



UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
POSGRADO EN CIENCIAS BIOLÓGICAS
INSTITUTO DE ECOLOGÍA
SISTEMÁTICA

**SISTEMÁTICA Y BIOGEOGRAFÍA DE UN NUEVO GÉNERO DE PICUDOS DE LA
HOJARASCA DEL NUEVO MUNDO (COLEOPTERA: CURCULIONIDAE:
MOLYTINAE: CONOTRACHELINI)**

TESIS

QUE PARA OPTAR POR EL GRADO DE:
DOCTOR EN CIENCIAS

PRESENTA:
MANUEL ALEJANDRO BARRIOS IZÁS

TUTOR PRINCIPAL DE TESIS: DR. JUAN JOSÉ MORRONE LUPI
FACULTAD DE CIENCIAS UNAM

MIEMBROS DEL COMITÉ TUTOR:

DR. SANTIAGO ZARAGOZA CABALLERO
INSTITUTO DE BIOLOGÍA, UNAM
DR. JACK CLAYTON SCHUSTER BURTON
UNIVERSIDAD DEL VALLE DE GUATEMALA, UVG
DR. SERGIO MELGAR VALLADARES
ESCUELA DE BIOLOGÍA, USAC

CIUDAD UNIVERSITARIA, CD. MX., ABRIL, 2018.



Universidad Nacional
Autónoma de México

Dirección General de Bibliotecas de la UNAM

Biblioteca Central



UNAM – Dirección General de Bibliotecas
Tesis Digitales
Restricciones de uso

DERECHOS RESERVADOS ©
PROHIBIDA SU REPRODUCCIÓN TOTAL O PARCIAL

Todo el material contenido en esta tesis esta protegido por la Ley Federal del Derecho de Autor (LFDA) de los Estados Unidos Mexicanos (México).

El uso de imágenes, fragmentos de videos, y demás material que sea objeto de protección de los derechos de autor, será exclusivamente para fines educativos e informativos y deberá citar la fuente donde la obtuvo mencionando el autor o autores. Cualquier uso distinto como el lucro, reproducción, edición o modificación, será perseguido y sancionado por el respectivo titular de los Derechos de Autor.

Lic. Ivonne Ramírez Wence
Directora General de Administración Escolar, UNAM
Presente

Me permito informar a usted, que el Subcomité de Ecología y Manejo Integral de Ecosistemas, del Posgrado en Ciencias Biológicas en su sesión ordinaria del día 22 de enero de 2018, aprobó el jurado para la presentación del examen para obtener el grado de **DOCTOR EN CIENCIAS** al alumno **BARRIOS IZÁS MANUEL ALEJANDRO** con número de cuenta **512014913** con la tesis titulada: "**SISTEMÁTICA Y BIOGEOGRAFÍA DE UN NUEVO GÉNERO DE PICUDOS DE LA HOJARASCA DEL NUEVO MUNDO (COLEOPTERA: CURCULIONIDAE: MOLYTINAE: CONOTRACHELINI)**", bajo la dirección del **DR. JUAN JOSÉ MORRONE LUPÍ**:

| | |
|-------------|--------------------------------------|
| Presidente: | DR. HARRY URAD BRAILOVSKY ALPEROWITZ |
| Vocal: | DR. OSCAR FEDERICO FRANCKE BALLVÉ |
| Secretario: | DR. SANTIAGO ZARAGOZA CABALLERO |
| Suplente: | DR. JOSÉ GUADALUPE PALACIOS VARGAS |
| Suplente | DR. ALFONSO NERI GARCÍA ALDRETE |

Sin otro particular, me es grato enviarle un cordial saludo.

ATENTAMENTE
"POR MI RAZA HABLARA EL ESPIRITU"
Cd. Universitaria, Cd. Mx., a 07 de marzo de 2018


DR. ADOLFO GERARDO NAVARRO SIGÜENZA
COORDINADOR DEL PROGRAMA



AGRADECIMIENTOS INSTITUCIONALES

Agradezco al programa de Doctorado en Ciencias Biológicas de la Universidad Nacional Autónoma de México (UNAM) y a la Universidad de San Carlos de Guatemala (USAC), por el apoyo al convenio de Doctorado entre la Universidad Nacional Autónoma de México (UNAM) y la Universidad de San Carlos de Guatemala.

Agradezco a las instituciones que contribuyeron con el financiamiento de esta tesis doctoral, en especial al programa PAEP-UNAM, a la Dirección General de Docencia de la USAC, al programa de becas The Ernst Mayr Travel Grants in Animal Systematics del Museum of Comparative Zoology de la Universidad de Harvard, al Consejo Nacional de Ciencia y Tecnología (CONCYT) por el apoyo brindado a través del proyecto FODECYT 35-2011, al programa de Protección de Bosques y Cuencas del Plan Trifinio y a The Rufford Foundation por el apoyo brindado a través de los proyectos 12752-1 y 17005-2.

Agradezco el apoyo y asesoría de mi comité tutorial, Dr. Juan José Morrone Lupi (UNAM), Dr. Santiago Zaragoza Caballero (UNAM), Dr. Sergio Melgar Valladares (USAC) y Dr. Jack C. Schuster (Universidad del Valle de Guatemala).

AGRADECIMIENTOS PERSONALES

Agradezco a la Doctora María del Coro Arizmendi Arriaga (UNAM), al Doctor Juan Nuñez Farfán (UNAM) y al Dr. Oscar Cobar Pinto (USAC), por el apoyo al convenio de Doctorado entre la Universidad Nacional Autónoma de México (UNAM) y la Universidad de San Carlos de Guatemala.

Agradezco al jurado de mi examen de titulación de doctorado, Dr. Santiago Zaragoza Caballero, Dr. Oscar Federico Francke Ballvé, Dr. Harry Urad Brailovsky Alperowitz, Dr. José Guadalupe Palacios Vargas y Dr. Alfonso Neri García Aldrete.

Agradezco al Canadian Museum of Nature (CMN), en especial a Doctor Robert S. Anderson y al Doctor Françoise Génier, por su invaluable apoyo durante mis estancias de investigación y el acceso de sus instalaciones, equipo y especímenes para el desarrollo de esta tesis doctoral.

Agradezco a la Facultad de Ciencias y al Instituto de Biología de la UNAM por el préstamo de sus instalaciones y equipos; además del apoyo brindado por el Doctor Juan José Morrone Lupi, la Doctora Roxana Acosta, la Doctora Fabiola Ramírez Corona, el Doctor Santiago Zaragoza Caballero y la Maestra Susana Guzmán.

Agradezco al Centro Universitario de Zacapa y Centro de Estudios Conservacionistas de la USAC y a la Universidad Rafael Landívar, Campus San Luis Gonzaga S.J. de Zacapa; en especial al Maestro Carlos Vargas Gálvez, al Maestro Ángel Cordón, a la Doctora Eunice Enríquez Cotton, al Maestro Francisco Castañeda Moya, al Maestro Jorge Luis Galindo y la Maestra Mercedes Barrios; por el apoyo institucional brindado durante mis estudios de doctorado.

Agradezco también el apoyo de Charles y Lois O'Brien y de Robert y Katherine Anderson por haberme recibido en sus hogares durante las estancias de investigación y las deliciosas comidas y agradables momentos que me brindaron.

Agradezco el apoyo brindado por mi familia, es especial a mis padres Milagro de Lourdes Izás, Otto Leonel Barrios Longo, mi hermano Leonel Antonio Barrios Izás y mi esposa Michelle Bustamante Castillo.

DEDICATORIA

A mis queridos hijos; ¡por todo su amor, paciencia y buenos momentos que hemos pasado!

ÍNDICE

| | |
|---|----|
| RESUMEN | 1 |
| ABSTRACT | 3 |
| INTRODUCCIÓN | 5 |
| Capítulo 1. Artículo: Barrios-Izás, M.A., Anderson, R.S. and Morrone, J.J. (2016) A taxonomic monograph of the leaf-litter inhabiting weevil genus <i>Plumolepilius</i> new genus (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Mexico, Guatemala, and El Salvador. <i>Zootaxa</i> , 4168(1), 061-091. | 7 |
| Capítulo 2. Artículo: Barrios-Izás, M.A. New species of the leaf-litter inhabing weevil genus <i>Plumolepilius</i> (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Guatemala, Honduras, Nicaragua, Costa Rica and Panama | 24 |
| Capítulo 3. Artículo: Barrios-Izás, M.A. y Morrone, J.J. Systematics and biogeography of the New World genus <i>Plumolepilius</i> Barrios-Izás & Anderson (Curculionidae: Molytinae: Conotrachelini)..... | 69 |
| DISCUSIÓN GENERAL | 78 |
| CONCLUSIONES GENERALES | 80 |
| RECOMENDACIONES GENERALES | 81 |
| LITERATURA CITADA | 82 |
| OTRAS PUBLICACIONES | 83 |
| Artículo: Barrios-Izás, M.A. y Coty, D. 2016. A new fossil species of <i>Caulophilus</i> Wollaston, 1854 (coleoptera: curculionidae: cossoninae) from Mexican Amber. <i>The Coleopterist Bulletin</i> , 70(1): 177–179. | 83 |

RESUMEN

En la presente tesis se realizó la revisión taxonómica de un género de curculiónidos de la hojarasca recientemente descrito, *Plumolepilius* Barrios-Izás *et* Anderson, 2016. Las especies de *Plumolepilius* habitan generalmente por encima de los 1,400 msnm en bosques mesófilos de montaña, bosques de encino y bosques de *Ostrya*. Se pueden encontrar ejemplares en bosques de coníferas (*Pinus* spp. o *Abies guatemalensis*) siempre que haya encinos entremezclados. El rango de distribución de *Plumolepilius* se encuentra desde el sureste de México en Chiapas hasta el volcán Chiriquí en Panamá dentro de la Zona de Transición Mexicana, el dominio Mesoamericano y el dominio Pacífico (*sensu* Morrone 2014).

Los objetivos del proyecto doctoral de investigación fueron: 1) determinar la monofilia del género *Plumolepilius* (Coleoptera: Curculionidae, Molytinae) y sus relaciones evolutivas con otros géneros de la tribu Conotrachelini, 2) realizar la descripción taxonómica de las especies de *Plumolepilius* tratadas en el presente estudio, 3) determinar si las relaciones evolutivas y la distribución de las especies de picudos de *Plumolepilius* son consistentes con la regionalización biogeográfica propuesta por Morrone (2014) y 4) proponer una hipótesis biogeográfica con base en las relaciones filogenéticas entre las especies de *Plumolepilius*. Los resultados del presente trabajo se presentan en tres manuscritos.

El primer manuscrito (Barrios-Izás *et al.*, 2016) contiene un análisis filogenético de los géneros de Conotrachelini, en donde se demostró la monofilia de *Plumolepilius*. En este manuscrito se realizó la descripción de *Plumolepilius* y nueve especies del sureste de México, Guatemala y El Salvador. En la publicación se incluye una clave taxonómica, las diagnósis, distribuciones geográficas, se asignaron los nombres científicos para cada una de las especies de *Plumolepilius* y las especies tratadas en el manuscrito.

En el segundo manuscrito se describen 16 especies de *Plumolepilius* de Honduras, Nicaragua, Costa Rica y Panamá. La estructura y contenido del manuscrito es similar al del primer manuscrito, se incluye una clave taxonómica para las 25 especies de *Plumolepilius*. Es importante considerar que la descripción de estas 16 nuevas especies ha sido sometida para publicación en una revista

científica indexada, por lo que los nombres científicos asignados en este documento no deben de ser considerados como disponibles.

En el tercer y último manuscrito, se elaboró una filogenia de las 25 especies de *Plumolepilius* con base en caracteres de la morfología externa y los genitales masculinos y escleritos asociados con los genitales en ambos sexos.

ABSTRACT

In the present thesis, a taxonomic revision of a genus of leaf litter weevils, *Plumolepilius* Barrios-Izás *et al.*, 2016 was done. The species of *Plumolepilius* inhabit mainly above 1,400 m in cloud forests, oak forests and *Ostrya* forests. *Plumolepilius* species also inhabit coniferous forests (*Pinus* spp. or *Abies guatemalensis*) wherever they are intermixed with oaks. *Plumolepilius* species geographical ranges extend from southeastern Mexico in Chiapas through Chiriquí volcano in Panama within the Mexican Transition Zone, the Mesoamerican dominion and the Pacific dominion (*sensu* Morrone 2014).

The aims of the doctoral project were: 1) to determine the monophyly of the genus *Plumolepilius* (Coleoptera: Curculionidae, Molytinae) and its evolutionary relationships with other genera of the tribe Conotrachelini, 2) to undertake the taxonomic description of the species of *Plumolepilius* treated in this project, 3) to determine if the evolutionary relationships and the distribution of the leaf litter weevils of *Plumolepilius* are consistent with the biogeographic regionalization proposed by Morrone (2014) and 4) to propose a biogeographic hypothesis based on the phylogenetic relationships of the species of *Plumolepilius*. The results of this project are presented in three manuscripts.

The first manuscript (Barrios-Izás *et al.*, 2016) contains a phylogenetic analysis of the genera of Conotrachelini, the monophyly of *Plumolepilius* was supported. The genus *Plumolepilius* and nine species from southeastern Mexico, Guatemala and El Salvador were described. A taxonomic key, diagnoses, geographical distributions and scientific names were included.

The second manuscript contains the description of 16 new species of *Plumolepilius* from Honduras, Nicaragua, Costa Rica and Panama. The structure and contents of the manuscript are similar to the first manuscript, a taxonomic key for the 25 species of *Plumolepilius* is included. It is important to consider that the description of these 16 new species has been submitted for publication in an indexed scientific journal, so the scientific names assigned in this document should not be considered available.

The third and last manuscript contains a phylogeny of the 25 species of *Plumolepilius*, it was constructed using characters from the external morphology, the male genitalia and the sclerites associated to the genitalia of both sexes.

INTRODUCCIÓN

Los picudos (Coleoptera: Curculionidae) son uno de los grupos hiperdiversos de insectos, actualmente se han descrito cerca de 62,000 especies y se considera que existen más de 200,000 especies (Oberprieler *et al.* 2007). La mayor parte de los picudos son fitófagos, hay algunas especies que son depredadoras (Oberprieler *et al.* 2014); en general, se alimentan de todos los órganos de las plantas. Los picudos habitan en todos los lugares de la Tierra en donde haya plantas y en hábitats extremos como glaciares, hábitats acuáticos y dentro del suelo (Oberprieler *et al.* 2007).

Los picudos de la hojarasca son un grupo altamente diverso, especialmente en los trópicos, sin embargo, es un gremio poco conocido tanto en su diversidad como en sus interacciones, historias de vida y evolución.

El presente estudio se enfoca en el género *Plumolepilius* Barrios-Izás & Anderson, 2016 que habita en el estrato de la hojarasca de bosques montanos latifoliados del sur de México y América Central. El género *Plumolepilius* cuenta con 25 especies que se distribuyen en su mayoría dentro de la provincia de las Tierras Altas de Chiapas en la Zona de Transición Mexicana. Otras especies se distribuyen en las partes altas de las provincias de Mosquitia, Tierras Bajas del Pacífico y Puntarenas-Chiriquí.

La Zona de Transición Mexicana se extiende desde el noroeste de México hasta el norte de Nicaragua (Halfpter 1987) y es una zona de traslape o transición de las biotas neártica y neotropical (Hoffmann 1936, Vivó 1943, Darlington 1957, Morrone 2014, Halfpter y Morrone 2017). De tal manera que la entomofauna de la Zona de Transición Mexicana está compuesta por elementos neárticos, neotropicales y del cenocrón que evolucionó dentro de esta zona. Las especies de *Plumolepilius* corresponden al cenocrón de insectos que evolucionó en Chiapas y Centroamérica, de acuerdo con Halfpter, estos grupos de insectos por sus afinidades biogeográficas pudieron haber radiado al final del Cenozoico en diferentes episodios de dispersión de sur a norte.

El Istmo de Tehuantepec y la depresión del lago de Nicaragua se consideran como las principales barreras biogeográficas para la entomofauna del norte de América Central, por sus afinidades bióticas y endemismos esta zona ha sido denominada como América Central Nuclear (Halfiter 1987) o la provincia de las Tierras Altas de Chiapas (Morrone 2014). La distribución de algunos géneros de insectos de la horofauna de la Zona de Transición Mexicana puede extenderse fuera de estos límites, tales son los casos de algunos picudos con bajas capacidades de dispersión como *Plumolepilius* que se extiende hasta el norte de Panamá, *Lepilius* Champion se extiende hasta Texas y *Eurhoptus* LeConte se extiende hasta el norte de los Estados Unidos.

Capítulo 1. Artículo: Barrios-Izás, M.A., Anderson, R.S. and Morrone, J.J. (2016) A taxonomic monograph of the leaf-litter inhabiting weevil genus *Plumolepilius* new genus (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Mexico, Guatemala, and El Salvador. *Zootaxa*, 4168(1), 061-091.



A taxonomic monograph of the leaf-litter inhabiting weevil genus *Plumolepilius* new genus (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Mexico, Guatemala, and El Salvador

MANUEL A. BARRIOS-IZÁS^{1,2}, ROBERT S. ANDERSON³ & JUAN J. MORRONE¹

¹Museo de Zoología "Alfonso L. Herrera", Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México. Apartado postal 70-399, 04510 Mexico City, Mexico.

E-mail: manuelbarriosgt@gmail.com, juanomorrone2001@yahoo.com.mx

²Centro de Estudios Conservacionistas (CDC) - Centro Universitario de Zacapa (CUNZAC), Universidad de San Carlos de Guatemala, Ciudad Universitaria, Zona 12, 01012 Guatemala, Guatemala.

³Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario, K1P 6P4, Canada. E-mail: randerson@mus-nature.ca

Abstract

We describe the Mesoamerican leaf litter weevil genus *Plumolepilius* Barrios-Izás & Anderson, **new genus** (Coleoptera: Curculionidae: Molytinae: Conotrachelini) (type species *P. trifiniensis* Barrios-Izás & Anderson, **new species**), species of which inhabit mountain ecosystems from the state of Chiapas in southeastern Mexico to northern Panama. In this paper we describe nine new species from Mexico, Guatemala, and El Salvador: *P. trifiniensis* Barrios-Izás & Anderson, **new species** (El Salvador and Guatemala); *P. branstetteri* Barrios-Izás & Anderson, **new species** (Guatemala and Mexico); *P. longinói* Barrios-Izás & Anderson, **new species** (Guatemala and Mexico); *P. curtezi* Barrios-Izás & Anderson, **new species** (Guatemala and Mexico); *P. canoi* Barrios-Izás & Anderson, **new species** (Guatemala); *P. schusteri* Barrios-Izás & Anderson, **new species** (Guatemala and Mexico); *P. daryi* Barrios-Izás & Anderson, **new species** (Guatemala); *P. yolnabajensis* Barrios-Izás & Anderson, **new species** (Guatemala); and *P. macalajauensis* Barrios-Izás & Anderson, **new species** (Guatemala).

The genus and the species are named and described, information on their geographical distributions is given and images of the habitus of both sexes and the aedeagus are presented. A key to the species of *Plumolepilius* based on males is included.

The monophyly of *Plumolepilius* was confirmed by a parsimony analysis of external and male aedeagus morphology and the genus is best characterized by the presence of plumose scales lining the prosternal channel. Phylogenetic analysis supports that *Lepilius* Champion 1905 is the sister genus of *Plumolepilius*.

Introduction

Mesoamerica is considered among the most important hotspots of biodiversity in the world with a high number of species still remaining undiscovered or unnamed (Myers *et al.* 2000). Such is the case for most leaf litter arthropods, but especially weevils (Coleoptera: Curculionidae). Recently 93 species of the previously monotypic genus *Theognete* Champion, 1902 were described (Anderson 2010), 32 new species of *Tylosinus* Champion, 1905 were described from Chiapas, Mexico (Luna-Cozar *et al.* 2014), and many new species in other genera await study and description. Here we describe *Plumolepilius* Barrios-Izás & Anderson, a new leaf litter weevil genus from Mesoamerica, inhabiting primarily forests at middle to high elevations between approximately 1,400 and 2,700 m.

In this first part of the taxonomic monograph we describe nine species of *Plumolepilius* from southern Mexico, Guatemala, and El Salvador. A morphological phylogenetic analysis supporting the monophyly of the genus was also performed. In the second part to be published later we will add several new species from Honduras, Nicaragua, Costa Rica, and Panama that are still under examination. In a third part, we will perform a phylogenetic and biogeographic analysis of the species of *Plumolepilius* for a better understanding of the evolutionary background of the montane fauna of Mesoamerica.

Classification of *Plumolepilius* Barrios-Izás & Anderson, new genus

The genus *Plumolepilius* is best placed within Conotrachelini (Curculionidae: Molytinae) by the presence of an open rostral channel, and mesoventrite depressed but not adapted for receiving the rostrum (as occurs in Cryptorhynchini). We identify *Lepilius* Champion, 1905 as the sister group with both genera having a short and swollen mesepisternal suture in common. *Plumolepilius* is best separated from other genera of Conotrachelini by the presence of plumose scales lining the prosternal channel. Expanded elytral humeri and tubercles are present in several species, and some species have two conical tubercles, laterally compressed, at the base of the elytral declivity on the fourth interstice. Characters such as the elytral humeri shape, form of tubercles and male genital morphology could be useful for classifying species into natural groups. Some species can be differentiated with precision only by the inspection of male genitalia. Sex of specimens is easily determined by the distribution of rostral scales; in males scales are present from the base of the rostrum to the antennal insertion, while in females scales are present only at the base of the rostrum (Figs. 1–2). Other characters, if present, such as expanded elytral humeri and tubercles, are more developed in males or absent in females.

Natural history

Plumolepilius is distributed in the Mesoamerican dominion and the southern part of the Mexican transition zone (*sensu* Morrone 2014). The genus ranges from southeastern Mexico to Panama. It is composed of more than 20 species inhabiting montane ecosystems at middle to high elevations, especially in cloud and oak forests. This distributional pattern corresponds to the Montane Mesoamerican cenocron, which includes Neotropical taxa that evolved in humid montane habitats throughout Mexico and Central America, have South American affinities, and are hypothesized to have diversified in the Oligocene (Halffter 1987; Morrone 2010, 2015). Adults have been collected only during the rainy season in leaf litter. Species of *Plumolepilius* show features of adaptation to a leaf-litter inhabiting existence, such as the fusion of the elytra, the absence of hind wings, and the absence of a scutellum.

Material and methods

Specimen collection. Most specimens of *Plumolepilius* were collected by Berlese or Winkler extractions of leaf-litter samples. Samples were obtained by sifting leaf litter and debris in montane forests. Sifted material was stored in fabric bags and transported to facilities where arthropods were extracted by one of the methods previously mentioned. All extracted arthropods were stored in ethyl alcohol (95%), and weevils were sorted, point-mounted, and labeled.

Specimen examination. Specimens were inspected using an Olympus SZX7 dissecting microscope. For the examination of male genitalia tissues were softened by immersion of specimens in warm water for 20–30 minutes. The abdomen was then extracted pressing through the first ventral suture and gently pulling off the abdomen. The specimen and the detached abdomen were immersed in a lysis buffer overnight (see Gilbert *et al.* 2007) at 55 °C with gentle agitation. After DNA extraction, abdomens were immersed in a warm solution of KOH for removal of the musculature and fat tissues. Cleaned aedeagus and associated sclerites were mounted on acetate slides with a solution of 5,5-dimethyl hydantoin formaldehyde (DMHF) (Steedman 1958) following the techniques used by Miguel Angel Alonso-Zarazaga at Museo Nacional de Ciencias Naturales, Spain. Photographs of male and female habitus, and male genitalia were taken using a Leica Z16 APOA stereoscope, with an 8 megapixel Leica DFC490 camera and multilayer images were processed using Leica Application Suite software. Electron scanning microscope micrographs were taken with a Hitachi SU3500 II Scanning Electron Microscope at the Museo de Zoología "Alfonso L. Herrera", Mexico City, Mexico.

Descriptions and annotations. Taxonomic descriptions are based principally on male external and aedeagal morphology. Females are described mainly with respect to their differences from males; female genitalia and associated sclerites were not useful for distinguishing species. Specimen collecting data are transcribed as written in labels, however information from labels from the World Weevil Database and from the United States National

Science Foundation project "Leaf Litter Arthropods of Mesoamerica" (LLAMA) were condensed. In the case of the former the phrase "World Weevil Database" has not been written and for the labels of the latter since specimens were collected in samples along a transect, we condensed the information on all specimens from the same transect and here record only the first three decimals of the geographic coordinates and the LLAMA code without the number of the individual sample along the transect.

Phylogenetic methods. In order to test the monophyly of *Plumolepilius* we examined nine species of the genus from Mexico, Guatemala, and El Salvador, as well as species of other genera of Conotrachelini, namely *Aeatus* Champion, 1905, *Aemus* Champion, 1905, *Aeneasis* Champion, 1905, *Aepalius* Champion, 1905, *Conotrachelus* Dejean, 1835, *Dorytosomimus* Hustache, 1940, *Enomides* Champion, 1905, *Epoxalles* Kissinger, 1964, *Gayus* Kuschel, 1986, *Grypidiopsis* Champion, 1902, *Lepilius* Champion, 1905, *Micralcimus* LeComte, 1876, *Microhyus* LeComte, 1876, and *Pheloconus* Roelofs, 1875. The outgroup includes species of the Hylobiini genera *Heilipus* Germar, 1824, *Marshallius* Kuschel, 1955, and *Rhineitipus* Kuschel, 1955; only those character states that were constant in the three outgroup species were considered for the analysis. At the final consensus phylogenetic tree, the three outgroup species were collapsed as Hylobiini.

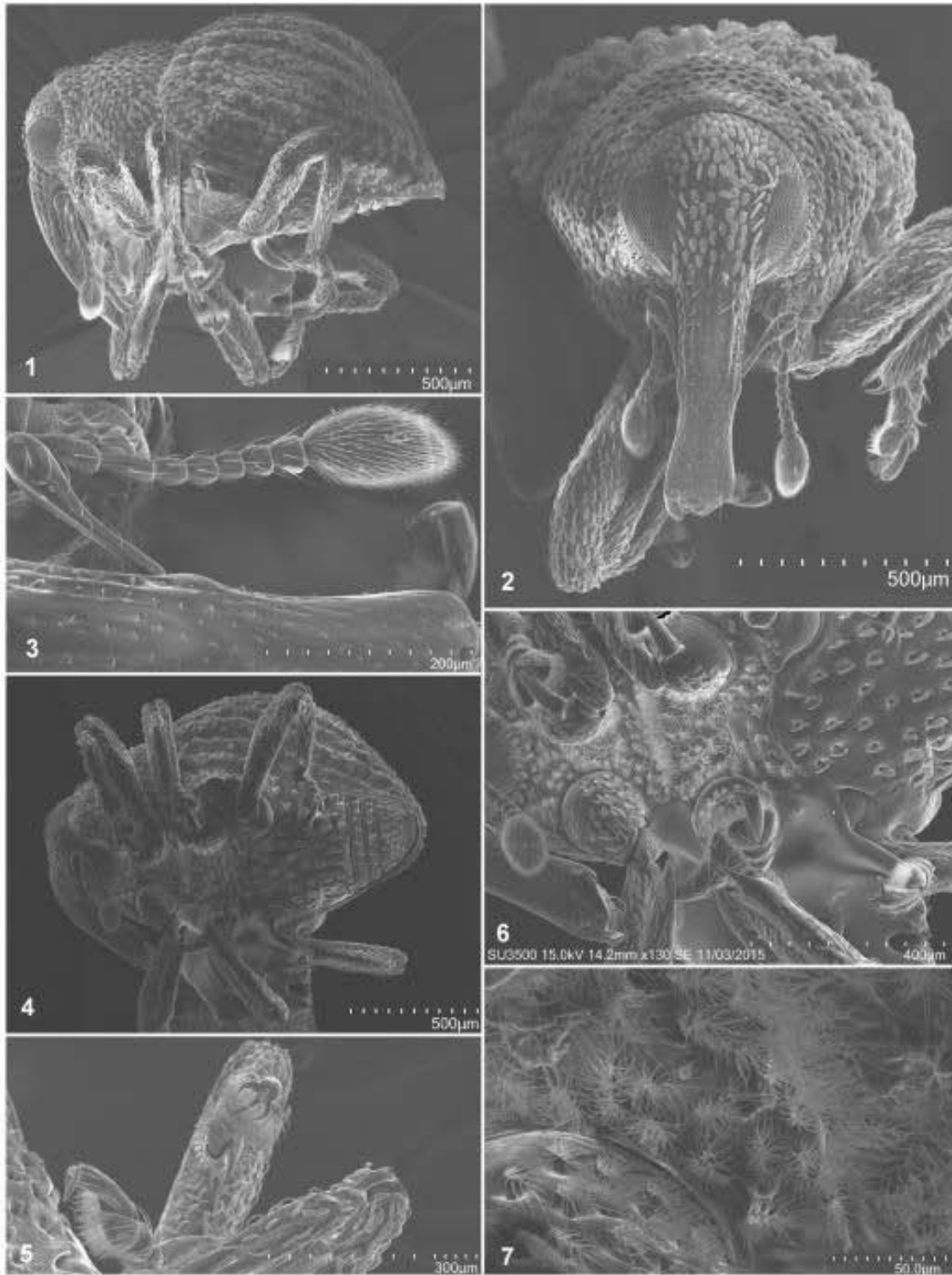
The 32 morphological characters used in the analysis were taken from external structures (29) and male external genitalia (3). Character states from *Dorytosomimus*, *Pheloconus eribricollis* (Say, 1831), and *Conotrachelus humerosus* Fahraeus, 1837, were recorded from females. The distribution of character states is shown in the data matrix (Table 1). The characters and their corresponding character states are as follows:

Head

- 1 Angle of rostrum longitudinal axis in relation to forehead axis in lateral view: (0) parallel or semiparallel; (1) semiperpendicular (Fig. 1).
- 2 Width ratio of rostrum in relation to head: (0) rostrum thick, at least 0.3X the width of the head; (1) rostrum thin, less than 0.25X the width of the head.
- 3 Angle at base of rostrum: (0) straight; (1) curved (Fig. 1).
- 4 Shape of rostrum: (0) subcylindrical (Fig. 1); (1) subquadrate.
- 5 Shape of apex of rostrum: (0) subcylindrical; (1) flattened (Figs. 2–3).
- 6 Antennal insertion position: (0) close to apex of rostrum; (1) close to middle of rostrum (Fig. 2).
- 7 Lateral carina from the antennal insertion to apex of rostrum: (0) absent; (1) present.
- 8 Length of scape: (0) almost as long as the funiculus or longer; (1) as long as or shorter than first four joints of funiculus (Figs. 1–3).
- 9 Shape of antennal club: (0) acute; (1) obtuse (Fig. 3).

Thorax

- 10 Shape of pronotum: (0) subcylindrical; (1) swollen at base.
- 11 Pronotal postocular lobes: (0) absent; (1) present.
- 12 Lateral fovea of pronotum: (0) absent; (1) present.
- 13 Prosternal channel: (0) absent; (1) present.
- 14 Mesoventerite with an intercoxal process: (0) present; (1) absent.
- 15 Metanepisternal suture swollen: (0) absent; (1) present.
- 16 Distance between mesocoxae and metacoxae: (0) long; (1) short; (2) almost contiguous (additive).
- 17 Elytra overall dimensions: (0) at least 1.5X longer than broader; (1) less than 1.5X longer than broad.
- 18 Shape of elytra: (0) elongate; (1) semielongate; (2) semiglobose; (3) globose (additive).
- 19 Humeri: (0) present; (1) absent.
- 20 Intercoxal distance of mesothoracic legs: (0) subcontiguous; (1) broadly separated.
- 21 Profemora armature: (0) strong tooth; (1) small tooth; (2) unarmed (additive).
- 22 Mesofemora armature: (0) strong tooth; (1) small tooth; (2) unarmed (additive).
- 23 Metafemora armature: (0) strong tooth; (1) small tooth; (2) unarmed (additive).
- 24 Tarsal claws: (0) simple (Figs. 4–5); (1) appendiculate; (2) bifid (additive).
- 25 Scutellum: (0) visible; (1) not visible.
- 26 Tubercle at base of elytral declivity: (0) absent; (1) present.
- 27 Elytral sculpture: (0) punctate; (1) seriate-punctate; (2) punctate-striate (additive).



FIGURES 1–7. *Plumolepilus canoi*, female paratype. 1, Habitus, lateral view. 2, Head frontal view. 3, Antennae. 4, Ventral view. 5, Claws. 6, Prosternal channel. 7, Plumose setae.

Abdomen

- 28 Aedeagal shape in lateral view: (0) bent; (1) straight.
29 Length of aedeagal apodemes: (0) as long as pedon; (1) shorter than pedon; (2) longer than pedon (non-additive).
30 Basal piece of tegmen: (0) closed; (1) open.

Vestiture

- 31 Shape of setae of prosternal channel: (0) simple; (1) plumose (Figs. 6–7).
32 Clavate scales on the elytra: (0) absent, (1) recumbent, (2) suberect (non-additive).

The cladograms were constructed using software TNT (Goloboff *et al.* 2008). The effect of homoplasy on the results was explored by conducting different implied weights analyses (Goloboff 1993), with constants of concavity (k) set to a different integer value of 1–12, where 1 is weighted most severely against homoplastic characters. Implied weights analyses were conducted using the heuristic “traditional search” algorithm of TNT, with 1000 replications and tree-bisection-reconnection branch-swapping (TBR), holding 1000 trees during each replication.

Specimen depositories

| | |
|-------|--|
| ASUHC | Arizona State University, Hasbrouck Insect Collection, Tempe, Arizona, United States of America (Nico Franz) |
| BMNH | The Natural History Museum, London, United Kingdom (Max Barclay) |
| CMNC | Canadian Museum of Nature Collection, Ottawa, Ontario, Canada (François Génier) |
| CNCI | Canadian National Collection of Insects, Agriculture Canada, Ottawa, Ontario, Canada (Patrice Bouchard) |
| CWOB | Charles W. O’Brien personal collection, Green Valley, Arizona, United States of America (Charles W. O’Brien) |
| ECOS | El Colegio de la Frontera Sur, Museo de Entomología, San Cristóbal de Las Casas, Chiapas, Mexico (Jorge Leonel León Cortés) |
| MCZ | Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, United States of America (Phil Perkins) |
| MNCN | Museo Nacional de Ciencias Naturales, Madrid, Spain (Miguel Ángel Alonso-Zarazaga) |
| MZFC | Museo de Zoología “Alfonso L. Herrera”, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City, Mexico (Juan J. Morrone) |
| URLC | Universidad Rafael Landívar, Campus San Luis Gonzaga, Societas Jesu, Guatemala (Manuel Barrios-Izás) |
| USAC | Museo de Historia Natural, Universidad de San Carlos de Guatemala, Guatemala City, Guatemala (Enio B. Cano) |
| USNM | National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia, United States of America (Lourdes Chamorro) |
| UVGC | Universidad del Valle de Guatemala, Guatemala City, Guatemala (Jack C. Schuster) |

Plumolepilus Barrios-Izás & Anderson, new genus

Type species. *Plumolepilus trifidens* Barrios-Izás & Anderson, here designated.

Gender. Masculine.

Diagnosis. *Plumolepilus* species are best recognized by having a prosternal channel lined with plumose scales (Figs. 6–7). The pronotum is often widened at the base and always with postocular lobes. Elytral humeri are produced laterally or not, tubercles absent or two subconical tubercles on the beginning of the elytral declivity or several between the base of elytra and elytral declivity. Intercoxal distance of mesocoxae and metacoxae less than the width of a coxa. Mesepisternal suture is swollen and shorter than in other genera of Conotrachelini, except for

Lepilius. The male genitalia of *Plumolepilius* differ from *Lepilius* in having a completely curved penis if seen from lateral view and the aedeagal apodemes are also much longer than in *Lepilius*.

Description. **Head.** Scales covering rostrum from antennal insertion (males) or from base of rostrum (females) to head, rostrum smooth or finely punctate, sometimes feebly rugose on dorsum; forehead slightly depressed; antenna inserted close to middle of rostrum or the first half, scrobes lateral, reaching eye margin, scape not passing base of rostrum, funiculus of 7 desmomes, desmomes 1 and 2 subequal in length, 3–7 moniliform; eyes lateral, medium-sized, occupying nearly one third of head. **Pronotum.** Coarsely punctate, laterally swollen; scales clavate, suberect, color variegate, ochreous scales sometimes forming 2 or 3 vittae; postocular lobes present. **Thoracic sterna.** Prosternal channel lined with plumose scales, mesoventrite depressed anteriorly but not specialized for reception of rostrum, metaventrite short. **Wings.** Elytra fused, with vestiture of suberect clavate scales varying in color from ochreous to dark brown; usually coarsely punctate and punctate-striate; males with humeri produced laterally or not, absent in females; tubercles absent or two or several, always before the elytral declivity when present. Hind wings absent. **Abdomen.** Abdominal ventrites 1 and 2 large, fused medially in most species, abdominal ventrite 1 in males depressed in middle; abdominal ventrites 3 and 4 combined usually as long as abdominal ventrite 2, abdominal ventrite 5 bearing tufts of setae at apex or not. **Legs.** Vestiture of scales and setae, femora armed with a small tooth or not, tibiae shorter than femora, straight or slightly sinuate, uncinata, premucro absent, corbels closed, tarsal claws 2, simple, lacking basal tooth, free. **Genitalia.** Aedeagus with pedon curved (lateral view), apodemes at least 2X longer than pedon, tegmen open, manubrium almost as large as pedon, parameroid lobes not distinguishable, genital sclerites differing in shape.

Derivation of the generic name. The generic name refers to the sister genus *Lepilius* and to the plumose scales lining the prosternal channel.

Phylogenetic relationships of *Plumolepilius* with other genera of Conotrachelini

The analysis of the data matrix (Table 1) with different concavity constants led always to the same two cladograms, where *Plumolepilius* was recovered as a monophyletic taxon and *Lepilius* recognized to be its sister genus (Fig. 8). The cladograms had resolved 116 steps, consistency index = 0.35 and retention index = 0.81. *Plumolepilius*, *Lepilius*, *Aenesias* and *Epacalles* are grouped in a clade that differs from other Conotrachelini genera in having the dorsal side of the ring of the tegmen open, which is apparently unusual (Alonso-Zarazaga, Museo Nacional de Ciencias Naturales, Spain, personal communication). The monophyly of *Plumolepilius* is supported by the presence of plumose scales lining the prosternal channel; to our knowledge this character is not convergent with any other genus within the subfamily. Geographically both genera are in parapatry, *Lepilius* is distributed from Texas, United States of America to Central America (Anderson 2012) and *Plumolepilius* distribution ranges from southern Mexico to northern Panama.

