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Source: Journal of Orthoptera Research, 20(1) : 1-33

Published By: Orthopterists' Society

URL: <https://doi.org/10.1665/034.020.0101>

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## New species of *Phaulotettix* Scudder (Orthoptera: Acrididae) from northeastern Mexico

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### Abstract

This paper treats the genus *Phaulotettix* Scudder, 1897, which previously included only three species. In this work we describe 12 new species: *P. adibilis* n. sp., *P. opimus* n. sp., *P. altissimus* n. sp., *P. ablusus* n. sp., *P. adiaphoros* n. sp., *P. ambrosius* n. sp., *P. arcadius* n. sp., *P. flaccidus* n. sp., *P. affinis* n. sp., *P. adynatos* n. sp., *P. nimius* n. sp. and *P. jocundus* n. sp. Species separation is based on male cerci and internal genitalia. The members of this group are distributed mostly in northeastern Mexico: Coahuila, Nuevo León, Tamaulipas, San Luis Potosí, Hidalgo and north Veracruz. Two species, *P. compressus* Scudder, 1897 and *P. eurycercus* Hebard, 1918, extend their distribution into Texas, USA. Many of the species treated here overlap geographically, and many occur sympatrically. We also provide a brief discussion of the geography of northeastern Mexico.

### Key words

Melanoplinae, description, dimorphism, diversity

### Introduction

In 1897, Scudder erected the genus *Phaulotettix* and described its single species, *P. compressus* (Acrididae: Melanoplinae), based on a single male specimen collected at Montelovez (= Monclova), Coahuila, Mexico. Later, Hebard (1918) described *P. eurycercus* from Hidalgo, County, Texas; this species was confirmed to occur in northeastern Mexico by Barrientos-Lozano (2004) and by Fontana & Buzzetti (2007). Buzzetti *et al.* (2010) described *P. huastecus*. All three known species occur in northeastern Mexico, with *P. eurycercus* and *P. compressus* extending their distribution to South Texas, USA.

Between 2000-2010, we collected 355 specimens of *Phaulotettix* from northeastern Mexico. However, these specimens could not be assigned to any of the three known *Phaulotettix* species. We therefore now revise this genus. We describe 12 new *Phaulotettix* species. We also redescribe the genus and females of the known species (*P. compressus*, *P. eurycercus* and *P. huastecus*), adding new characters. We illustrate the most important diagnostic characters of males. Females are more difficult to identify, but may be separated by association with males collected simultaneously at the same locality or by collecting mating pairs in the field.

*Physiography and biogeography of northeastern Mexico.*—To understand speciation in northeastern Mexico, it is necessary to understand the physiography of that area. Mexico occupies the core of a complex and varied region known as the Mexican Transition Zone (MTZ) in which Nearctic and Neotropical biota overlap. This area includes part of the southwestern United States, all of Mexico and a large part of Central America, extending southward to the Nicaraguan lowlands (Halffter 1987).

The physiography of the MTZ is varied and complex as a result of its geologic history. The area's flora and fauna are exceptionally rich, owing on the one hand to the great variety of environments and ecological refuges available in the zone, and on the other to the numerous routes for dispersion of fauna of different origin, ranging from cold temperate mountains to humid tropical corridors, to continuous coastal zones. Equally significant in the MTZ are the enormous possibilities of allopatric differentiation that derive from an extremely complex orography in a tropical region (Halffter 1987).

Transition Zones deserve special attention, because boundaries between biogeographic regions are not static lines, but rather areas of intense dynamic biotic interactions (Morrone 2010). In this zone, communication with North America has existed since the Mesozoic, despite temporary barriers, particularly in the region of the Isthmus of Tehuantepec. Likewise, communication with South America, and therefore the possibility of the introduction of South American elements that at present form an important part of the biota in the zone, has also been highly variable over time.

Geologic, climatic, and ecological changes, along with both dispersal and vicariance, may explain extensive biotic evolution in the MTZ (Brooks & McLennan 2001, Morrone 2009). The origin and distribution of insects in the MTZ has been discussed by Halffter (1976, 1987), Morrone & Márquez (2001) and Morrone (2010) based on geological history and climatic change. Penetration of Holarctic entomological fauna in Mexico and expansion of taxa of South American origin in the MTZ and in North America have been analyzed by many authors (Ball 1968; Whitehead 1972; Halffter 1976, 1987; Morrone & Marquez 2001).

