fredonia, 14.IV.1991, coll. K. King, 1 ♀ (UAT).

DISTRIBUTION. USA (from Texas to Georgia and Florida), Mexico (Chihuahua, Nuevo León).

3. *Megarhyssa verae* Kasparyan, 2002

Megarhyssa verae Kasparyan, 2002: 305 [holotype female (USNM), Mexico, State of Mexico, 6 km W of lake Zempoala, 2.X.1991, coll. A.L. Norrbom].

COMPARISON. *Megarhyssa verae* resembles the Nearctic *M. nortoni* (Cresson, 1864) in colour pattern of wings and metasoma, but differs from this and other Nearctic species of *Megarhyssa* by hind femur and tibia entirely black dorsally, and by unusual combination of yellow markings on the mesopleuron.

DISTRIBUTION. Mexico (State of Mexico/Morelos border).

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