TABLE 1. Data matrix.

| Taxa / characters | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | |
| Hylobiini (outgroup) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| <i>Aeatus</i> Champion, 1905 sp. 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| <i>Aeatus</i> sp. 2 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| <i>Aemus</i> Champion, 1905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | |
| <i>Aenesias tuberculirostris</i> Champion, 1905 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | | |
| <i>Aenesias cavifrons</i> Champion, 1905 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | |
| <i>Aepallus</i> Champion, 1905 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 1 |
| <i>Conotrachelus</i> Dejean, 1835 sp. 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| <i>Conotrachelus</i> sp. 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

.....continued on the next page

TABLE 1. (Continued)

| Taxa / characters | 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 3 3 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | | | | | |
| <i>Conotrachelus humerosus</i> Fahraeus, 1837 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | ? | ? | ? | 0 | 0 |
| <i>Dorytosomimus</i> Hustache, 1940 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | ? | ? | ? | ? | 0 | 0 | | | |
| <i>Enomides</i> Champion, 1905 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | | | |
| <i>Epacalles inflatus</i> (Blatchley, 1916) | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | | |
| <i>Gayus elegans</i> (Blanchard, 1851) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| <i>Grypidlopsis variegatus</i> Champion, 1902 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| <i>Grypidlopsis lenti</i> Kuschel, 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| <i>Lepillus</i> Champion, 1905 sp. 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| <i>Lepillus</i> sp. 2 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| <i>Lepillus</i> sp. 3 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| <i>Lepillus</i> sp. 4 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| <i>Lepillus</i> sp. 5 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| <i>Micralcinus parvulus</i> (Champion, 1904) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| <i>Micralcinus maculatus</i> (Blatchley, 1916) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | |
| <i>Microhyus</i> LeConte, 1876 sp. 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | |
| <i>Microhyus</i> sp. 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | |
| <i>Microhyus</i> sp. 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | |
| <i>Pheloconus rubicundulus</i> (Boheman, 1837) | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| <i>Pheloconus cribricollis</i> (Say, 1831) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | ? | ? | ? | ? | 0 | 0 | 0 | 0 | 0 | |
| <i>Plumolepillus branstetteri</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| <i>Plumolepillus daryi</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus yolnabajensis</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus cortezii</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus trifiniensis</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus longinoi</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus schusteri</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus canoi</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Plumolepillus macalajauensis</i> Barrios-Izás & Anderson | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 1 | 2 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

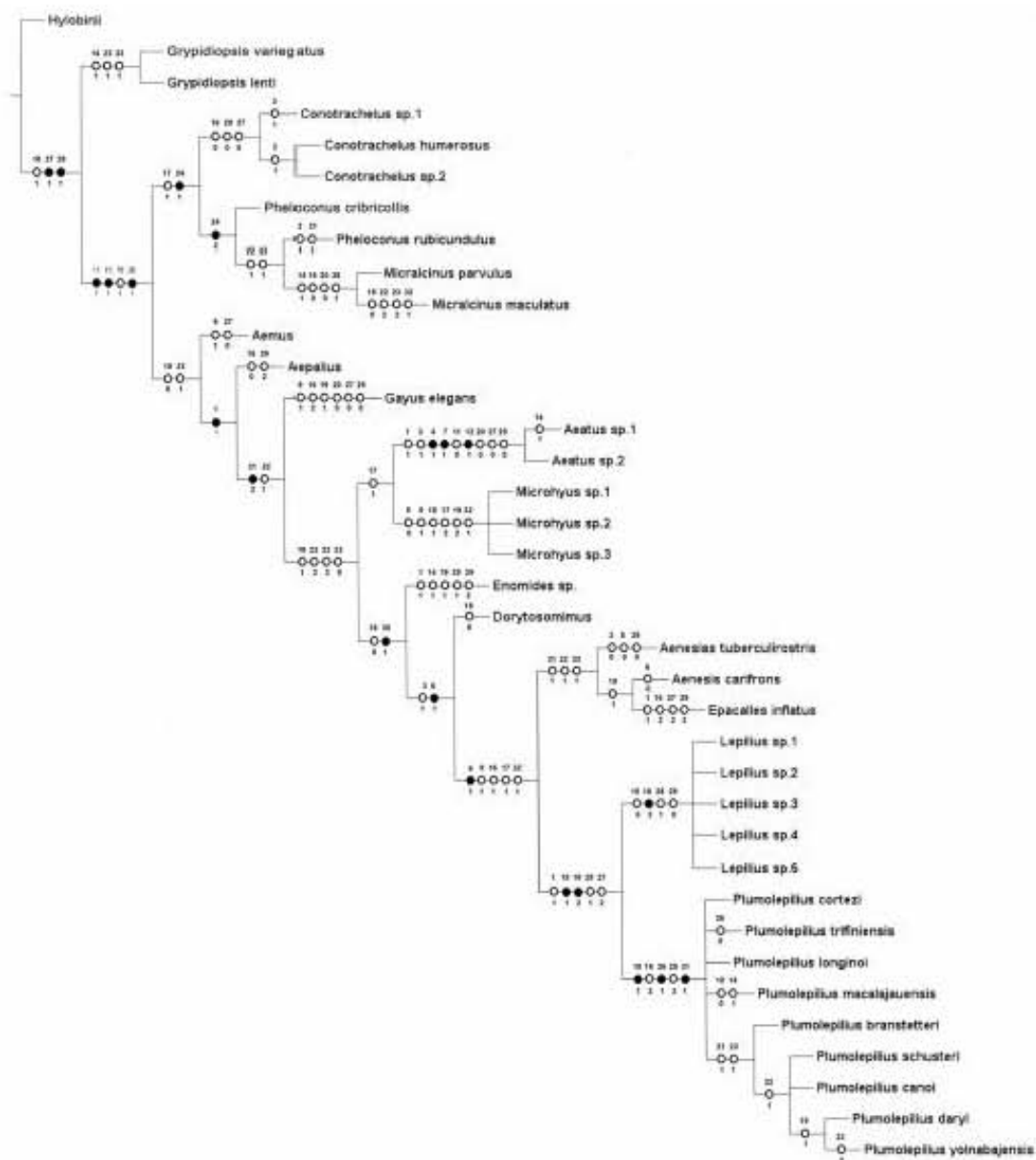


FIGURE 8. Strict consensus cladogram of the two most parsimonious cladograms obtained with concavities 1–12.

Checklist of included species from Mexico, Guatemala, and El Salvador arranged in alphabetical order

1. *Plumolepilus branstetteri* Barrios-Izás & Anderson, new species; Guatemala (Quetzaltenango and San Marcos) and Mexico (Chiapas).
2. *Plumolepilus canot* Barrios-Izás & Anderson, new species; Guatemala (Chiquimula and Zacapa).
3. *Plumolepilus cortezii* Barrios-Izás & Anderson, new species; Guatemala (Huehuetenango and Quetzaltenango) and Mexico (Chiapas).
4. *Plumolepilus daryi* Barrios-Izás & Anderson, new species; Guatemala (Baja Verapaz).

5. *Plumolepilius longinói* Barrios-Izás & Anderson, new species; Guatemala (Huehuetenango, Quetzaltenango and Quiché) and Mexico (Chiapas).
6. *Plumolepilius macalajauensis* Barrios-Izás & Anderson, new species; Guatemala (Quiché).
7. *Plumolepilius schusteri* Barrios-Izás & Anderson, new species; Guatemala (San Marcos) and Mexico (Chiapas).
8. *Plumolepilius trifiniensis* Barrios-Izás & Anderson, new species; El Salvador (Santa Ana) and Guatemala (Escuintla, Guatemala, Jalapa, Quiché, Sacatepequez, Santa Rosa, and Suchitepequez)
9. *Plumolepilius yolnabajensis* Barrios-Izás & Anderson, new species; Guatemala (Huehuetenango).

Key to the species of *Plumolepilius*

The key to the species of *Plumolepilius* is based only on males. Extraction of the aedeagus may be necessary for identification of some species.

1. Humeri rounded, not produced. Elytra with small tubercles before elytral declivity 2
- Humeri laterally produced. Elytra with tubercles before elytral declivity or not 3
2. Metaventrite with fovea; mesepisternum bare; abdomen elongate-narrow (Figs. 30-31) *P. daryi*
- Metaventrite lacking fovea; mesepisternum clothed with scales; abdomen more or less globose (Figs. 65-66). *P. yolnabajensis*
3. Elytra lacking tubercles (Figs. 58-59); penis not lobed at apex (Fig. 61); endophallus with anterior genital sclerite forming bilobed capsule (Figs. 61, 88), posterior genital sclerite sting-like in shape (Figs. 61, 88) *P. trifiniensis*
- Elytra with two subconical tubercles at base of elytral declivity, with other small tubercles or not, penis lobed at apex or not; genital sclerites of several shapes 4
4. Subconical tubercles at base of elytral declivity large (Figs. 44-45), separated by less than half of own diameter (Fig. 45) *P. macalajauensis*
- Subconical tubercles at base of elytral declivity separated by at least own diameter. 5
5. Elytra with only two tubercles at elytral declivity 6
- Elytra with two tubercles at elytral declivity, and with small tubercles at disc 7
6. Pronotum produced laterally forming pterygoid expansions (Fig. 51) *P. schusteri*
- Pronotum without pterygoid expansions (Fig. 16) *P. canoi*
7. Abdominal ventrite 5 with two protuberances at apex (Fig. 41); penis widening at apex forming lobe (Figs. 40, 76), median foramen wide and groove-like (Figs. 40, 76); femora unarmed; scape bare. *P. longinói*
- Surface of abdominal ventrite 5 flat; penis straight or slightly widening but not forming an apical lobe, posterior aperture of endophallus not forming wide groove; femora armed or not; scape bare or with setae 8
8. Elytral flanks not acute-angulate; scape bearing setae; femora unarmed *P. cortezi*
- Elytral flanks acute-angulate (Fig. 10); scape bare; femora armed with small tooth at inner margin *P. branstetteri*

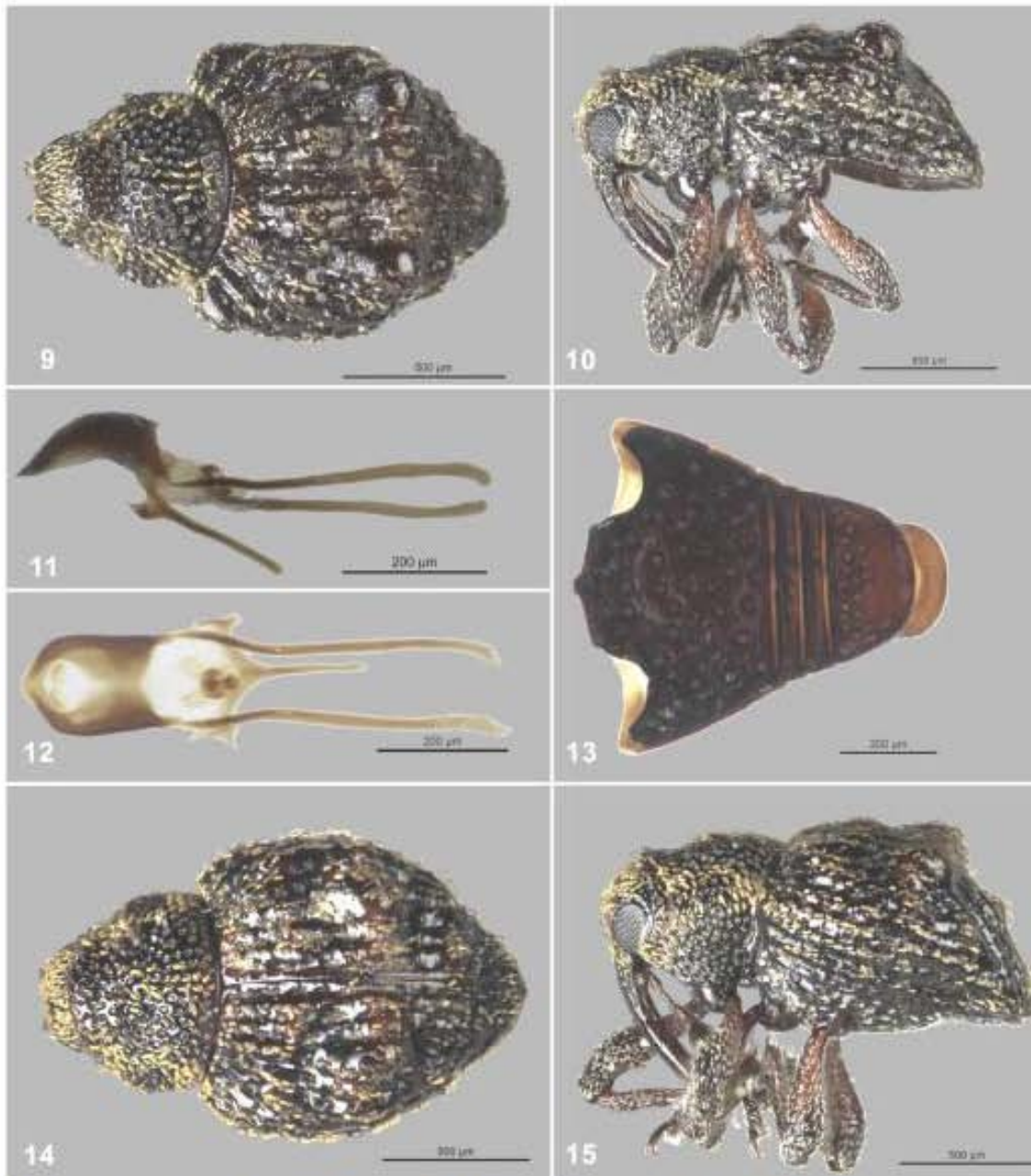
Plumolepilius branstetteri Barrios-Izás & Anderson, new species

(Figs. 9-15, 72, 81, 90, 99)

Diagnosis. Male. Length (1.65-2.00 mm). Width (1.00-1.45 mm). Subovate, nigropiceous, infused with dark orange at legs and apex of rostrum, coarsely punctate. Vestiture of recurved, clavate, variegated yellow to dark brown scales; adpressed at mesepisternum. Rostrum stout, base slightly humped, finely punctate. Antenna inserted at the middle, setulose, except for scape, scape slightly larger than desmomer 1 and 2 together, both desmomer 1 and 2 elongate, desmomer 3 to 7 moniliform. Pronotum narrower than elytra, constricted in front, three vittae of ochreous scales, the middle vittae incomplete. Elytra punctate-striate, parallel and abruptly confluent at the elytral declivity, flanks acuteangulate with dorsum, two large rounded tubercles on interstice 3 at base of elytral declivity, various callous tubercles, humeri angle sharp. Abdominal ventrite 5 broad, flat, bearing two tufts of setae at apex (not always evident), strongly punctate at anterior half, posterior half finely punctate. Femora with scattered scales, small tooth at inner margin, tibiae slender, shorter than femora, apical transverse comb of setae, uncinata, premucro absent. Pedon subparallel, apodemes at least 3X longer than pedon.

Female. Length (1.95-2.10 mm). Width (1.10-1.35 mm). Elytra tuberculate, humeri not produced but acuteangulate.

Geographic distribution. Guatemala (Huehuetenango, Quetzaltenango, Quiché, and San Marcos) and Mexico (Chiapas). Fig. 99.



FIGURES 9–15. *Plumolepillus branstetteri*. 9, Male dorsal habitus. 10, Male lateral habitus. 11, Aedeagus lateral view. 12, Aedeagus dorsal view. 13, Male abdominal ventrites 1–5. 14, Female dorsal view. 15, Female lateral view.

Derivation of the specific name. Patronym, named after Michael G. Branstetter, a myrmecologist at the University of Utah.

Material examined: 12♂♂, 24♀♀ (ASUHIC, BMNH, CMNC, CWOB, USAC, USNM). Holotype ♂ (CMNC): GUATEMALA: Quetzaltenango. Las Nubes, 14.80143°N 91.67197°W, 2190m, 12.IX.2008, oak forest ex sifted leaf litter, R. S. Anderson RSA2008-116 / WWD0023227 / Holotype ♂ *Plumolepillus branstetteri* Barrios-Izás & Anderson sp. nov. Aedeagus extracted. Paratypes: same data as holotype / WWD0023187 (1♂ CWOB). WWD0023188 (1♂ USNM). WWD0023192 (1♀ CWOB). WWD0023193 (1♀ CMNC). WWD0023195 (1♀ USNM). WWD0023199 (1♂ ASUHIC). WWD0023200 (1♀ ASUHIC). WWD0023201 (1♀ ASUHIC).

WWD0023202 (1♀ USAC). WWD0023204 (1♀ CMNC). WWD0023206 (1♀ CMNC). WWD0023211 (1♀ CMNC). WWD0023217 (1♂ USAC). WWD0023224 (1♀ CMNC). WWD0023225 (1♂ BMNH). WWD0023226 (1♀ CMNC). WWD0023228 (1♀ CMNC). WWD0023229 (1♀ CMNC). WWD0023230 (1♀ CMNC). WWD0023231 (1♀ CMNC). WWD0023235 (1♀ CMNC). WWD0023240 (1♀ CMNC). GUATEMALA: Quiche, Joya Larga, 15.41997°N 90.83630°W, 2025m, 15.IX.2008, oak/cloud forest, ex sifted leaf litter, R. S. Anderson, RSA2008-124 / WWD0028871 (1♀ CMNC). WWD0028875 (1♀ CMNC). WWD0028880 (1♀ CMNC). WWD0028942 (1♂ CMNC). WWD0028948 (1♂ CMNC). GUATEMALA: Huehuetenango. Max, oak/cloud forest, 15.50673°N 91.644473°W, 2750m, 14.IX.2008, ex sifted leaf litter, R.S. Anderson RSA2008-119 / WWD0023523 (1♂ CMNC). GUATEMALA: San Marcos. La Fraternidad, 1920m, 14.93604°N 91.86778°W, 11 Sep 2008. M.G. Branstetter, disturbed cloud forest, MGB-938 (1♂ CMNC). MEXICO: Chiapas, Volcan Tacana, lower slopes, ca. 4km. N.Union Juarez, 2000m, 19.IX.1992, R.S.Anderson, 92-110, cloud forest litter (2♀♀ CMNC). Same data except for 92-111, cloud forest litter (2♂♂, 2♀♀ CMNC).

***Plumolepilius canoi* Barrios-Izás & Anderson, new species**

(Figs. 16–22, 73, 82, 91, 101)

Diagnosis. Male. Length (1.55–2.05 mm). Width (1.00–1.45 mm). Subovate, brown, rostrum, antenna and legs rufescent. Vestiture of variegated scales from ochreous to dark brown, recumbent or appressed. Rostrum longer than the pronotum, posterior half finely punctate and with setae, anterior half with larger puncture and scales, scrobes lateral, antenna inserted behind the middle, setulose, scape almost touching the lower margin of eyes, as large as desmomerer 1 and 2 together, both desmomerer elongate, subequal in length, other desmomerer moniliform. Pronotum broader than anterior margin of elytra, broadest at the middle, constricted in front, flanks transversely swollen at middle. Elytra punctate-striate, 10 striae, broadest at the middle, two laterally flattened tubercles on the fourth interstice at base of elytral declivity, humeri produced, quadrate. Vestiture of abdominal ventrites of setae and recumbent clavate scales. Femora armed with small tooth on inner margin. Pedon sublanceolate, median orifice oval.

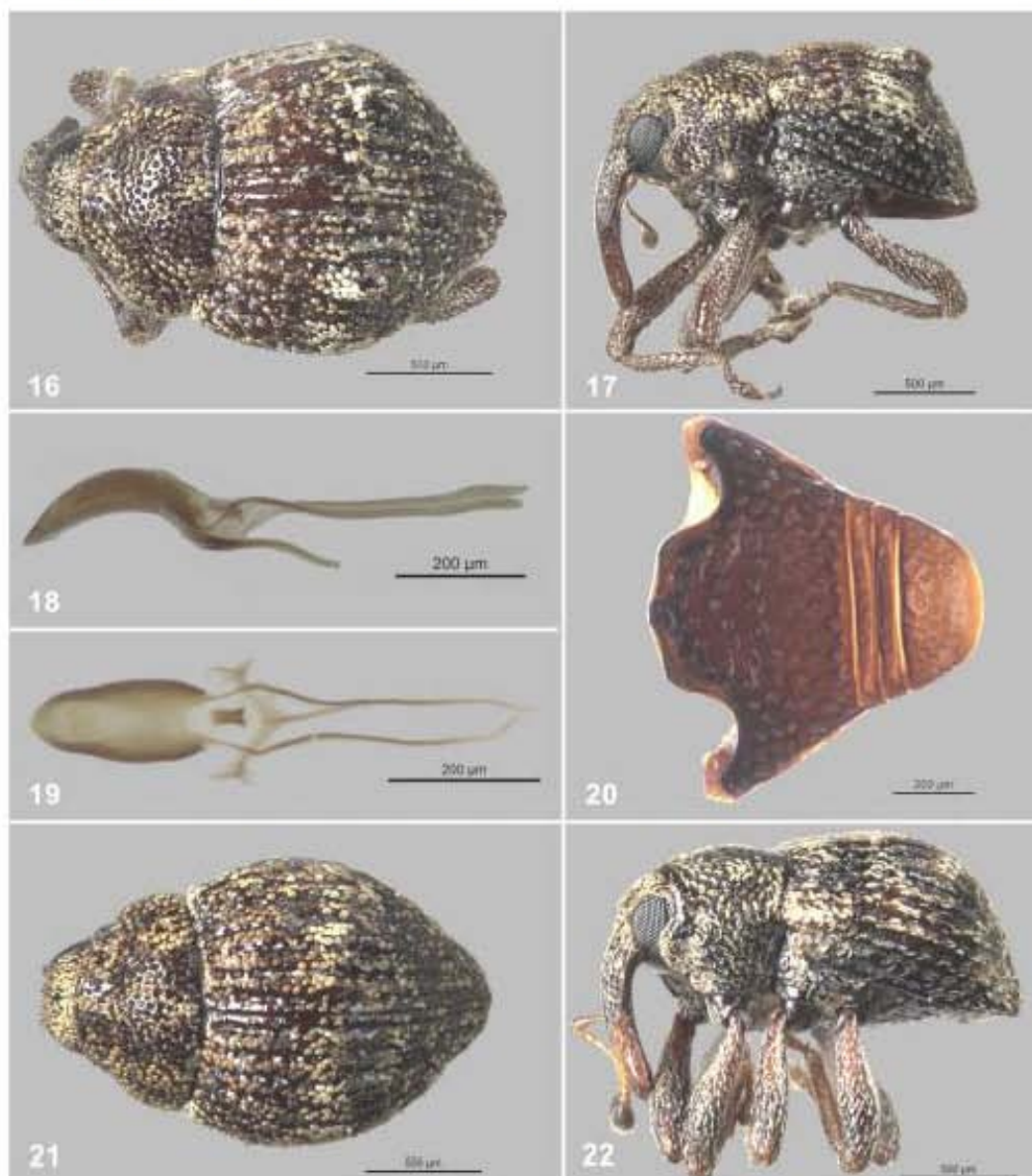
Female. Length (1.70–2.20 mm). Width (1.10–1.50 mm). Humeri not produced, tubercles absent but interstice 4 slightly elevated.

Geographic distribution. Guatemala (Zacapa and Chiquimula). Fig. 101.

Derivation of the specific name. Patronym, named after Enio B. Cano, a coleopterist at Universidad del Valle in Guatemala City.

Material examined. 33♂♂, 45♀♀ (ASUHIC, BMNH, CMNC, CWOB, MNCN, URLC, USAC, USNM, UVGC). Holotype ♂ (CMNC): GUAT.: ZACAPA, 3.5km. S.E. La Union, 1500m, 23.VI.1993, R.Anderson, cloud for.litter,93-12C / Holotype ♂ *Plumolepilius canoi* sp. nov. Barrios-Izás & Anderson. Paratypes: same data as holotype (2♂♂ 1♀, CMNC). 93-12A (1♂ 1♀, CMNC). 93-12B (2♂♂ 1♀, CMNC, 1♂ USAC). 93-12G (1♀, CMNC). 93-12i (2♀♀, CMNC). 93-12F (1♂ 1♀, CMNC). 93-12L (2♀♀, CMNC, 1♀ CWOB). 93-12J (1♀, CMNC). 93-12K (1♂, CMNC). GUAT.: ZACAPA, 3.5km. S.E. La Union, 1600m, 25.VI.1993, R.Anderson, cloud for. litter, 93-15H (2♀♀, CMNC). GUAT.: ZACAPA, 3.5km. S.E. La Union, 1500m, 4.VI.1991, R. Anderson, cloud forest litter, 91-50 (1♂1♀ ASUHIC, 2♂♂ 1♀, BMNH, 4♂♂ 1♀ CMNC, 1♂ CWOB). GUAT.: ZACAPA. 3.5km S.E. La Union, 1500m, 25–27.VI.1993, J. Ashe & R. Brooks, cloud forest, FIT (1♂ 1♀ CMNC, 1♂ 1♀ CWOB, 1♂1♀ USNM). GUAT.: ZACAPA. 3.5km S.E. La Union, 1500m, 25–27.VI.1993, J. Ashe & R. Brooks, cloud forest, FIT / EMB23 / Aedeagus extracted (1♀, CMNC). GUATEMALA:ZACAPA. 3.5km S.E. La Union, 1500m, 23.VI.1993, J.S. Ashe, tree fall litter (085) (2♀♀, CMNC). GUATEMALA: ZACAPA. 2km SE La Unión, 14.954 -89.277 ±50m, 1430m, 12.V.2009, LLAMA Wa-B-03-2 / WWD0036632 (1♀, UVGC). WWD0036639 (1♀, USAC). WWD0036680 (1♀, CMNC). WWD0036681 (1♂, CMNC). WWD0036687 (1♂, CMNC). GUATEMALA: ZACAPA. 2km SE La Unión, 14.954 -89.276 ±50m, 1430m, 12.V.2009, LLAMA Wa-B-03-2 / WWD0036753 (1♂, USNM). WWD0036754 (1♀, CMNC). WWD0036760 (1♀, CMNC). WWD0036787 (1♀, CMNC). GUATEMALA: ZACAPA. 2km SE La Unión, 14.953 -89.276 ±50m, 1430m, 12.V.2009, LLAMA Wa-B-03-2 / WWD0036841 (1♀, USNM). WWD0036868 (1♀, CMNC). WWD0036869 (1♀, CMNC). WWD0036873 (1♂, CMNC). WWD0036957 (1♀, CMNC). WWD0036959 (1♀, CMNC). GUATEMALA: ZACAPA. 2km SE La Unión, 14.953 -89.275 ±50m, 1430m, 12.V.2009, LLAMA Wa-B-03-2 / WWD0036987 (1♂, USAC). WWD0037006 (1♀, CMNC). WWD0037007 (1♀, MNCN). WWD0037012 (1♀, CMNC). WWD0037013 (1♀,

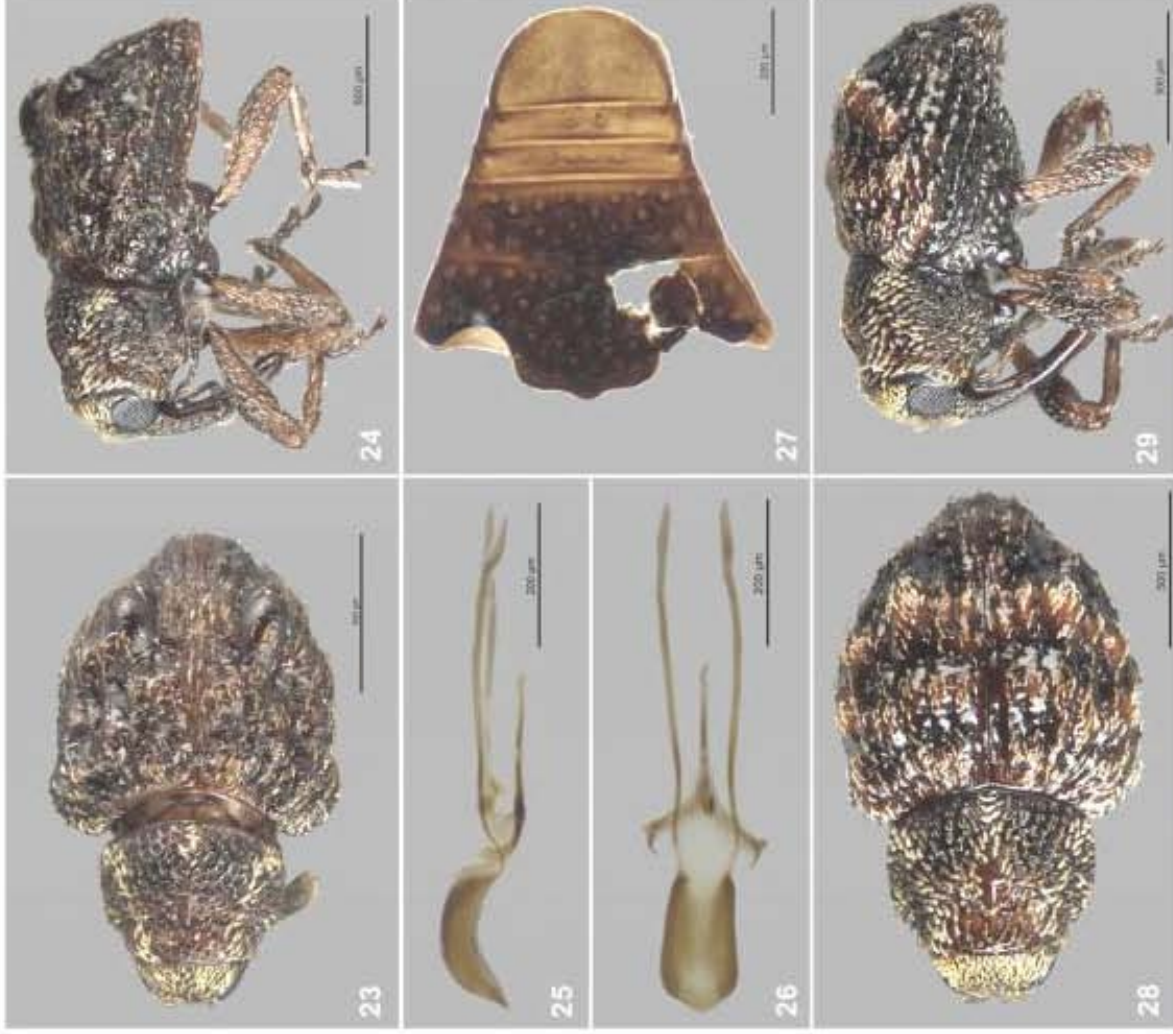
CMNC). WWD0037015 (1♂, MNCN). WWD0037036 (1♀, CMNC). WWD0037050 (1♂, UVGC). WWD0037086 (1♀, CMNC). GUATEMALA. Chiquimula. Quezaltepeque. Las Cebollas. Bos Nuboso Mixto. 30.VII.2013. Hojarasca 4.5lt. 14.58491°N, 89.39326°W. 1757m. Col. M. Barrios MBI172 (1♂, CMNC). GUATEMALA. Chiquimula. Quezaltepeque. Las Cebollas. Bos Nuboso Mixto. 30.VII.2013. Hojarasca 4.5lt. 14.58491°N, 89.39326°W. 1757m. Col. M. Barrios MBI173 (2♀♀, CMNC, URL). GUATEMALA. Chiquimula. Quezaltepeque. Las Cebollas. 30.VII.2013. 14.58329°N, 89.39997°W. Bnuboso. Hoj. 4.5 lt. 1631m. Col. M. Barrios MBI174 (2♂♂, URLC). GUATEMALA. Chiquimula. Quezaltepeque. Las Cebollas. 30.VII.2013. 14.58381°N, 89.39865°W. Bnuboso. Hoj. 4.5 lt. 1639m. Col. M. Barrios MBI171 (1♂ 2♀♀, CMNC). GUATEMALA. Chiquimula. El Durazno. BEncino-Pino. 1551m. 7.VIII.2013. 14.83825 -89.66762. Hoj. 4.5lt. Wink. Col. M. Barrios. MBI202 (2♂♂ 2♀♀, URLC).



FIGURES 16–22. *Plumolepillus canoi*. 16, Male dorsal habitus. 17, Male lateral habitus. 18, Aedeagus lateral view. 19, Aedeagus dorsal view. 20, Male abdominal ventrites 1–5. 21, Female dorsal view. 22, Female lateral view.

***Plumolepilus cortezii* Barrios-Izás & Anderson, new species**
(Figs. 23–29, 74, 83, 92, 101)

Diagnosis. Length, male (1.55–2.15 mm). Width, male (0.95–1.55 mm). As *P. branstetteri* but rostrum not humped, scape with setae, as large as desmcomeres 1 to 3 together. Elytral margins subparallel to declivity, tubercles at the base of declivity slight and laterally compressed, flanks not acuteangulate with the dorsum, humeral projections rounded. Abdominal ventrite lacking tufts of setae. Femora unarmed. Pedon subparallel, not lobulate at the apex as *P. longinoi*, apodemes more than 2.5X longer than pedon, posterior genital sclerite in dorsal view a concave plate with anterior side concurrent and rounded, anterior genital sclerite with basal ring and 2 processes forming capsule-like structure divided longitudinally along the middle.



FIGURES 23–29. *Plumolepilus cortezii*. 23, Male dorsal habitus. 24, Male lateral habitus. 25, Aedeagus lateral view. 26, Aedeagus dorsal view. 27, Male abdominal ventrites 1–5. 28, Female dorsal view. 29, Female lateral view.

Female. Length (1.80–2.15 mm). Width (1.05–1.25 mm). Elytra tuberculate, tubercles conspicuously smaller than those in males, humeri rounded.

Geographic distribution. Mexico (Chiapas) and Guatemala (Huehuetenango, Quetzaltenango, and Quiché). Fig. 101.

Derivation of the specific name. Patronym, named after Jorge León Cortez, a lepidopterist at El Colegio de la Frontera Sur, Chiapas, Mexico.

Material examined. 94♂♂, 106♀♀ (ASUHIC, BMNH, CMNC, CWOB, MNCN, USAC, USNM, UVGC). Holotype ♂ (CMNC): Mexico: Chiapas, Cerro Huitepec, ca. 5km. W. San Cristobal, 2700m, 14.IX.1992, R.S.Anderson, 92-100, wet oak forest litter / Holotype ♂ *Plumolepilius cortezi* Barrios-Izías & Anderson sp. nov. Aedeagus extracted. Paratypes: same data as holotype (1♂1♀ ASUHIC, 9♂♂ 15♀♀ CMNC, 1♂1♀ USNM, 1♂1♀ USAC, 1♂1♀ UVGC). MEX.: Chiapas, Cerro Huitepec (Pico), ca. 5km. W. San Cristobal, 2750m., 15.IX.1991, R. Anderson, cloud forest litter, 91-101 (1♂1♀ ASUHIC, 13♂♂10♀♀ CMNC, 1♂1♀ CWOB, 1♂1♀ MNCN, 1♂1♀ USAC). MEX.: Chiapas, Cerro Huitepec (Pico), ca. 5km. W. San Cristobal, 2750m., 18.IX.1991, R. Anderson, cloud forest litter, 91-107 (1♂1♀ ASUHIC, 1♂1♀ BMNH, 21♂♂20♀♀ CMNC, 1♂1♀ MNCN, 1♂1♀ USNM, 2♂♂2♀♀ URLC, 1♂1♀ USAC, 1♂1♀ UVGC). MEX.: Chiapas, Cerro Tzontehuitz (Pico), 2910m. ca. 10km. N.E. San Cristobal, 16.IX.1991, R. Anderson, cloud forest litter, 91-104 (8♂♂ 12♀♀, CMNC, CWOB). MEX.: Chiapas, Cerro Tzontehuitz (Pico), 2910m. ca. 10km. N.E. San Cristobal, 16.IX.1991, R. Anderson, cloud forest litter, 91-104 (1♀ CMNC) / EMB18. MEX.: Chiapas, Cerro Huitepec, ca. 5km. W. San Cristobal, 2650m., 17.IX.1991, R. Anderson, wet oak for. litter, 91-106 (5♂♂ 3♀♀, CMNC). MEXICO: CHIAPAS. Mpio. San Cristobal, Reserva Huitepec, 2600 m, 16°44.578 N 92°41.287 W, 9.VII.2007, mixed oak-cloud forest litter, R.Anderson, 2007-005 / WWD0046648 (1♀, CMNC). WWD0046649 (1♂, BMNH). WWD0046655 (1♀, CWOB). WWD0046656 (1♀, ECOS). WWD0046689 (1♂, CWOB). WWD0046704 (1♀, CMNC). WWD0046707 (1♂, ECOS). WWD0046709 (1♀, BMNH). WWD0046710 (1♂, USAC). WWD0046711 (1♂, USAC). WWD0046712 (1♀, CMNC). WWD0046718 (1♀, CMNC). WWD0046721 (1♂, CMNC). WWD0046728 (1♂, CMNC). WWD0046729 (1♀, CMNC). WWD0046732 (1♀, CMNC). WWD0046733 (1♂, CMNC). MEXICO: CHIAPAS. Mpio: Huixtán Bazóm, 16°44'19.0 N, 92°29'18.3 W, 2450m, 9.VII.2003, R.Anderson, mixed magnolia/oak forest litter, 2003-106B (1♀, CMNC). MEXICO: CHIAPAS. Mpio: Huixtán Bazóm, 16°44'19.0 N, 92°29'18.3 W, 2450m, 9.VII.2003, R.Anderson, mixed magnolia/oak forest litter, 2003-106B (1♀, CMNC). MEXICO: CHIAPAS. Mpio: Huixtán Bazóm, 16°44'19.0 N, 92°29'18.3 W, 2450m, 9.VII.2003, R.Anderson, mixed magnolia/oak forest litter, 2003-106C (1♂, CMNC). MEXICO: CHIAPAS. Mpio: Huixtán Bazóm, 16°44'19.0 N, 92°29'18.3 W, 2450m, 9.VII.2003, R.Anderson, mixed magnolia/oak forest litter, 2003-106E (1♀, CMNC). MEXICO: CHIAPAS. Mpio: Huixtán Bazóm, 16°44'19.0 N, 92°29'18.3 W, 2450m, 9.VII.2003, R.Anderson, mixed magnolia/oak forest litter, 2003-106F (1♀, CMNC). MEXICO: CHIAPAS. Mpio: Tenejapa, Cerro Tzontehuitz, 2864m, 16°48'47"N 92°34'24.8"W, 29.VII.2005, R. Anderson, mixed oak forest litter, 2005-015A (2♂♂, CMNC). MEXICO: Chiapas. Mpio: Tenejapa, Cerro Tzontehuitz, 2864m, 16°48'40.8"N 92°35'02.4"W, 29.VII.2005, R. Anderson, mixed cloud forest litter, 2005-014B (1♂, CMNC). MEXICO: Chiapas, Cerro Huitepec, ca. 5km. W. San Cristobal, 2760m, 14.IX.1992 R.S.Anderson, 92-102, cloud for. beating dead vegetation. MEXICO: Chiapas, Cerro Huitepec, ca. 5km. W. San Cristobal, 2700m, 14.IX.1992, R.S.Anderson, 92-101 wet oak forest litter (1♀, CMNC). GUATEMALA: Huehuetenango, La Libertad, Los Planes, 2997m, 15.50957N, 91.91553W, 25.VI.2009, F. Camposeco, 2009-302, winkler funnels, leaf litter / WWD0072883 (1♂, CMNC). GUATEMALA: Huehuetenango, Max, oak/cloud forest, 15.50673°N 91.64473°W, 2750m, 14.IX.2008, ex sifted litter, R. S. Anderson RSA2008-119 / WWD0023488 (1♂, CMNC). WWD0023577 (1♂, CMNC). WWD0023578 (1♂, CMNC). WWD0023586 (1♂, CMNC). WWD0027820 (1♂, CMNC). WWD0027853 (1♀, CMNC). WWD0027867 (1♂, CMNC). WWD0027868 (1♀, CMNC). WWD0028002 (1♂, CMNC). WWD0028013 (1♂, CMNC). GUATEMALA: Quetzaltenango, Volcan Chicabal, 14.79198°N 91.65247°W, 2800m, 12.IX.2008, ridge oak/alder forest, ex sifted leaf litter, R. S. Anderson, RSA2008 / WWD0023135 (1♂, CMNC). WWD0023134 (1♀ CMNC). WWD0023133 (1♀, CMNC). WWD0023158 (1♀, CMNC). WWD0023160 (1♀, CMNC). WWD0023161 (1♀, CMNC). GUATEMALA: Quetzaltenango, Volcan Chicabal, 2700m, 14.78720°N 91.65839°W, 12 Sept 2008, M.G. Branstetter, cloud bamboo forest litter, MGB-943 (6♀♀, CMNC, CWOB, USAC). GUAT.: QUETZALTENANGO, 12km.S.E. Zunil, N.W. face Cerro Zunil, 2700–2760m 28.V.1991, R. Anderson hardwood for. litt., 91-30 (4♂♂ 3♀♀, CMNC). GUAT.: QUEZALTEN. 12km. S.E. Zunil, N.W. face Cerro Zunil, 2700–2760m, 28.V.1991, R. Anderson, hardwood for. litter, 93-8f (1♂, CMNC). GUAT.: QUETZALTENANGO, 12 km SW Zunil, NE face Cerro Zunil, 2700–2760m 28 May 1991, R. Anderson 91-30 ex:hardwood forest litter (1♂,

CMNC). GUATEMALA: Quiche, 3km S Joya Larga, 15.40538°N 90.85805°W, 2350m, 15.IX.2008, oak/cloud forest, ex sifted leaf litter, R. S. Anderson RSA2008-123 / WWD0028642 (1♀, CMNC).