Physiography of the Mexican territory is the result of the interactions of five tectonic plates: North America, Pacific, Rivera, Cocos, and Caribbean, which created mountain ranges by folding (Eastern Sierra Madre and Southern Sierra Madre) or by volcanism (Western Sierra Madre, Transverse Volcanic Belt), and created plateaus (Central Highlands) and depressions (Balsas and Chiapas) between the main mountain ranges (Halffter 1987, Ortega *et al.* 2000, CONABIO 2008). The Mexican mainland includes five mountain ranges (four mentioned above and the Sierra Madre de Chiapas), two large coastal plains (the Gulf of Mexico Coastal Plain and the Pacific Coastal Plain), and the Mexican High Plateau (Central Highlands). Even the coastal plains and plateau pose isolated mountains that give rise to major local climatic differentiation, causing an increase of biodiversity and in the number of endemisms. Soils of different geological origin, including marine, sedimentary, bedrock, and volcanic, favored different floral communities and, therefore, different insect communities. The funnel shape of the Mexican territory, orography, and the influence of winds and seasonal oscillation of the subtropical belt contribute to highly diverse climatic patterns

ranging from cold alpine to dry desert, to warm and wet tropical forests, to coastal climates (García 2004, Vidal-Zepeda 2005, CONABIO 2008).

This diverse mosaic of geographic and climatic patterns produces great environmental heterogeneity, which determines the geographic patterns of species richness and explains why the Mexican territory prefers such a diverse biota. Regarding the origin of this diversity two major explanations are proposed: The Migration Hypothesis proposes invasion or expansion of plant and animal groups in different geological periods, from both the north and south, which converged in different areas of the country to increase biodiversity (CONABIO 2008). The In Situ Speciation Hypothesis proposes extensive local speciation because of habitat fragmentation and diversity (Halffter 1987, CONABIO 2008).

All *Phaulotettix* species treated in this work inhabit one or more of four biogeographic provinces that exist in northeastern Mexico: Eastern Sierra Madre (ESM), Tamaulipas (TAM), Gulf of Mexico (GM) and the southern Mexican High Plateau (MHP) (CONABIO 2008).

The ESM consists of a series of elongated folds (mountains and valleys) with a NNW to SSE direction, ending in the north on the Texas platform. In the southeast it merges with the Transverse Volcanic Belt. Its length is ~600 km, with an average width of 80 km. The altitudinal range varies from 350 masl in the lowlands to about 3,750 masl at the highest peaks. Cerro Potosí (3,750 masl) and Cerro Peña Nevada (3,650 masl) are the highest mountains, both occurring on the western side by the border between Nuevo León and Tamaulipas. The climate varies from semiwarm to temperate; in winter temperature drops below 0°C. Rainfall is scarce on the west slope and more abundant to the east, and this influences the vegetation. In the lowlands, vegetation is mainly thorny scrub, whereas in the highlands, oak forest (*Quercus* spp.) and conifers (*Pinus culminicola*, *P. greggi*, and *P. pinceana*) are dominant. On the western slope vegetation is sparse and of semidesert type, e.g., *Agave* spp., *Euphorbia cerifera*, and cacti, amongst other species. This climatic dichotomy, together with the existence of elongated valleys, facilitates the penetration of many tropical elements into relatively high elevations, while many mountain elements descend into the coastal plains.