***Plumolepilius daryi* Barrios-Izás & Anderson, new species**
(Figs. 30–36, 75, 84, 93, 101)

Diagnosis: Male. Length (2.05–2.10 mm). Width (1.15–1.20 mm). Elongate-ovate, narrow, shining, brown to orange, vestiture of scattered pale yellow, clavate, recumbent scales, mesepisternum and metanepisternum bare. Rostrum stout, longer than pronotum, posterior half finely punctate, punctation increased in diameter in anterior half, antenna setulose, inserted at middle of rostrum, scape capitate, as large as desmomes 1 to 3 together. Pronotum narrower than elytra, constricted in front, broadest at the middle, coarsely punctate, punctures contiguous. Elytra punctate-seriate, punctures separated by their own diameter, several tubercles distributed in 3 bands up to the elytral declivity on interspaces 2 to 5. Metaventrite with large foveae. Abdominal ventrite 5 with two tufts of setae at apex. Femora with small tooth on inner margin. Pedon subrectangular, broadest at the middle, apex semitruncate, with setae, apodemes 2.4X longer than pedon, genital sclerites conspicuously larger, posterior genital sclerite sting-like, anterior genital sclerite with the shape of number “2”.

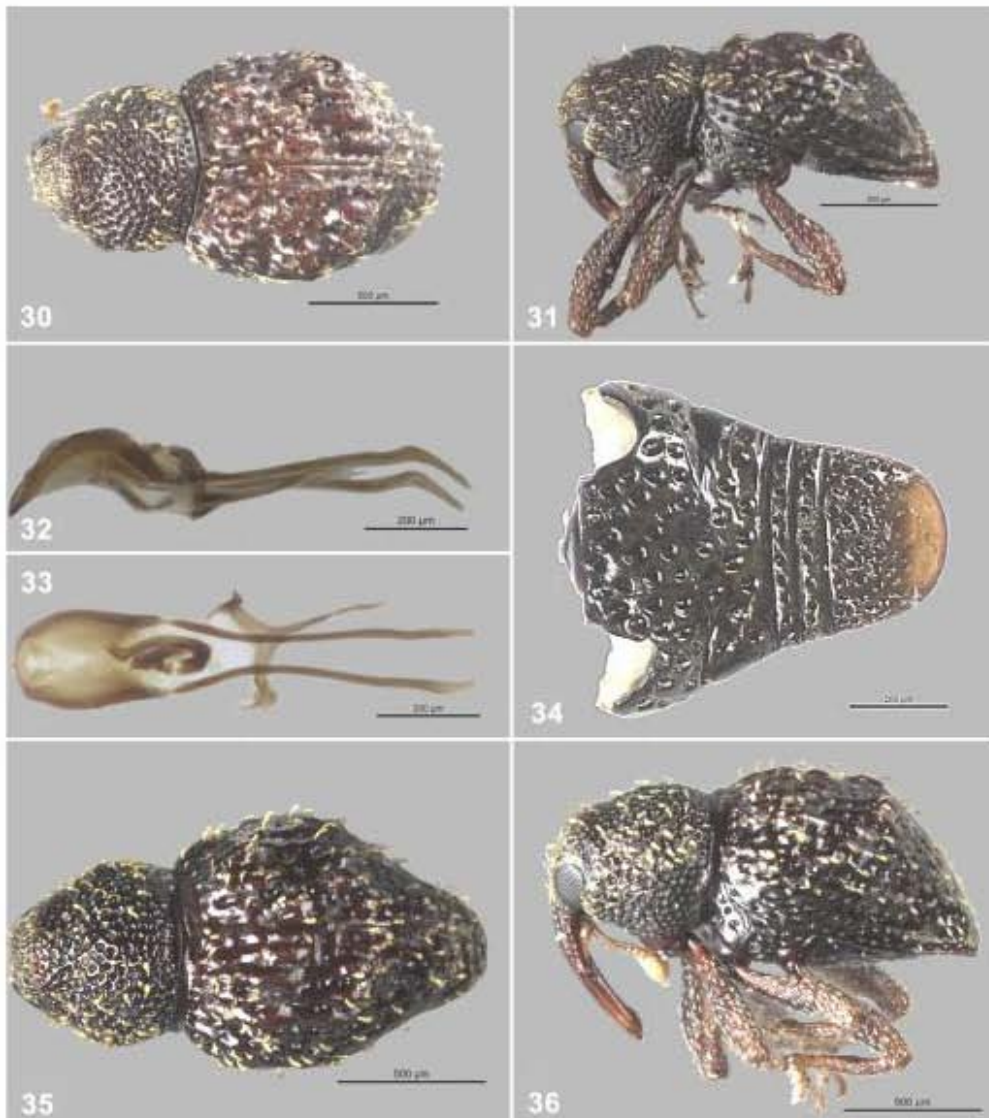
Female. Length (1.80–2.00 mm). Width (1.00–1.15 mm). Venter with depression at metaventrite, abdomen without tufts of setae at abdominal ventrite 5, spiculum ventrale different from other species by bifurcating before middle of length.

Geographic distribution. Guatemala (Baja Verapaz). Fig. 101.

Derivation of the specific name. Patronym, named after Mario Dary Rivera, a scientist and former rector of San Carlos University. He founded the first protected areas of the university, the Center of Studies for Conservation, the School of Biology, and the Research Fund at San Carlos University. He was murdered during the most repressing period of the Guatemalan civil war in 1981.

Material examined. 28♂♂, 25♀♀ (ASUHC, BMNH, CMNC, CWOB, USAC, USNM, UVGC). Holotype ♂ (CMNC): GUAT.: BAJA VERAPAZ. 7km.E. Purulha, 1600m, 25.V.1991. R. Anderson, cloud forest litter, 91-21 / Holotype ♂ *Plumolepilius daryi* Barrios-Izás & Anderson sp. nov. Aedeagus extracted. Paratypes: same data as holotype (1♂ 1♀, ASUHC). GUAT.: BAJA VERAPAZ. 4km S. Purulhá, 1630m, 24.V.1991. R. Anderson, cloud forest litter, 91-19. (1♂ 1♀ CMNC). 91-2 (1♂, CMNC). cloud forest litter, 91-14 (1♀, CMNC). cloud forest litter, 91-6 (1♀, CMNC). cloud forest litter, 91-7 (2♀♀, CMNC). Same data except for 91-27 (1♀, CMNC). GUAT.: BAJA VERAPAZ. 4.3km.E.Purulha, 1680m, 3.VII.1993, R.Anderson, cloud for.litter, 93-37A (1♀, CMNC). GUAT.: BAJA VERAPAZ. 3.5km.S.Purulha, 1770m, 1.VII.1993, R.Anderson, cloud for.litter, 93-31A (1♂, CWOB). GUAT.: BAJA VERAPAZ. 3.5km.S.Purulha, 1700m, 1.VII.1993, R.Anderson, cloud for.litter, 93-32AA (1♂, CMNC). GUAT.: BAJA VERAPAZ. 3.5km.S.Purulha, 1825m, 2.VII.1993, R.Anderson, cloud for.litter, 93-35C (1♂, CMNC). GUATEMALA: Baja Verapaz. Rancho El Quetzal, 15.21443°N 90.22123°W, 1750m, 20.IX.2008, cloud forest ex sifted litter, R.S. Anderson RSA2008-137 / WWD0031023 (1♂, CMNC). WWD0031051 (1♂, CMNC). GUATEMALA: Baja Verapaz, 4km S Purulhá, 1650m, 2 July 1993, J. Ashe, R. Brooks, #185, ex mossy branches (1♀, CMNC). GUAT.: BAJA VERAPAZ. 4.3km E. Purulha, 1680m, 29.VI-3.VII.1993, J. Ashe & R. Brooks, cloud forest, FIT (1♂, CMNC). GUATEMALA: Baja Verapaz. Biotopo Quetzal, cloud forest, 15.212 -90.214 ±50m, 1750m, 7.V.2009, LLAMA Wa-B-02-1 / WWD0035956 (1♂, CMNC). GUATEMALA: Baja Verapaz. Biotopo Quetzal, cloud forest, 15.212 -90.215 ±50m, 1750m, 7.V.2009, LLAMA Wa-B-02-1 / WWD0035577 (1♀, CWOB). WWD0035739 (1♀, CMNC). GUATEMALA: Baja Verapaz. Biotopo Quetzal, cloud forest, 15.213 -90.215 ±50m, 1750m, 7.V.2009, LLAMA Wa-B-02-1 / WWD0035490 (1♀, CMNC). GUATEMALA: Baja Verapaz. Biotopo Quetzal, cloud forest, 15.213 -90.219 ±50m, 1725m, 7.V.2009, LLAMA Wa-B-02-2 / WWD0027081 (1♂, CMNC). WWD0027112 (1♀, CMNC). WWD0027127 (1♀, CMNC). WWD0027136 (1♂, CMNC). WWD0027137 (1♀, BMNH). WWD0027141 (1♂, USNM). WWD0027152 (1♂, CMNC). WWD0027190 (1♂, BMNH). WWD0027211 (1♂, CMNC). WWD0027319 (1♀, CWOB). WWD0027331 (1♂, CMNC). WWD0027334 (1♂, CMNC). WWD0027336 (1♀, UVGC). WWD0027339 (1♂, UVGC). WWD0027340 (1♀, USNM). WWD0027348 (1♂, CMNC). WWD0027378 (1♂, USAC). WWD0027384 (1♀, USAC). WWD0027463 (1♂, CMNC). WWD0027508 (1♀, CMNC). GUATEMALA: Baja Verapaz. Biotopo Quetzal, cloud forest, 15.213 -90.218 ±50m, 1725m, 7.V.2009, LLAMA Wa-B-02-2 / WWD0026769 (1♀,

CMNC). WWD0026773 (1♂, CMNC). WWD0026893 (1♀, CMNC). WWD0026894 (1♀, CMNC). WWD0026929 (1♂, CMNC). WWD0026978 (1♀, CMNC). GUATEMALA. BVerapaz. Purulha. BUCQ. Bosque Nuboso. 25.I.2012. -90.23106 15.21815. 4.5lt hojarasca. Wink. Col. H. Mejía (1♂1♀, USAC).



FIGURES 30–36. *Plumolepillius daryi*. 30, Male dorsal habitus. 31, Male lateral habitus. 32, Aedeagus lateral view. 33, Aedeagus dorsal view. 34, Male abdominal ventrites 1–5. 35, Female dorsal view. 36, Female lateral view.

***Plumolepillius longinoi* Barrios-Izás & Anderson, new species**

(Figs. 37–43, 76, 85, 94, 100)

Diagnosis. Male. Length (1.70–2.30 mm). Width (1.10–1.50 mm). As *P. branstetteri* but rostrum not humped.

Capítulo 2. Artículo: Barrios-Izás, M.A. New species of the leaf-litter inhabing weevil genus *Plumolepilius* (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Guatemala, Honduras, Nicaragua, Costa Rica and Panama

New species of the leaf-litter inhabiting weevil genus *Plumolepilius* (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Guatemala, Honduras, Nicaragua, Costa Rica and Panama

MANUEL A. BARRIOS-IZÁS^{1,2}

¹Museo de Zoología “Alfonso L. Herrera”, Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México Apartado postal 70-399, 04510 Mexico City, Mexico.

²Centro Universitario de Zacapa, Universidad de San Carlos de Guatemala, 12 calle “A” 14-03 zona 1 Barrios La Laguna, Código Postal 19001 Zacapa, Guatemala.

E-mail: manuelbarriosgt@gmail.com

Abstract

Sixteen new species of the genus *Plumolepilius* Barrios-Izás & Anderson 2016, are described. Images of habitus and genitalia of both sexes are presented, as well as a dichotomous key for the identification of males of the known species of the genus. The species included here are *P. andersoni* Barrios-Izás, **new species** (Costa Rica and Panamá), *P. antonioi* Barrios-Izás, **new species** (Honduras), *P. camuna* Barrios-Izás, **new species** (Nicaragua), *P. genieri* Barrios-Izás, **new species** (Honduras), *P. guaimacaensis* Barrios-Izás, **new species** (Honduras), *P. hectorii* Barrios-Izás, **new species** (Costa Rica), *P. linaresi* Barrios-Izás, **new species** (Honduras), *P. maesi* Barrios-Izás, **new species** (Nicaragua), *P. molinai* Barrios-Izás, **new species** (Honduras), *P. morronei* Barrios-Izás, **new species** (Honduras), *P. nelsonii* Barrios-Izás, **new species** (Honduras), *P. nicaraguensis* Barrios-Izás, **new species** (Nicaragua), *P. obrienorum* Barrios-Izás, **new species** (Costa Rica), *P. solisii* Barrios-Izás, **new species** (Costa Rica), *P. velizii* Barrios-Izás, **new species** (Honduras) and *P. zarazagai* Barrios-Izás, **new species** (Honduras). As well as a new geographical record for *Plumolepilius canoi* Barrios Izás & Anderson from Honduras.

Introduction

The genus *Plumolepilius* Barrios-Izás & Anderson is a genus with a distribution within the Chiapas Highlands (18 spp.) south into the Western Panamanian Isthmus (7 spp.) biogeographic provinces (*sensu* Morrone 2014). *Plumolepilius* species are associated with angiosperm dominated habitat where they probably feed on dead tissues, roots or seeds. They primarily inhabit montane humid broad leaf forest, especially oak or cloud forests. Species of *Plumolepilius* have not been found in coniferous forests unless the forest is intermixed with broadleaf tree species.

Immatures of *Plumolepilius* are unknown. They are not captured during leaf litter sifting and it is possible that larvae could be feeding deeper in the soil inside roots or mining dead leaves (Anderson 2012). Another commonly found genus in leaf litter is *Anchonus* Schönherr, wick larvae has been found feeding on dead wood (Anderson 1952).

The genus *Plumolepilius* was described very recently and the species from Mexico, Guatemala and El Salvador were treated in the first monograph of the genus (Barrios-Izás *et al.* 2016). This second paper treats the taxonomy of the species from Honduras, Nicaragua, Costa Rica and

Panama and one new species of Guatemala. There are no records of species of *Plumolepilius* from South America.

Material and methods

Methods for specimen collection, curation, genitalia extraction and mounting, image capture and label data transcription follow Barrios-Izás *et al.* (2016).

External and genital morphology nomenclature follows Oberprieler *et al.* (2014). Species descriptions were done uniquely on holotypes. Characters such as body length, body width, color, scales density, setae density and humeral projections showed variation among specimens of the species. Holotypes were selected from series of males where secondary sexual characters were well developed. Species descriptions include a diagnosis, geographical data, derivation of the species name and material examined. In order to avoid redundancy characters common to all species are included only in the genus description (see Barrios-Izás *et al.* 2016).

Specimen depositories

ASUHC: Arizona State University, Hasbrouck Insect Collection, Tempe, Arizona, United States of America (Nico Franz)

BMNH: The Natural History Museum, London, United Kingdom (Max Barclay)

CMNC: Canadian Museum of Nature Collection, Ottawa, Ontario, Canada (François Génier)

CNCI: Canadian National Collection of Insects, Agriculture Canada, Ottawa, Ontario, Canada (Patrice Bouchard)

CWOB: Charles W. O'Brien personal collection, Green Valley, Arizona, United States of America (Charles W. O'Brien)

MCZN: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, United States of America (Phil Perkins)

MNCN: Museo Nacional de Ciencias Naturales, Madrid, Spain (Miguel Ángel Alonso-Zarazaga)

MZFC: Museo de Zoología "Alfonso L. Herrera", Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City, Mexico (Juan J. Morrone)

UZAC: Insect Collection, Instituto de Investigaciones, Centro Universitario de Zacapa, Universidad de San Carlos de Guatemala (Manuel A. Barrios-Izás)

USNM: National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia, United States of America (Lourdes Chamorro)

Checklist of included species from Honduras, Nicaragua, Costa Rica and Panamá arranged in alphabetical order

1. *Plumolepilius andersoni* Barrios-Izás, new species; Costa Rica (San José and Puntarenas) and Panamá (Chiriquí).
2. *Plumolepilius antonioi* Barrios-Izás, new species; Honduras (Olancho).
3. *Plumolepilius camuna* Barrios-Izás, new species; Nicaragua (Jinotega).
4. *Plumolepilius canoi* Barrios-Izás & Anderson 2016. New geographical record. Honduras.
5. *Plumolepilius genieri* Barrios-Izás, new species; Honduras (Santa Barbara).
6. *Plumolepilius guaimacaensis* Barrios-Izás, new species; Honduras (Francisco Morazan).

7. *Plumolepilius hectorii* Barrios-Izás, new species, Costa Rica (Alajuela, Heredia, Puntarenas and San José).
8. *Plumolepilius linaresi* Barrios-Izás, new species; Honduras (Comayagua and Francisco Morazan).
9. *Plumolepilius maesi* Barrios-Izás, new species; Nicaragua (Granada).
10. *Plumolepilius molinae* Barrios-Izás, new species; Honduras (Cortes).
11. *Plumolepilius morronei* Barrios-Izás, new species; Honduras (Yoro).
12. *Plumolepilius nelsonii* Barrios-Izás, new species; Honduras (La Paz).
13. *Plumolepilius nicaraguensis* Barrios-Izás, new species; Nicaragua (Jinotega).
14. *Plumolepilius obrienorum* Barrios-Izás, new species, Costa Rica (Guanacaste and Puntarenas).
15. *Plumolepilius solisii* Barrios-Izás, new species, Costa Rica (Heredia, Monteverde and Puntarenas).
16. *Plumolepilius velizii* Barrios-Izás, new species, Honduras (El Paraíso and Francisco Morazán).
17. *Plumolepilius zarazagai* Barrios-Izás, new species, Honduras (Lempira).

Key to the species of *Plumolepilius* based on males Bob revisions

- 1 Pronotum widened at base.....2
- 2 Humeri rounded, not produced.3
 - Humeri laterally produced.....10
- 3 Metaventrite with fovea; mesepimeron and mesanepisternum bare; abdomen elongate-narrow.....*P. daryi*
 - Metaventrite lacking fovea; mesepimeron and mesanepisternum clothed with scales or not; abdomen more or less globose.....4
- 4 Mesepimeron and mesanepisternum bare.....*P. hectorii*
 - Mesepimeron and mesanepisternum clothed with scales.....5
- 5 All femora armed with a small spine on inner margin.....*P. nicaraguensis*
 - Hind femora unarmed, front and middle femora armed or unarmed.....6
- 6 Front and middle femora armed with a small spine on inner margin; penis with median foramen wide and delineated.....*P. yolnabajensis*
 - Middle and hind femora unarmed.....7
- 7 Front femora with small spine on inner margin.....*P. maesi*
 - All femora unarmed.....8
- 8 Elytral interstice 4 at base of elytral declivity without large tubercle.....*P. nelsonii*
 - Elytral interstice 4 at base of elytral declivity with large tubercle.....9
- 9 Elytral tubercles on interstices 4 separated by least its own diameter..... *P. guaimacaensis*
 - Elytral tubercles on interstices 4 separated by less than its own diameter.....*P. genieri*
- 10 Elytra with small tubercles or at least with tubercles in elytral declivity slightly sinuated; penis not lobed at apex.....11
 - Elytra tuberculate or with two subconical tubercles at base of elytral declivity, penis lobed at apex or not.....14
- 11 Elytra with several small tubercles12
 - Elytral surface smooth, elytral declivity with instertice 4 angulate.....13

| | |
|--|------------------------|
| 12 Endophallus with genital sclerite conspicuously shorter than pedon; humeri moderately produced, rounded..... | <i>P. andersoni</i> |
| - Endophallus with genital sclerite longer than pedon; humeri slightly produced, angulate..... | <i>P. molinai</i> |
| 13 Mesepimeron and mesanepisternum clothed with appressed scales..... | <i>P. trifiniensis</i> |
| - Mesepimeron and mesanepisternum bare..... | <i>P. obrienorum</i> |
| 14 Elytra with only two tubercles at elytral declivity..... | 15 |
| - Elytra with two tubercles at elytral declivity, and with small tubercles on disc | 17 |
| 15 Pronotum produced laterally forming pterygoid expansions..... | <i>P. schusteri</i> |
| - Pronotum without pterygoid expansions..... | 16 |
| 16 Elytra densely covered with recumbent and appressed scales..... | <i>P. canoi</i> |
| - Elytra covered with few recumbent scales..... | <i>P. antonioi</i> |
| 17 Abdominal ventrite 5 with two protuberances at apex; penis widening at apex forming lobe, median foramen wide and groove-like; femora unarmed; scape bare..... | <i>P. longinoi</i> |
| - Abdominal ventrite 5 surface flat; penis straight or slightly widening but not forming an apical lobe, posterior aperture of endophallus not forming wide groove; femora armed or not; scape bare or with setae..... | 18 |
| 18 Elytral flanks not acute-angulate; scape with setae..... | 19 |
| - Elytral flanks acute-angulate; scape with setae or bare..... | 20 |
| 19 Humeral scales lanceolate and recumbent..... | <i>P. cortesi</i> |
| - Humeral scales rounded and appressed..... | <i>P. solisii</i> |
| 20 Femora unarmed..... | 21 |
| - Femora armed with small tooth on inner margin..... | 22 |
| 21 Elytral intertices 6-8 sharply elevated..... | <i>P. genieri</i> |
| - Elytral interstices 6-8 elevated but rounded..... | <i>P. zarazagai</i> |
| 22 Mesanepisternum and mesepimeron bare..... | <i>P. morronei</i> |
| - Mesanepisternum and mesepimeron with appressed scales..... | 23 |
| 23 Scape bare, endophallus with internal sclerites broad and short..... | <i>P. branstetteri</i> |
| - Scape with setae, endophallus with internal sclerite thin and enlarged..... | <i>P. linaresi</i> |

***Plumolepilius andersoni* Barrios-Izás, new species**
(Figs. 1–11)

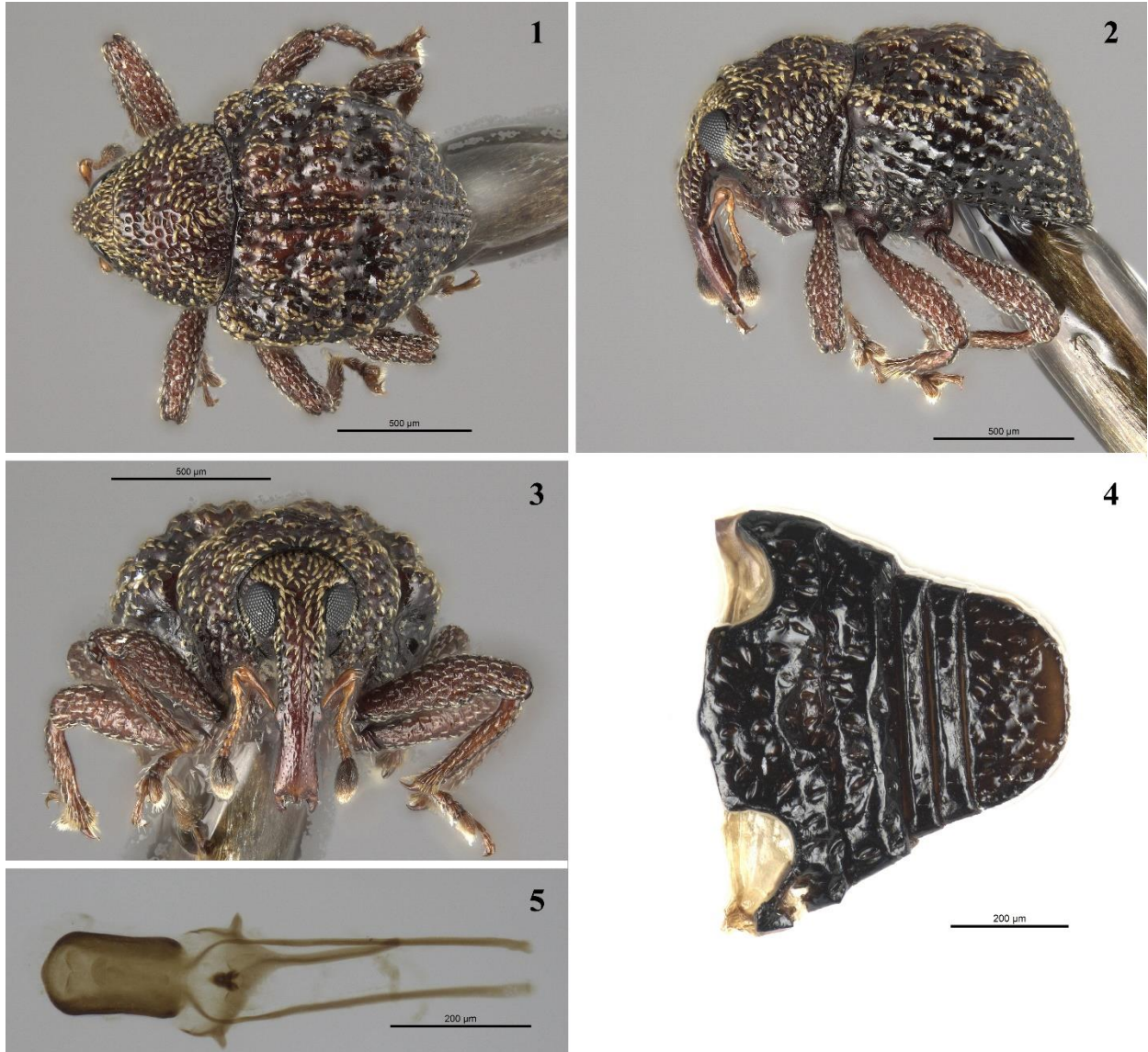
Diagnosis: Male. Length (1.63 – 1.94 mm). Width (1.06 – 1.25 mm). As for *P. hectori* but cuticle brown, rostrum and legs orange, antenna yellow; rostral scales almost reaching antennal insertions, frons less sunken between eyes, humeri produced, hind femoral spine inconspicuous. Pedon elongate, subparallel, slightly wider at apex; temones large and thin; 1.8x longer than pedon, anterior genital sclerite Y-shape, bilobed, posterior genital sclerite curved plate.

Female. Length (1.56 – 1.88 mm). Width (0.94 – 1.25 mm). As for the male except differs by the rounded humeri and bare rostrum.

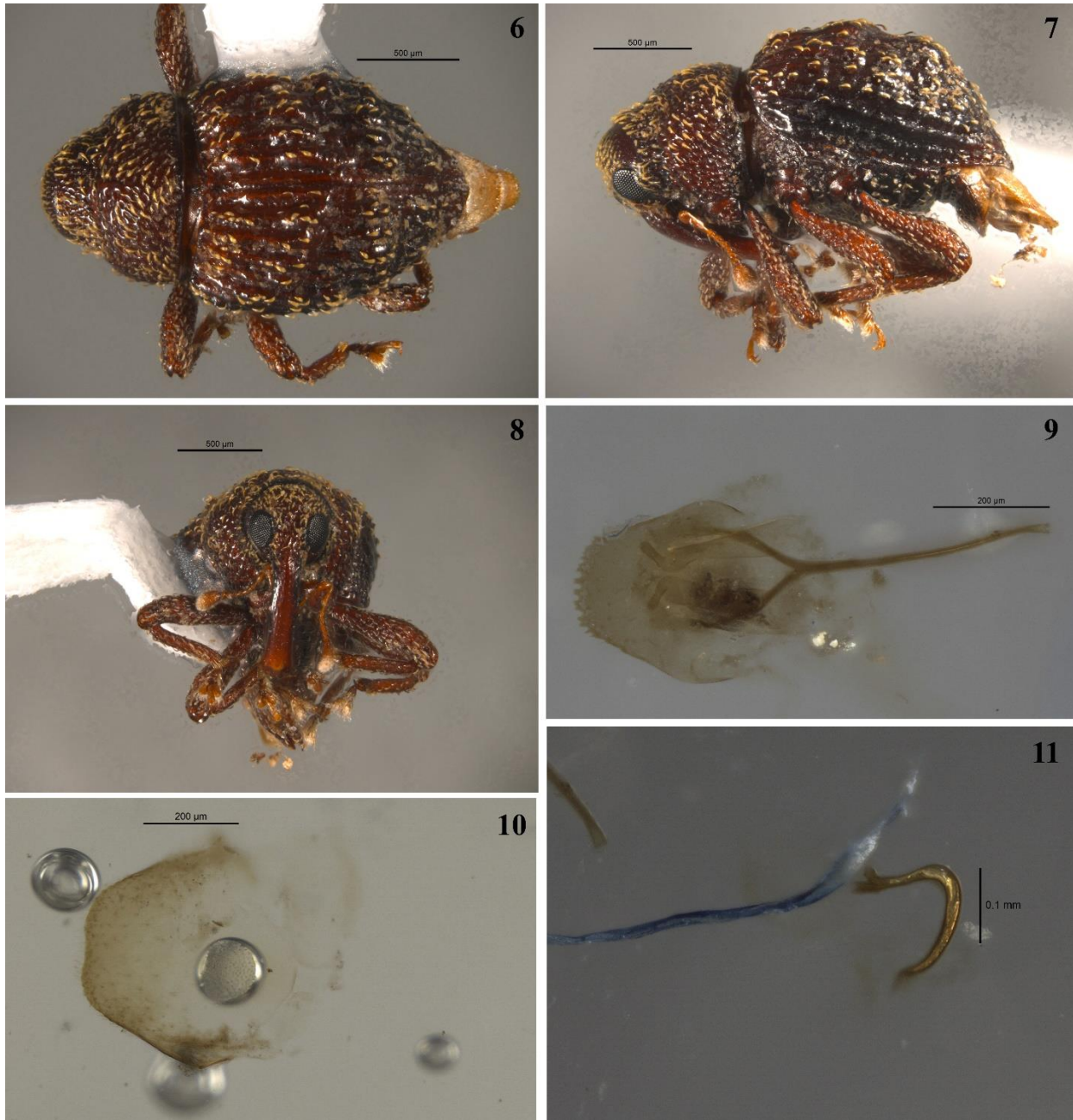
Geographic Distribution. Costa Rica (San José and Puntarenas) and Panamá (Chiriquí).

Derivation of the specific name. Patronym, after Robert S. Anderson, a weevil systematist at the Canadian Museum of Nature, Ottawa, Canada.

Material examined: 16♂♂, 10♀♀ (CMNC). Holotype ♂ (CMNC): COSTA RICA: PUNTARENAS, Valle de Silencio, Bajando Cerro Hoffman, 2307m, 82°56'36" W 09°04'41" N, 26-27.II.2005, R. Anderson, mixed oak forest litter / Holotype ♂ *Plumolepilius andersoni* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: Same data as holotype (2♀♀). Same data except for Bajando Cerro Quemado, 2202m, 82°59'01" W 09°03'43" N, 27.II.2005 (1♂1♀). COSTA RICA: San Jose, km 117 Pan-Am Hwy, 19km.N.San Isidro 09°28'N 83°42'20"W, 1800m, 20.VI.1997, R.S. Anderson, cloud for. litter 97-021 (1♂). Same data except for 25.VI.1997, 97-035C (1♀). COSTA RICA: Puntarenas, Est. Biol. Las Alturas. 8°57'N 82°52'W. 1550m forest litter,. 27-29 March 2002. A. Cline (1♀). COSTA RICA: Puntarenas, Est. Biol. Las Alturas, 2km.N.E. Alturas, 1520m, 08°56'56"N 82°50'01"W, 20.vi.1998, R. Anderson, upper montane/cloud forest trans. litter 98-104H (1♀). Same data except for 10.VII.1999, 99-126D (1♀). PANAMA: Chiriqui, 5.6km.N.Boquete, La Culebra Trail, 1450m, 15-19.VI.1996, J.Ashe & R.Brooks, FIT,#176 (1♂). PANAMA: CHIRIQUI, 12km.N.E. Santa Clara Cerro Pando, 8°54.74'N 82°43.29'W, 1850m, 96-139B, 18.VI.1996, R.Anderson oak forest litter (1♂). PANAMA: CHIRIQUI, P. Nac. Volcan Baru, 11.0km W. Boquete, 2150m, 18.VI.1995-33H, R.S. Anderson, mixed oak for. litt. (1♂). PANAMA: CHIRIQUI, 30.7 km W. Volcan, Hartmann's Finca, 1800m, 16.VI.1995-28F, R.S.Anderson, mixed oak for. litt. (1♂1♀). Same data except for 1450m, 14.VI.1995-24E, wet mont trop.for.litt. (1♂). PANAMA: CHIRIQUI, 5.6km.N. Boquete La Culebra Trail, 1450m, 19.VI.1996, R.Anderson, 96-141B oak forest litter (1♂). COSTA RICA. PUNTARENAS, Zona Protectora Las Tablas, 0.5 km. N. Las Alturas, 1500-2000m, 8°56'N, 82°50'W, 27.v.2007, M.G. Branstetter, MGB-528, primary premonate rain forest leaf litter / WWD0128599 (1♂), WWD0128486 (1♂). COSTA RICA. PUNTARENAS, La Amistad International Park, nr. Casa Coca, 4 km N.E. Altamira Biological Station, 9°04'N, 83°00'W, 1900m, 31.v.2007, M.G. Branstetter, MGB-582, primary premonate forest leaf litter / WWD0128160 (1♂). COSTA RICA: PUNTARENAS, Altamira Biological Station, Sendero de los Gigantes de Bosque, 9°02'N 83°01'W, 1400m, 1.vi.2007, M.G. Branstetter, MGB-588, primary premontane rain forest litter / WWD0122656 (1♂), WWD0122651 (1♂), WWD0128012 (1♂), WWD0122678 (1♂), WWD0128041 (1♀), WWD 0127881 (1♀).



FIGURES 1–5. *Plumolepilius andersoni*. 1, Male dorsal habitus. 2, Male lateral habitus. 3, Male frontal view. 4, Male abdominal ventrites 1–5. 5, Male aedeagus dorsal view.



FIGURES 6–11. *Plumolepilius andersoni*. 6, Female dorsal habitus. 7, Female lateral habitus. 8, Female frontal view. 9, Female genitalia and associated sclerites. 10, Female pygidium. 11, Female spermatheca.

***Plumolepilius antonioi* Barrios-Izás, new species**
(Figs. 12–21)

Diagnosis: Male. Length (1.50 – 1.94 mm). Width (0.94 – 1.38 mm). Subovate, cuticle rufescent. Vestiture of suberect, clavate, ochreous scales, appressed on mesanepisternum and mesepimeron. Head and rostrum up to 1/4 covered with scales, rostrum finely punctate; scrobes lateroventral, reaching the margin of eyes, antenna inserted in middle of rostrum, scape clavate, as long as

desmomeres 1 to 3 together, desmomere 1 longer than desmomere 2, both longer than demomeres 3 to 7, funiculus and antennal club setose. Pronotum trapeziform, narrower than elytra, 1.4x wider than long, anterior margin annulate, deeply punctate, scales moderately distributed; postocular lobes bearing vibrissae. Elytra punctate-striate, humeri slightly produced, interstices 4 at base of elytral declivity with a feebly produced tubercle, stria 10 complete. Abdominal ventrites slightly punctate, suture of abdominal ventrite 1 and 2 complete but not articulated, apex of abdominal ventrite 5 excavated, rounded and bearing two tufts of setae. Metanepisternal suture swollen. All femora armed with small spines. Pedon width gradually increasing from base to apex, apex lobed; temones 3.4X longer than pedon; genital sclerites sting-shape.

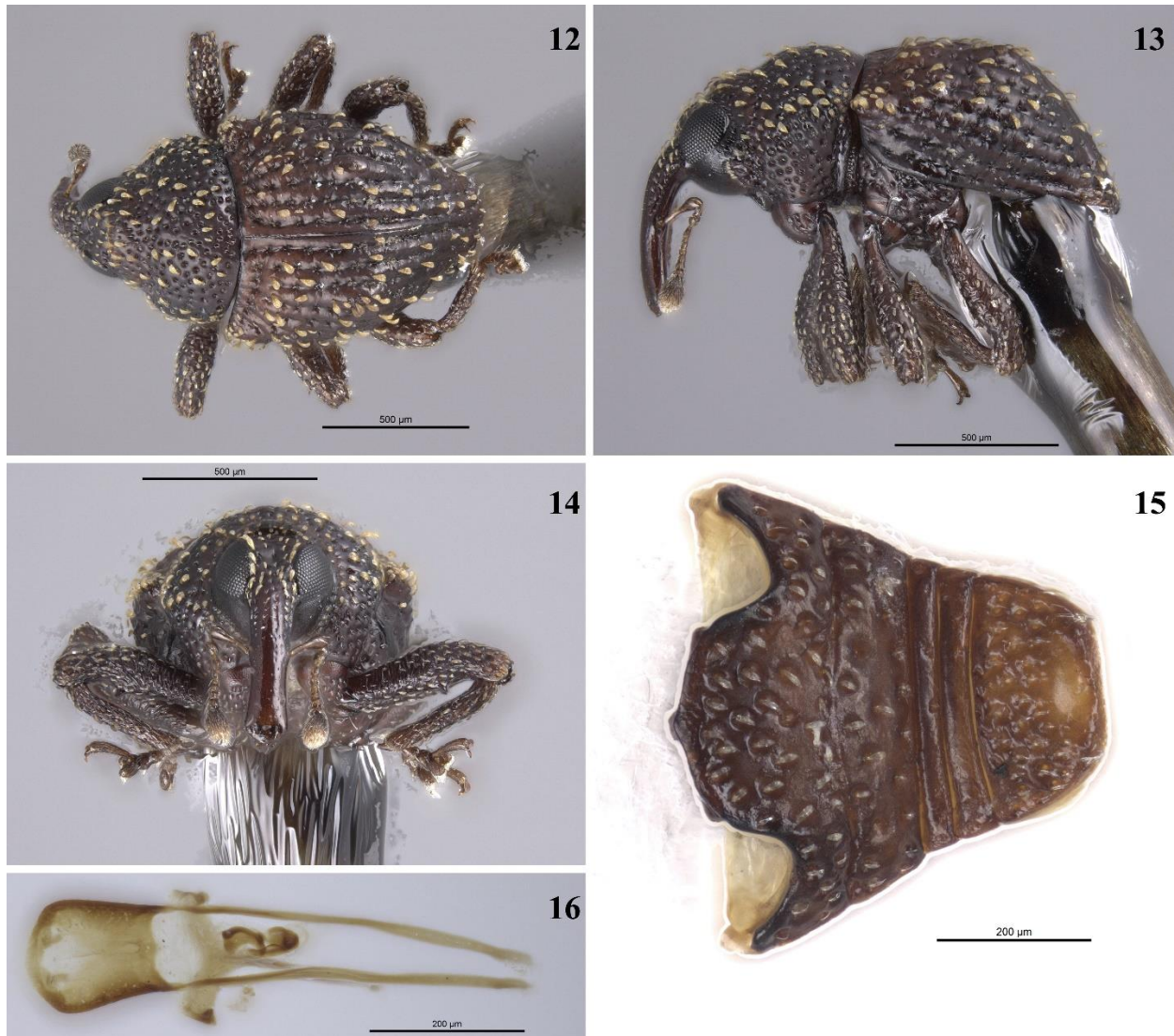
Female. Length (1.56 – 1.75 mm). Width (0.94 – 1.25 mm). Scales only at base of rostrum. Elytral humeri rounded.

Geographic Distribution. Honduras (Olancho).