The TAM Biotic Province is located on the northern portion of the Northeast of Mexico Coastal Plain, comprising north Tamaulipas, north Nuevo León, northeast Coahuila and the adjacent portion of Texas in the United States of America. This Province is bordered to the west by the eastern Sierra Madre; the altitudinal range varies from sea level in the lowlands south of the Rio Grande to about 1000 m towards the northeast of Coahuila. Rainfall is bimodal: spring and autumn record the highest rainfall. The spring rains are the result of frontal activity, whereas fall rains are usually of tropical origin. The amount of precipitation received in the fall is usually the most consistent. Average annual precipitation, ranges from 200 mm to 1400 mm, but six to eight months are relatively dry. The average total rainfall for the region is 430 mm, with larger amounts received along the coast. The total precipitation decreases from east to west. Transpiration and evaporation far exceeds the amount of water available from precipitation. The area is classified as a semi-arid arid place. Rainfall is also very erratic. The area has the second highest coefficient of variation (proportional relationship of the SD with respect to the mean) in precipitation (35%) among semi-arid regions of the world. This extreme variation in moisture from year to year is an important constraint upon ecological systems, even more than the low amount of annual precipitation. Droughts are also common and often severe. The dominant vegetation is xeric

scrub and thorn forests (91%).

The GM Province extends from the San Fernando Basin River in Tamaulipas, Mexico, south to the Rio Candelaria, where the Yucatan Peninsula starts. This province occupies mostly the coastal plains; altitude varies from sea level to about 1000 m in the highest portions. Due to its high humidity, 90% of this area receives over 1000 mm of annual rainfall; nearly half is over 2000; high and medium-sized evergreen forests dominate the landscape (57%) and associated halophytic vegetation with coastal lagoons (8%). Savannas, palm groves, grasslands and xeric vegetation are represented in minor proportions.

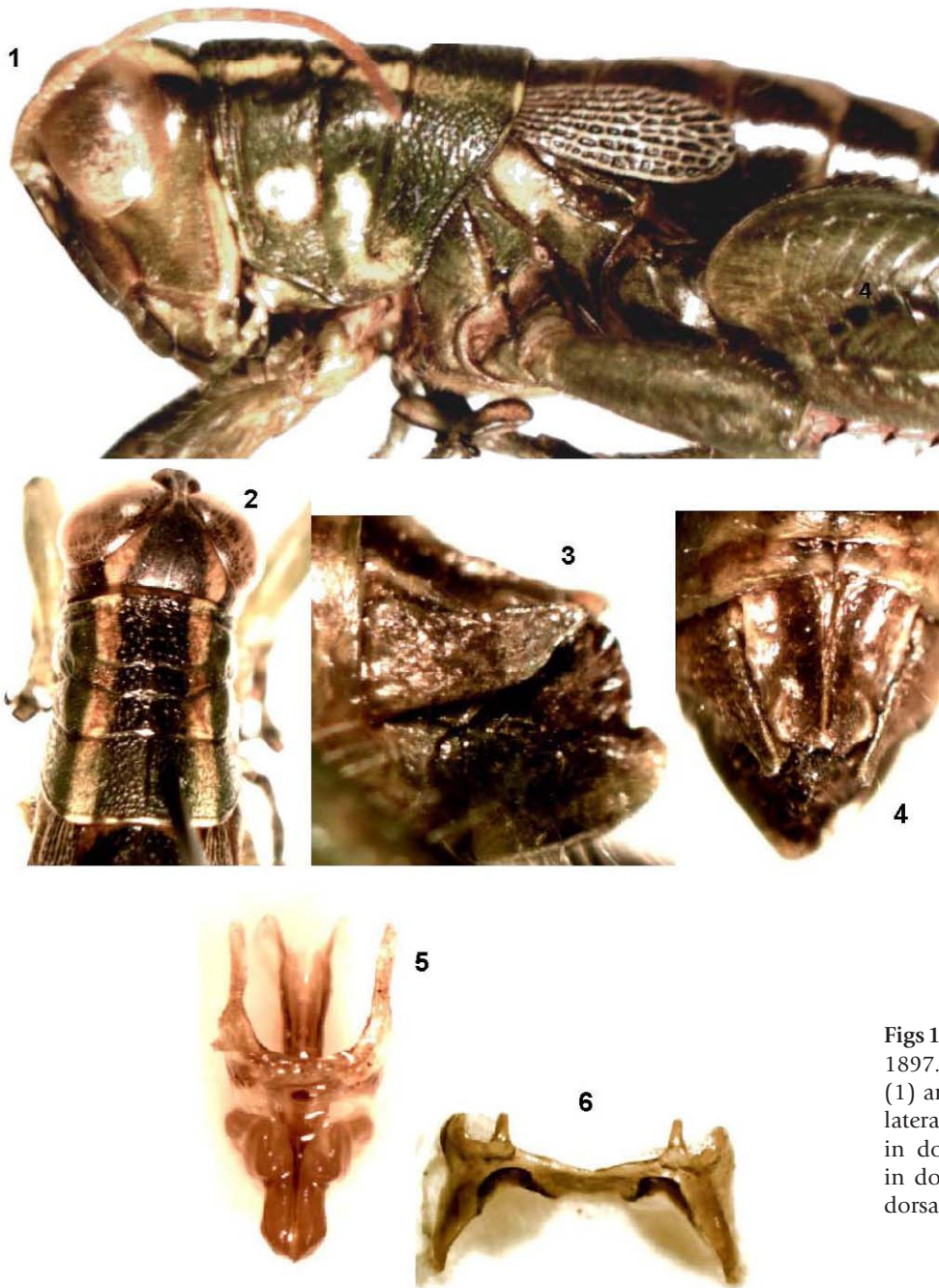
The MHP is situated between the Western Sierra Madre and the Eastern Sierra Madre. It is comprised of the States of Chihuahua, Zacatecas, Durango, Guanajuato, part of Coahuila, Nuevo León, San Luis Potosí, Jalisco, Michoacán, Tlaxcala, Puebla, as well as Sonora, New Mexico and southern Texas in the United States of America. Its altitude varies between 1000 and 2000 m. Watershed basins are very common, some relatively large, such as those feeding the Nazas, Aguanaval, and Casas Grandes Rivers; other basins are associated with smaller rivers, such as the Bolsón of Mapimí and the Salado. The northern and central areas of the plateau are arid and semi-arid, with the drier regions receiving about 300 mm of rainfall annually. Rainfall increases in the southern regions of the plateau, which receive about 500 to 650 mm of annual rainfall, with most of it falling typically in the summer. The dominant vegetation is steppe grasses of the genera *Bouteloua* spp., and *Aristida* spp., widespread among xeric shrublands and forests in the plains and intermountain valleys. Among the most common plant species are *Andropogon citratus*, *Aristida glauca*, *Bouteloua aristidoides*, *B. eriopoda*, *B. divaricata* and *Larrea hirsuta* var. *tridentata*. Arriaga *et al.* (1997) distinguished a province of North Highlands and a Southern High Plateau. Although both have been treated as a single province by Morrone *et al.* (2002).