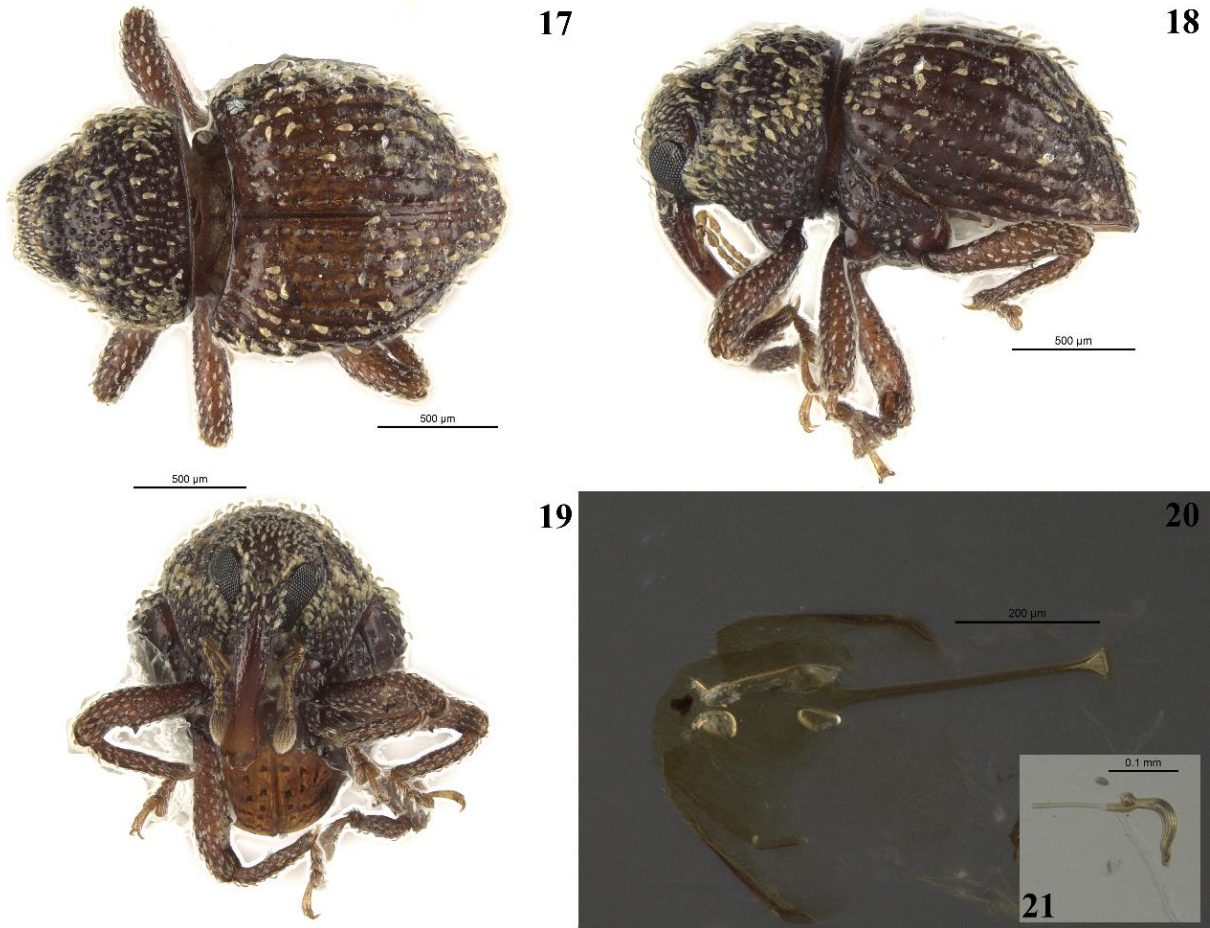
Derivation of the specific name. Patronym, named after Leonel Antonio Barrios Izás, an agronomist at Guatemala, as gift for his support to the author during the preparation of this paper.

Material examined: 95♂♂73♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): HONDURAS: OLANCHO, La Muralla N.P., 14km N. La Union, 1450m, 25.VI.1994-130, R. Anderson, mont.wet evergr. for.litt. / Holotype ♂ *Plumolepilius antonioi* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (12♂♂12♀♀, CWOB). Same data except for 16-17.VIII.1994-207 mont.wet evergr. for.litt. berl. (12♂♂5♀♀, BMNH, USNM). HONDURAS: OLANCHO, P.N. La Muralla, 14km N. La Union, 1510-1550m, 16-17.VIII.1994-209, R. Anderson, transition cloud for.litt. berl. (2♂♂2♀♀). Same data except for 1430m, 16-17.VIII.1994-208, liquidambar/oak for. litt. berl. (14♂♂15♀♀, ASUHC, UZAC). Same data except for 1450-1500m, 16-17.VIII.1994-206, montane wet evergreen forest, beating (5♂♂7♀♀). HONDURAS: Olancho, La Muralla NP, 14km N. La Union, 1350m, 1.IX.1994-209, S.&J. Peck, montane forest litter, 94-70 (5♂♂). HONDURAS: Olancho, P.N. La Muralla, 8.3km NNW La Unión, 1460m, 15.09723°N, 86.73842°W, 4 Oct 2008, M.G. Branstetter, mesic forest, MGB1131 (3♂♂3♀♀). Same data except for 8.9km NNW La Union, 1530m, 15.10123°N, 86.74527°W, MGB-1133 (1♀). Same data except for 8.4km NNW La Union, 15.09862°N, 86.73526°W, MGB-1136 (2♂♂1♀). HOND.: Olancho, LaMuralla N.P., 14km.N La Union, 1450m, 25.VI.1994-130exc., R. Anderson, montane wet evergreen for. litt. (2♂♂3♀♀). HONDURAS: OLANCHO, La Muralla N.Pk., 14km.N. La Union, 1450m, 17.VIII.1994, S. Peck, 94-39, wet mont.for.litter. (2♂♂6♀♀). HONDURAS: Olancho, PN La Muralla, 15.094 -86.73950 ±20m, 1420m, 2.V.2010, LLAMA Wa-C-01-2 / WWD0061961 (1♀), WWD0061962 (1♀), WWD0062113 (1♂), WWD0062129 (1♂), WWD0062134 (1♂), WWD0061957 (1♂), WWD0062099 (1♀), WWD0062144 (1♂), WWD0062146 (1♀), WWD0062174 (1♂), WWD0062376 (1♀), WWD0062392 (1♀), WWD0062523 (1♂), WWD0062524 (1♂), WWD0062574 (1♂), WWD0062612 (1♂), WWD0062661 (1♂), WWD0062664 (1♀), WWD0062666 (1♀), WWD0062667 (1♀), WWD0062669 (1♀), WWD0062674 (1♂). Same data except for 15.094 -86.740 / WWD0062728 (1♂), WWD0062732 (1♂), WWD0062743 (1♂), WWD0062785 (1♀), WWD0062787 (1♂), WWD0062789 (1♂), WWD0062793 (1♂), WWD0062794 (1♂), WWD0062840 (1♂). Same data except for 15.094 -86.739 / WWD0062343 (1♂), WWD0062374 (1♂), WWD0062384 (1♂), WWD0062385 (1♂), WWD00627395 (1♂), WWD0062402 (1♂), WWD0062420 (1♂). Same data except for 15.093 -86.740 / WWD0062821

(1♂), WWD0062822 (1♂), WWD0064837 (1♀), WWD0062839 (1♂), WWD0062842 (1♀), WWD0064844 (1♀), WWD0064846 (1♀), WWD0064847 (1♀). Same data except for 15.095 - 86.739 / WWD0060945 (1♀), WWD0061000 (1♀), WWD0061028 (1♂), WWD0061029 (1♂), WWD0061080 (1♂), WWD0061090 (1♂). Same data except for 15.100 -86.740, 1530m, LLAMA Wa-C-01-1 / WWD0060498 (1♂).



FIGURES 12–16. *Plumolepilius antonioi*. 12, Male dorsal habitus. 13, Male lateral habitus. 14, Male frontal view. 15, Male abdominal ventrites 1–5. 16, Male aedeagus dorsal view.



FIGURES 17–21. *Plumolepilius antonioi*. 17, Female dorsal habitus. 18, Female lateral habitus. 19, Female frontal view. 20, Female genitalia and associated sclerites. 21, Female spermatheca.

***Plumolepilius camuna* Barrios-Izás, new species**
(Figs. 22–24)

Diagnosis: Male. Length (1.63 mm). Width (0.94 mm). Elongate-ovate, cuticle brown. Vestiture of recumbent, clavate, ochreous to brown scales, mesanepisternum and mesepimeron bare. Head covered with scales, scales almost reaching antennal insertions; bare section of rostrum polished, finely punctate; scrobes lateroventral, reaching the head, dorsal border slightly carinate, antenna inserted before middle of rostrum, scape clavate, as long as desmomeres 1 to 3 together, desmomere 1 longer than desmomere 2, funiculus and antennal club setose. Pronotum transverse, wider at middle, narrower than elytra, anterior margin annulate, moderately punctate, punctuations equidistant; postocular lobes conspicuous, bearing vibrissae. Elytra punctate-striate, humeri slightly angulate, interstices 4 at base of elytral declivity with a feebly produced tubercle, stria 10 complete. Abdominal ventrites scarcely punctate, suture of abdominal ventrite 1 and 2 complete but not articulated, abdominal ventrite 5 surface flat. Metanepisternal suture swollen. Femora armed with small spines, maximum width at longitudinal axis of spine, apex at outer side rounded and glossy. Pedon subparallel, strongly arcuate in lateral view; temones 2.8X longer than pedon; genital sclerites symmetric, hook-like.

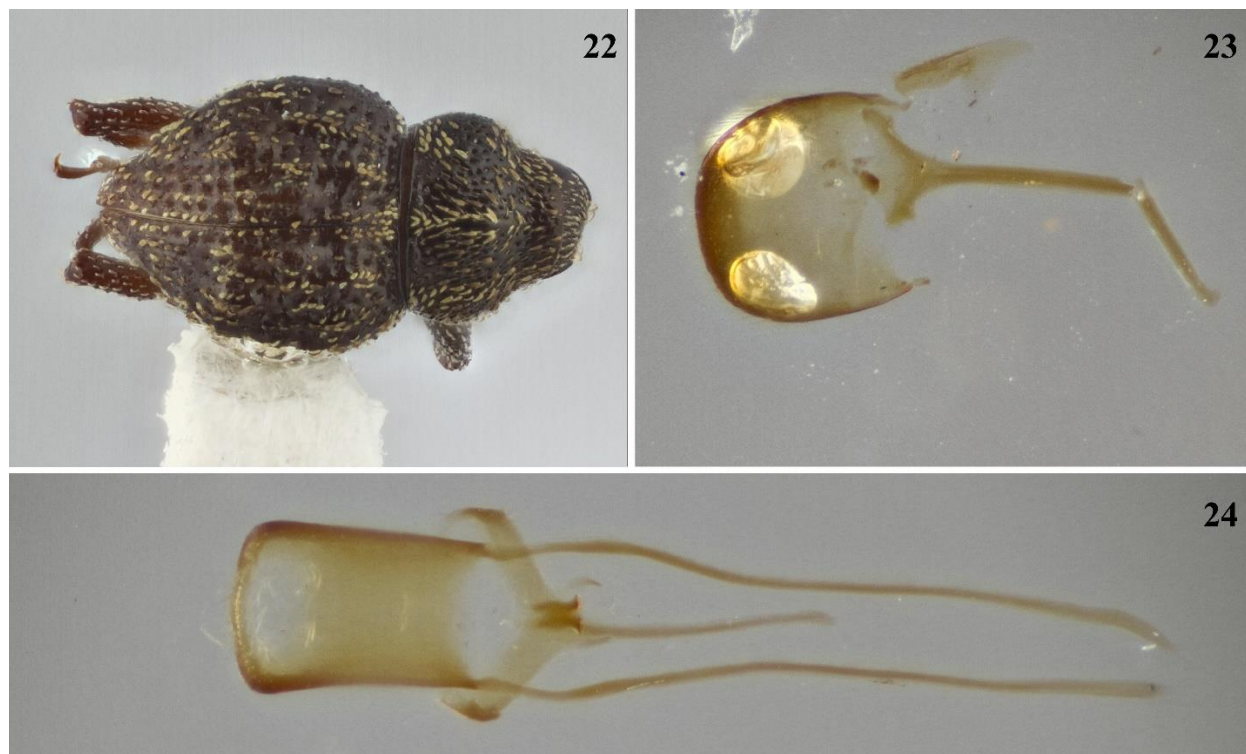
Female. Not known.

Geographic Distribution. Nicaragua (Jinotega).

Derivation of the specific name.

Material examined: 1♂ (CMNC). Holotype ♂ (CMNC): NICARAGUA: Jinotega, PN Cerro Saslaya, 13.77054 -85.03025 ±50m, 1330m, 12.V.2011 LLAMA Wm-D-03-2-04 / WWD0063794 / Holotype ♂ *Plumolepilius camuna* Barrios-Izás & Anderson sp. nov. Aedeagus extracted.

Note. During photography the thorax and head became detached from the holotype and could not be found.



FIGURES 22–24. *Plumolepilius camuna*. 22, Male dorsal habitus. 23, Male genitalia associated sclerites. 24, Male aedeagus dorsal view.

***Plumolepilius canoi* Barrios-Izás & Anderson 2016: 71-72. New geographical record**

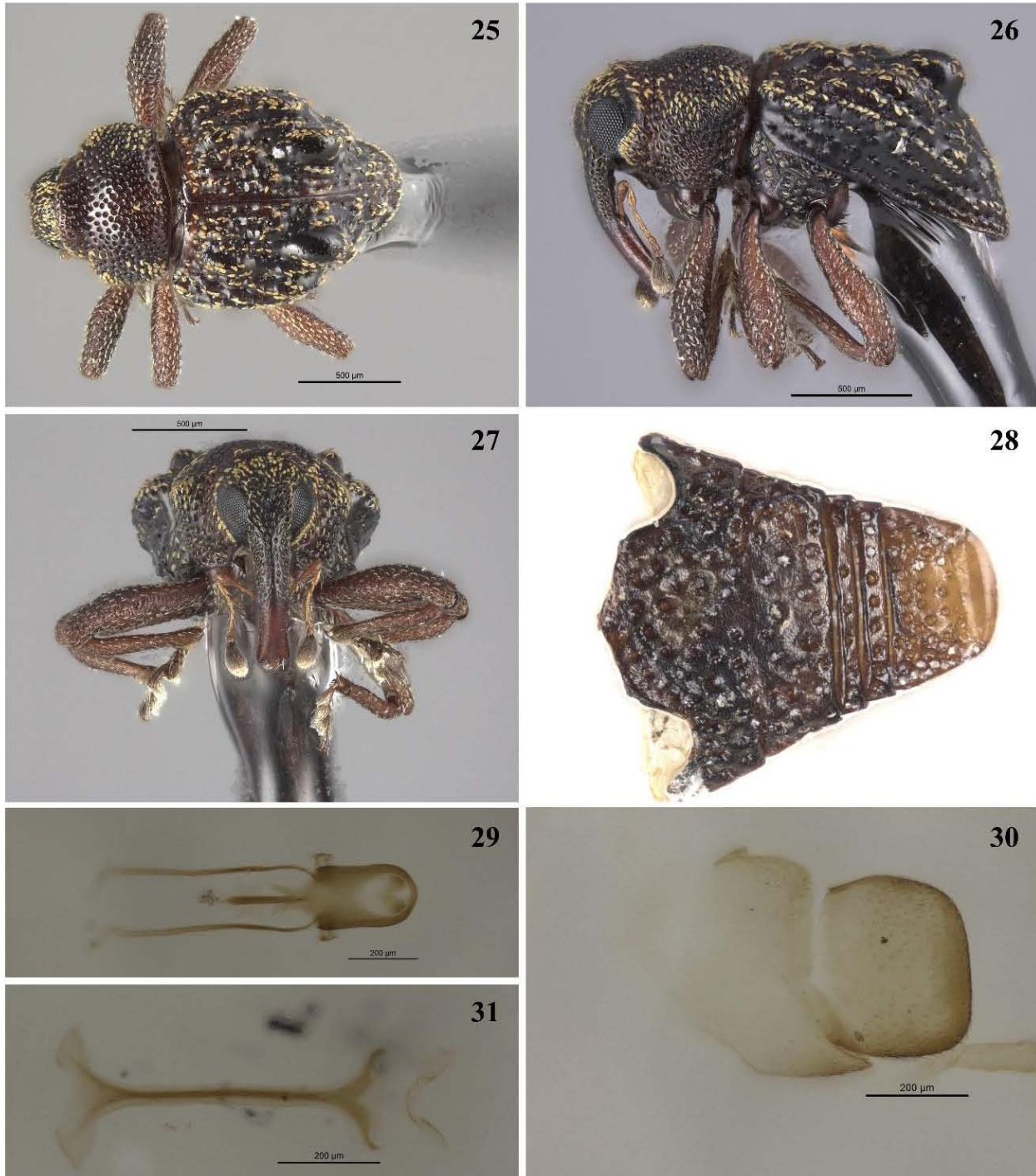
Geographic Distribution. Previously known from Guatemala (Zacapa and Chiquimula). Collected recently from Honduras (Ocotepeque), 14.37078N 89.01930W, 1640 m.

***Plumolepilius genieri* Barrios-Izás, new species`
(Figs. 25–35)**

Diagnosis: Male. Length (1.81 – 2.25 mm). Width (1.18 – 1.37 mm). As for *P. velizii* but body oval, scales ochreous. Rostral basal half not rugose but punctate, apical half bare, densely and finely punctate. Pronotum subrectangular. Large tubercles at interstices 4 laterally compressed. Apex of abdominal ventrite 5 rounded and with two tufts of setae. Femora unarmed. Pedon short, subparallel, temones 2.67X longer than pedon; genital sclerite thin and elongate, almost as same size of manubrium.

Female. Length (1.68 – 1.75 mm). Width (1.12 – 1.44 mm). As for the male except body tinged with brown and red; rostral scales less dense; elytral humeri rounded, tubercles smaller.

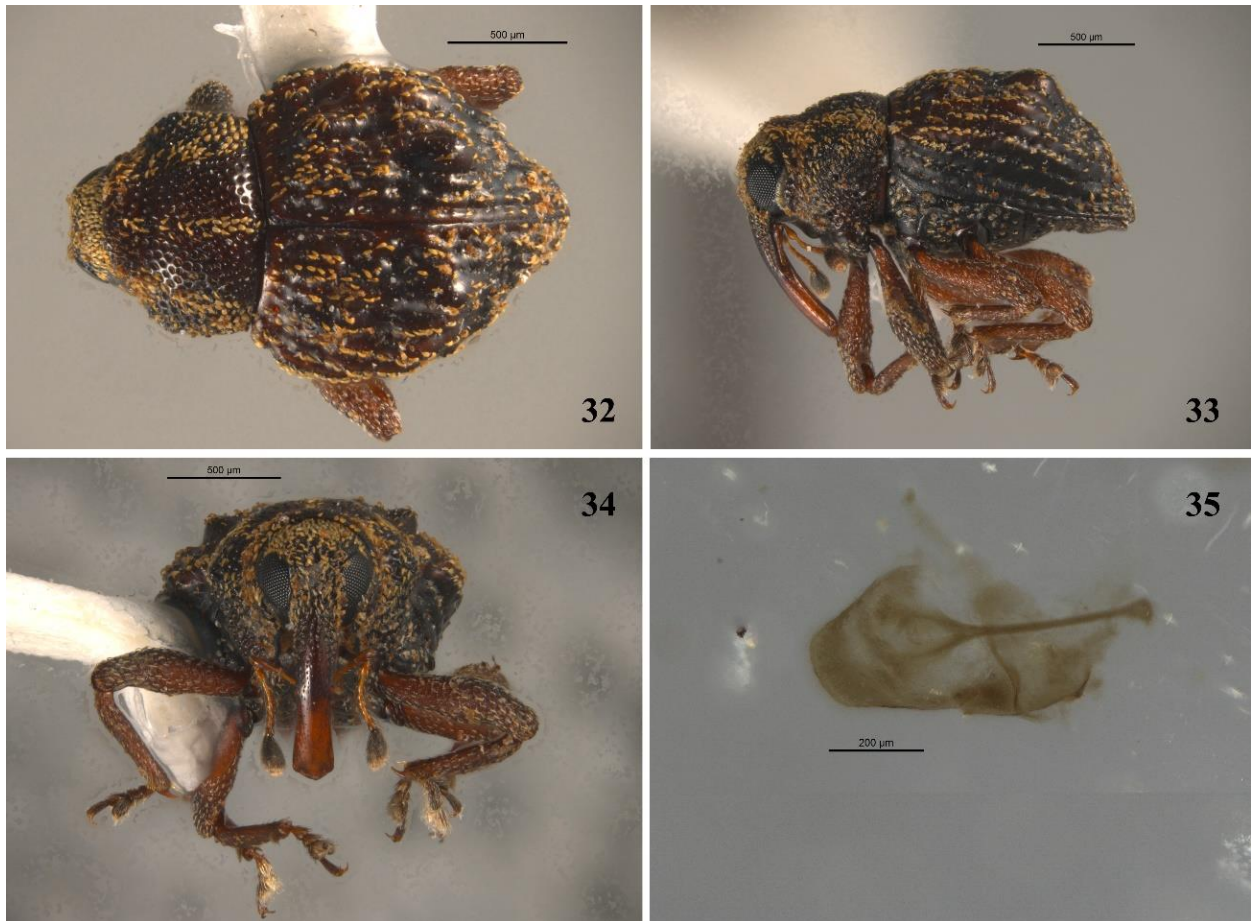
Geographic Distribution. Honduras (Santa Barbara).



FIGURES 25–31. *Plumolepilius genieri*. 25, Male dorsal habitus. 26, Male lateral habitus. 27, Male frontal view. 28, Male abdominal ventrites I-V. 29, Male aedeagus dorsal view. 30, Male pygidium. 31, Male spiculum gastralae.

Derivation of the specific name. Patronym, named after François Génier, a scarabaeidologist at the Canadian Museum of Nature, Canada.

Material examined: 53♂♂, 42♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): HONDURAS: STA. BARBARA, Cerro Santa Barbara, 11.5km.S. & 5.6km W. Penas Blancas, 1870m, 24.VIII.1994-220, R. Anderson, cloud for. litt. berl. / Holotype ♂ *Plumolepilius genieri* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: Same data as holotype (27♂♂27♀♀, ASUHC, CWOB, BMNH, USNM, UZAC). HONDURAS: STA. BARBARA. Same data as holotype except for 20.VI.1994-127 (9♂♂3♀♀). HONDURAS: Sta. Barbara, Cerro Santa Barbara, 1850m, 15km.S.E. Peñas Blancas, 24.VIII.1994, S.Peck, mont.wet for. litter, 94-58 (2♂♂5♀♀). HONDURAS: SANTA BARBARA, Cerro Santa Barbara, 15km.S.E. PeNas Blancas, 1850m, 24.VIII.1994, S.Peck, 94-58, wet mont. for. litter (8♂♂4♀♀). HONDURAS: Sta. Barbara, Cerro Santa Barbara, 1850m, 11.5km.S.& 5.6km W. Peñas Blancas, R. Anderson, cloud for. litter, 94-220 (6♂♂3♀♀).



FIGURES 32–35. *Plumolepilius genieri*. 32, Female dorsal habitus. 33, Female lateral habitus. 34, Female frontal view. 35, Female genitalia and associated sclerites.

***Plumolepilius guaimacaensis* Barrios-Izás, new species**
(Figs. 36–44)

Diagnosis: Male. Length (1.94 – 2.00 mm). Width (1.12 – 1.31 mm). Oval; cuticule blackish to rufescent in apex of rostrum, antennae and tibiae. Vestiture of recumbent ochreous and brown scales. Head and rostrum up to antennal insertion covered with scales, apical half of rostrum finely punctate; scrobes lateroventral, reaching margin of eyes, antenna inserted in middle of rostrum, scape clavate, as long as desmomerer 1 to 3 together, desmomerer 1 and 2 longer than desmomerer 3 to 7, desmomerer 1 1.5X longer than desmomerer 2, antennal club setose. Pronotum 1.3X wider than longer, laterally expanded in middle, anterior margin annulate, coarsely punctate, slightly narrower than elytra, postocular lobes bearing vibrissae. Elytra punctate-striate, humeri rounded, dorsal surface from base of elytra to base of declivity with several tubercles, interstice 4 at base of elytral declivity with two large conical tubercles, stria 10 complete. Mesoventrite excavated transversally. Abdominal ventrites punctate, abdominal ventrites 1 and 2 fused at disk, subequal in length, abdominal ventrites 3 and 4 together as long as abdominal ventrite 2, abdominal ventrite 5 setose, two small protuberances at apex. Metanepisternal suture swollen. Femora unarmed. Pedon subparallel, apex triangular; temones 2.7X longer than pedon, anterior genital sclerite U-shape, posterior genital sclerite single anteriorly acute plate, convex.



36



37



38



39



40

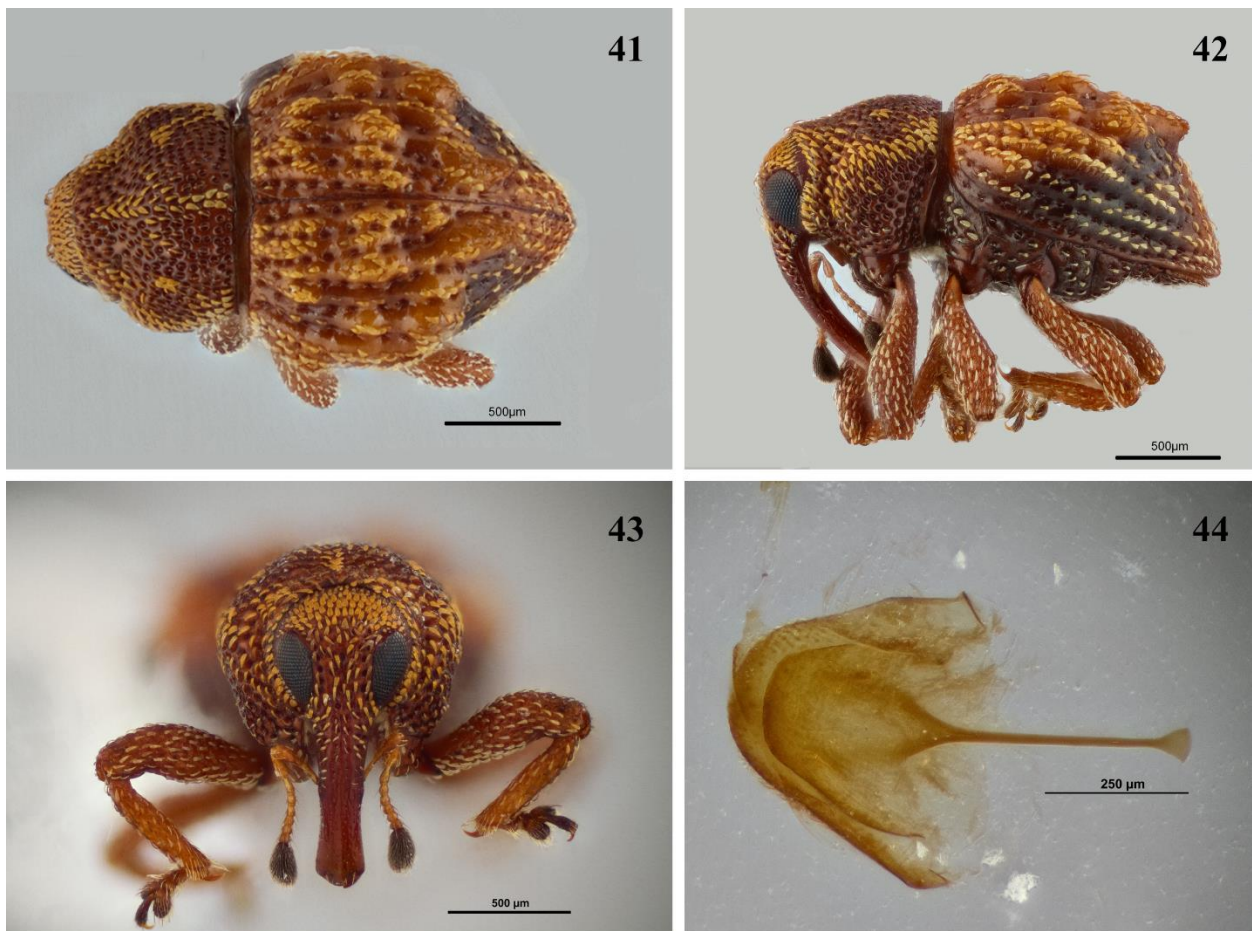
FIGURES 36–40. *Plumolepilius guaimacaensis*. 36, Male dorsal habitus. 37, Male lateral habitus. 38, Male frontal view. 39, Male abdominal ventrites I-V. 40, Male aedeagus dorsal view.

Female. Length (2.00 – 2.06 mm). Width (1.25 mm). As for the male except rostral scales less dense.

Geographic Distribution. Honduras (Francisco Morazán).

Derivation of the specific name. Named after the municipality of Guaimaca in Honduras.

Material examined. 5♂♂, 3♀♀ (CMNC). Holotype ♂ (CMNC): HONDURAS: F. MORAZAN, Res. Biol. El Chile, nr. Guaimaca, N14°21' W86°52', 1600m, 8.v.2002, R. Anderson, upper montane for. litter, 2002-011 / Holotype ♂ *Plumolepilius guaimacaensis* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (4♂♂3♀♀).

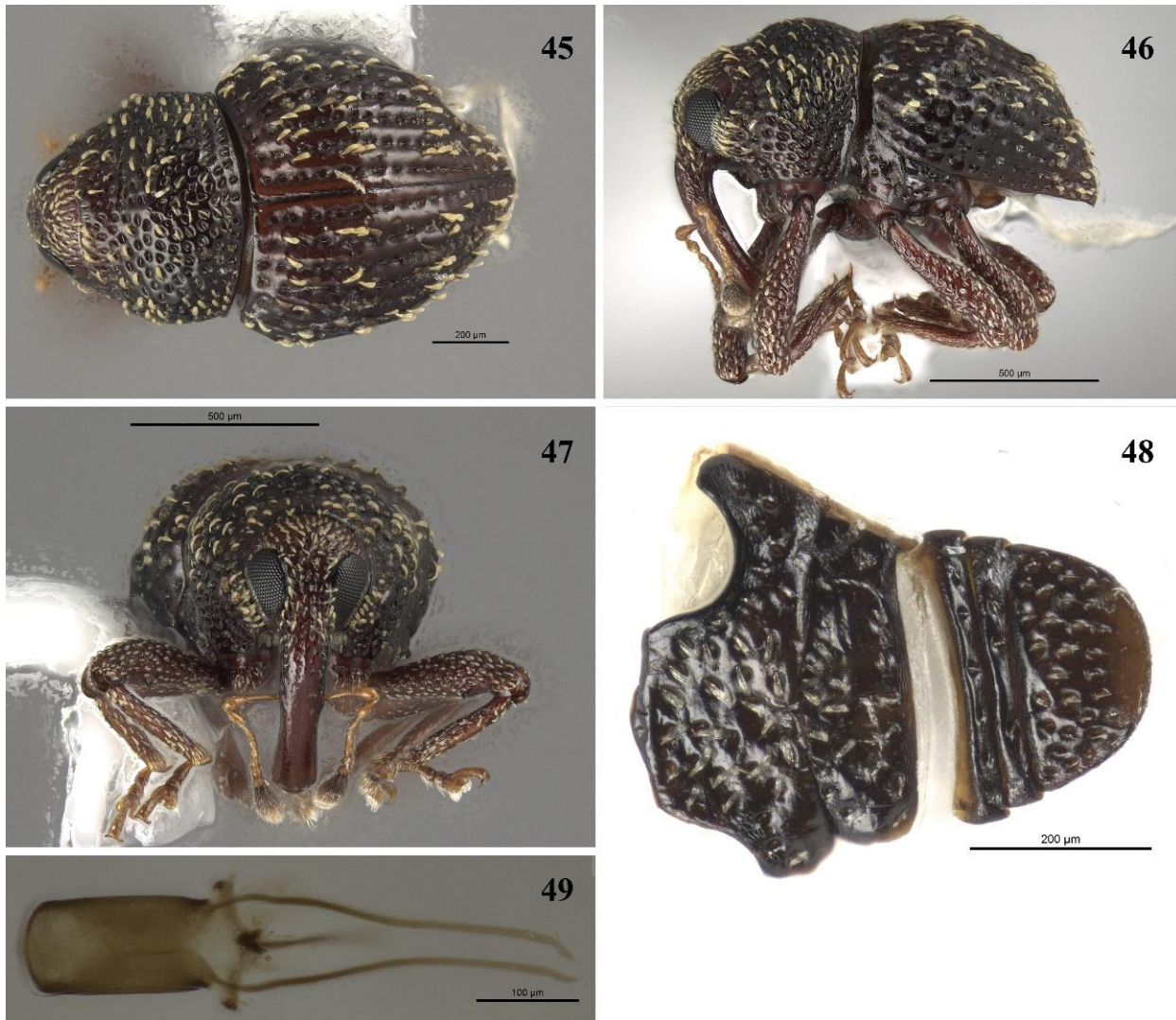


FIGURES 41–44. *Plumolepilius guaimacaensis*. 41, Female dorsal habitus. 42, Female lateral habitus. 43, Female frontal view. 44, Female genitalia and associated sclerites.

***Plumolepilius hectorii* Barrios-Izás, new species**
(Figs. 45–53)

Diagnosis: Male. Length (1.38 – 1.75 mm). Width (0.94 – 1.13 mm). Ovate, cuticle rufescent. Vestiture of sparse recumbent ochreous scales, mesanepisternum and mesepimeron bare. Head and

base of rostrum with sparse scales, scales not reaching the antennal insertions; frons conspicuously sunken between eyes, basal half rugous, apical half finely punctate; scrobes lateroventral, reaching the eyes margin; antenna inserted in middle of rostrum, scape as longer as desmomerer 1 to 3 together, desmomerer 1 slightly longer than desmomerer 2, both longer than desmomerer 3 to 7, funiculus and antennal club setose. Pronotum oval, transverse, annulated anteriorly, punctate, ocular lobes with vibrissae. Elytra striate-punctate, interstices elevated, polished, surface before elytral declivity sinuous, humeri rounded, striae 10 complete. Abdominal ventrites punctate, punctures with setae, abdominal ventrites 1 and 2 fused on disk, abdominal ventrite 2 broader than abdominal ventrites 3 and 4 together. Metanepisternal suture swollen. Femora armed with a small spine, coxae without plumose scales. Pedon subparallel; tementes 1.9X longer than pedon; genital sclerite minute and triangular.



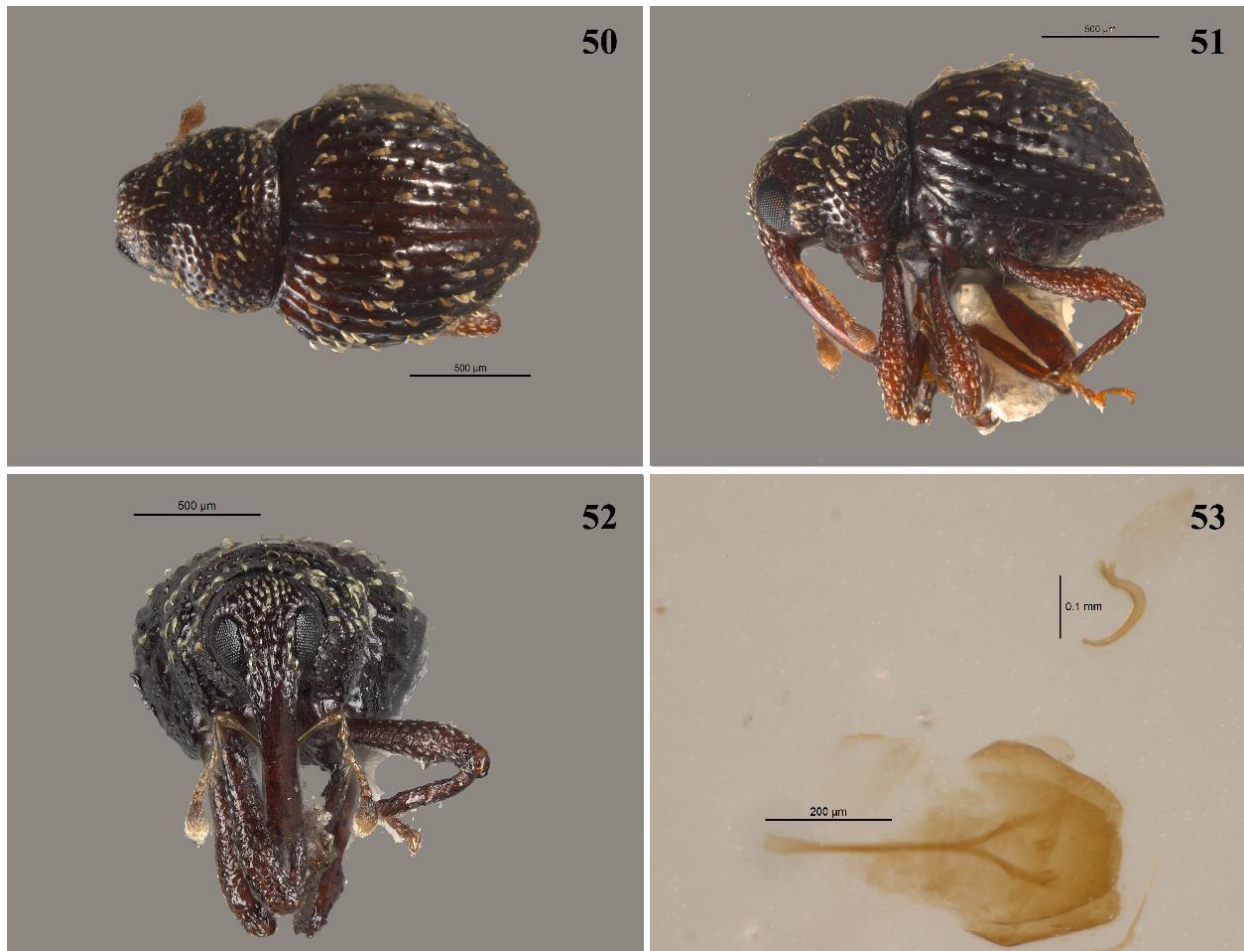
FIGURES 45–49. *Plumolepilius hectorii*. 45, Male dorsal habitus. 46, Male lateral habitus. 47, Male frontal view. 48, Male abdominal ventrites I-V. 49, Male aedeagus dorsal view.

Female. Length (1.38 – 1.81 mm). Width (0.88 – 1.13 mm). As for the male except smaller in size, rostrum with setae instead of scales, rostrum less humped than in males.

Geographic Distribution. Costa Rica (Alajuela, Heredia, Puntarenas and San José).

Derivation of the specific name. Patronym, named after Héctor E. Barrios Velazco, a weevil entomologist at University of Panama.