The great variation in ecological conditions, displacement during climatic changes, fragmentation during geological events, as well as allopatry derived from a very complex orography may have favored differentiation of *Phaulotettix* spp., as has occurred in other insect groups.

## Materials and methods

Specimens were collected using a sweep net or by hand. Morphological characters, original descriptions (Scudder 1897, Rehn 1904, Bruner *et al.* 1900-1909, Hebard 1917; 1918, Fontana & Buzzetti 2007, Buzzetti *et al.* 2010) and online resources (Orthoptera Species File Online) were used to identify specimens. Measurements and laboratory images were taken with a Motic Stereomicroscope, Model 43-FBGC-C, 3.0 mp. Dorsal view measurements: body length (measured from the vertex to the apex of the hind femora) and pronotum length; lateral view: hind femora and tegmina length. All measurements were taken at 10x. Males' cerci and supraanal plate drawings were performed using a Motic stereomicroscope model K-400L equipped with a drawing device SP10.0102K; drawings were made at 50x, then reduced 50%.

Internal genitalia dissection was performed by relaxing specimens in hot water for 1 h. After relaxation the male was positioned on a sheet of pinning surface, and using insect pins with the tip bent at a right angle, the phallus was slipped back. The phallic complex was placed, for ca 10 min., in a 10% KOH solution to clear and remove membranes and muscles. After this interval the membranes and muscles were completely removed using insect pins with the tip bent, and the epiphallus separated from the phallic complex.



Figs 1-6. *Phaulotettix compressus* Scudder, 1897. Male pronotum in left lateral view (1) and dorsal view (2); left cercus in lateral view (3); male abdomen apex in dorsal view (4); phallic complex in dorsal view (5) and epiphallus in dorsal view (6).

The mass was then washed with cold water. Phallic structures were mounted on cardboard and photographs made. This procedure varies according to different authors (Hubbell 1932, Cohn & Cantrall 1974).

*Habitat*.—Samples of grasses and host plants were collected during field trips; dichotomous keys were used for determination following Rzedowski and Rzedowski (2005) and Rzedowski (2006). Coordinates and altitude measurements were taken using Garmin-GPS48-12 channels.

*Depositories*.—University of Michigan Museum of Zoology (UMMZ): ♂ holotypes and ♀ allotypes. Instituto de Biología-Universidad Nacional Autónoma de México (IB-UNAM): 1 ♂ and 1 ♀ paratypes.

L. Barrientos-Lozano collection-Instituto Tecnológico de Cd. Vic-

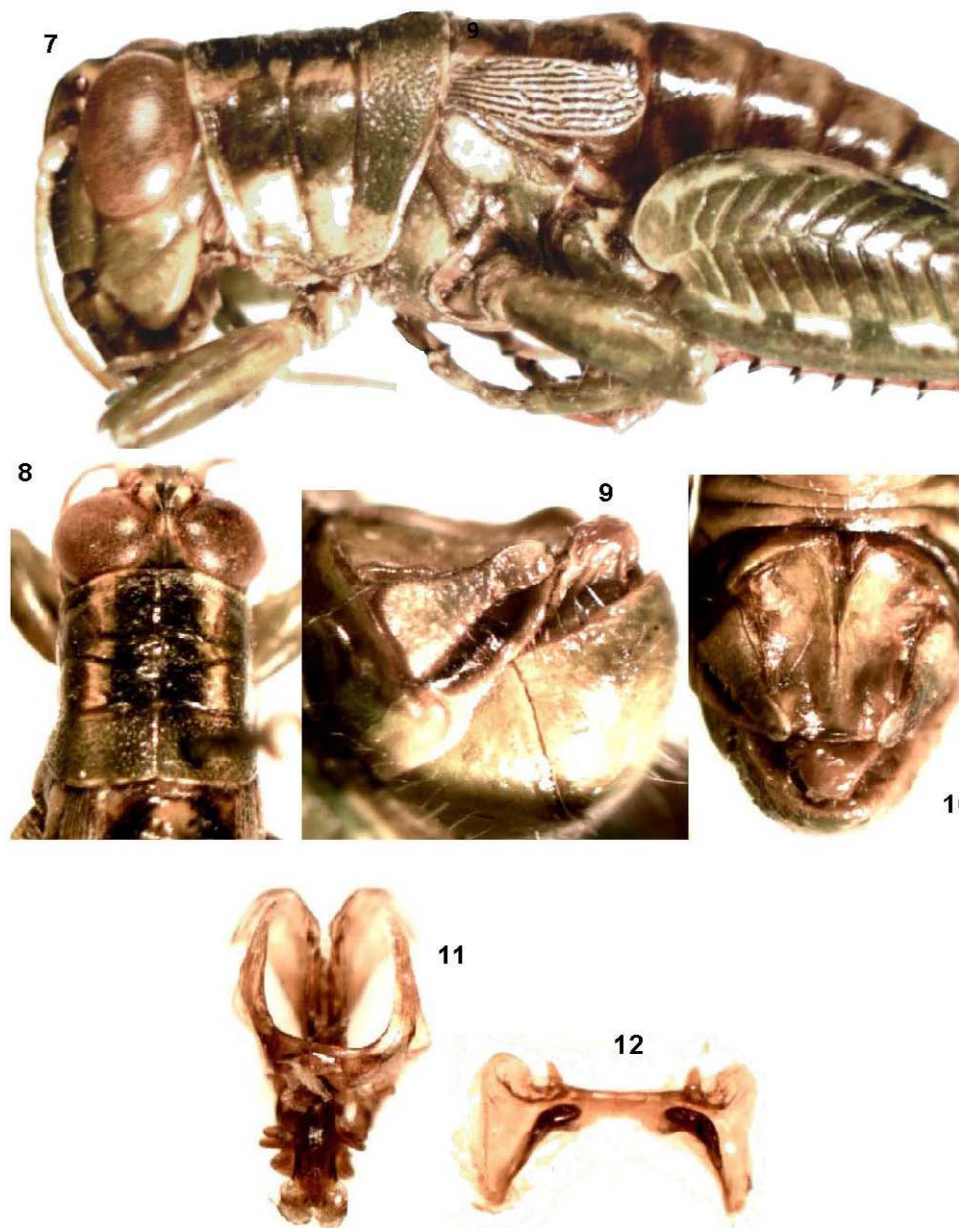
toria, Tamaulipas, México. (L. Barrientos-Lozano-ITCV): all other ♂ and ♀ paratypes.