Material examined: 35♂♂, 23♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): COSTA RICA: Alajuela, E.B. San Ramon, R.B. San Ramon, 27km.N.&8km.W. San Ramon, 10°13'30"N 84°35'30"W, 1050m, 15.VI.1997, R.Anderson, wet premontane forest litter 97-015 / Holotype ♂ *Plumolepilius hectorii* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype except for 950m, 97-014 (3♂♂). COSTA RICA: PUNTARENAS, Monteverde, Estacion Biologica Monteverde, 10°18'53"N 84°47'49"W, 1650m, 10.VI.2001, R.Anderson, montane forest litter 2001-103 (2♂♂1♀). Same data except for 1600m, 14.VI.2001, 2001-113 (1♂). Same data except for 1800m, cloud forest litter, 2001-102 (1♂1♀). Same data except for 10°19'10"N 84°48'57"W, 1730m, 12.VI.2001, R. Anderson, cloud forest litter, 2001-107 (1♂). Same data except for 10°19'10"N 84°48'57"W, 1800m, 13.VI.2001, R. Anderson, cloud forest litter, 2001-109, cloud forest litter (1♂). COSTA RICA: Punta. Prov., Monte Verde Biol. Sta, 1515m, 10°19.672'N 84°49.141'W, 10-17.VI.2001, S&J.Peck, ex. Cloud forest f.i.t., S&JP 2001-10 (2♂♂). COSTA RICA: HEREDIA, 9km NE Vara Blanca, 1450-1550m, 10°14'N 84°06'W, 15/WF/04/, 15 Apr 2005-OET-ALAS transect (2♂♂1♀). Same data except for 15/WF/02/, 12 Mar 2005 (2♂♂2♀♀). Same data except for 15/WF/03/, 06 Mar 2005 (2♂♂2♀♀). Same data except for 1450-1550m, 15/WF/01, 12-15 Feb 2005 (1♂). Same data except for 15/WF/01/, 19-22 Mar 2005 (2♀♀). Same data except for 1500m, 14-20.II.2005, INBio-OET-ALAS transect (2♂♂1♀). 09 Feb 2001, INBio-OET-ALAS transect, COSTA RICA: Prov. Heredia: 16km SSE La Virgen, 1050-1150m, 10°16'N 84°05'W / 9 de Febrero 2001, Transect, 11/B/BH/013 / Project ALAS INB0003212572 (1♂). Same data except for 17 Marzo 2001 / 17 Marzo 2001, 11/WF/02 / Project ALAS INB0003212378 (1♂). Same data except for 23 Febrero 2001 / 23 Febrero 2001, 11/WF/01 / INB0003213069 (1♂). Same data except for 23 Febrero 2001 / 23 Febrero 2001, 11/WF/01 / INB0003213070 (1♂). Same data except for 25 Marzo 2001 / 25 de Marzo 2001, 11/WF/03 / INB0003212579 (1♀). COSTA RICA: Alajuela, E.B. San Ramon, R.B. San Ramon, 27km. N.& 8km. W. San Ramon, 10°13'30"N 84°35'30"W, 850-950m, 29.VI-6.VII.1999, R.Anderson, wet pre-montane forest RSA1999-108 / n. genus near *Lepilius*, det. R.S. Anderson, 20 (1♂). COSTA RICA: San Jose, km.117 Pan-Am Hwy, 19km.N.San Isidro 09°28'N 83°42'20"W, 1800m, 20.VI.1997, R.S. Anderson, cloud for. litter 97-021 (1♂8♀♀). COSTA RICA: Puntarenas, Monte Verde, 1500-1580m, 9 May 1989, J. Ashe, R. Brooks, R. Leschen, ex., pitfall traps / Snow Entomol. Mus., Costa Rica exped.#088 (1♂). Same data except for 1570m, 16 May 1989, ex., berlese (2♂♂). COSTA RICA: PUNTARENAS, Monteverde, Estacion Biologica Monteverde, 10°19'10"N 84°47'49"W, 1650m, 13.VI.2001, R.Anderson, montane forest litter 2001-107 (2♂♂). Same data except for 10°19'40"N 84°49'08"W, 1540m, 9.VI.2001, R.Anderson, montane forest litter 2001-101 (1♂). Same data except for 10°18'53"N 84°47'49"W, 1650m, 13.VI.2001, 2001-111 (1♂). COSTA RICA: PUNT. Monteverde, 1520m, 30.VI.1986. J.S. Ashe & R.M. Timm, sifted forest litter (1♂). COSTA RICA: San Jose, km 117 Pan-Am Hwy, 19km.N.San Isidro 09°28'N 83°42'20"W, 1800m, 25.VI.1997, R.S. Anderson, cloud for. litter 97-035 (1♀). COSTA RICA: San Jose, km 117 Pan-Am Hwy, 19km.N.San Isidro 09°28'N 83°42'20"W, 1800m, 15.II.1998, R.S. Anderson, cloud for. litter (3♀♀).

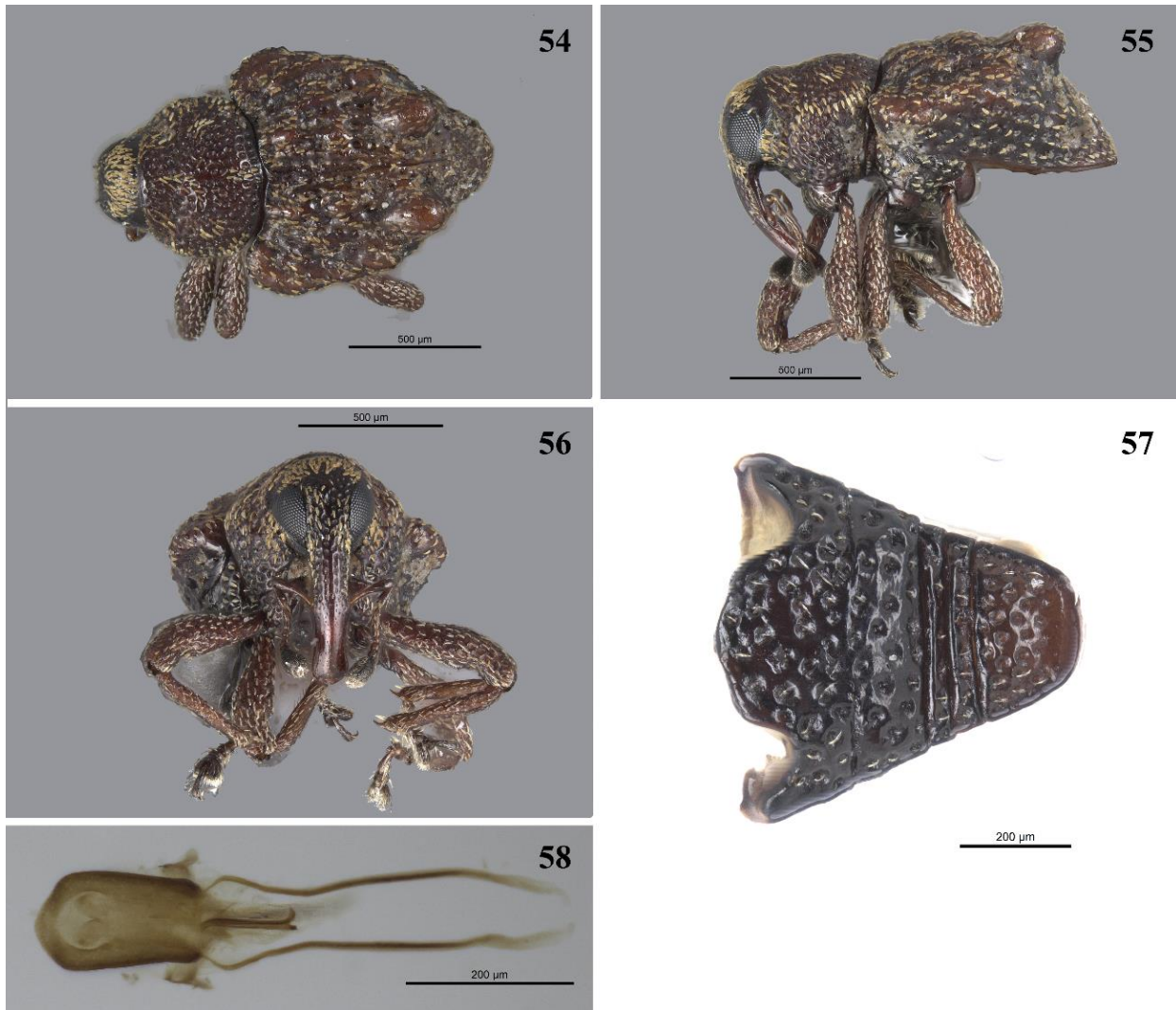


FIGURES 50–53. *Plumolepilius hectorii*. 50, Female dorsal habitus. 51, Female lateral habitus. 52, Female frontal view. 53, Female genitalia and associated sclerites.

***Plumolepilius linaresi* Barrios-Izás, new species**
(Figs. 54–62)

Diagnosis: Male. Length (1.56 – 1.75 mm). Width (1.06 – 1.25 mm). As for *P. velizii* but cuticle orange to dark brown. Rostral scales and setae almost reaching the antennal insertion, rostral apical half smooth with sparse finely punctures, basal half of rostrum not scabrous. Pronotum subquadrate. Base of declivity with two big tubercles at interstice 4 and elevated backwards, interstices 5 and 6 at declivity elevated. Apex of abdominal ventrite 5 rounded and finely punctated. Pedon parallel; temones 2.3X longer than pedon; genital sclerite thin, elongated, almost as long as manubrium, basal extreme bifurcated.

Female. Length (1.62 – 1.94 mm). Width (0.93 – 1.31 mm). As for the male except rostral scales only at base, not reaching antennal insertions, surface not rugose; scape shorter than desmomeres 1 to 3; elytral humeri rounded, several tubercles before elytral declivity; femora unarmed.



FIGURES 54–58. *Plumolepilius linearesi*. 54, Male dorsal habitus. 55, Male lateral habitus. 56, Male frontal view. 57, Male abdominal ventrites I-V. 58, Male aedeagus dorsal view.

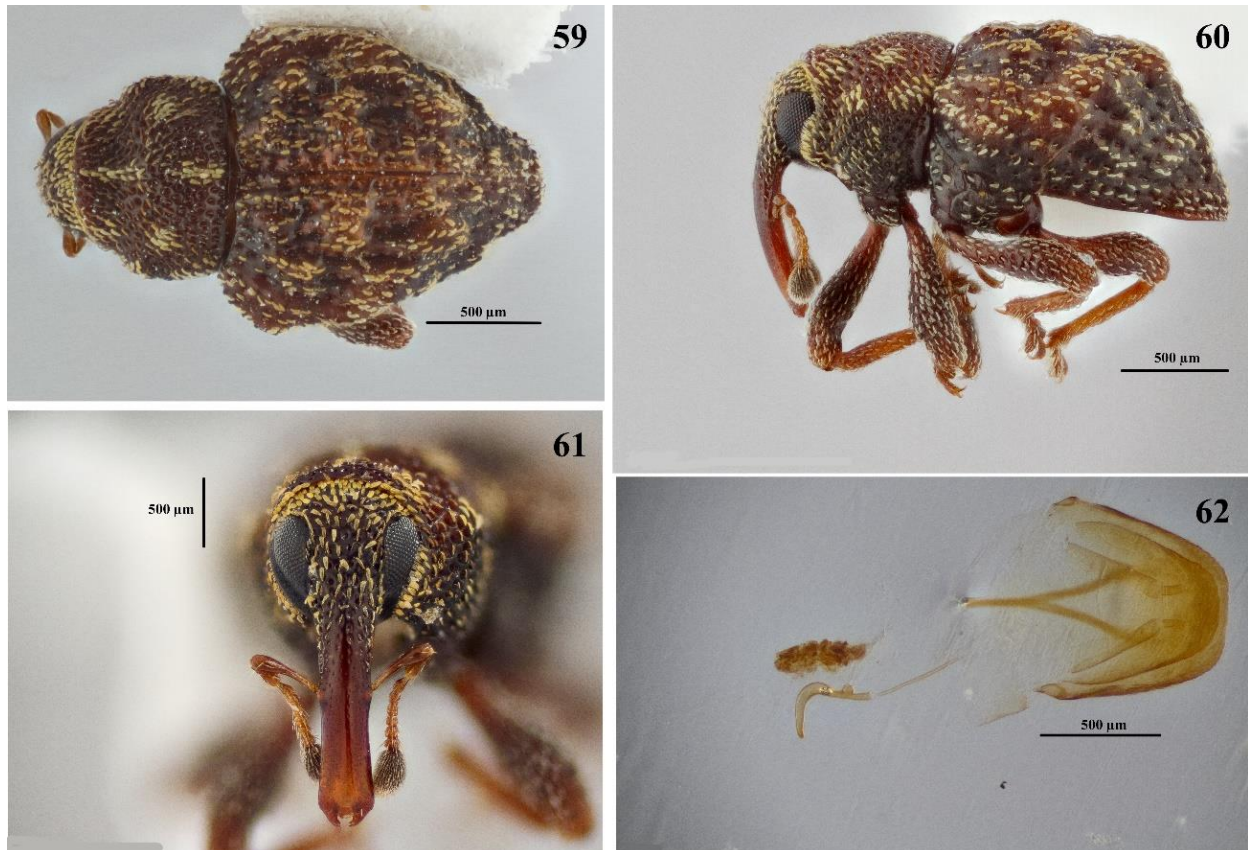
Geographic Distribution. Honduras (Comayagua and Francisco Morazan).

Derivation of the specific name. Patronym, named after José Linares, a botanist at the Universidad Nacional, La Ceiba, Honduras.

Material examined. 206♂♂, 40♀♀ (ASUHC, CMNC, CWOB, MNCN, BMNH, USNM, UZAC). Holotype ♂ (CMNC): HONDURAS: Comayagua. 12km ENE Comayagua, 14.482 - 87.531 ±20m, 2140, 15.V.2010 LLAMA Wa-C-03-2 / WWD0087730 / Holotype ♂ *Plumolepilius linearesi* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: Same data as holotype / WWD0087479 (1♂). WWD0087480 (1♂). WWD0087526 (1♂). WWD0087527 (1♂). WWD0087531 (1♂). WWD0087532 (1♂). WWD0087533 (1♂). WWD0087534 (1♂). WWD0087601 (1♂). WWD0087602 (1♂). WWD0087654 (1♂). WWD0087655 (1♂). WWD0087656 (1♂). WWD0087678 (1♂). WWD0087679 (1♂). WWD0087681 (1♂). WWD0087682 (1♂). WWD0087731 (1♂). WWD0087738 (1♂). WWD0087739 (1♂). WWD0087741 (1♂). WWD0087742 (1♂). WWD0087743 (1♂). WWD0087744 (1♂).

WWD0087747 (1♂). WWD0087804 (1♂). WWD0087805 (1♂). WWD0087806 (1♂).
 WWD0087813 (1♂). WWD0087815 (1♂). WWD0087818 (1♂). HONDURAS: COMAYAGUA,
 Mont. Comayagua, 18.0km. E. Comayagua, 20.VIII.1994-216, 2000m, R. Anderson,
 oak/cloud/liquidambar forest litter berlese (30♂♂23♀♀). HONDURAS: Comayagua, 12km ENE
 Comayagua, 14.48418 -87.52934 ±20m, 2270m, 16.V.2010, LLAMA Wm-C-03-2-02
 (4♂♂2♀♀). HOND.:Comayagua, 18km.E.N.E. Comayagua, 1950m, S.B.Peck, 94-52,
 20.VIII.1994, wet oak/pine forest litter (3♂♂6♀♀). HONDURAS: Comayagua, Comayagua (18
 km.E.N.E.) 1950m, 20.VIII.1994, S. Peck, wet oak-pine forest litter, SBP 94-52 (4♂♂).
 HONDURAS: Comayagua, 12km ENE Comayagua, 14.484 -87.529 ±20m, 2270m, 16May2010,
 LLAMA#Wm-C-03-2 / WWD0081710 (1♂). WWD0081716 (1♂). HONDURAS: Comayagua.
 12km ENE Comayagua, 14.482 -87.531 ±20m, 2140m, 15.V.2010 LLAMA WA-C-03-2 /
 WWD0087529 (1♂). WWD0087683 (1♂). WWD0087746 (1♂). HONDURAS: Comayagua.
 12km ENE Comayagua, 14.482 -87.530 ±10m, 2190m, 16May2010 LLAMA#Wm-C-03-2 /
 WWD0081516 (1♂). WWD0081523 (1♂). WWD0081537 (1♂). WWD0081560 (1♂).
 WWD0081572 (1♂). WWD0081574 (1♂). WWD0081594 (1♂). WWD0081621 (1♂).
 WWD0081622 (1♂). HONDURAS: Comayagua. 10km E Comayagua, 14.471 -87.540 ±20m,
 1860m, 16.V.2010 LLAMA#Wm-C-03-1, disturbed cloud forest litter / WWD0080392 (1♂).
 WWD0080396 (1♂). WWD0080401 (1♂). WWD0080416 (1♂). WWD0080421 (1♂).
 WWD0097393 (1♂). WWD009394 (1♂). WWD0097395 (1♂). HONDURAS: Comayagua. 10km
 E Comayagua, 14.460 -87.545 ±10m, 2010m, 15.V.2010 LLAMA#Wm-C-03-1 / WWD0097164
 (1♂). WWD0097165 (1♂). WWD0097166 (1♂). WWD0097739 (1♂). WWD0097748 (1♂).
 WWD0097764 (1♂). WWD0097794 (1♂). WWD0097796 (1♂). WWD0097820 (1♂).
 HONDURAS: Comayagua. 10km E Comayagua, 14.471 -87.540 ±20m, 1860m, 16.V.2010
 LLAMA Wm-C-03-1 / WWD0080384 (1♂). WWD0080395 (1♂). WWD0080399 (1♂).
 WWD0080400 (1♂). WWD0080432 (1♂). WWD0080435 (1♂). WWD0097392 (1♂).
 HONDURAS: Comayagua. 12km ENE Comayagua, 14.481 -87.531 ±20m, 2140, 15.V.2010
 LLAMA Wa-C-03-2 / WWD0087168 (1♂). WWD0087171 (1♂). WWD0087173 (1♂).
 WWD0087174 (1♂). WWD0087179 (1♂). WWD0087263 (1♂). WWD0087266 (1♂).
 WWD0087269 (1♂). WWD0087270 (1♂). WWD0087271 (1♂). WWD0087272 (1♂).
 WWD0087274 (1♂). WWD0087275 (1♂). WWD0087277 (1♂). WWD0087282 (1♂).
 WWD0087283 (1♂). WWD0087311 (1♂). WWD0087312 (1♂). WWD0087313 (1♂).
 WWD0087314 (1♂). WWD0087408 (1♂). WWD0087454 (1♂). WWD0087363 (1♂).
 WWD0087364 (1♂). WWD0087368 (1♂). WWD0087369 (1♂). WWD0087370 (1♂).
 WWD0087403 (1♂). WWD0087404 (1♂). WWD0087405 (1♂). WWD0087410 (1♂).
 WWD0087451 (1♂). WWD0087447 (1♂). WWD0087450 (1♂). WWD0087451 (1♂).
 WWD0087452 (1♂). HONDURAS: Comayagua. 12km ENE Comayagua, 14.481 -87.532 ±10m,
 2150, 15May2010 LLAMA#Wm-C-03-2 / WWD0080819 (1♂). WWD0080820 (1♂).
 WWD0080824 (1♂). WWD0080843 (1♂). WWD0080865 (1♂). WWD0080869 (1♂).
 WWD0080870 (1♂). WWD0080896 (1♂). WWD0080897 (1♂). WWD0080914 (1♂).
 WWD0080915 (1♂). WWD0080918 (1♂). WWD0080919 (1♂). WWD0080929 (1♂).
 WWD0080930 (1♂). HONDURAS: Comayagua. 12km ENE Comayagua, 14.483 -87.530 ±20m,
 2230, 16May2010 LLAMA#Wm-C-03-2, cloud forest litter / WWD0080652 (1♂).
 WWD0080657 (1♂). WWD0080664 (1♂). WWD0080681 (1♂). WWD0080696 (1♂).
 WWD0080702 (1♂). WWD0080710 (1♂). WWD0080743 (1♂). WWD0080745 (1♂).
 WWD0080770 (1♂). WWD0080771 (1♂). WWD0080775 (1♂). WWD0080786 (1♂).
 HONDURAS: Comayagua. 12km ENE Comayagua, 14.484 -87.529 ±20m, 2270, 16May2010

LLAMA#Wm-C-03-2, cloud forest litter / WWD0081690 (1♂). WWD0081691 (1♂). WWD0081772 (1♂). HONDURAS: Comayagua. 12km ENE Comayagua, 14.484 -87.529 ±20m, 2270, 16May2010 LLAMA#Wm-C-03-2, cloud forest litter (10♂). COMAYAGUA, Mont. Comayagua, 18.0km. E. Comayagua, 20.VIII.1994-216, 2000m, R. Anderson, oak/cloud/liquidambar forest litter berlese (2♂♂). HOND.: Comayagua, 18km.E.N.E. Comayagua, 1950m, S.B.Peck, 94-52, 20.VIII.1994, wet oak/pine forest litter (2♂♂). HONDURAS: FRANC. MOR. 29.9km W. & 7km N.W. Tegucigalpa, lower slope Cerro Yerba Buena, 1920m, 28.VI.1994-137, R. Anderson oak/cloud forest litter (14♂♂ 9♀♀).

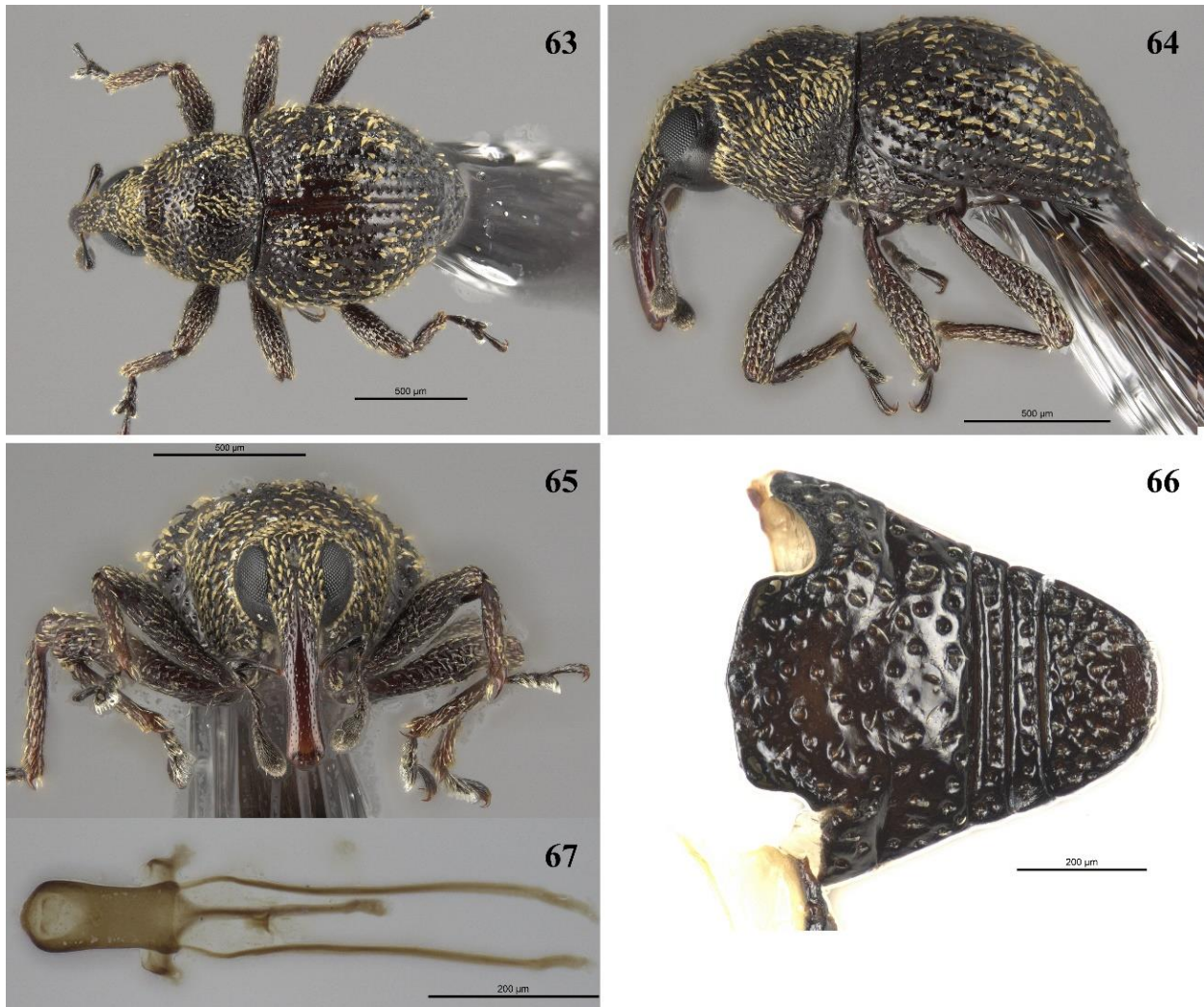


FIGURES 59–62. *Plumolepilius linaresi*. 59, Female dorsal habitus. 60, Female lateral habitus. 61, Female frontal view. 62, Female genitalia and associated sclerites.

***Plumolepilius maesi* Barrios-Izás, new species
(Figs. 63–71)**

Diagnosis: Male. Length (1.44 – 2.13 mm). Width (0.81 – 1.81 mm). As for *P. guaimacaensis* but scales from appressed to suberect. Scales covering from head to basal 1/3 of rostrum before antennal insertion, scape as long as desmomerer 1 to 4 together, desmomerer 1 and 2 longer than desmomerer 3 to 7, desmomerer 2 slightly longer than desmomerer 1, funiculus and antennal club setose. Pronotum subquadrate, 1.2X wider than long. Elytra with two small tubercles in interstice 4 at base of elytral declivity. Mesoventrite not excavated. Abdominal ventrite 1 2X longer than abdominal ventrite 2, fused at disk, abdominal ventrite 5 sparsely covered with setae, two slightly developed protuberances apicad. Anterior femora armed with spine at inner margin. Pedon

subparallel, narrower between first and second quarter; temones 2.8X longer than pedon, genital sclerite short, parallel though its length except for basal extreme which widens conically.



FIGURES 63–67. *Plumolepilius maesi*. 63, Male dorsal habitus. 64, Male lateral habitus. 65, Male frontal view. 66, Male abdominal ventrites I-V. 67, Male aedeagus dorsal view.

Female. Length (1.62 – 2.19 mm). Width (0.87-1.19 mm). As for the male except rostral scales only at base, elytra lacking tubercles.

Geographic Distribution. Nicaragua (Granada).

Derivation of the specific name. Patronym, named after Jean-Michel Maes, an entomologist at Museo Entomológico, Nicaragua.

Material examined: 24♂♂, 26♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): NICARAGUA: Granada Dept. Res. Nat. Volcan Mombacho, 1150m 11°50.05'N 85°58.83'W, 1-5-VI-2002, R.Brooks, Z. Falin, S.Chatzimanolis ex.flight, intercept

trap / Holotype ♂ *Plumolepilius maesi* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: Same data as holotype (9♂♂10♀♀). NICARAGUA: Granada, Dept. Volcan Mombacho Res. Nat. 1150m, 11°50.0'N 85°58.8'W, 2-5.VI.2002, R. Anderson, ex. elfin cloud forest beating, RSA2002-034X (6♂♂8♀♀). NICARAGUA: Granada, Volcan Mombacho, 15.xii.1997, 1115 m, malaise trap, J.M. Maes (1♂). NICARAGUA: Granada, Volcan Mombacho, bosque enano, 18.viii.1998, malaise trap, J.M. Maes (1♂1♀). Same data except for 15.x.1998 (1♂). Same data except for Bosque nuboso 3, 30.ix.1998 (1♂1♀). NICARAGUA: Granada, Res. Nat. Volcán Mombacho, 1150m 11°50.05'N 85°58.83'W, 1-5.VI.2002, R.Brooks, Z.Falin, & S.Chatzimanolis, ex.f.i.t.,#190 (2♂♂2♀♀). NICARAGUA: Granada Dept. Reserva Domitilia, 100m 11°42.50'N 85°57.20'W, 6-9-VI-2002, R.Brooks, Z.Falin, S.Chatzimanolis ex. flight intercept trap, N1C1BFC02 255 (1♂1♀). NICARAGUA: Grenada Dept. Volcan Mombacho Res. Nat. N11°50.0' W85°58.8', 1150 m, elfin cloud forest litter, 2-5.VI.2002, R. Anderson, RSA2002-033 (1♂1♀). NICARAGUA: Grenada, Volcan Mombacho, 10.6km SSW Grenada, 1150m, 11.83430°N 85.98000°W, 14 Oct 2008, M.G. Branstetter, cloud forest, MGB-1170 (2♀♀).

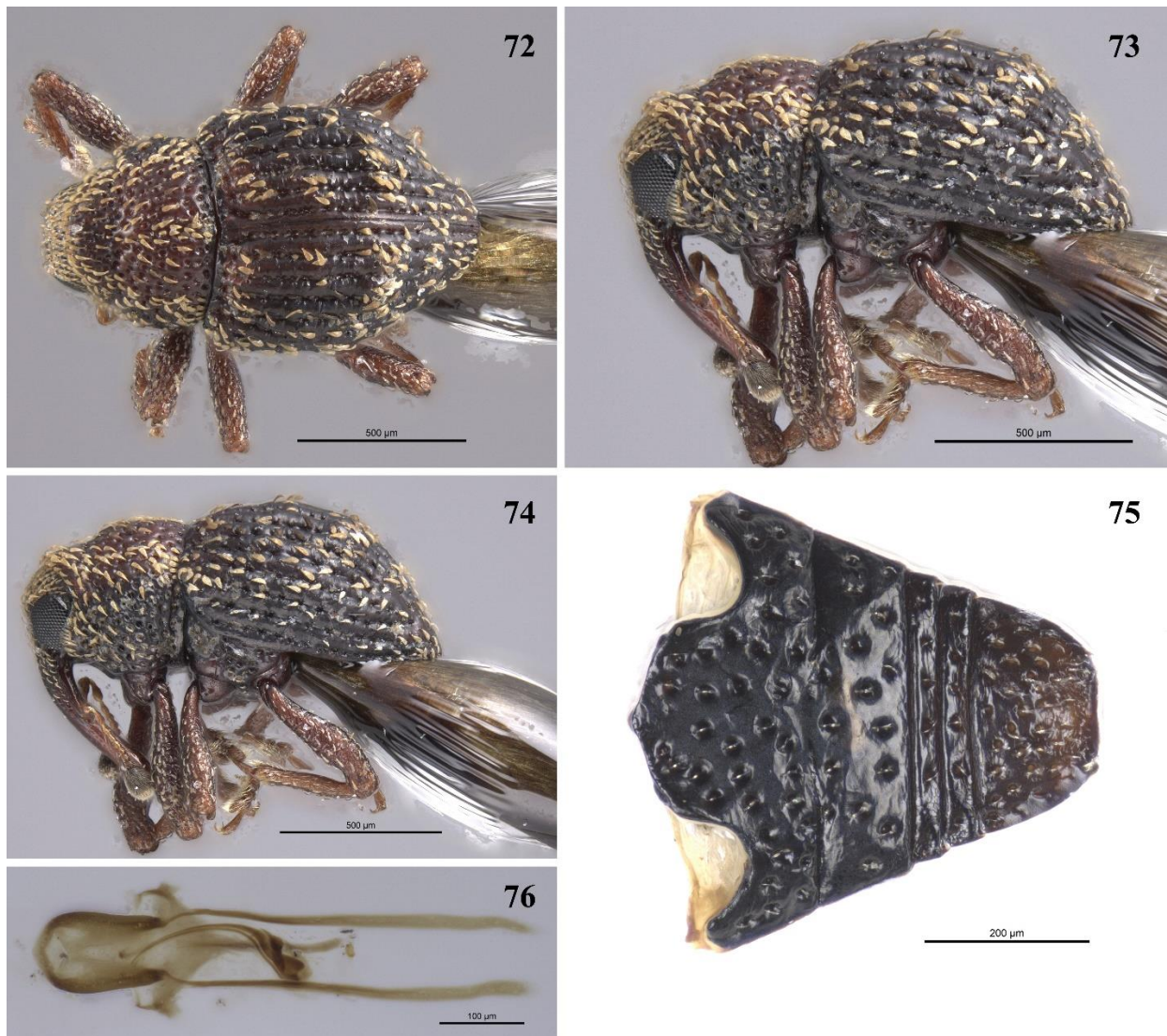


FIGURES 68–71. *Plumolepilius maesi*. 68, Female dorsal habitus. 69, Female lateral habitus. 70, Female frontal view. 71, Female genitalia and associated sclerites.

***Plumolepilius molinai* Barrios-Izás, new species**
(Figs. 72–80)

Diagnosis: Male. Length (1.50 – 1.56 mm). Width (0.87 – 1.06 mm). As for *P. antonioi* but mesanepisternum and mesepimeron bare. Pronotum expanded in the base, 1.3X broader than long, scales denser. Elytra with several small tubercles arranged in three bands between base of elytra and elytral declivity. Abdominal ventrites coarsely punctate, abdominal ventrites 1 and 2 fused on disk, apex of abdominal ventrite 5 flat. Femora unarmed. Aedeagus subparallel, curved in lateral view, anterior border rounded; temones 2.75x longer than pedon; genital sclerite flagellum shape, base oval, longer than manubrium.

Female. Length (1.56 – 1.88 mm). Width (0.94 – 1.19 mm). As for the male except scales only at base of rostrum; elytral humeri rounded.

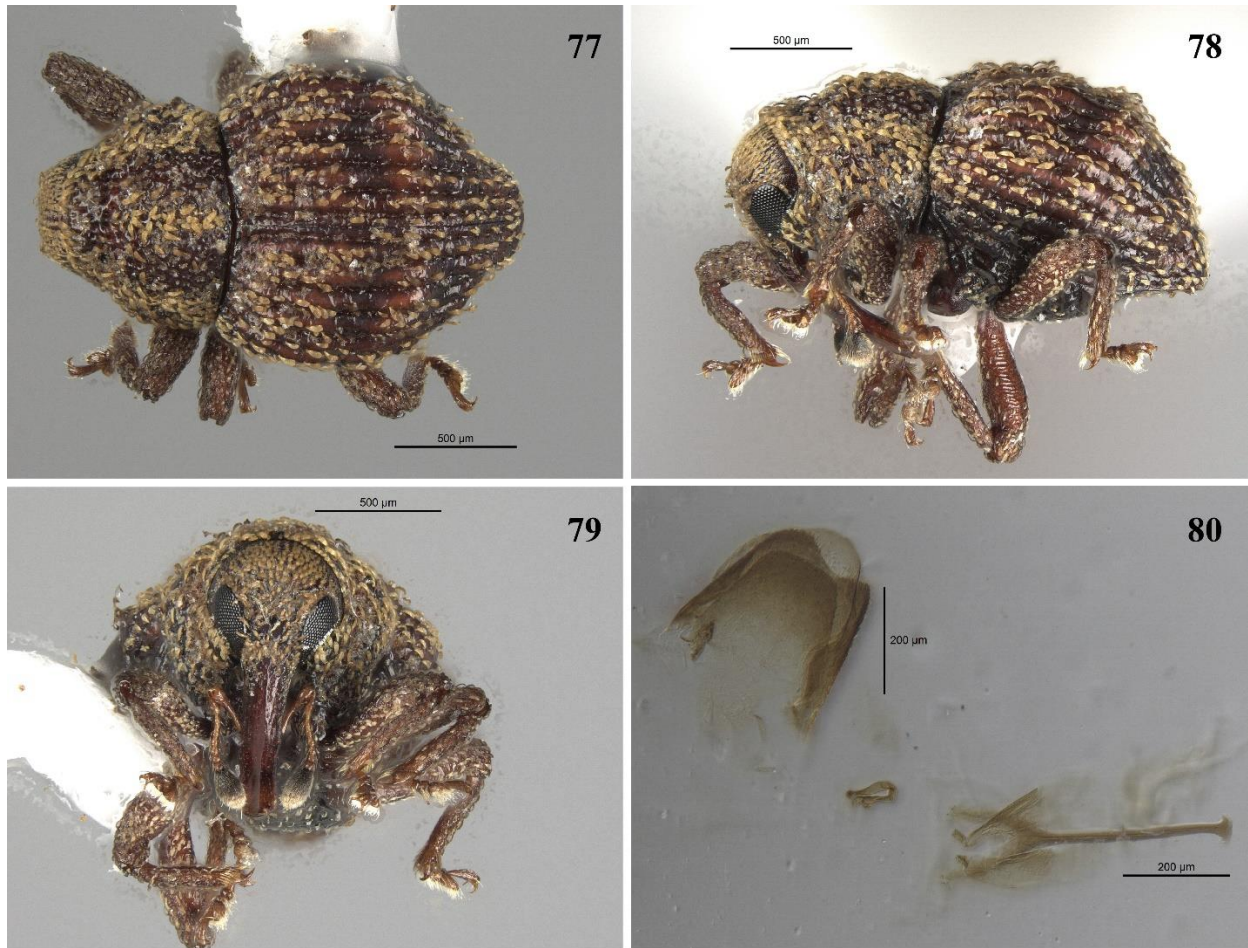


FIGURES 72–76. *Plumolepilius molinai*. 72, Male dorsal habitus. 73, Male lateral habitus. 74, Male frontal view. 75, Male abdominal ventrites I-V. 76, Male aedeagus dorsal view.

Geographic Distribution. Honduras (Cortes).

Derivation of the specific name. Patronym, named after José Antonio Molina Rosita, a botanist at Escuela Agrícola Panamericana “Zamorano”, Honduras. Antonio Molina was an honduran botanist that contibuted significantly to the study and knowlege of the vascular flora of Central America over more than 60 years. He also studied the flora of Mexico and the Antilles.

Material examined: 28♂♂, 25♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): HONDURAS: CORTES, P. N. Cusuco, 18.7km N. Cofradia, 5.4km. W. Buenos Aires, Cerro Jilincó, 1960m, 26.VIII.1994-223, R. Anderson pine/cloud forest litter berlese / Holotype ♂ *Plumolepilius molinai* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (15♂♂12♀♀). Same data except for 1650m, 26.VIII.1994-224, liquidambar forest litter berlese (3♂♂7♀♀). Same data except for 2000m, 26.VIII.1994-222, cloud forest litter berlese (7♂♂5♀♀). Same data except for 2080m, 26.VIII.1994-221, elfin cloud forest litter berlese (2♂♂1♀).



FIGURES 77–80. *Plumolepilius molinai*. 77, Female dorsal habitus. 78, Female lateral habitus. 79, Female frontal view. 80, Female genitalia and associated sclerites.

***Plumolepilius morronei* Barrios-Izás, new species**
(Figs. 81–89)

Diagnosis: Male. Length (1.94 – 2.00 mm). Width (1.31 – 1.44 mm). Ovate; cuticle dark brown, matte, antenna orange, club darker. Vestiture of sparse recumbent ochreous to dark brown scales. Head with scales up to antennal insertions, basal half of rostrum rugous, apical half of rostrum finely punctate and shiny, scrobes lateroventral, reaching the margin of eyes, antenna inserted at middle of rostrum, funicle and desmomereres as in *P. velizii*, antennal club setose. Pronotum trapezoidal, annulate anteriorly, widened laterally at middle, punctures deep and wide, narrower than elytra, three dorsal vittae of ochreous scales, postocular lobes with vibrissae. Elytra with humeri produced, sparsely covered with scales, flanks almost bare and angulate, elytra dorsum surface basal half tuberiferous, two large subconical and laterally compressed tubercles on base of elytral declivity, both tubercles between striae 3 and 4, punctate-striate, punctures shallow, striae 10 complete. Abdominal ventrites with sparse deep punctures, punctures bearing setae, suture between abdominal ventrite 1 and 2 complete but not articulated, abdominal ventrites 3 and 4 together slightly shorter than abdominal ventrite 2, abdominal ventrite 5 apex finely punctate. Metanepisternal suture swollen. Front and middle femora armed with a small tooth, hind-femora unarmed, tibia uncinated. Pedon width gradually increasing from base to apex, temones 2.8x longer than pedon, genital sclerites sting-shape, opposite orientated.

Female. Length (1.88 mm). Width (1.31 mm). As for the male except scales not reaching antennal insertions, humeri rounded, tubercles less developed, all abdominal ventrite punctures subequal in size.

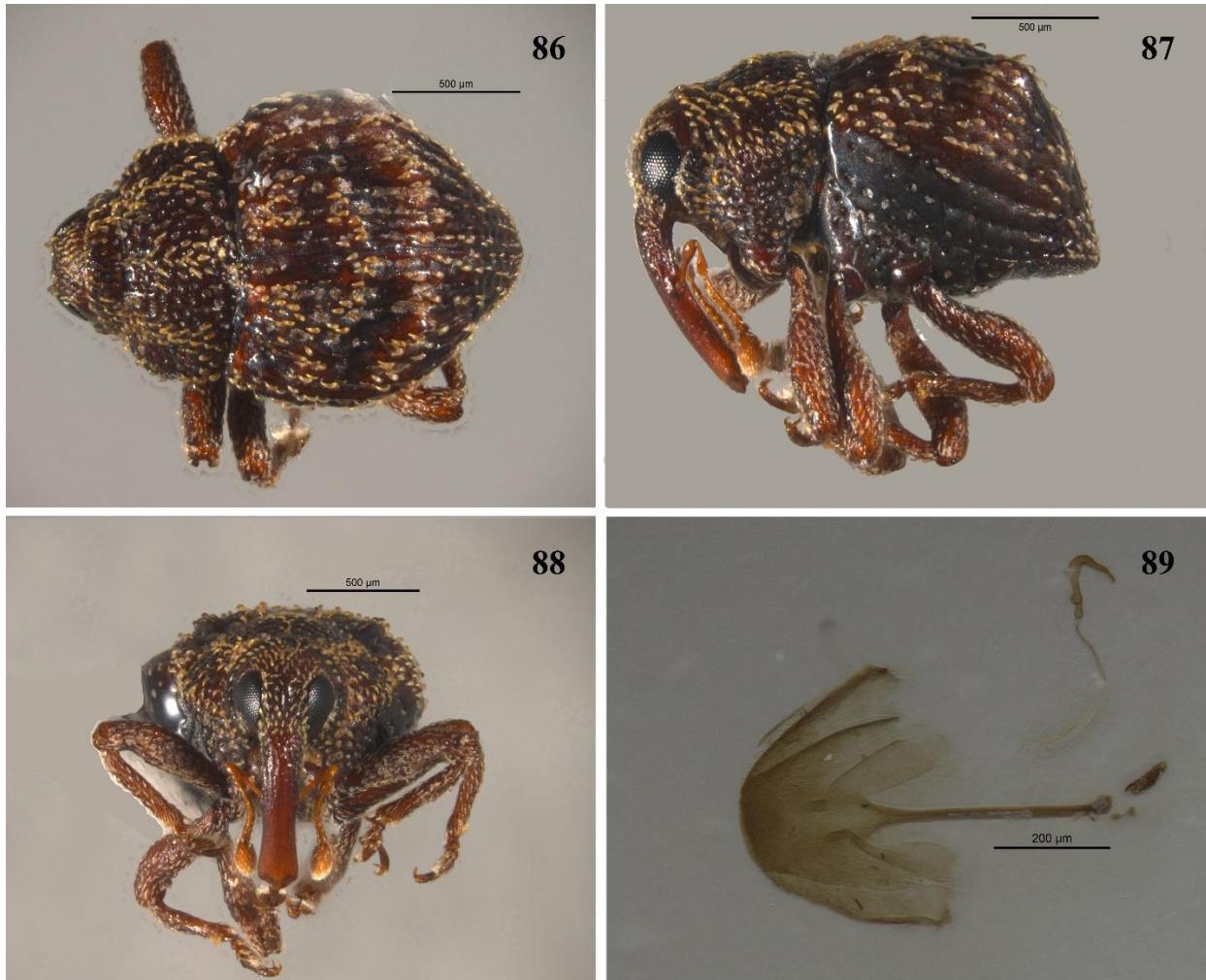
Geographic Distribution. Honduras (Yoro).

Derivation of the specific name. Patronym, named after Juan José Morrone, a weevil entomologist and biogeographer at the Universidad Nacional Autónoma de México.

Material examined: 2♂♂1♀ (CMNC). Holotype ♂ (CMNC): HONDURAS: YORO, P. N. Pico Piljol, 1300 m, N15°09.4' W87°37.6', 11.V.2002, R. Anderson, upper montane forest litter, 2002-017 / Holotype ♂ *Plumolepilius morronei* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype except for 1400 m, 2002-016 (1♂1♀).



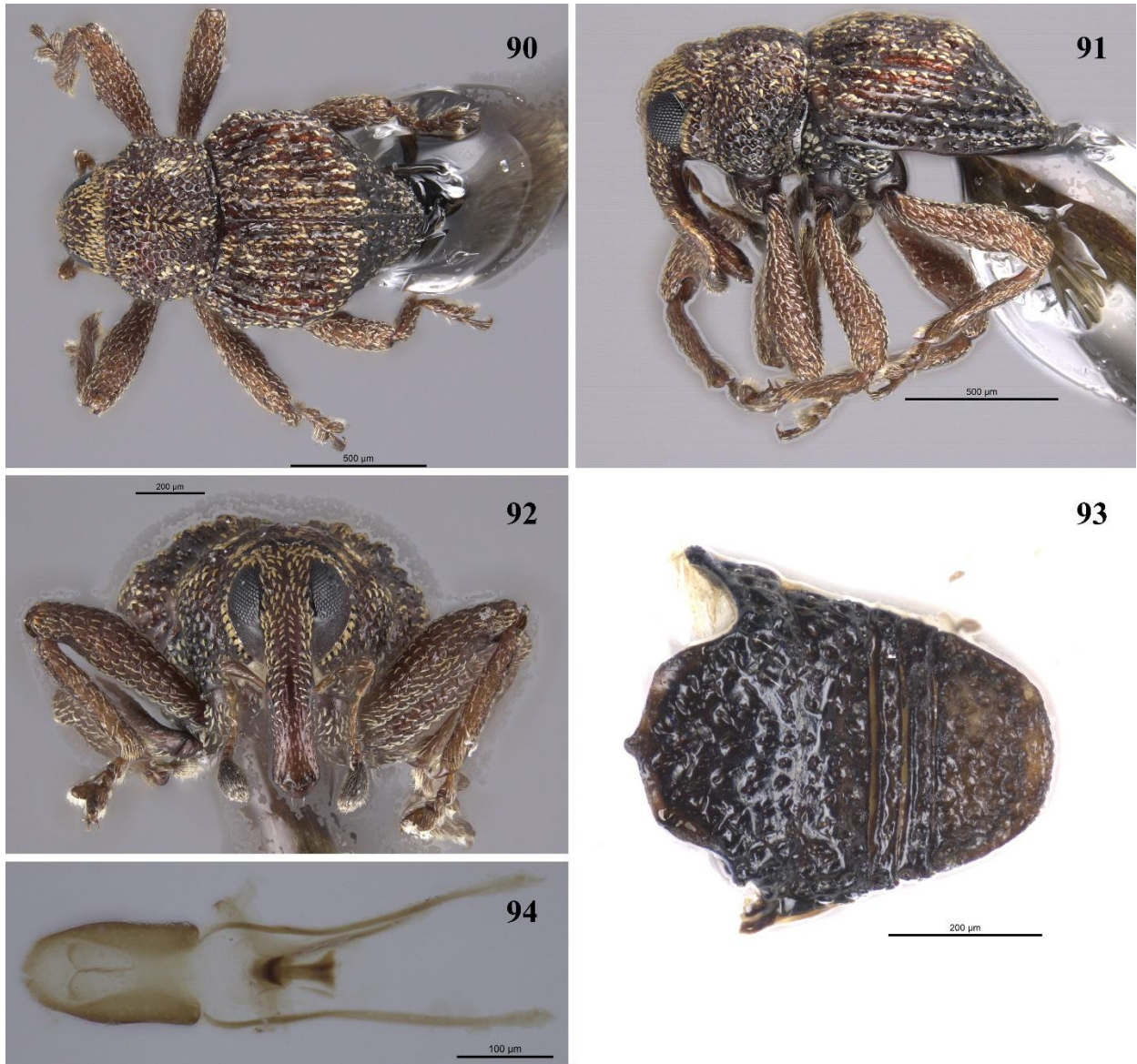
FIGURES 81–85. *Plumolepilius morronei*. 81, Male dorsal habitus. 82, Male lateral habitus. 83, Male frontal view. 84, Male abdominal ventrites I-V. 85, Male aedeagus dorsal view.



FIGURES 86–89. *Plumolepilius morronei*. 86, Female dorsal habitus. 87, Female lateral habitus. 88, Female frontal view. 89, Female genitalia and associated sclerites.

***Plumolepilius nelsonii* Barrios-Izás, new species**
(Figs. 90–94)

Diagnosis: Male. Length (1.69 – 1.81 mm). Width (1.06 mm). As for *P. guaimacaensis* but cuticule mostly rufescent. Rostrum deeply punctate and covered with scales from base to antennal insertion, antenna inserted passing at half of 2/3 of rostrum, 3/3 of rostrum finely punctate and with minute setae, desmomes 1 and 2 subequal in length. Pronotum 1.4X wider than long. Elytra with several small tubercles arranged in two bands at dorsum. Mesoventrite slightly depressed but not excavated transversally. Abdominal ventrite five regularly covered with setae. Pedon subparallel, width gradually reducing at apex; temones 2.1X longer than pedon; anterior genital sclerite shape like half sphere with a dorsal plate, encrusting the tip of basal genital sclerite, the latter small, curved in lateral view, wider at base, width gradually reducing through apex.



FIGURES 90–94. *Plumolepilius nelsonii*. 90, Male dorsal habitus. 91, Male lateral habitus. 92, Male frontal view. 93, Male abdominal ventrites I-V. 94, Male aedeagus dorsal view.

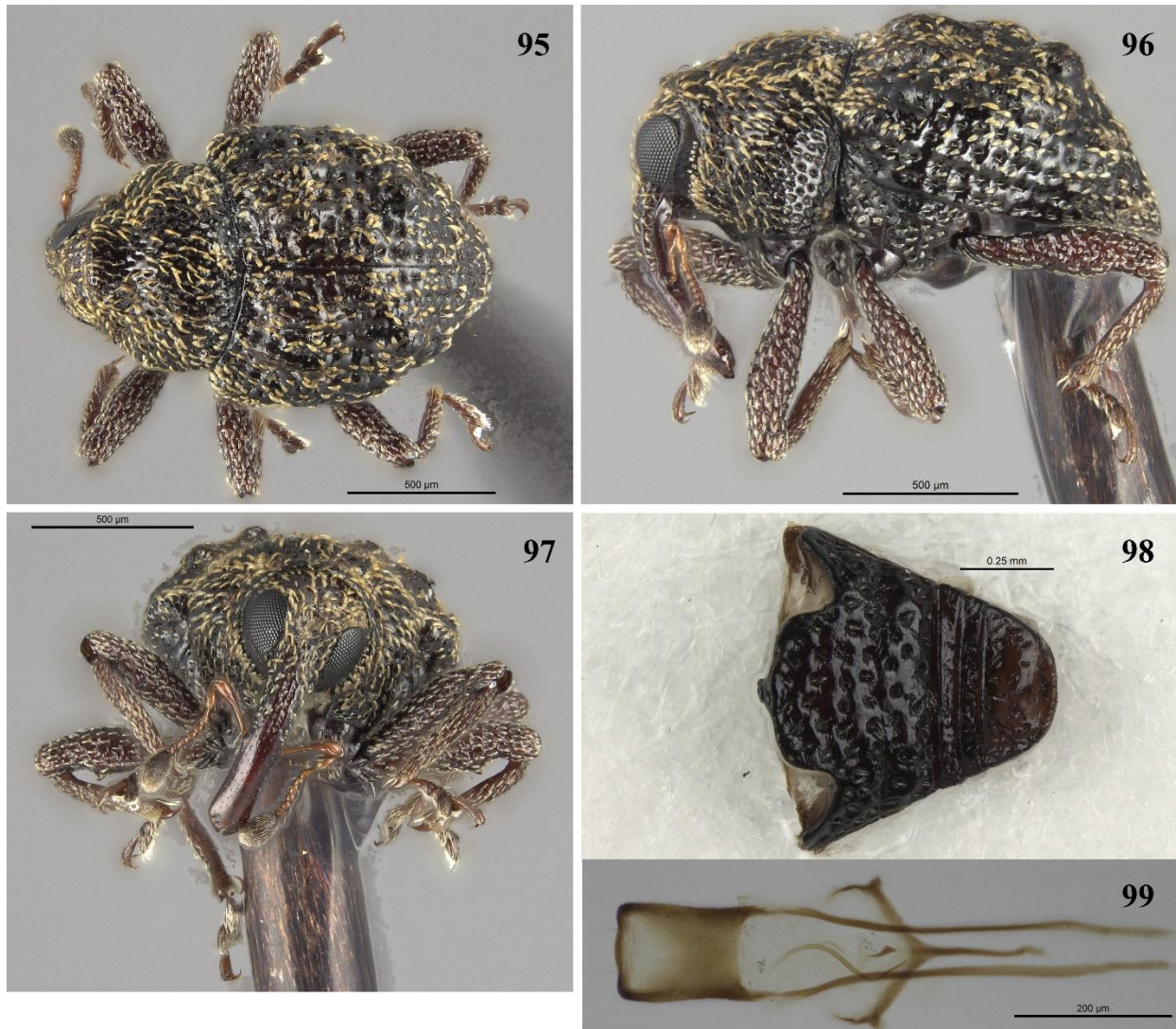
Female. Not known.

Geographic Distribution. Honduras (La Paz).

Derivation of the specific name. Patronym, named after Cirilo Nelson Sutherland, a botanist at Universidad Nacional Autónoma of Honduras.

Material examined. 3♂♂ (CMNC). Holotype ♂ (CMNC): HONDURAS: LA PAZ, Tutule, Res. Biol. Guajiquiro, N14°10' W87°50', 2130m, 7.v.2002, R. Anderson, cloud forest litter, 2002-010 / Holotype ♂ *Plumolepilius nelsonii* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (2♂♂).

Plumolepilius nicaraguensis Barrios-Izás, new species
(Figs. 95–103)



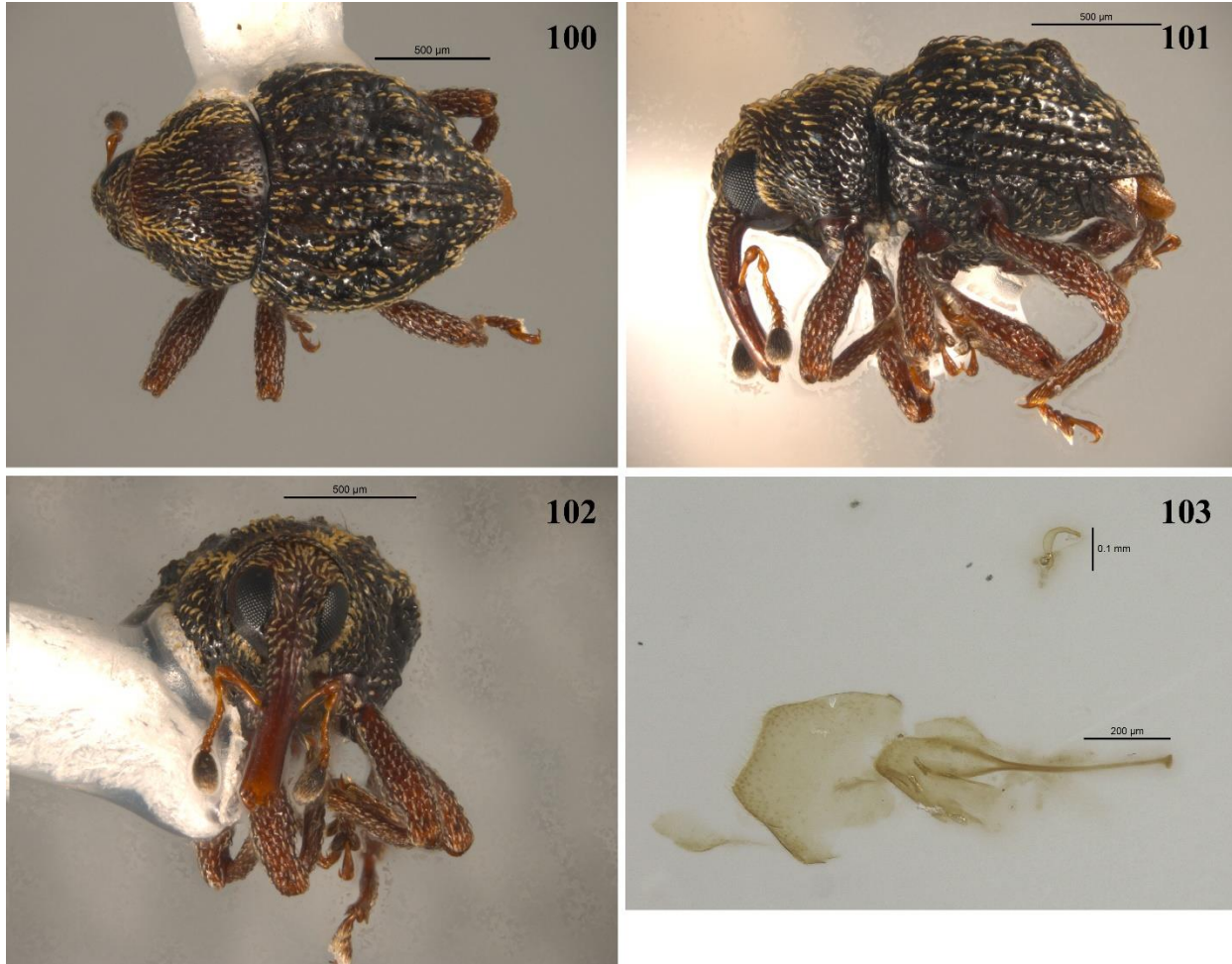
FIGURES 95–99. *Plumolepilius nicaraguensis*. 95, Male dorsal habitus. 96, Male lateral habitus. 97, Male frontal view. 98, Male abdominal ventrites I-V. 99, Male aedeagus dorsal view.

Diagnosis: Male. Length (1.56 – 1.88 mm). Width (1.00 – 1.31 mm). As for *P. hectorii* but cuticle dark brown, vestiture denser, mesanepisternum and mesepimeron with appressed scales, scales denser at head and rostrum reaching antennal insertions, small tubercles before elytral declivity, two small subconical laterally compressed tubercles at base of elytral declivity, humeri produced, abdominal ventrite 2 as broad as abdominal ventrites 3 and 4 together. Aedeagus subpararell, curved in lateral view, anterior border rounded, apex slightly projected, two small setae at both sides of apex, temones 2.6X than pedon, genital sclerite S-shaped, ring of tegmen not sclerotized dorsally.

Female. Length (1.56 – 2.13 mm). Width (1.06 – 1.38 mm). As for the male except cuticle dark brown to yellow, elytral humeri rounded, tubercles smaller, abdominal ventrite 5 without tufts of setae.

Geographic Distribution. Nicaragua (Jinotega).

Derivation of the specific name. Named after the type locality country, Nicaragua.



FIGURES 100–103. *Plumolepilius nicaraguensis*. 100, Female dorsal habitus. 101, Female lateral habitus. 102, Female frontal view. 103, Female genitalia and associated sclerites.

Material examined: 77♂♂76♀♀ (CMNC). Holotype ♂ (CMNC): NICARAGUA: Jinotega, Datanlí El Diablo, 13.109 -85.867 ± 150m, 1440m, 18.V.2011, LLAMA Wm-D-04-1 / WWD0066173 / Holotype ♂ *Plumolepilius nicaraguensis* Barrios-Izás & Anderson sp. nov. Aedeagus extracted. Paratypes: Same data as holotype / WWD0066809 (1♂). WWD0066811 (1♂). Same data except for 13.107 -85.869 ±40m, 1430m, 19.V.2011 / WWD0066844 (1♂). Same data except for 13.107 -85.869 ±40m, 1430m, 19.V.2011 / WWD0066874 (1♀). Same data except for 13.107 -85.869 ±40m, 1430m, 19.V.2011 / WWD0066948 (1♀). Same data except for 13.107 -85.869 ±40m, 1430m, 19.V.2011 / WWD0066967 (1♂). Same data except for 13.118 -85.869 ±20m, 1470m, 19.V.2011 / WWD0066585 (1♀). Same data except for 13.118 -85.869 ±20m, 1470m, 19.V.2011 / WWD0066597 (1♀). Same data except for 13.118 -85.869 ±20m, 1470m,

19.V.2011 / WWD0066603 (1♀). Same data except for 13.118 -85.869 ±20m, 1470m, 19.V.2011 / WWD0066604 (1♂). Same data except for 13.111 -85.867 ±20m, 1430m, 19.V.2011 / WWD0066253 (1♂). WWD0066204 (1♂). Same data except for 13.122 -85.870 ±10m, 1530m, 19.V.2011 / WWD0066388 (1♂). Same data except for 13.122 -85.870 ±10m, 1530m, 19.V.2011 / WWD0066396 (1♀). Same data except for 13.122 -85.870 ±10m, 1530m, 19.V.2011 / WWD0066399 (1♀). Same data except for 13.122 -85.870 ±10m, 1530m, 19.V.2011 / WWD0066418 (1♀). Same data except for 13.122 -85.870 ±10m, 1530m, 19.V.2011 / WWD0066430 (1♀). Same data except for 13.095 -85.858 ±20m, 1310m, 20.V.2011 LLAMA Wm-D-04-2 / WWD0069451 (1♀). Same data except for 13.095 -85.858 ±20m, 1310m, 20.V.2011 WWD0069453 (1♂). Same data except for 13.095 -85.858 ±20m, 1310m, 20.V.2011 / WWD0069462 (1♂). Same data except for ±20m, 19.V.2011 / WWD0066808 (1♀). Same data except for 13.107 -85.868 ±40m, 1450m, 19.V.2011 / WWD0067154 (1♀). Same data except for 13.107 -85.868 ±40m, 1450m, 19.V.2011 / WWD0067168 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.109 -85.867 ± 12m, 1440m, 18.V.2011, LLAMA Wm-D-04-1 / WWD0048769 (1♀). WWD0048870 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.109 -85.867 ± 16m, 1440m, 18.V.2011, LLAMA Wa-D-04-1 / WWD0048697 (1♂). Same data except for ±11m / WWD0048807 (1♂). WWD0048801 (1♂). Same data except for ±13m / WWD0048860 (1♂). Same data except for ±10m / WWD0048954 (1♂). Same data except for ±10m / WWD0048975 (1♂). Same data except for ±10m / WWD0048990 (1♂). Same data except for ±10m / WWD0048997 (1♂). Same data except for ±10m / WWD0048947 (1♂). NICARAGUA: Jinotega, Datanlí El Diablo, 13.103 -85.868 ±10m, 1400m, 18.V.2011, LLAMA Wa-D-04-2 / WWD0049086 (1♂). WWD0049087 (1♂). WWD0049094 (1♂). WWD0049136 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.109 -85.867 ± 10m, 1440m, 18.V.2011, LLAMA Wa-D-04-1 / WWD0048980 (1♀). WWD0048985 (1♀). WWD0049514 (1♀). WWD0049455 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.104 -85.868 ± 10m, 1400m, 18.V.2011, LLAMA Wa-D-04-1 / WWD0049157 (1♀). WWD0049224 (1♀). WWD0049227 (1♀). WWD0049260 (1♀). WWD0049261 (1♀). WWD0049292 (1♀). WWD0049293 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.108 -85.867 ±10m, 1440m, 18.V.2011, LLAMA WA-D-04-1 / WWD0048329 (1♀). WWD0048439 (1♀). WWD0048469 (1♀). WWD0048496 (1♂). WWD0048536 (1♀). WWD0048554 (1♂). WWD0048603 (1♂). WWD0048604 (1♀). WWD0048605 (1♀). WWD0048606 (1♀). WWD0048607 (1♂). WWD0048608 (1♂). WWD0048617 (1♀). NICARAGUA: Jinotega, Datanlí El Diablo, 13.104 -85.867 ±10m, 1400m, 18.V.2011, LLAMA Wa-D-04-2 / WWD0049228 (1♂). WWD0049226 (1♂). WWD0094230 (1♂). WWD0094378 (1♂). Same data except for 13.105 -85.867 / WWD0049457 (1♂). Same data except for 13.105 -85.867 / WWD0049458 (1♂). Same data except for 13.104 -85.867 / WWD0049328 (1♂). NICARAGUA: Jinotega, RN Cerro Musún, 12.970 -85.233 ±20m, 1120m, 2.V.2011, LLAMA Wm-D-01-1 / WWD0061873 (1♂). WWD0062889 (1♂). WWD0062890 (1♂). WWD0063083 (1♂). WWD0063319 (1♂). NICARAGUA: Matagalpa, R.N. El Musun, 5.1km NNW Rio Blanco, 1280m, 12.97722°N 85.23212°W, 11 Oct 2008, M.G. Branstetter, cloud forest, MGB-1177 (1♂). NICARAGUA: Matagalpa, R.N. El Musun, 4.8km NNW Rio Blanco, 1170m, 12.97389°N 85.23380°W, 11 Oct 2008, M.G. Branstetter, mesic forest, MGB-1179 / WWD0015879 (1♀). WWD0015880 (1♂). WWD0015882 (1♂). WWD0015897 (1♀). NICARAGUA: Matagalpa, RN Cerro Musún, 12.97426 -85.23400 ±20m, 1200m, 2.V.2011, LLAMA Wm-D-01-1-05 / WWD0061775 (1♀). WWD0061805 (1♀). Same data except for 12.970 -85.233, 1120m / WWD0063084 (1♀). Same data except for 12.968 -85.233, 1060m / WWD0063163 (1♀). NICARAGUA: MATAGALPA, Reserva Nacional Cerro Musún, 12.96993

-85.23375, 1100m, 02.V.2011, R.S. Anderson 2011-010, wet montane forest, ex. sifted leaf litter / WWD0056117 (1♀). WWD0056118 (1♂). NICARAGUA: MATAGALPA, Reserva Nacional Cerro Musún, 12.97283 -85.23419, 1170m, 02.V.2011, R.S. Anderson 2011-011, wet montane forest, ex. sifted leaf litter / WWD0056071 (1♂). WWD0056086 (1♀). NICARAGUA: MATAGALPA, Reserva Nacional Cerro Musún, 12.97608 -85.23299, 1250m, 02.V.2011, R.S. Anderson 2011-012, wet montane forest, ex. sifted leaf litter / WWD0056292 (1♀). WWD0056296 (1♂). WWD0056321 (1♀). WWD0056324 (1♀). WWD0056334 (1♀). WWD0056395 (1♀). NICARAGUA: Matagalpa, Selva Negra, 9.1km NNE Matagalpa, 1500m, 13.00717°N 85.91000°W, 7 Oct 2008, M.G. Branstetter, cloud forest, MGB-1146 / WWD0015652 (1♀). WWD0015656 (1♀). WWD0015667 (1♂). WWD0015689 (1♀). WWD0015706 (1♀). NICARAGUA: MATAGALPA, 6 km N Matagalpa Selva Negra, 1550m, N12°59.9' W85°54.6', 19.V.2002, R. Anderson, ridge-top cloud for. litter, 2002-024 (11♂♂6♀♀). NICARAGUA: MATAGALPA, 6 km N Matagalpa Selva Negra, 1480m, N12°59.9' W85°54.6', 20.V.2002, R. Anderson, ridge-top cloud for. litter, 2002-025 (12♂♂13♀♀). NICARAGUA: MATAGALPA, 6 km N Matagalpa Selva Negra, 1500m, N12°59.9' W85°54.6', 21.V.2002, R. Anderson, ridge-top cloud for. litter, 2002-026 (4♂♂). NICARAGUA: MATAGALPA, 6 km N Matagalpa Selva Negra, 1450m, N12°59.9' W85°54.6', 21.V.2002, R. Anderson, SUB-ridge-top cloud for. lit, 2002-027 (1♂4♀♀). NICARAGUA: Matagalpa Dept., 6 km N Matagalpa, Selva Negra Hotel, 1400m, 12°59.99'N 85°54.53'W, 19-22-V-2002, R.Brooks, Z.Falin, S. Chatzimanolis ex. flight intercept trap, Fountain of Youth trail, NIC1BFC02 055 (1♂). NICARAGUA: Matagalpa, Fuente Pura, 17.vii.1995, malaise trap, J.M. Maes (1♂1♀). NICARAGUA: Matagalpa, Fuente Pura, malaise trap, vi. 1993, J.M. Maes (4 ♂♂, 13♀♀).

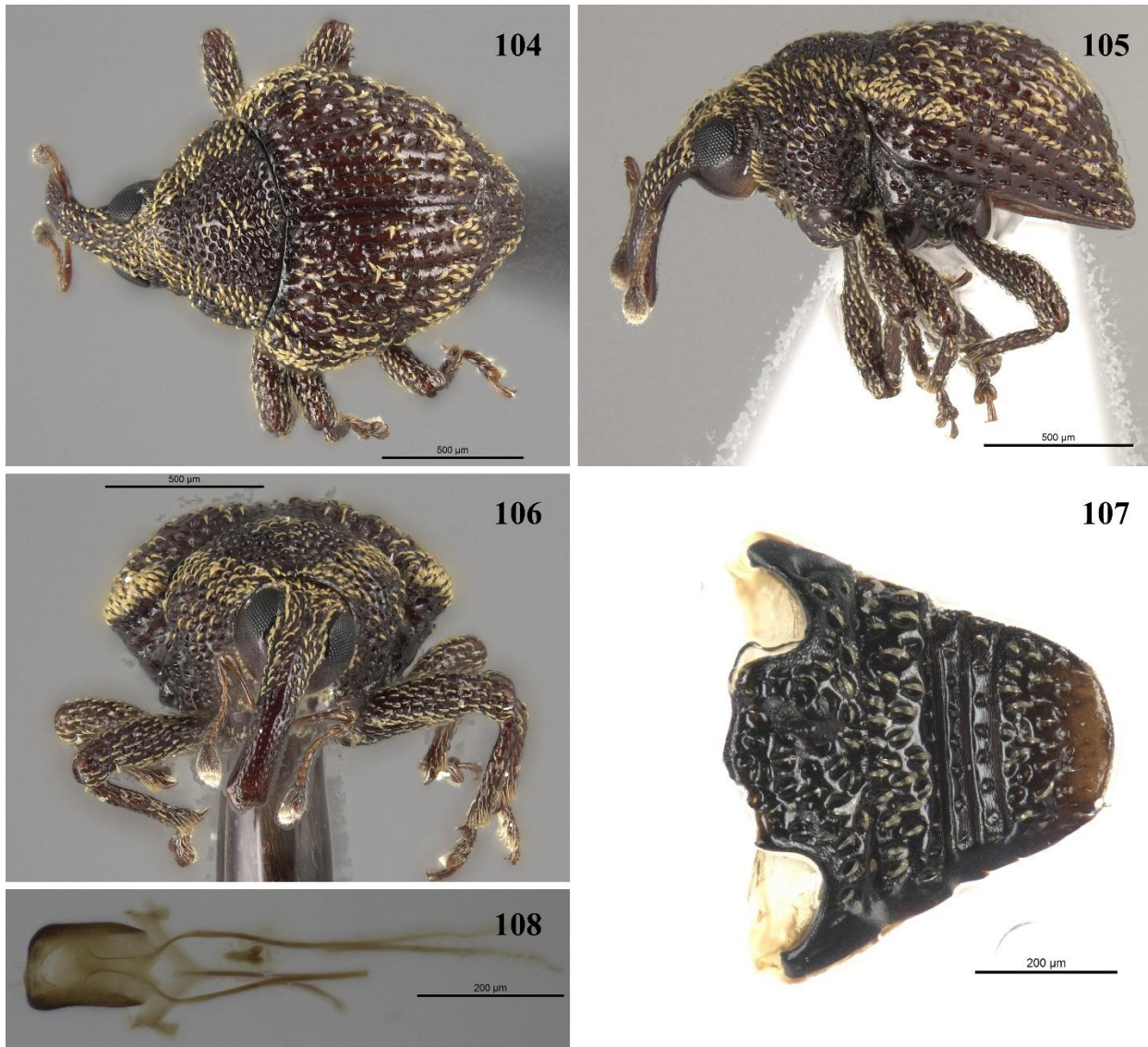
***Plumolepilius obrienorum* Barrios-Izás, new species**
(Figs. 104–112)

Diagnosis: Male. Length (0.81 – 1.81 mm). Width (1.00 – 1.31 mm). Subovate, cuticle orange, elytra dorsum yellowish. Vestiture of recumbent ochreous and brown scales, mesanepisternum and mesepimeron bare, pronotum and elytra flanks almost bare. Rostrum, antenna and scrobes as in *P. velizii*. Pronotum oval, transverse, annulate anteriorly, deeply punctate, two lateral vittae of ochreous scales, spot of ochreous scales medially at base, other scales brown, postocular lobes conspicuous, vibrissae present. Elytra with humeri sharply produced, scales condensed at humeri, punctate-striate, punctures deep, wide and bare, scales only on interstices, tubercles absent. Abdominal ventrites punctate and squamose, ventrites 3 and 4 together as wide as ventrite 2, apex of abdominal ventrite 5 with few setae and smooth, rounded. Metanepisternal suture swollen. Femora armed with small spine, tibiae uncinated, front coxae with plumose scales. Pedon short, curved in lateral view, apex lobed; temones 3.4X longer than pedon; genital sclerite triangular, slightly bifurcated at base.

Female. Length (1.44 – 1.69 mm). Width (0.94 – 1.19 mm). As for the male except cuticle brown, antenna yellow, rostral scales only at base of rostrum, not reaching antennal insertion, punctures shallower than in males, humeri rounded, femora spines not distinguishable, abdominal ventrites completely punctate and setose.

Geographic Distribution. Costa Rica (Guanacaste and Puntarenas).

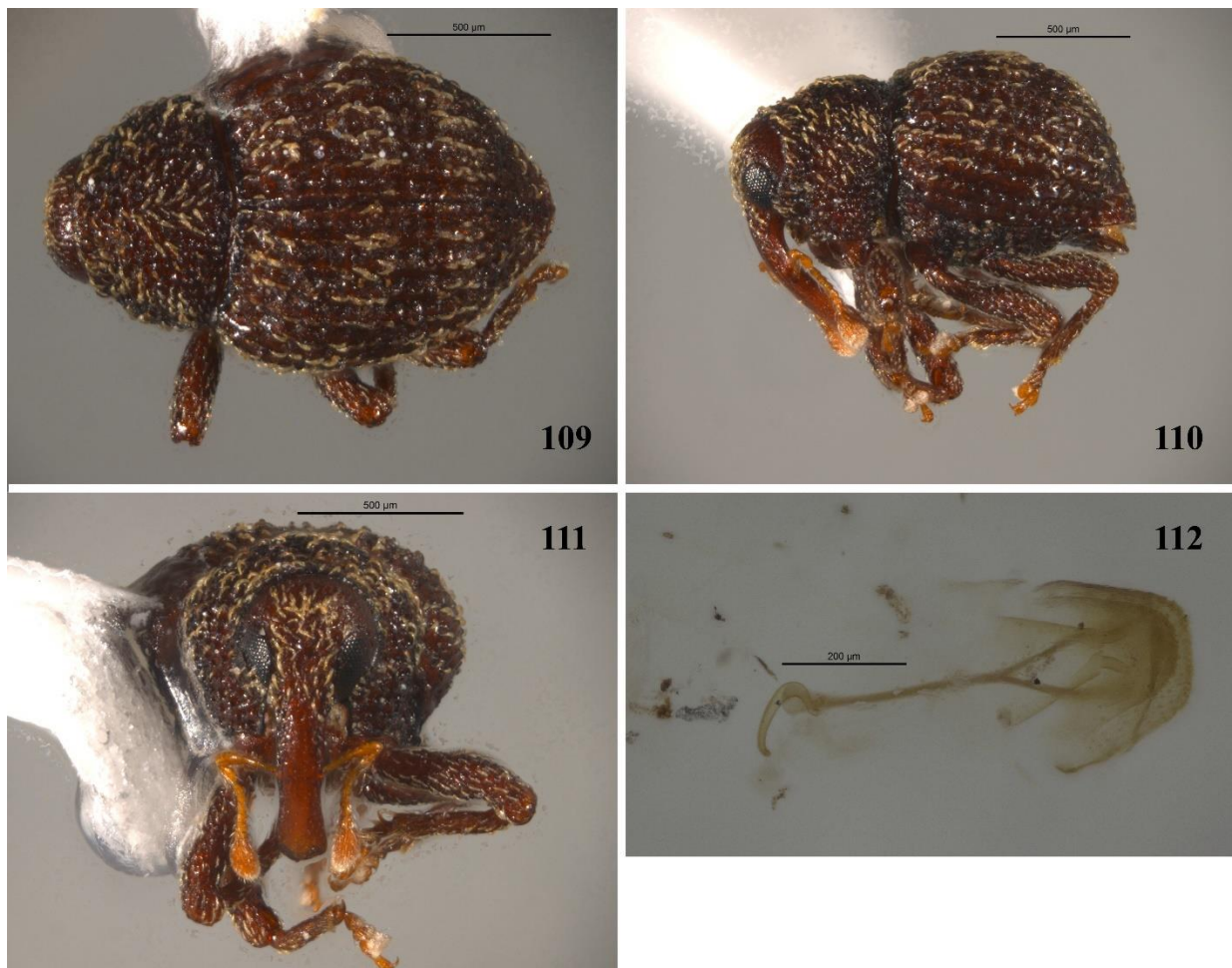
Derivation of the specific name. Patronym, named after Charles W. O'Brien and Lois O'Brien, a weevil and fulgorid taxonomists respectively at The University of Arizona in United States of America.



FIGURES 104–108. *Plumolepilius obrienorum*. 104, Male dorsal habitus. 105, Male lateral habitus. 106, Male frontal view. 107, Male abdominal ventrites I-V. 108, Male aedeagus dorsal view.

Material examined. 57♂♂, 32♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): COSTA RICA: GUANACASTE, Guanacaste Cons. Area, Cacao Field Station, 1150m, 15.II.1996-014, R. Anderson, wet montane forest litter / Holotype ♂ *Plumolepilius obrienorum* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (11♂♂3♀♀). Same data except for 1000m (1♂). Same data except for 1200m, 12.II.1996-006 (3♂♂3♀♀). Same data except for 1250m, 20.II.1996-023 (3♂♂2♀♀). COSTA RICA: GUANAC. Guanacaste Cons. Area, Cacao Field Station, 1100m, 4.V.1995, R. Anderson., mont. Hardwood-cloud for. litt. berl. (24♂♂16♀♀). COSTA RICA: PUNT. Monteverde, 1500m,

23-27.II.1991, H. & A. Howden / Berlesed leaf litter (1♂1♀). COSTA RICA: PUNTARENAS, Monteverde, Estacion Biologica Monteverde, 10°19'40"N 84°49'08"W, 1540m, 9.VI.2001, montane forest litter 2001-101 (2♂♂). Same data except for 11.VI.2001, 2001-106 (1♀). Same data except for 12.VI.2001, 2001-108 (1♀). Same data except for 15.VI.2001, 2001-115 (1♂). Same data except for 16.VI.2001, 2001-117 (4♂♂1♀). COSTA RICA: Punt. Prov. Monte Verde Biol. Sta. 1540m, 10°19.672N 84°49.141W, 10-17.VI.2001, S.&J.Peck, ex. Cloud forest f.i.t, S&JP 2001-9 (1♂). COSTA RICA: Puntarenas, 5km.S.W. Est. Biol. Las Cruces, 1400m, 08°47'13"N 82°59'13"W, 22.vi.1998, R. Anderson, wet cloud forest litter, 98-110 (1♂3♀♀). Same data except for 1425m, 08°46'59"N 82°59'18"W, 98-108 (1♂1♀). COSTA RICA: GUANACASTE, Guanacaste Cons. Area, Maritza Field Station, 875m, 17.II.1996-019, R. Anderson, dry-tropical wet montane forest trans. litter (1♂). COSTA RICA: Puntarenas, Monte Verde, 1280m, 14 May 1989, J. Ashe, R. Brooks, R. Leschen, es., berlese (1♂). COSTA RICA. Puntarenas, Altamira Biological Station, Sendero de los Gigantes del Bosque, 9 02'N, 83 01'W, 1400m, 1.vi.2007, M.G. Branstetter, MGB-588, primary premonate rain forest leaf litter (1 male) / WWD0128110 (1♂).



FIGURES 109–112. *Plumolepilius obrienorum*. 109, Female dorsal habitus. 110, Female lateral habitus. 111, Female frontal view. 112, Female genitalia and associated sclerites.

***Plumolepilius solisii* Barrios-Izás, new species**
(Figs. 113–122)

Diagnosis: Male. Length (1.50 – 1.81 mm). Width (1.00 – 1.31 mm). Subovate, cuticle orange, legs, antenna and apex of rostrum yellow. Vestiture of ochreous to brown scales, recumbent and appressed, mesanepisternum and mesepimeron bearing appressed scales. Rostrum, antenna and scrobes as in *P. velizii*. Pronotum oval, transverse, annulate anteriorly, punctate, three dorsal vittae of ochreous scales, other scales brown, postocular lobes, postocular lobe with vibrissae. Elytral with humeri produced, in some males enlarged as wing-like shape, tubercles several within base of elytra to base of elytral declivity, two subconical tubercles at base of elytral declivity, punctate-striate, punctures deep, slightly compressed laterally. Abdominal ventrites punctates, punctures with setae, abdominal ventrite 2 as large as abdominal ventrites 3 and 4, ventrite 5 without tufts of setae or at least not evident, apex rounded. Metanepisternal suture swollen. Femora unarmed, tibiae uncinated, pro- and mesocoxae with plumose scales. Pedon subparallel, moderately curved in lateral view; temones 3.1X longer than pedon; anterior genital sclerite short, strong, with two anterior claw like projections, posterior genital sclerite flagellate.