## Results

### Genus *Phaulotettix* Scudder, 1897

- Phaulotettix* Scudder, S.H. 1897. Proc. U.S. Nation. Mus. 20 (1124): 29.  
*Calotettix* Bruner, L. 1908. Biologia Centrali-Americana 2: 309.  
*Phaulotettix* Kirby, W.F. 1910. A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae) 3(2): 494.  
*Phaulotettix* Otte, D. 1995. Orthoptera Species File 4: 406.  
*Phaulotettix* Fontana & Buzzetti. 2007. Atti Acc. Rov. Agiati 87(B): 101.

The genus description by Scudder, 1897 was based on males only, since he did not have females available. Medium sized insects;



Figs 7-12. *Phaulotettix eurycercus* Hebard, 1918. Male pronotum in left lateral view (7) and dorsal view (8); left cercus in lateral view (9); male abdomen apex in dorsal view (10); phallic complex in dorsal view (11) and epiphallus in dorsal view (12).

slightly less than twice as long as the metazona, divided in the middle by a distinct transverse sulcus, followed at a short distance behind by a less distinct sinuous sulcus, very feebly and sparsely punctate in distinction from the densely, though not sharply, punctate metazona. Prosternal spine short, blunt, conical, retrorse; interval between mesosternal lobes subquadrate, the metasternal lobes attingent over a short space. Tegmina ovate, not extending or scarcely to moderately extending beyond second abdominal segment, situated high upon the sides. Fore and middle femora scarcely tumescent; hind femora very short and moderately stout, the hind tibiae with nine spines in the outer series. Abdomen strongly compressed in males, not so in females, the tip scarcely enlarged as seen from above, upturned only by its inferior curve; margins of the subgenital plate not ampliate at the base, straight, well rounded and entire apically, extending beyond the tip of the supraanal plate by about half the length of the latter. Furcula minute, digitiform. Cerci simple, laminate, tapering basally, inferiorly angulated at apex; subgenital plate of male with no apical tubercle. Epiphallus (Fig. 92): size small; ancorae well developed, curved inwards; anterior process well developed; lophi cylindrical, medium size; short narrow bridge, inner margin straight or in some species with a hump in the middle; posterior

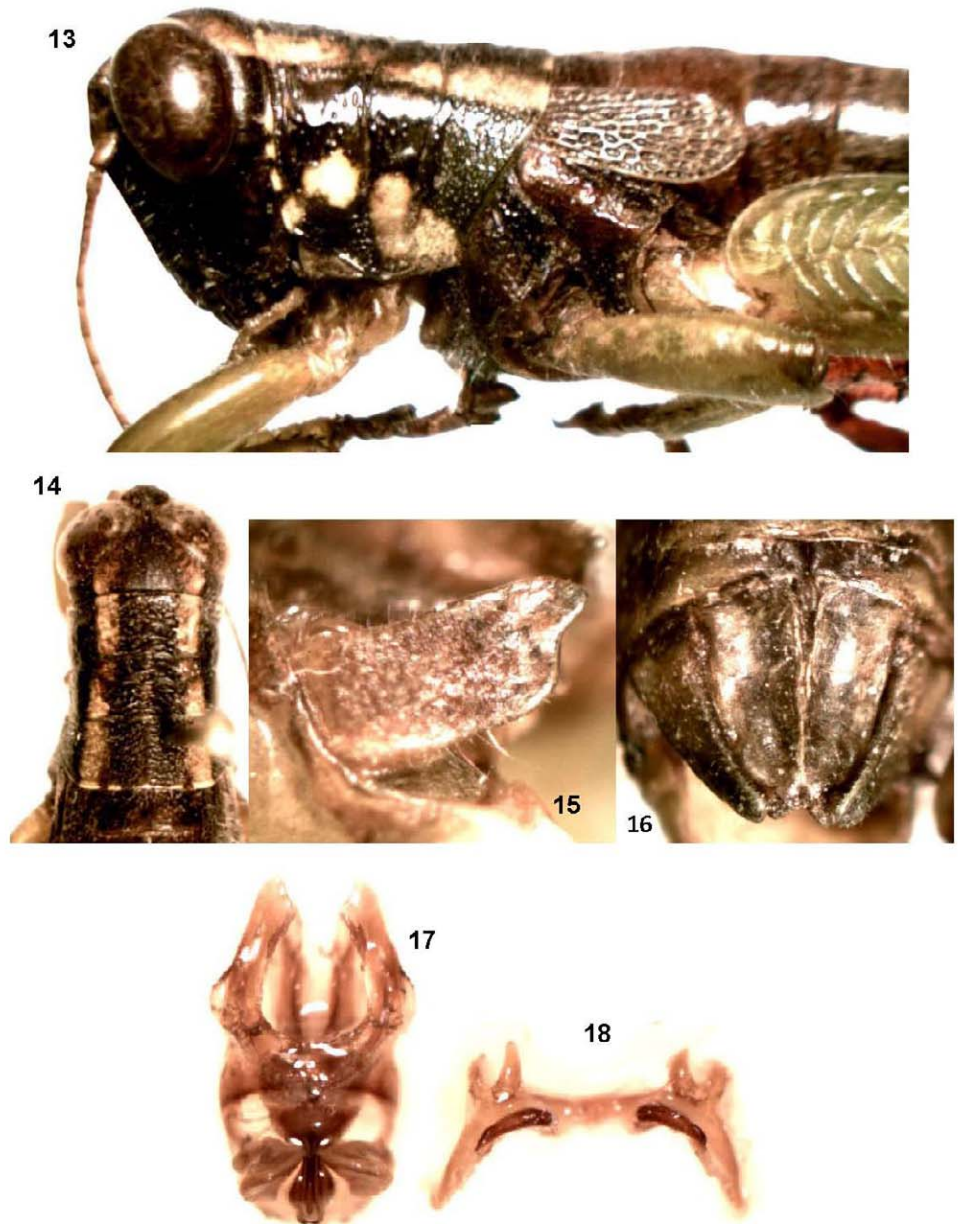
process well developed, projecting downwards. Internal valves of aedeagus (Fig. 92): dorsal valves elongated, broad and mostly concave; ventral valves of variable size and shape. Species may be easily separated from other genera of Melanoplinae based on the male's cerci, genitalic characters and external morphology.

males: 16.0-20.0 mm; females: 20.0-27.0 mm (Tables 1, 2). Male body color green (alive), with dark green postocular band, hind tibiae distal portion and tarsi, intense pink-red, white triangular marks on abdominal tergites (Figs 94, 95); females are robust and exhibit a green or light brown-grey form, with a dark postocular band on head and pronotal lobes, hind tibiae basal half to two thirds bluish, distal portion and tarsi intense pink-red (Figs 94, 95). The body is compact, laterally compressed, pilose. Head not prominent, not wider (including the eyes) than the broadest part of the thorax, the vertex gently arched, not elevated above pronotum, the fastigium descending rapidly, the face retreating slightly; eyes large but not very prominent, more than half as long as broad in the male and nearly twice as long as the anterior infra-ocular portion of the genae, separated above by a very narrow space; frontal costa narrow, but wider than the space between the eyes, equal, percurrent, sulcate; antennae only a little longer than head and pronotum together. Pronotum truncate at each extremity, barely broader behind than in front, transversely convex, the disk passing insensibly into the vertical lateral lobes, a slight median carina; prozona transverse,

process well developed, projecting downwards. Internal valves of aedeagus (Fig. 92): dorsal valves elongated, broad and mostly concave; ventral valves of variable size and shape. Species may be easily separated from other genera of Melanoplinae based on the male's cerci, genitalic characters and external morphology.