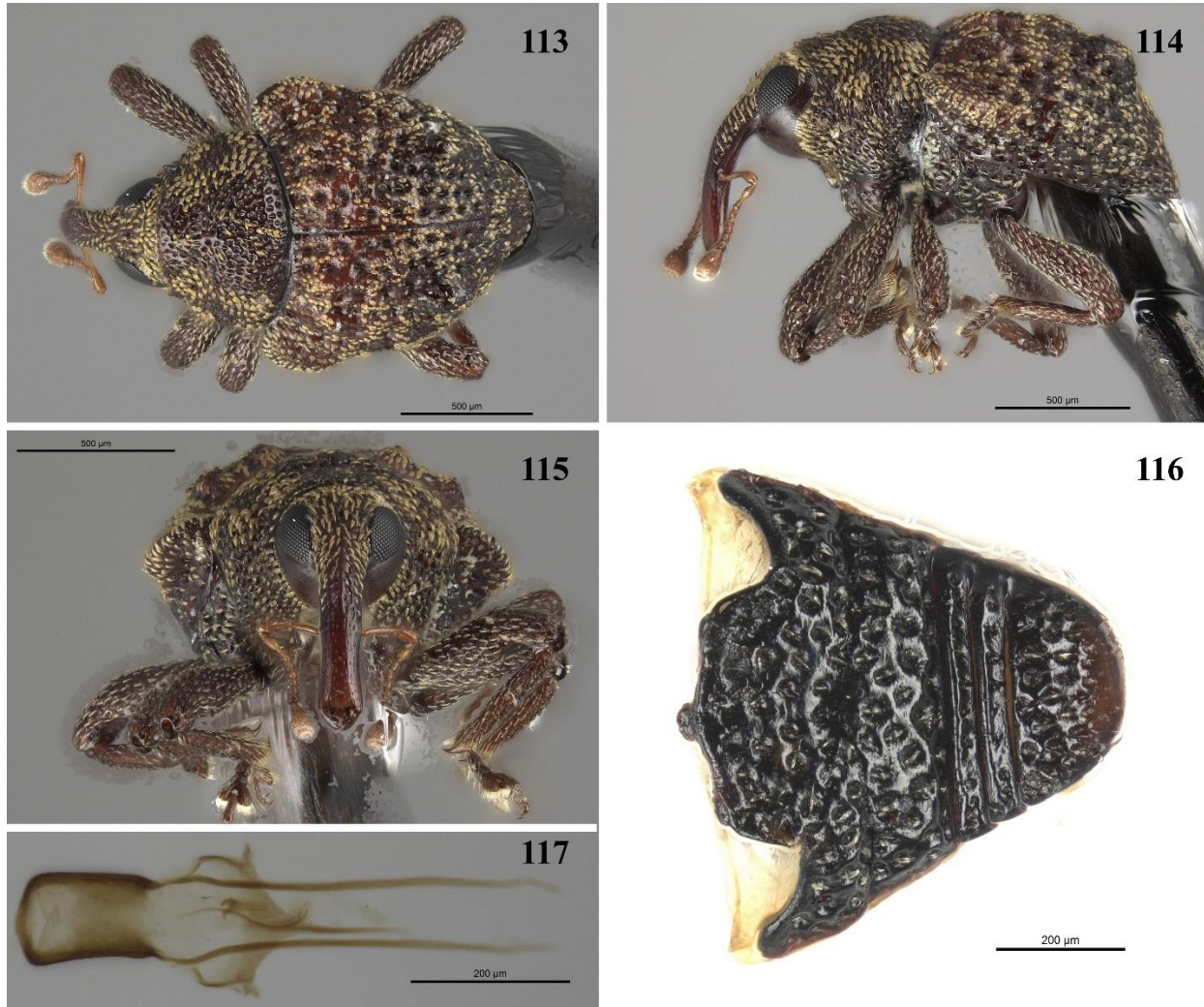
Female. Length (1.75 – 2.06 mm). Width (1.00 – 1.25 mm). As for the male except humeri sharply pointed but not wing-like, rostral scales only at base not reaching antennal insertions, tubercles smaller.

Geographic Distribution. Costa Rica (Heredia, Monteverde and Puntarenas).

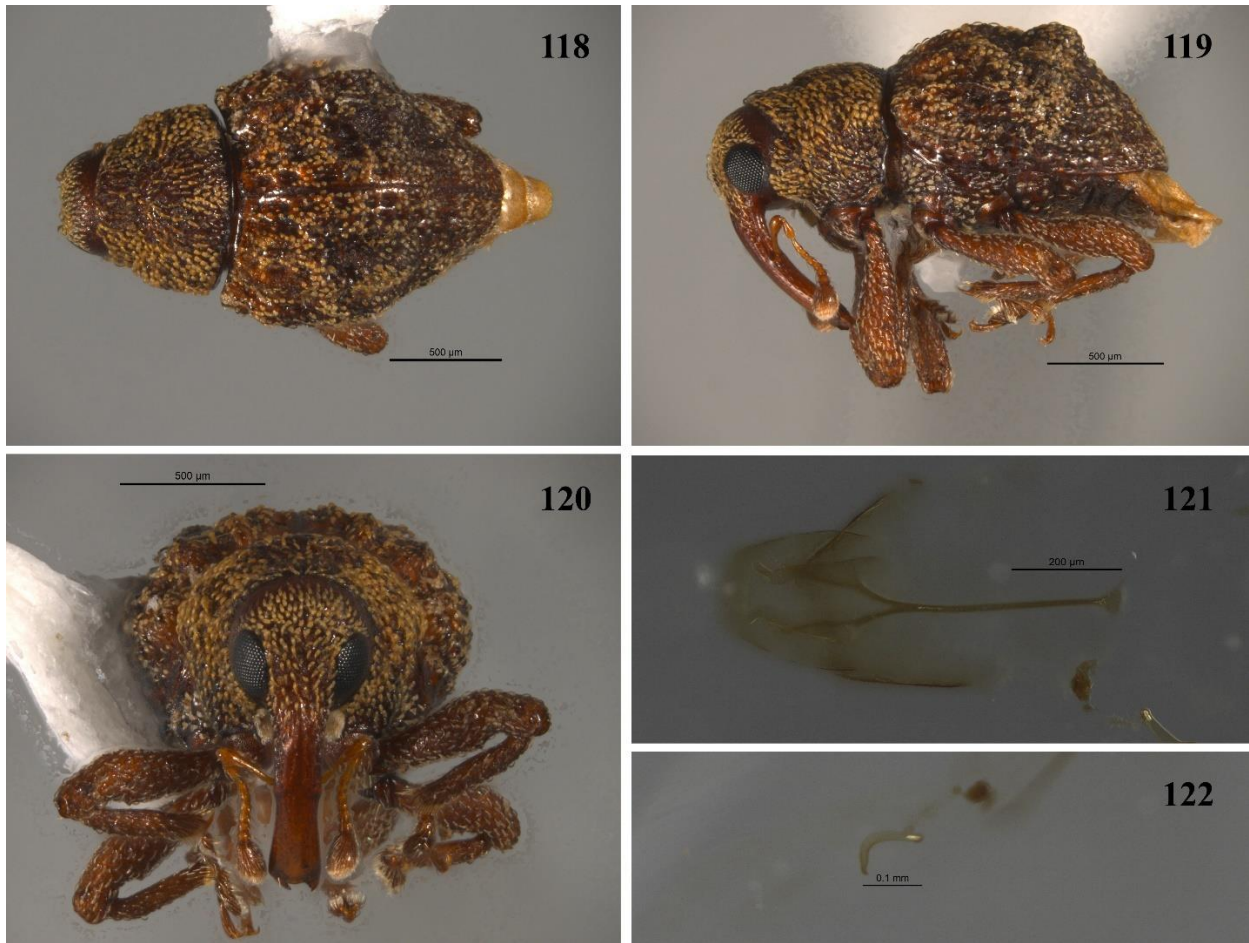
Derivation of the specific name. Patronym, named after Angel Solís, a scarabaeidologist at the National Museum of Costa Rica.

Material examined: 29♂♂, 32♀♀ (ASUHC, CMNC, CWOB, BMNH, USNM, UZAC). Holotype ♂ (CMNC): COSTA RICA: PUNTARENAS, Monteverde, Estacion Biologica Monteverde, 10°19'10"N 84°48'57"W, 1800m, 13.VI.2001, R. Anderson, cloud forest litter, 2001-109C / Holotype ♂ *Plumolepilius solisii* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: Same data as holotype except for 10°19'40"N 84°49'08"W, 1540m, 12.VI.2001, montane forest litter 2001-108 (2♂♂1♀). Same data except for 10°19'40"N 84°49'08"W, 1540m, 15.VI.2001, montane forest litter 2001-115 (1♀). Same data except for 10°19'40"N 84°49'08"W, 1540m, 11.VI.2001, montane forest litter 2001-106 excess (1♀). COSTA RICA: PUNTARENAS, Monteverde, Bajo del Tigre, 10°17'55"N 84°48'43"W, 1380m, 11.VI.2001, R. Anderson, montane forest litter, 2001-105 (3♀♀). COSTA RICA: Punt. Monteverde, 1400m, 31 May 1979, H & A Howden (1♀). COSTA RICA: Punt. Monteverde, 1500m, 23-27.II.1991, H. & A. Howden / Berlesed leaf litter (1♀). COSTA RICA: PUNT. Monteverde, 29.V.1987. J.S. Ashe & R.M. Timm, berlese sifted litter (1♂). Same data except for 6.VI.1987 (1♀). Same data except for 1400', 26.V.1987, fungus log lit (1♂). Same date except for 1520m, 30.IV.1986, sifted forest litter (2♂♂5♀♀). COSTA RICA: Puntarenas, Monte Verde, 1400m, 7 May 1989, J. Ashe, R. Brooks, R. Leschen / Snow Entomol. Mus. Costa Rica Exped#056 (5♂♂4♀♀). Same data except for 1240m, 10 May 1989 (1♂). Same data except for 1280m, 14 May 1989 (1♀). Same data except for 1280m, 14 May 1989, ex., berlese (5♂♂2♀♀). Same data except for 1400m, 5 May 1989, ex., berlese (1♀). COSTA RICA: Punt. Prov. Monte Verde Biol. Sta. 1540m, 10°19.672N 84°49.141W, 10-17.VI.2001, S.&J.Peck, ex. Cloud forest f.i.t, S&JP 2001-9 (2♀♀). COSTA RICA, 1520m, Monteverde, 16.VII.1983 D.H. Lindeman (1♀). COSTA RICA: 1450m, Monteverde, Pit Tp. Campbell's bull pen, 16-18.VII.1983, D.H. Lindeman (1♀). COSTA RICA:

Monteverde, 10 unbaited pit traps, 3.VII.1983, D.H. Lindeman (1♀). COSTA RICA: Heredia, 2km.N. Frijanes 1700m 10°10'N, 84°12'30W, 28.VI.1997, R.S. Anderson, mixed. Ficus. litt, 97-041 (9♂♂3♀♀). COSTA RICA: Heredia, Porrosati, 6km.N.San Jose de la Montana, 1900m 10°05'30"N 84°07'W, 27.VI.1997, R.S. Anderson, montane for litt. 97-039 (2♂♂2♀♀).



FIGURES 113–117. *Plumolepilius solisii*. 113, Male dorsal habitus. 114, Male lateral habitus. 115, Male frontal view. 116, Male abdominal ventrites I-V. 117, Male aedeagus dorsal view.



FIGURES 118–122. *Plumolepilius solisii*. 118, Female dorsal habitus. 119, Female lateral habitus. 120, Female frontal view. 121, Female genitalia and associated sclerites. 122, Spermatheca.

***Plumolepilius velizii* Barrios-Izás, new species**
(Figs. 123–131)

Diagnosis: Male. Length (1.50 – 2.00 mm). Width (0.87 – 1.44 mm). Subovate; cuticle dark brown, legs, apex of rostrum, scape and funiculus orange. Vestiture of recumbent ochreous to brown scales, appressed in mesanepisternum and mesepimeron. Head and rostrum up to antennal insertion covered with scales, dorsal surface of basal half of rostrum rugose, apical half finely punctated with sparse setae; scrobes lateroventral, reaching the margin of eyes, antenna inserted in middle of rostrum, scape clavate, as long as desmomer 1 to 3 together, desmomer 1 and 2 subequal in length, twice as long as desmomer 3 to 7 separately, antennal club setose. Pronotum oval, transverse, annulate in anterior margin, deeply punctate, narrower than elytra; postocular lobes present, bearing vibrissae. Elytra with humeri laterally produced, punctate-striate, basal half with several scabrous tubercles, base of declivity with two big tubercles at interstice 4, stria 10 complete. Abdominal ventrites punctate, abdominal ventrite 1 and 2 fused on disk, abdominal ventrites 3 and 4 together shorter than abdominal ventrite 2, apex of abdominal ventrite 5 rounded, depressed and smooth. Metanepisternal suture swollen. Femora armed with small spine, tibiae

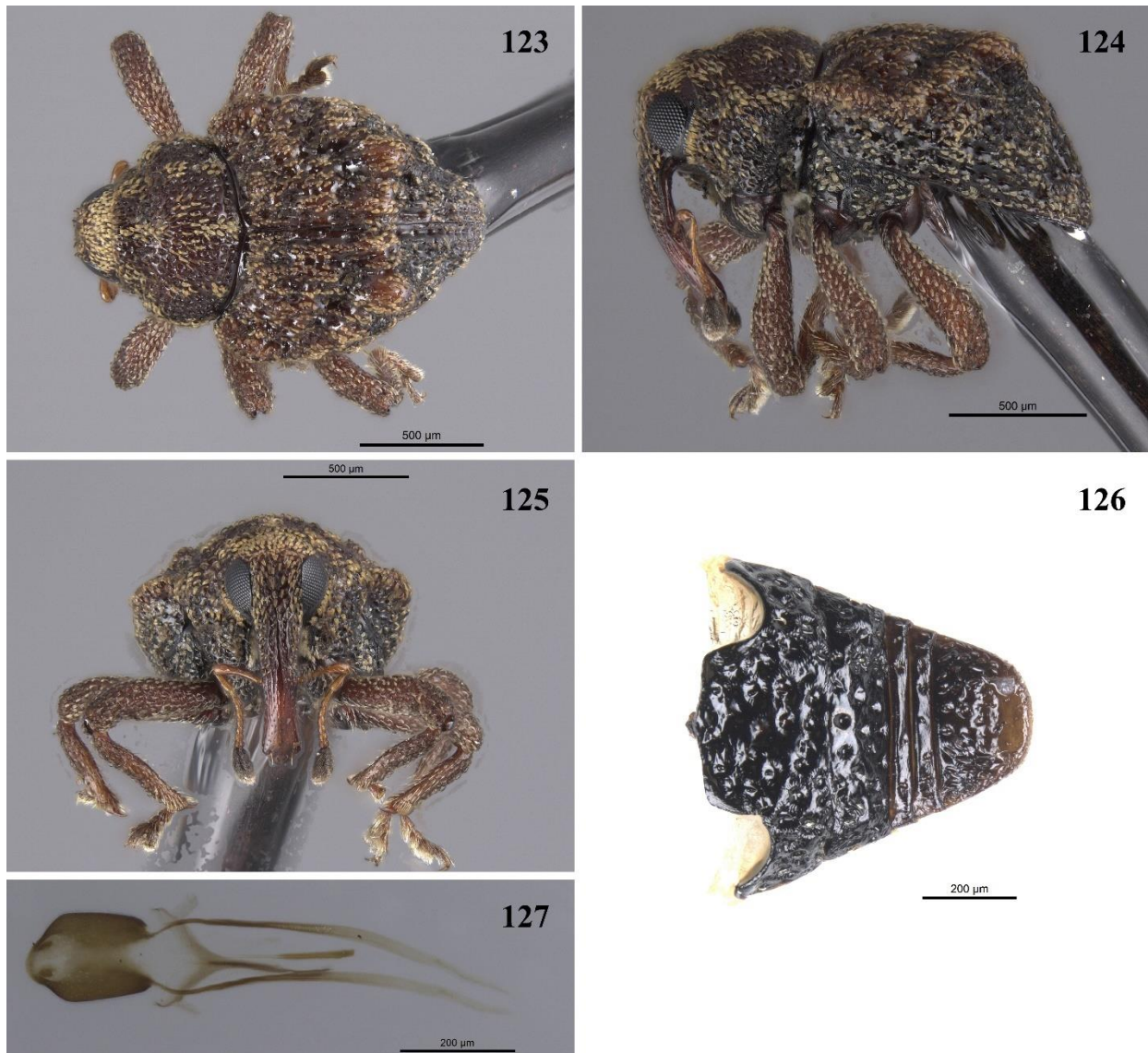
uncinated. Pedon short, strong, 1.3X longer than wider, apex triangular, rounded at tip; temones 3.1X longer than pedon; genital sclerite thin, elongate, as long as manubrium or longer.

Female. Length (1.62 – 2.30 mm). Width (1.00 – 1.50 mm). As for the male except body tinged with brown, red and yellow; rostrum bare beyond the basal 1/8; elytral humeri rounded, tubercles smaller.

Geographic Distribution. Honduras (El Paraíso and Francisco Morazán).

Derivation of the specific name. Patronym, named after Mario E. Veliz, a botanist at San Carlos University, Guatemala City, Guatemala.

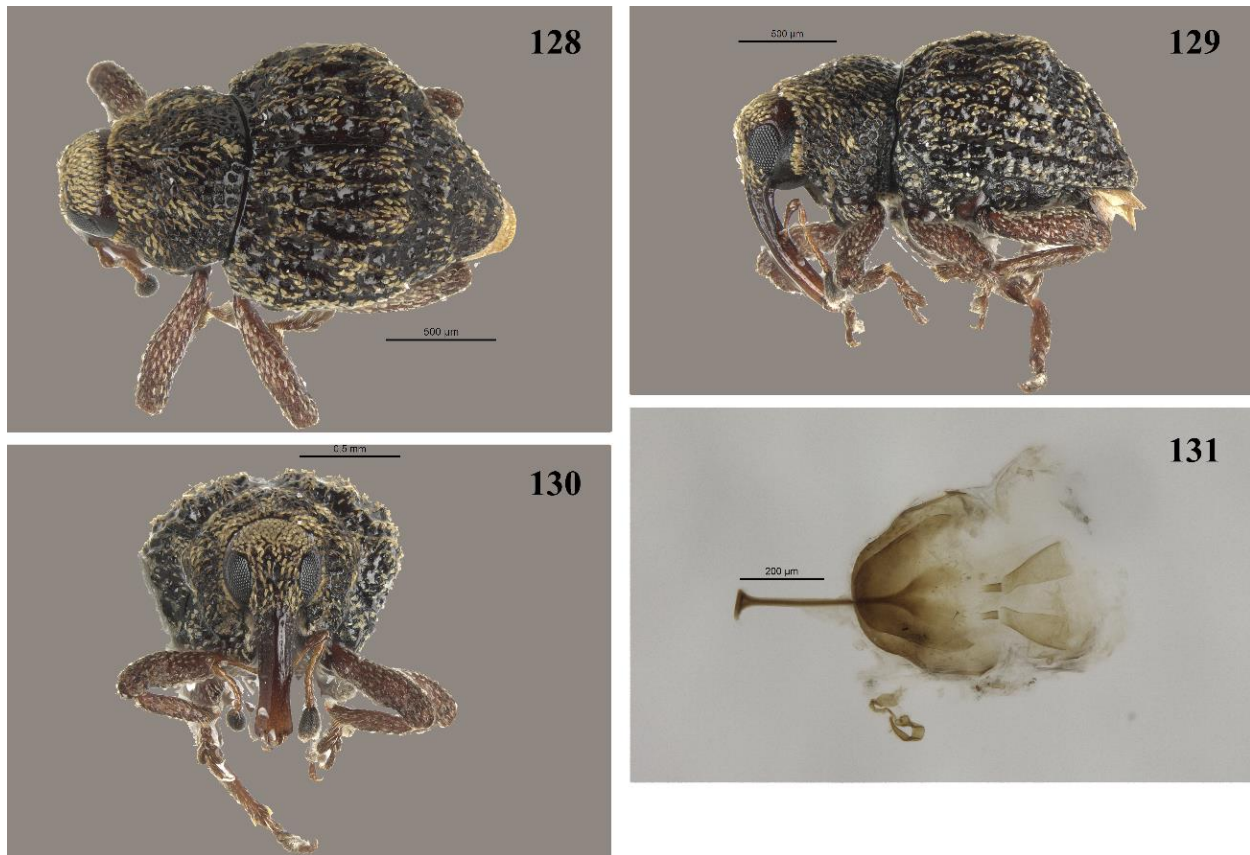
Material examined: 191♂♂, 170♀♀ (ASUHC, CMNC, CWOB, MNCN, BMNH, USNM, UZAC). Holotype ♂ (CMNC): HONDURAS: FRANC. MOR. Cerro Uyuca, ca. 10km.W.Zamorano, 6.VI.1994-101, 1840-1910m, R. Anderson, cloud forest litter berlese / Holotype ♂ *Plumolepilius velizii* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (13♂♂ 12♀♀). Same data except for 27.VI.1994-135, 1840m (4♂♂2♀♀). HONDURAS: El Par., 19km. NW. El Zamorano, July28, 1977 C.W. O'Brien & Marshall (2♂♂1♀, CWOB). HONDURAS: FRANC. MOR. P.N. La Tigra, 23.2km N. Tegucigalpa, 1950m., 29.VI.1994-139, R. Anderson, oak cloud forest litt. berl. (34♂♂37♀♀). Same data except for 21.6km 15.VIII.1994-203A, oak forest litter berlese (2♀♀). HONDURAS: F. Morazan, La Tigra NP, 23.2km N Tegucigalpa, 2100m, 7.VI.1994, R. Anderson, cloud-forest litter, ex:berl., 94 (9♂♂3♀♀). HONDURAS: F. Morazan, La Tigra NP, 23km N Tegucigalpa, Esperanza Trail, 2100m, 15.VIII.1994, S. Peck, wet cloud forest litter, 94-30 (2♀♀). HONDURAS: FRANC. MOR. Cerro Uyuca, ca. 10km W. Zamorano, 1840m, 30.VI.1994-140, R. Anderson, cloud forest litter berlese (3♂♂10♀♀). Same data except for 9.VI.1994-105 (7♂♂5♀♀). Same data except for cloud for., beat dead branches (1♂). HONDURAS: FRANC. MOR. P. N. La Tigra, 23.2km. N. Tegucigalpa, 1910m., 7.VI.1994-104. R. Anderson oak forest litter berlese (12♂♂). Same data except for 2100m (39♂♂25♀♀). HONDURAS: F. Morazan, La Tigra NP, 23.2km N Tegucigalpa, 2100m, 8.VI.1994, R. Anderson, cloud-forest litter, ex:berl., 94-104 (6♀♀). HONDURAS: Francisco Morazan, Reserva Uyuca, 4.9km WNW Zamorano, 1840m, 14.02821°N 87.07208°W,



FIGURES 123–127. *Plumolepilius velizii*. 123, Male dorsal habitus. 124, Male lateral habitus. 125, Male frontal view. 126, Male abdominal ventrites I-V. 127, Male aedeagus dorsal view.

24 Sept 2008, M.G. Branstetter, cloud forest MGB-1036 (2♂♂3♀♀). HONDURAS: Francisco Morazan, Reserva Uyuca, 4.9km WNW Zamorano, 1850m, 14.02796°N 87.07139°W, 24 Sept 2008, M.G. Branstetter, cloud forest MGB-1037 (5♂♂4♀♀). Same data and also WWD0014052 (1♀). HONDURAS: Francisco Morazan, Reserva Uyuca, 4.8km WNW Zamorano, 1900m, 14.02695°N 87.07077°W, 24 Sept 2008, M.G. Branstetter, oak forest MGB-1043 (1♀). HONDURAS: Francisco Morazan, P.N. La Tigra, 2.6km SE San Juancito, 1870m, 14.21778°N 87.09101°W, 25 Sept 2008, M.G. Branstetter, mesic forest MGB-1047 (13♂♂7♀♀). HONDURAS: Francisco Morazan, P.N. La Tigra, 3.2km SE San Juancito, 1850m, 14.21145°N 87.09328°W, 25 Sept 2008, M.G. Branstetter, mesic forest MGB-1050 (13♂♂5♀♀). HONDURAS: Francisco Morazan, P.N. La Tigra, 3.6km SE San Juancito, 1830m, 14.20731°N 87.09428°W, 25 Sept 2008, M.G. Branstetter, mesic forest MGB-1051 (7♂♂13♀♀). HONDURAS: FRANC. MOR. P.N. La Tigra, 22.2km. N. Tegucigalpa, 15.VIII.1994-202, 2030m,

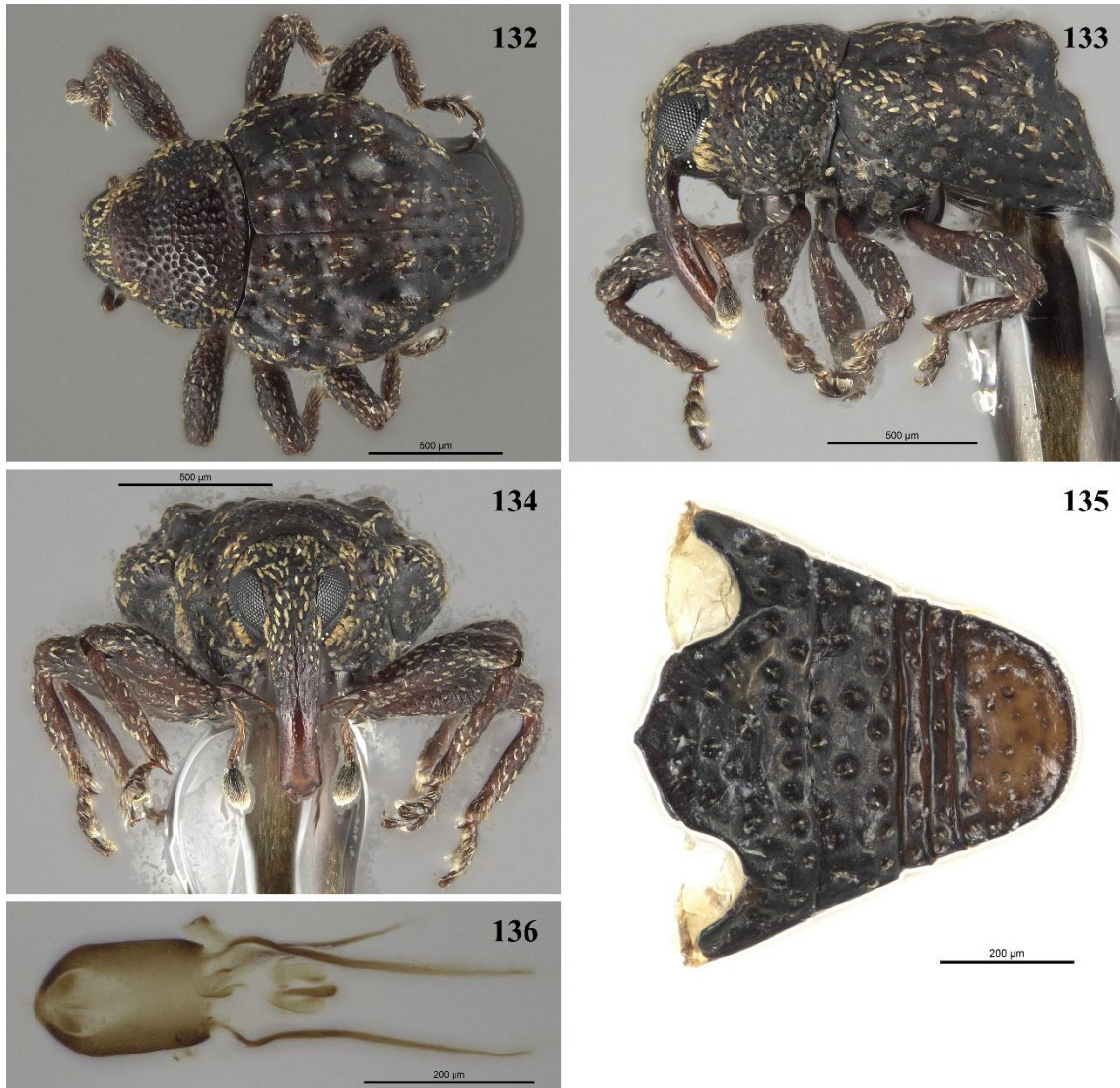
R. Anderson, transition cloud forest litter berlese (2♂♂4♀♀). Same data except for 23.2km, 15.VIII.1994-201, 2100m, cloud forest litter berlese (23♂♂22♀♀). HONDURAS: F. Morazan, La Tigra NP, 22.2km N Tegucigalpa, 2030m, 15.VIII.1994, R. Anderson, transition cloud forest litter berlese, ex: berl. 94-202 (3♀♀). Same data except for 23.2km N, Tegucigalpa, 2100m, 15.VIII.1994, R. Anderson, cloud-forest litter, ex: berl., 94-201 (2♀♀). HONDURAS: Fran. Morazan, Cerro Uyuca, ca. 10km.W. Zamorano, 10-27.VI.1994-#218, 1870m, Ashe & Brooks, cloud forest FIT (1♂). Same data except for 6-9.VI.1994-#49 (1♀).



FIGURES 128–131. *Plumolepilius velizii*. 128, Female dorsal habitus. 129, Female lateral habitus. 130, Female frontal view. 131, Female genitalia and associated sclerites.

***Plumolepilius zarazagai* Barrios-Izás, new species
(Figs. 136–145)**

Diagnosis: Male. Length (1.75 – 2.06 mm). Width (1.12 – 1.44 mm). As for *P. morronei* but antenna brown with yellow funicle. Pronotum subquadrate, annulated anteriorly, not widened laterally at middle, punctures not as deep and wide, medial vittae absent or incomplete, lateral vittae complete or incomplete. Femora unarmed. Aedeagus subpararell, curved in lateral view, anterior border triangular, small setae at apex, temones 2.64X than pedon, first genital sclerite u-shaped, second genital sclerite sting-shaped laying on a plate.



FIGURES 132–136. *Plumolepilius zarazagai*. 132, Male dorsal habitus. 133, Male lateral habitus. 134, Male frontal view. 135, Male abdominal ventrites I-V. 136, Male aedeagus dorsal view.

Female. Length (1.75 – 1.88 mm). Width (1.06 – 1.31 mm). As for the male except body globose, elytral humeri almost rounded, tubercles smaller, rostral scales not reaching antennal insertions.

Geographic Distribution. Honduras (Lempira).

Derivation of the specific name. Patronym, named after Miguel Ángel Alonso Zarazaga, a weevil entomologist at Museo Nacional de Ciencias Naturales, Spain.

Material examined: 9♂♂, 6♀♀ (CMNC). Holotype ♂ (CMNC): HONDURAS: Lempira Dept. P. N. Celaque, nr. Gracias Campamiento Naranjo, 2500m, N14°32.7' W88°39.7', 12-13.V.2002, R. Anderson, cloud forest litter, 2002-20 / Holotype ♂ *Plumolepilius zarazagai* Barrios-Izás sp. nov. Aedeagus extracted. Paratypes: same data as holotype (8♂♂5♀♀, CMNC). HONDURAS: Lempira, P. N. Celaque, 8.7km SW Gracias, 2100m, 14.55877°N 88.66117°W, 30 Sept 2008, M.G. Branstetter, pine/oak/cloud forest, MGB-1109 (1♀, CMNC).



FIGURES 137–141. *Plumolepilius zarazagai*. 137, Female dorsal habitus. 138, Female lateral habitus. 139, Female frontal view. 140, Female genitalia and associated sclerites. 141, Spermatheca.

ACKNOWLEDGEMENTS

Thanks to the Posgrado en Ciencias Biológicas from Universidad Nacional Autónoma de México. I am very grateful with Juan Jose Morrone from Universidad Nacional Autónoma de México and Robert S. Anderson the Canadian Museum of Nature for their revisions, recommendation and support during the completion of this paper. To Santiago Zaragoza from the Instituto de Biología, Universidad Nacional Autónoma de México, Sergio Melgar from Universidad de San Carlos de Guatemala and Jack Schuster from the Universidad del Valle de Guatemala for their advisory help. To Roxana Acosta and Fabiola Corona from the Universidad Nacional Autónoma de México, Gene Hall and Wendy Moore from the University of Arizona, Tucson for hosting me at their labs during the different phases of this study. To François Génier (Collection Manager at Insect Collection of the Canadian Museum of Nature) and Susana Guzmán (photography technician, Instituto de Biología of Universidad Nacional Autónoma de México), for their assistance with digital imagery. To Carlos Vargas Gálvez Axel Popol Oliva and Carlos Alvarado Cerezo from Universidad de San Carlos de Guatemala and to Ángel Cordón from Universidad Rafael Landívar for their support during the completion of this paper. I also appreciate the financial support of Ernst

Mayr Grants from the Museum of Comparative Zoology of Harvard University during my visit to the Canadian Museum of Nature.

LITERATURE CITED

Anderson, R.S. (2012) The genus *Lepilius* Champion (Coleoptera: Curculionidae: Molytinae: Conotrachelini) in North America, with description of a new species, *Lepilius chisosensis* Anderson, from Big Bend National Park, Texas, U.S.A. *The Coleopterists Bulletin*, 66(1), 67-69.

Anderson, W.H. (1952) Larvae of some genera of Cossoninae (Coleoptera: Curculionidae). *Annals of the Entomological Society of America*, 45(2), 281-309.

Barrios-Izás, M.A., Anderson, R.S. and Morrone, J.J. (2016) A taxonomic monograph of the leaf-litter inhabiting weevil genus *Plumolepilius* new genus (Coleoptera: Curculionidae: Molytinae: Conotrachelini) from Mexico, Guatemala, and El Salvador. *Zootaxa*, 4168(1), 061-091.

Morrone, J.J. (2014) Biogeographical regionalization of the neotropical region. *Zootaxa*, 3782(1), 1-110.

Oberprieler, R.G., Anderson, R.S. and Marvaldi, A.E. (2014) 3 Curculionoidea Latreille, 1802: Introduction, Phylogeny. In: Handbook of Zoology (Kristensen, N.P. and Beutel, R.G.).

Capítulo 3. Artículo: Barrios-Izás, M.A. y Morrone, J.J. Systematics and biogeography of the New World genus *Plumolepilius* Barrios-Izás & Anderson (Curculionidae: Molytinae: Conotrachelini)

Systematics and biogeography of the New World genus *Plumolepilius* Barrios-Izás et Anderson (Curculionidae: Molytinae: Conotrachelini)

MANUEL A. BARRIOS-IZÁS^{1,2} & JUAN J. MORRONE¹

¹Museo de Zoología “Alfonso L. Herrera”, Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México, 04510 Mexico City, Mexico. E-mail: manuelbarriosgt@gmail.com, juanmorrone2001@yahoo.com.mx

²Centro Universitario de Zacapa (CUNZAC) – Centro de Estudios Conservacionistas (CECON-CDC), Universidad de San Carlos de Guatemala, Ciudad Universitaria, Barrio La Laguna, Zacapa, Guatemala.

Abstract

Plumolepilius Barrios-Izás & Anderson is a leaf litter weevil genus that inhabits montane broadleaf forests from southern Mexico to northern Panama. The genus consists of 25 species, 20 species are distributed in the Chiapas Highland province and five species in the Pacific dominion (Costa Rica and Panama). Here we analyze the phylogenetic relationships of the genus. Two main clades were resolved: one including two species from the Pacific dominion and another including all the species from the Chiapas Highlands and three species restricted to the Pacific dominion. We hypothesize that this redundant distributional pattern could be due dispersion processes, probably during the Pleistocene glaciations.

Introduction

Plumolepilius Barrios-Izás & Anderson 2016 (Curculionidae: Molytinae: Conotrachelini) is a leaf litter weevil genus from southern Mexico and Central America, that comprises at least 25 known species, and that based on a preliminary cladistic analysis has proved to be monophyletic taxon (Barrios-Izás et al. 2016). The genus distribution ranges from southern Mexico through Central America up to northern Panama, within the Mexican Transition Zone (Chiapas Highland province), the Mesoamerican dominion (Pacific Lowlands province) and the Pacific dominion (Puntarenas-Chiriquí province; *sensu* Morrone 2014), through a range of about 8° of latitude. *Plumolepilius* species are mostly found in montane broadleaf humid forests, approximately between 1,400 and 2,800 masl. All species of *Plumolepilius* have low dispersal capacities showing troglobiomorphic adaptations such as the absence of hind wings, fused elytra, scutellum absent and reduced metasternum.

The dispersal-vicariance model has been proposed as one of the main hypotheses for explaining the evolution of the montane fauna of Central America (MacVean and Schuster 1981). Pleistocene glaciations have played an important role in the distribution of biodiversity by expanding and contracting vegetation (Hooghiemstra and van der Hammen, 1998; Haffer, 1969). It has been demonstrated that during glacial periods humid montane neotropical forest migrated to lower altitudes allowing the migration of species, whereas in warmer periods humid forests contracted to upper altitudes leaving species isolated (Urrego *et al.*, 2016).

Our aims are to determine the phylogenetic relationships of the species of *Plumolepilius* and to propose a biogeographic hypothesis.

Material and methods

All known species of *Plumolepilius* were included in the phylogenetic analysis. Specimens are stored at the Insect Collection of the Canadian Museum of Nature (CMN). *Lepilius pulchellus* Champion 1905 (Charles W. O'Brien Collection), *Lepilius chisosensis* Anderson 2010 (Museo de Zoología "Alfonso L. Herrera", Insect Collection) and two undescribed species of *Lepilius* from Honduras and El Salvador (CMN) were used as outgroups.

Specimens were relaxed by immersion in hot water with a solution of soap (Lactacyd FEMINA, Sanofi®) during 15-20 minutes. Abdominal ventrites were removed from the abdomen together with the alimentary canal, genitalia and fat and muscular tissues. The body was washed with water, then in a solution of ethanol (95%), air dried and double pin mounted. Fat and muscular tissues from abdominal content were cleared by immersion in a warm solution of KOH (10%) during 30-60 minutes. After clearing abdominal structures were washed in water and ethanol (95%) for removing the KOH. Abdominal ventrites were mounted in a card and pin mounted together with the specimen. Male and female genitalia and associated sternites were mounted in slides using 5,5-dimethyl hydantoin formaldehyde (DMHF; Steedman 1958).

We assembled a data matrix (Table 1) we used 20 external body characters and 9 characters from male and female genitalia. Multistate characters 10, 11, 19, 26, 27 and 28 were treated as additive. Characters and their states are described below:

Body

1. Body shape: 0. Ovate, 1. Subovate, 2. Romboid, 3. Elongate-ovate.

Thorax

2. Spines on legs: 0. Absent, 1. Present.
3. Lateral expansions of pronotum contiguous with humeri: 0. Absent, 1. Present.
4. Orientation of pronotum: 0. Longitudinal, 1. Transverse.
5. Prosternal channel with plumose scales: 0. Absent, 1. Present.

Elytra

6. Shape of elytral declivity: 0. Rounded, 1. Angulate.
7. Shape of elytral humeri in males: 0. Rounded, 1. Produced.
8. Shape of elytral humeri in females: 0. Rounded, 1. Acutangulate.
9. Elytral tubercles: 0. Absent, 1. Present.
10. Shape of tubercle on interstice 5 at elytral declivity: 0. Absent, 1. Moderately developed, 2. Well developed.
11. Shape of interstice 4 at elytral declivity: 0. Rounded, 1. Angulate, 2. Small tubercle present, 3. Large tubercle present.
12. Elytral tubercle in females: 0. Absent, 1. Several small, 2. Two large tubercles on 4th interstice, 3. Two large tubercles on 4th interstice but convergent.

13. Elytral striae: 0. Well defined, 1. Seriate-punctate.

Abdomen

14. Shape of apex of ventrite 5: 0. Flat, 1. With two protuberances, 2. Depressed.
15. Number of distinguishible genital sclerites: 0. Two, 1. One.
16. Shape of genital sclerites: 0. Symmetrical, 1. Assymetrical.
17. Shape of posterior genital sclerite: 0. Hook-like, 1. Flagellate, 2. Sting-like, 3. Enlarged-straight, 4. Single plate, 5. Not distinguishable, 6. Ring-like.
18. Shape of anterior genital sclerite: 0. Hook-like 1. Capsule, 2. Sting-like, 3. Enlarged-straight, 4. Single plate, 5. Folded plate, 6. Flagellate, 7. Absent.
19. Length of temones: 0. Subequal to pedon, 1. Between 1.5-2.0X length of pedon, 2. Between 2.0-2.9X length of pedon, 3. More than 3.0X length of pedon.
20. Shape of pedon: 0. Rectangular, 1. Other shapes.
21. Bifurcation distance of the spiculum ventrale: 0. First quarter, 1. Half.
22. Shape of border of female tergite VII: 0. Straight, 1. Sinuated.
23. Spermatheca shape: 0. Wide, 1. Thin.

Vestiture

24. Appressed scales at mesanepisternum and mesepimeron: 0. Present, 1. Absent.
25. Erect scales at elytra: 0. Absent, 1. Present.
26. Elytral scales shape: 0. Rounded, 1. Slightly elongate 2. Clavate, 3. Lanceolate.
27. Angle of elytral scales: 0. Appressed, 1. Almost erect, 2. Suberect.
28. Density of erect or suberect scales: 0. Absent, 1. Sparse. 2. Dense.
29. Abdominal ventrite 5 apex with tuft of setae: 0. Absent, 1. Present.

Phylogenetic analysis: The cladograms were constructed using TNT software (Goloboff *et al.* 2008). We performed a preliminary analysis assigning all characters equal weights and then we tested the effect of homoplasy on the results by conducting different implied weights analyses (Goloboff 1993), with the constant of concavity (k) set to integer values from 1–12, where 1 was weighted most severely against homoplastic characters. Implied weights analyses were conducted using the heuristic “traditional search” algorithm of TNT, with 1000 replications and tree-bisection-reconnection branch-swapping (TBR), holding 1000 trees during each replication.

Results

The phylogenetic analysis of the data matrix (Table 1) under equal weights led to 19 most parsimonious trees. With the constant of concavity (k) set at 3 three cladograms were obtained, with k= 6 six cladograms were obtained, and with k= 12 led to a single cladogram. The latter has 178 steps, CI of 0.31 and RI of 0.52 (Fig. 1). In all the analyses, the species of *Plumolepilius* were recovered as a monophyletic group, with one clade including *P. maesi* and *P. obrienorum*, and the other including the remaining species. Characters states from *Plumolepilius* that differs from *Lepilius* were: body shape not ovate (1: 1-3) neither globose, pronotum transverse (4:1), prosternal channel with plumose scales (5:1), temones longer than 1.5X the length of pedon (19: 1-3), pedon not rectangular (20:1).

According to the cladogram topology (Fig. 1), *P. maesi* and *P. obrienorum* are recovered into a clade A. Both species are distributed in the Pacific dominion (fig. 2), *P. obrienorum* is widely

distributed in Costa Rica and *P. maesi* has been recorded from Mombacho volcano south from the lake of Nicaragua.

The remaining 23 species were recovered within clade B, this clade is composed by: *P. trifiniensis* (*P. nelsonii* (*P. molinai* (*P. hectori* (*P. daryi* (*P. camuna* (*P. andersoni* (*P. morronei* (*P. yolnabajensis* ((*P. antonioi*, *P. nicaraguensis*)(*P. branstetteri* (*P. solisii* (*P. zarazagai* (((*P. guaimacaensis*, *P. macalajauensis*)(*P. cortesi*, *P. longinoi*))(*P. genieri* (*P. linarezi* (*P. velizi* (*P. canio*, *P. schusteri*)))))))))))))). Most of the species in the clade B are distributed in the Chiapas Highland province, except for *P. andersoni*, *P. hectori* and *P. solisii* which are distributed within the Pacific dominion.

Within clade B (Fig. 1), *P. antonioi* and *P. nicaraguensis* form a clade C supported by a sinuated border of female tergite VII (22:1). Both species are endemic, *P. antonioi* from La Muralla National Park in Honduras, and *P. nicaraguensis* from Jinotega mountains in Nicaragua. The clade D is supported by an anterior and posterior genital sclerites both as single plates (17:4, 18:4), temones length 2.0-2.9X the length of pedon (19:2) and body densely covered by scales (28:2). All species from this clade are distributed within the Chiapas Highland province.

Discussion

Within the phylogenetic tree of *Plumolepilius* species, 12 nodes remain unresolved. Species of *Plumolepilius* inhabits inside the leaf litter of montane forests and show few troglobiomorphic characters such as the reduction of hind wing, fused elytra and the reduction of metasternum. Morphological phylogeny of troglobiomorphic species is usually highly obscured by convergent evolution due to natural selection pressure to the adaptation to the life in soil or caves (Bilandžija *et al.* 2013, Christiansen 2012, 1961; Poulson 1963). Some of the convergent characters determined in the phylogenetic analyses are: the presence of spines at inner side of femora, the development of elytral humeri in males, the reduction in the number of distinguishable genital sclerites, the shape of genital sclerites, the length of temones, the bifurcation distance of spiculum ventrale, the shape of border of female tergite, the presence of appressed scales at mesanepisternum and mesepimeron, the shape of elytral scales and the density of elytral scales.

Both main clades, A and B, are pretty well defined by the angle of elytral declivity and the presence of tubercles. *Plumolepilius* species in clade A have a completely rounded elytra through all its dorsal length while species in clade B have an angulate elytral declivity and possess tubercles or at least the interstice 4 on elytral declivity is slightly swollen. Species in clade A are distributed only within the northern PD. Species in clade B are mainly distributed in the CHP with the exception *P. hectori*, *P. andersoni* and *P. solisii* (fig. 2) that are distributed within the PD.

The Isthmus of Tehuantepec and Nicaraguan depression has been documented as important biogeographic barriers (Halfter 1987, 1978). *Plumolepilius* species distribution is restricted between the isthmus of Tehuantepec and the Choco forests. Specimens of *Plumolepilius* has not been found beyond this limits until now. Redundant distribution in the area cladogram (fig. 2) suggests dispersal events from the CHP through the PD in Costa Rica and Panama. Some authors hypothesize that Pleistocene glaciations allowed the connection of previously isolated cloud

forests by the shift of their elevation from higher to lower altitudes, this could have led to the dispersal of montane species (MacVean and Schuster 1981).

Acknowledgments

We thank Robert S. Anderson and François Génier from the Insect the Canadian Museum of Nature for the loaning of specimens. The senior author thanks the Posgrado en Ciencias Biológicas, UNAM, specially to María del Coro Arizmendi Arriaga and Lilia Judith Espinosa Sánchez.

References

- Bilandžija H, Ma L, Parkhurst A, Jeffery WR (2013) A Potential Benefit of Albinism in Astyanax Cavefish: Downregulation of the oca2 Gene Increases Tyrosine and Catecholamine Levels as an Alternative to Melanin Synthesis. *PLoS ONE* 8(11): e80823. <https://doi.org/10.1371/journal.pone.0080823>
- Christiansen, K.A. (1961) Convergence and parallelism in cave Entomobryinae. *Evolution*, 15: 288–301.
- Haffer, J. (1969) Speciation in Amazonian Forest Birds. *Science*, 165(3889): 131-135.
- Halffter G. (1978) Un nuevo patrón de dispersión en la zona de transición mexicana: el mesoamericano de montaña. *Folia Entomol Mex*, 39–40:219–222.
- Halffter G. (1987) Biogeography of the montane entomofauna of Mexico and Central America. *Annu Rev Entomol*, 32:95–114.
- Hooghiemstra, H. & van der Hammen, T. (1998) Neogene and Quaternary development of the neotropical rain forest: the forest refugia hypothesis, and a literature overview. *Earth-Science Reviews*, 44: 147-186.
- MacVean, C. & Schuster, J.C. (1981) Altitudinal Distribution of Passalid Beetles (Coleoptera, Passalidae) and Pleistocene Dispersal on the Volcanic Chain of Northern Central America. *Biotropica*, 13: 29-38.
- Poulson, T.L. (1963) Cave adaptation in amblyopsid fishes. *American Midland Naturalist*, 70: 257–290.
- Urrego, D. H., Hooghiemstra, H., Rama-Corredor, O., Martrat, B., Grimalt, J. O., Thompson, L., Bush, M. B., González-Carranza, Z., Hanselman, J., Valencia, B. & Velásquez-Ruiz, C. (2016) Millennial-scale vegetation changes in the tropical Andes using ecological grouping and ordination methods. *Climate of the past*, 12: 697-711.
- Steedman, H.F. (1958) Dimethyl Hydantoin Formaldehyde: A new Water-soluble Resin for Use as a Mounting Medium. *Quarterly Journal of Microscopical Science*, 99(4): 451-452.

Table 1. Data matrix of morphological characters used for the cladistic analysis of *Plumolepilius*. ‘?’ = unknown data.

| | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|------|
| <i>Lepilius</i> spp. | 00000 | 00000 | 00000 | 00000 | 00000 | 0000 |
| <i>Lepilius pulchellus</i> | 00000 | 00000 | 00000 | 00000 | 00001 | 2110 |
| <i>P. andersoni</i> | 11011 | 11011 | 21100 | 14511 | 00111 | 2210 |
| <i>P. antonioi</i> | 11011 | 11010 | 22110 | 12231 | 01111 | 2211 |
| <i>P. branstetteri</i> 11011 | 11111 | 32100 | 14251 | 00101 | 2211 | |
| <i>P. camuna</i> | 31011 | 10?11 | 2?100 | 00021 | ???11 | 2210 |
| <i>P. canoi</i> | 11011 | 11010 | 30111 | 15511 | 00101 | 1220 |
| <i>P. cortesi</i> | 21011 | 11012 | 32100 | 14521 | 01101 | 3220 |
| <i>P. daryi</i> | 31011 | 10012 | 21100 | 16221 | 10111 | 2210 |
| <i>P. genieri</i> | 20011 | 11011 | 32101 | 15321 | 00101 | 2221 |
| <i>P. guaimacaensis</i> | 30011 | 10011 | 33110 | 14511 | 00101 | 2221 |
| <i>P. hectori</i> | 31011 | 10011 | 21001 | 15211 | 00111 | 2210 |
| <i>P. linaresi</i> | 21011 | 11010 | 32121 | 15321 | 10101 | 2221 |
| <i>P. longinoi</i> | 20011 | 11011 | 32110 | 12521 | 01101 | 2220 |
| <i>P. macalajauensis</i> | 30011 | 10011 | 33101 | 15521 | 01101 | 3221 |
| <i>P. maesi</i> | 21011 | 00000 | 00001 | 15521 | 00101 | 2221 |
| <i>P. molinai</i> | 20011 | 11011 | 21000 | 11621 | 01111 | 2210 |
| <i>P. morronei</i> | 11111 | 11010 | 31100 | 12221 | 00111 | 2221 |
| <i>P. nelsonii</i> | 30011 | 10?10 | 2?000 | 14421 | ???01 | 2220 |
| <i>P. nicaraguensis</i> | 11011 | 11011 | 20100 | 12631 | 01101 | 2221 |
| <i>P. obrienorum</i> 11011 | 01000 | 00001 | 15531 | 00111 | 2221 | |
| <i>P. schusteri</i> | 11111 | 11010 | 30101 | ?5511 | 00001 | 1220 |
| <i>P. solisii</i> | 20011 | 11110 | 32100 | 11331 | 01100 | 1001 |
| <i>P. trifiniensis</i> | 10011 | 11000 | 10000 | 12521 | 01101 | 3220 |
| <i>P. velizi</i> | 21011 | 11011 | 32121 | 11731 | 00101 | 1220 |
| <i>P. yolnabajensis</i> | 31011 | 10011 | 22100 | 12421 | 00101 | 2211 |
| <i>P. zarazagai</i> | 10011 | 11111 | 32100 | 14421 | 00111 | 2221 |

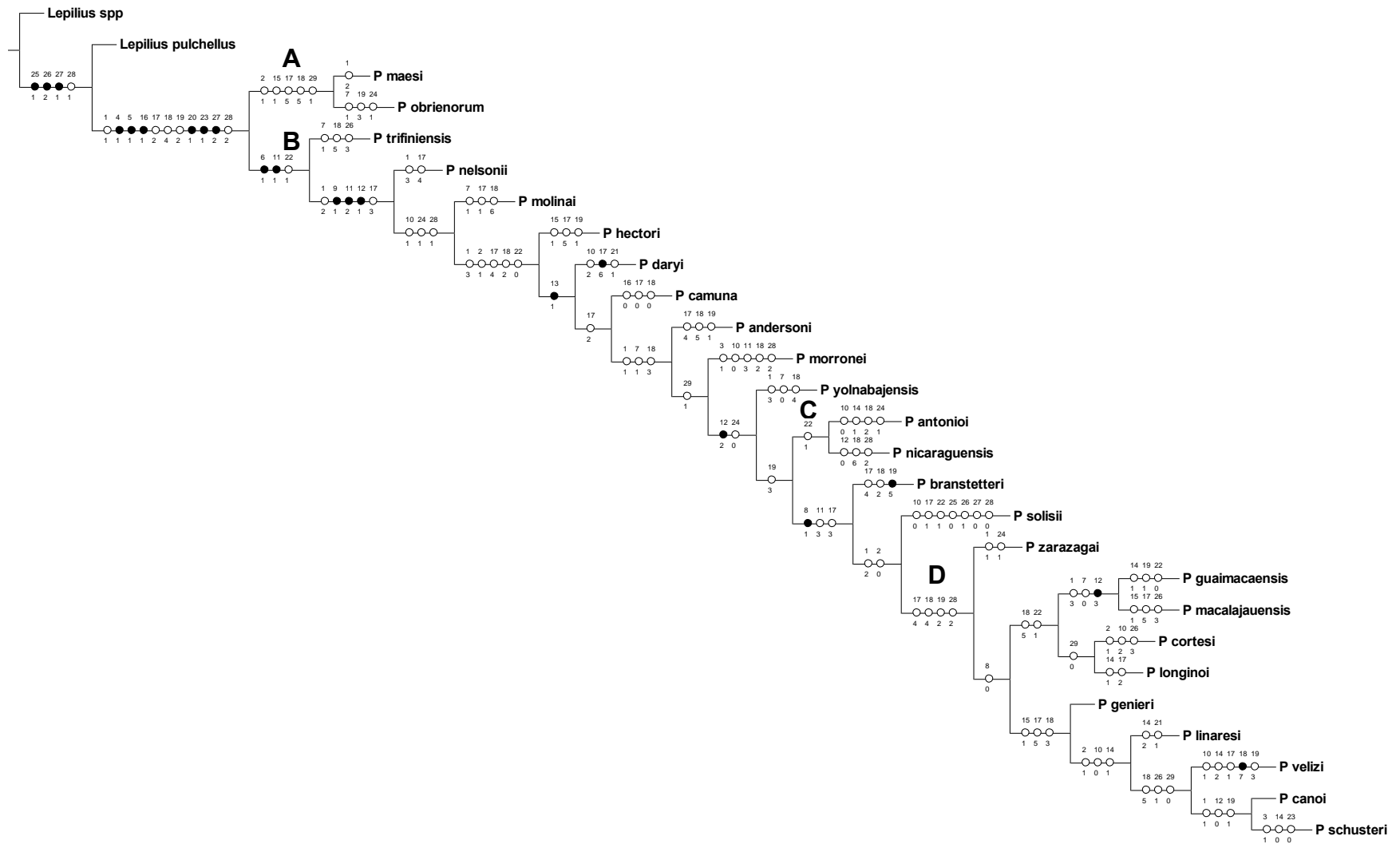


Figure 1. Phylogenetic tree for species of *Plumolepilius* recovered under implied weights (L= 178, CI= 0.31, RI= 0.52). Lateral bars: Chiapas Highland province (black) and Pacific dominion (red). Clades are represented at nodes by a capital letter at upper side.

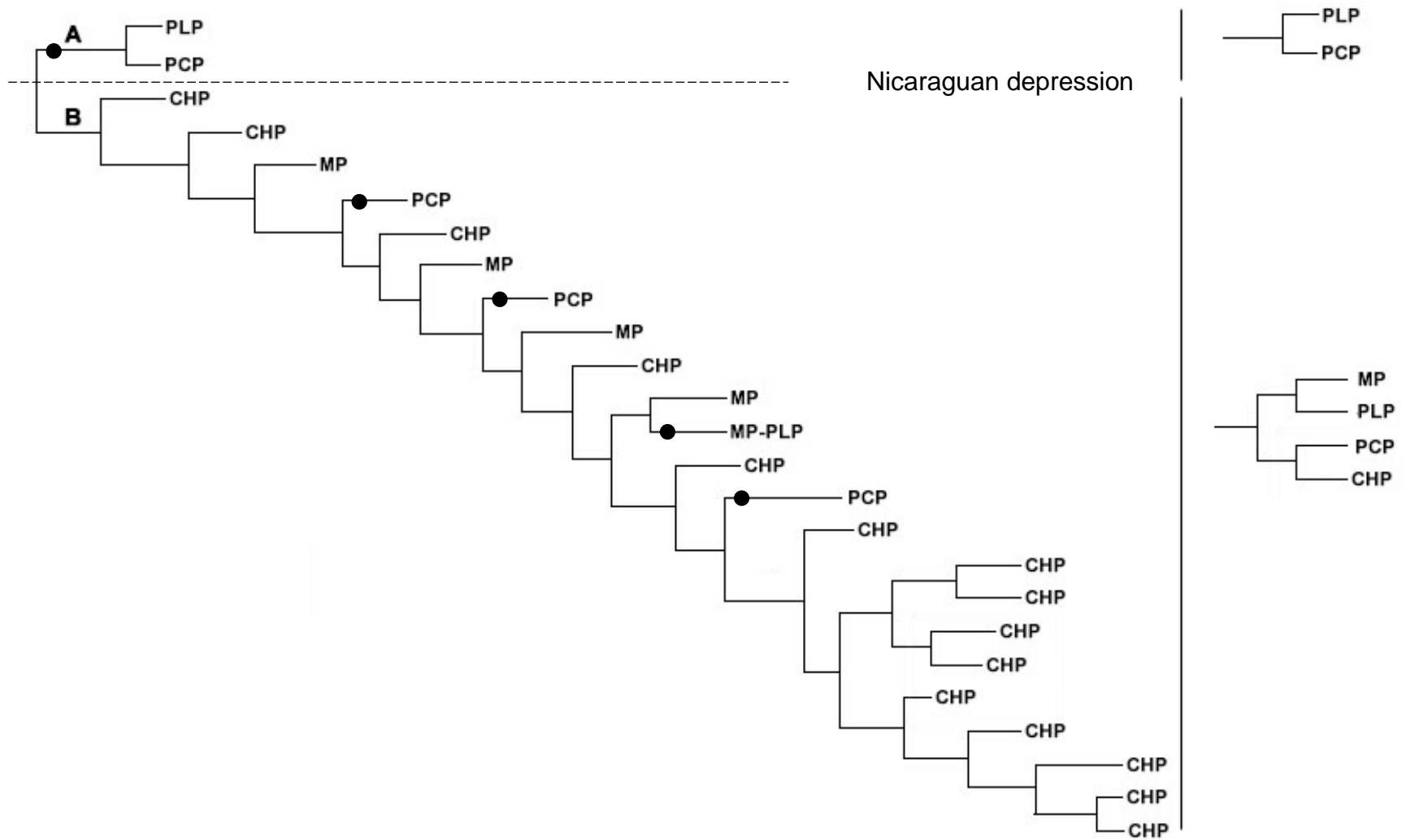


Figure 2. Area cladogram of *Plumolepilius* species. Geographic distribution is indicated as PLP (Pacific Lowlands province), PCP (Puntarenas-Chiriquí province), MP (Mosquito province) and CHP (Chiapas Highlands province).

DISCUSIÓN GENERAL

Taxonomía

Las autapomorfías que permiten diferenciar a *Plumolepilius* de otros géneros de Conotrachelini son las escamas plumosas del canal prosternal y la presencia de un tubérculo o ángulo oblicuo sobre el intersticio 4 en la base del declive elitral. El tubérculo del intersticio 4 está muy desarrollado en la mayor parte de las especies, en otras es pequeño y del mismo tamaño del resto de tubérculos elitrales o bien en el caso de *P. trifiniensis* el intersticio 4 puede estar levemente proyectado formando un ángulo oblicuo que sobresale en la curvatura regular de los élitros.

De acuerdo con el análisis filogenético de los géneros de Conotrachelini, el género hermano de *Plumolepilius* es *Lepilius*. Las sinapomorfías entre ambos géneros son la forma semiglobosa y globosa del abdomen y la sutura metanepisternal hinchada.

Con respecto al análisis filogenético de *Plumolepilius* se identificaron dos clados principales. El primer clado está compuesto por *P. maesi* y *P. obrienorum* y no se lograron detectar autapomorfías que lo definan, mientras el segundo clado está definido por la forma oblicua del declive elitral en el eje longitudinal.

Biogeografía

Los límites en la distribución de *Plumolepilius* están restringidos por dos barreras biogeográficas importantes para varios taxones de montaña, el Istmo de Tehuantepec y las tierras bajas de la provincia del Chocó-Darién (*sensu* Morrone 2014). Se han realizado esfuerzos de colecta intensos fuera de ambas barreras biogeográficas y no se han encontrado nuevos registros de *Plumolepilius* por lo que se puede aseverar con certeza que éstos son sus límites de distribución.

Con excepción de *P. trifiniensis* Barrios-Izás & Anderson 2016 y *P. canoi* Barrios-Izás & Anderson 2016, la mayor parte de especies de *Plumolepilius* poseen una distribución bastante restringida a una o tres localidades cercanas. En colectas recientes se realizó un nuevo registro en

la distribución de *P. canoi*, esta especie se conocía del bosque nuboso de La Unión, la montaña El Gigante y el bosque nuboso la montaña Las Cebollas; en los departamentos de Zacapa y Chiquimula en Guatemala. El nuevo registro se ubica hacia el sureste de la Reserva Biológica El Güisayote en Honduras, en un bosque de encino-liquidámbar. *P. canoi* no se ha registrado en la Reserva de Biosfera Trifinio en Guatemala ni en el bosque nuboso del norte de la Reserva Biológica El Güisayote en Honduras.

En el departamento de Huehuetenango, en Guatemala, se realizó recientemente el registro de una especie de *Plumolepilius* aún no descrita, que se diferencia fácilmente de otras por poseer un pronoto conspicuamente más angosto y la forma de los escleritos del saco interno del pene.

La especie con mayor rango de distribución es *P. trifiniensis*, que se encuentra desde el departamento de Suchitepequez en Guatemala hasta el departamento de Santa Ana en El Salvador. Se ha registrado en el arco volcánico en la cuenca del lago de Atitlán, Antigua Guatemala, el volcán de Pacaya, San José Pinula, Mataquescuintla, la Reserva de Biosfera Trifinio-Fraternidad, el volcán Chingo y Cerro Verde.

El género *Plumolepilius* pertenece al cenocrón Mesoamericano de Montaña y se encuentra en parapatría con el género hermano, *Lepilius*. Las especies de *Lepilius* se distribuyen desde América Central Nuclear hasta las montañas de Texas, esto sugiere que existieron episodios de dispersión hacia el Neártico a lo largo de la Zona de Transición Mexicana. A su vez, las especies de *Plumolepilius* se encuentran distribuidas desde Chiapas hasta Panamá, lo que indica que el género se dispersó hacia el sur atravesando la depresión de Nicaragua. De acuerdo con el cladograma de áreas de *Plumolepilius* ocurrieron al menos cinco episodios de dispersión a través de la depresión de Nicaragua. Aunque no se cuenta con dataciones del cladograma, de acuerdo con lo propuesto para escarabajos pasálidos por MacVean y Schuster (1981), es probable que la dispersión y eventos de radiación de *Plumolepilius* haya ocurrido durante las oscilaciones climáticas del Pleistoceno.

CONCLUSIONES GENERALES

Taxonomía

Las especies de *Plumolepilius* constituyen un grupo monofilético que se pueden separar de otros géneros de Conotrachelini por la presencia de escamas plumosas dentro del canal prosternal. La presencia de escamas con este tipo de morfología y en esta posición es muy rara y sólo se encuentra presentes en algunos géneros de otras subfamilias, por lo que el género puede distinguirse fácilmente de otros utilizando este carácter.

De acuerdo con el cladograma, el género hermano de *Plumolepilius* es *Lepilius* Champion 1905. La principal sinapomorfía que distingue a ambos géneros es que la sutura metanepisternal se encuentra hinchada. Esta característica tampoco se encuentra presente en ningún otro género de Conotrachelini y es poco común en otros géneros de Curculionidae.

Biogeografía

El Istmo de Tehuantepec y de la depresión del lago de Nicaragua han sido descritas como dos barreras biogeográficas importantes en la evolución y dispersión de la fauna de América Central. En el caso de *Plumolepilius* la barrera biogeográfica de mayor importancia al sur son las tierras bajas de la provincia del Chocó-Darién, ya que su distribución se extiende hasta el norte de Panamá.

Para otros géneros de la hojarasca como *Theognete* Champion 1902 y *Lepilius* Champion 1905 el Istmo de Tehuantepec no es una barrera biogeográfica de importancia, mientras la depresión del lago de Nicaragua sí constituye una barrera de importancia. El género *Theognete* se conoce desde Tamaulipas en México hasta Honduras, probablemente el género se extienda hasta el norte de Nicaragua (Anderson 2010). En el caso de *Lepilius* se han descrito dos especies, *L. pulchellus* Champion 1905 y *L. chisosensis* Anderson 2012, *L. pulchellus* fue descrita de Totonicapán en Guatemala y *L. chisosensis* fue descrita del Parque Nacional Big Bend en Texas; se han colectado otras especies de *Lepilius* de México, El Salvador y Honduras, probablemente también se encuentren algunas especies en el norte de Nicaragua.

RECOMENDACIONES GENERALES

Tradicionalmente los sistemas de áreas protegidas de México y América Central se han diseñado para resguardar muestras representativas de los ecosistemas, zonas de importancia para la provisión de agua, zonas que coinciden con sitios arqueológicos de importancia o bien el hábitat de especies emblemáticas. Es importante que las autoridades de las áreas protegidas incorporen criterios filogenéticos que contribuyan a conservar la diversidad biológica de una forma más integral.

La mayor parte de criterios biológicos para la conservación de áreas consideran mamíferos, reptiles, aves, plantas y en ocasiones peces; sin embargo, es importante considerar que la mayor parte de la diversidad biológica se concentra en los taxones hiperdiversos de insectos (Coleoptera, Diptera, Hymenoptera y Lepidoptera). En Latinoamérica gran parte de los taxones hiperdiversos se desconocen y enfrentan procesos de extinción a nivel de poblaciones y especies, principalmente por el avance de la frontera agrícola.

LITERATURA CITADA

- Anderson, R.S. (2010). A taxonomic monograph of the Middle American leaf-litter inhabiting weevil genus *Theognete* Champion (Coleoptera: Curculionidae; Molytinae; Lymantini). *Zootaxa*, 2458: 1-27.
- Darlington, J.P.Jr. (1957) Zoogeography: The geographical distribution of animals. John Wiley & Sons, Inc., New York, 236pp.
- Halffter G. (1987) Biogeography of the montane entomofauna of Mexico and Central America. *Annu Rev Entomol*, 32:95–114.
- Halffter, G. & Morrone, J.J. (2017) An analytical review of Halffter's Mexican transition zone, and its relevance for evolutionary biogeography, ecology and biogeographical regionalization. *Zootaxa*, 4226 (1): 001-046.
- Hoffmann, C.C. (1936) Relaciones zoogeográficas de los lepidópteros mexicanos. *Anales del Instituto Biología de la UNAM*, 7, 47–58.
- MacVean, C. & Schuster, J.C. (1981) Altitudinal distribution of passalid beetles (Coleoptera, Passalidae) and Pleistocene dispersal on the volcanic chain of northern Central America. *Biotropica*, 13: 29-38.
- Morrone, J.J. (2014) Biogeographical regionalization of the Neotropical region. *Zootaxa*, 3782(1), 1-110.
- Oberprieler, R.G., Marvaldi, A.E. and Anderson, R.S. (2007) Weevils, weevils, weevils everywhere. *Zootaxa*, 1668: 491-520.
- Oberprieler, R.G., Anderson, R.S. and Marvaldi, A.E. (2014) 3 Curculionoidea Latreille, 1802: Introduction, Phylogeny. In: *Handbook of Zoology* (Kristensen, N.P. and Beutel, R.G.).
- Vivó, J.A. (1943) Los límites biogeográficos en América y la zona cultural mesoamericana. *Revista Geográfica*, 3, 109–131.

OTRAS PUBLICACIONES

Artículo: Barrios-Izás, M.A. y Coty, D. 2016. A new fossil species of *Caulophilus* Wollaston, 1854 (coleoptera: curculionidae: cossoninae) from Mexican Amber. *The Coleopterist Bulletin*, 70(1): 177–179.

A NEW FOSSIL SPECIES OF *CAULOPHILUS* WOLLASTON, 1854 (COLEOPTERA: CURCULIONIDAE: COSSONINAE) FROM MEXICAN AMBER

MANUEL BARRIOS-IZÁS

Departamento de Biología Evolutiva, Museo de Zoología Alfonso L. Herrera
Facultad de Ciencias, Universidad Nacional Autónoma de México
Apartado postal 70-399, 04510 México D. F., MEXICO
Centro Universitario de Zacapa, Universidad de San Carlos de Guatemala, GUATEMALA
manuelbarriosgt@gmail.com

AND

DAVID COTY

Muséum National d'Histoire Naturelle
Institut de Systématique, Evolution, Biodiversité
ISYEB, UMT 7205 CNRS UPMC EPHE, Paris, FRANCE
coty.david@gmail.com

ABSTRACT

A new fossil weevil species of the cossonine genus *Caulophilus* Wollaston, *Caulophilus ayotzinapa* Barrios-Izás, new species, from the late Oligocene to middle Miocene amber of Totolapa, Chiapas, Mexico, is described. This represents the first record of the genus from Mexican amber. Diagnostic characters are the subquadrate shape of the pronotum, the lesser distance between eyes in dorsal view, the shallow seriate-punctate pattern of striae, interstices 8 and 9 costate, and the shape of the basal half of the tibiae widening apically from the base to the middle of the tibiae.

Key Words: taxonomy, weevils, Chiapas, Oligocene, Miocene

Species of *Caulophilus* Wollaston are commonly found within specific microhabitats, mainly under the bark of dead trees or in the leaf litter of broad-leaf forests where they probably feed on fungi or debris, with the exception of *Caulophilus oryzae* (Gyllenhal, 1838), which feeds on seeds of cultivated grains (Sauvard *et al.* 2010; Morrone 2014). In this work, a new species of *Caulophilus* collected from the Mexican amber of Totolapa in Chiapas, deposited between the late Oligocene and middle Miocene (Coty *et al.* 2014), is described.

A batch of crude amber was acquired by DC from Manuel Ramirez, owner of the Salty River Mine in Totolapa, Chiapas. This village is located in the central depression of Chiapas, 70 km southeast of Tuxtla Gutiérrez. The Salty River amber mine has been exploited since 2007 and is 1 km north of Totolapa, on the banks of the Salty River, which is a tributary of the Grijalva River. The arthropod fauna collected by DC is currently under study.

The original external surface of the amber piece was removed by polishing. Final illustration was done using diatomite powder. The fossil was examined using stereomicroscopes, both a Nikon SZ10[®] and an Olympus SZX9[®]. Photographs were taken with a Leica Z16 APOA stereomicroscope and an eight megapixel Leica DFC490[®] camera. Multi-

layer images were processed with Leica Application Suite[®] software.

SYSTEMATIC PALEONTOLOGY

Family Curculionidae Latreille 1802
Subfamily Cossoninae Schönherr 1825
Tribe Dryotribini LeConte, 1876
Genus *Caulophilus* Wollaston, 1854

Type Species. *Caulophilus sculpturatus* Wollaston, 1854 (= *Rhyncolus oryzae* Gyllenhal, 1838). Champion 1909: 39–40; O'Brien and Wibmer 1982: 225; Alonso-Zarazaga and Lyal 1999: 118; Anderson 2002: 722–815.

***Caulophilus ayotzinapa* Barrios-Izás, new species**
(Figs. 1–5)

Diagnosis. *Caulophilus ayotzinapa* can be distinguished from other species of *Caulophilus* by the subquadrate shape of the pronotum (subtriangular in some species), distance between eyes in dorsal view less than the width of an eye (separated by at least their own width in other species), shallow seriate-punctate pattern of striae (coarsely punctate in other species), interstices 8 and 9 costate (costate or not in other species), inner margin of



Figs. 1–5. *Caulophilus ayotzinapa*. 1) Habitus, dorsal view; 2) Habitus, lateral view; 3) Habitus, ventral view; 4) Head and prothorax, ventral view; 5) Thorax and legs, ventral view.

tibia abruptly expanding from the base to the middle (subparallel in other species), and elytra glabrous (with setae in some species).

Description. Length 2.56 mm, including the rostrum, width 0.68 mm. Body color probably black, cylindrical, dorsoventrally compressed, glabrous, coarsely punctate, alutaceous. Rostrum stout, feebly curved, finely punctate, 0.5X length of pronotum, antenna inserted at middle, scrobes well-defined, lateral, oblique, 1.3X longer than scape, extending from 3/4 to lower anterior margin of eye. Antenna glabrous, except for club and last funicular article, funiculus 7-articulated, articles I and II moniliform, III–VII transverse, scape as long as articles I–IV, eyes rounded and large, separated by less than width of rostrum in dorsal view. Pronotum oval, almost as broad as long, narrower than base of elytra, slightly constricted in front, discoid in lateral view, short setae on front margin, punctures more or less equidistant. Prosternum flat between front coxae, intercoxal distance more than half own width and gradually increasing between meso- and metacoxae, procoxae separated by less than own diameter, pro- and mesocoxae rounded,

hind coxae transverse. Elytra twice as long as pronotum, finely striate, 10 striae, interstices much broader than striae, uniseriate-punctate, convex at elytral declivity, interstices IV and V depressed behind middle, striae X incomplete ending posterior to level of metacoxae, interstices IX and X costate, humeri quadrate, scutellum oval, semi-truncate at base. Metaventrite large, almost 3X diameter of mesocoxae, coarsely punctate, depressed across own mid-length. Abdominal ventrites I and II subequal in size, abdominal ventrite I depressed on disk, abdominal ventrites III–IV together as long as abdominal ventrite II. Punctures on abdomen weakly impressed. Femora clavate, 1.4X longer than tibiae, tibiae laterally compressed, outer margin straight, inner margin gradually widening from base to middle, unci stout, almost as large as tarsomere V, premuro present at least on pro- and mesotibiae, trochanter moderately developed, tarsomeres I–III cylindrical, tarsomere II slightly shorter than others, tarsomere III with dense vestiture of setae but not forming spongy pad.

Material Examined. 1♂, deposited in the Rafael Landivar University Collection. Holotype: MEXICO:

Chiapas, Totolapa, Mina del Río Salado, 2010 / TOT 052.3 Coleoptera / Holotype ♂ *Caulophilus ayotzinapa* Barrios-Izás sp. nov.

Etymology. Ayotzinapa comes from the Nahuatl language and is the name of a town in Guerrero, Mexico. The name is dedicated to the memory of the students of the “Escuela Normal de Ayotzinapa”, Mexico, who were victims of the crime at Iguala on 26 September 2014.

Remarks. The species described here is best placed within the genus *Caulophilus* by the seven funicular articles, convex and slightly transverse eyes, dorsoventrally compressed body, distance between procoxae, and distance of the procoxae from the posterior margin of the prosternum, and semiparallel rostral margins in dorsal view. *Caulophilus ayotzinapa* is similar to *Caulophilus ashei* Davis and Engel, 2006 from Dominican amber but is easily differentiated by having a pronotum narrower than the elytra, elytra with shallow impressed striae, costate interstices, and glabrous elytra.

Discussion. The weevil genus *Caulophilus* currently comprises 16 extant species: *C. costatus* Champion, 1909; *C. dirutus* (Champion, 1909); *C. dubius* (Horn, 1873); *C. filiostris* (Champion, 1909); *C. guatemalensis* (Champion, 1909); *C. lineatocollis* (Champion, 1909); *C. oryzae*; *C. ovatus* (Hustache, 1938); *C. quichensis* (Champion, 1909); *C. rhyncoloides* (Champion, 1909); *C. rubicundus* (Champion, 1909); *C. rufipes* (Champion, 1909); *C. rufotestaceus* (Champion, 1909); *C. sericatus* (Champion, 1909); *C. veraepacis* (Champion, 1909); and *C. venezolanus* (Kuschel, 1959). Members of this genus are distributed in North, Central, and South America, the West Indies, Seychelles, and Europe. Moreover, eight fossil species have been previously described: *C. ashei*; *C. bennetti* Davis and Engel, 2007; *C. falini* Davis and Engel, 2007; *C. swensoni* Davis and Engel, 2007; *C. camptus* Poinar and Legalov, 2014; *C. ruidipunctus* Poinar and Legalov, 2014; *C. elongatus* Poinar and Legalov, 2014; and *C. zherikhini* Nazarenko, Legalov, and Perkovsky, 2011. *Caulophilus* is well represented in the fossil record from Dominican amber and Baltic amber.

This specimen of *C. ayotzinapa* is the first cossonine weevil described from Mexican amber and the second weevil after *Geratozygops durhami* (Zimmerman 1971) (Curculionidae: Conoderinae) that has been described from mines in northwestern Chiapas. The age of this deposit, as well as for the main Mexican amber locality, Simojovel, is still in debate. Its age has been proposed to date from the late Oligocene to middle Miocene (Coty *et al.* 2014). It is considered that the fossil resin could have been secreted by trees of *Hymenaea mexicana* Poinar and Brown (Fabaceae) or other *Hymenaea* L. species.

Considering *Caulophilus* as monophyletic, its past distribution suggests a colonization of the West Indies from Mesoamerica. A comprehensive phylogenetic and biogeographic revision of *Caulophilus* will help us to understand the patterns of colonization of the biota from Mesoamerica to the West Indies, or if reverse migration and colonization has occurred.

ACKNOWLEDGMENTS

We thank Andre Nel (Muséum National d'Histoire Naturelle, France) for hosting us during our work at the collection of fossil insects, Françoise Genier and Robert Anderson (Canadian Museum of Nature) for facilitating the photography system and access to the insect collection, and the Distributed European School of Taxonomy by facilitating the academic mobility of the first author. We also appreciate the comments on this article from Juan J. Morrone Lupi and Alejandro Zaldívar from Universidad Nacional Autónoma de México.

REFERENCES CITED

- Alonso-Zarazaga, M. A., and C. H. C. Lyal. 1999. A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) (excepting Scolytidae and Platypodidae). Entomopraxis, Barcelona, Spain.
- Anderson, R. S. 2002. Chapter 131. Curculionidae [pp. 722–815]. In: American Beetles Polyphaga: Scarabaeoidea through Curculionoidea, Volume 2 (R. H. Arnett Jr., M. C. Thomas, P. Skelley, and J. H. Frank, editors). CRC Press, Boca Raton, FL.
- Champion, G. C. 1909. Insecta. Coleoptera. Rhynchophora. Curculionidae. Curculioninae (concluded) and Calandrinae [pp. 1–48]. In: *Biologia Centrali-Americana* Vol. 4, part 7. Taylor and Francis, London, UK.
- Coty, D., C. Aria, R. Garrouste, P. Wils, F. Legendre, and A. Nel. 2014. The first ant-termite syn-inclusion in amber with CT-Scan analysis of taphonomy. PLoS ONE 9(8): e104410. doi:10.1371/journal.pone.0104410
- Morrone, J. J. 2014. Biodiversidad de Curculionoidea (Coleoptera) en México. Revista Mexicana de Biodiversidad, Suplemento 85: S312–S324.
- O'Brien, C. W., and G. J. Wibmer. 1982. Annotated checklist of the weevils (Curculionidae *sensu lato*) of North America, Central America, and the West Indies (Coleoptera: Curculionoidea). *Memoirs of the American Entomological Institute* 34: 1–382.
- Sauvard, D., M. Branco, F. Lakatos, M. Faccoli, and L. R. Kirkendall. 2010. Weevils and bark beetles (Coleoptera, Curculionoidea) Chapter 8.2. *BioRisk* 4(1): 219–266.
- Zimmerman, E. C. 1971. Mexican Miocene amber weevils (Insecta: Coleoptera: Curculionidae). University of California Publications in Entomology 63: 103–106.

(Received 1 September 2015; accepted 30 December 2015. Publication date 18 March 2016.)