*Similar genera.*—The genus *Phaulotettix* may be confused with *Phaedrotettix* Scudder, 1897 and/or *Philocleon* Scudder, 1897. However, *Phaedrotettix* is considerably smaller than *Phaulotettix*, and in *Phaedrotettix*, the head, pronotum and postocular band are dark brown, extending on sides of abdomen till about fifth segment; linear wings, abdominal tergites white cream, hind tibiae entirely bluish green, tarsi brown-bluish green dorsally, cerci of variable shape and size; whereas *Phaulotettix* specimens are larger and more robust, males are green and females green or brownish, postocular band not extending beyond pronotum, wings ovate, white cream triangular marks on abdominal tergites, hind tibiae distally — in some species almost entirely — intense pink-red, tarsi intense pink-red, cerci laminate, half basal portion tapering, lower margin obtuse-angulate.

Figs 13-18. *Phaulotettix huastecus* Buzzetti, Barrientos-Lozano & Fontana, 2010. Male pronotum in left lateral view (13) and dorsal view (14); left cercus in lateral view (15); male abdomen apex in dorsal view (16); phallic complex in dorsal view (17) and epiphallus in dorsal view (18).



*Philocleon* is larger than *Phaulotettix*, the pronotum more robust, gibbous; males are intense green, some species with tinges of yellow on head, pronotum lobes, sides of abdomen and lower margin of hind femora, postocular band intense brown extending on sides of abdomen; females intense green or brown, postocular band dark brown extending on abdomen sides; wings narrower than in *Phaulotettix*; knees are black in both sexes; hind tibiae bluish green, tarsi brownish; some *Philocleon* spp., e.g., *P. luceroae* and *P. nigrovittatus* possess tinges of brick-red on dorsal pronotum metazona, dorsally on hind femora and lower carinula and dorsally on fore and mid femora. Cerci laminate, basally broad, tapering gradually, curved inwards about midlength, half distal portion very narrow.

*Phaulotettix compressus* Scudder, 1897  
(Figs 1-6; 91; 92: 1A, 2A, 3A, 4A; 93; 94; 96)

*Phaulotettix compressus* Scudder S.H. 1897. Proc. U.S. Nat. Mus. 20 (1124): 30.

*Sinaloa brevispinis* Rehn J.A.G. 1904, Proc. Acad. Nat. Sci. Phil. 56: 535

*Calotettix bicoloripes* Bruner *et al.* 1900-1909. Biologia Centrali Americana 2: 309.

*Calotettix flavopictus* Bruner *et al.* 1900-1909. Biologia Centrali Americana 2: 310.

*Calotettix obscurus* Bruner *et al.* 1900-1909. Biologia Centrali Americana 2: 311.

*Phaulotettix compressus* Rehn J.A.G. & Hebard M. 1912. Proc. Acad. Nat. Sci. Philad. 64 (1): 74.

*Phaulotettix compressus* Hebard M. 1917. Proc. Acad. Nat. Sci. Philad. 69: 262.

*Phaulotettix compressus* Barrientos-Lozano L. 2004. Orthoptera. In: Biodiversidad, Taxonomía y Biogeografía de Artrópodos de México. Vol. IV: 614.

*Phaulotettix compressus* Fontana P. & Buzzetti F.M. 2007. Atti Acc. Rov. Agiati VIII- Vol. 7(B):102.

*Phaulotettix compressus* Fontana P., Buzzetti F.M. & Mariño-Pérez R. 2008. Chapulines, Langostas, Grillos y Esperanzas de México. Guía Fotográfica. Grasshoppers, Locusts, Crickets & Katydid of Mexico. Photographic Guide, 188-189.

Figs 19-24. *Phaulotettix adibilis* n. sp. Male pronotum in left lateral view (19) and dorsal view (20); left cercus in lateral view (21); male abdomen apex in dorsal view (22); phallic complex in dorsal view (23) and epiphallus in dorsal view (24).

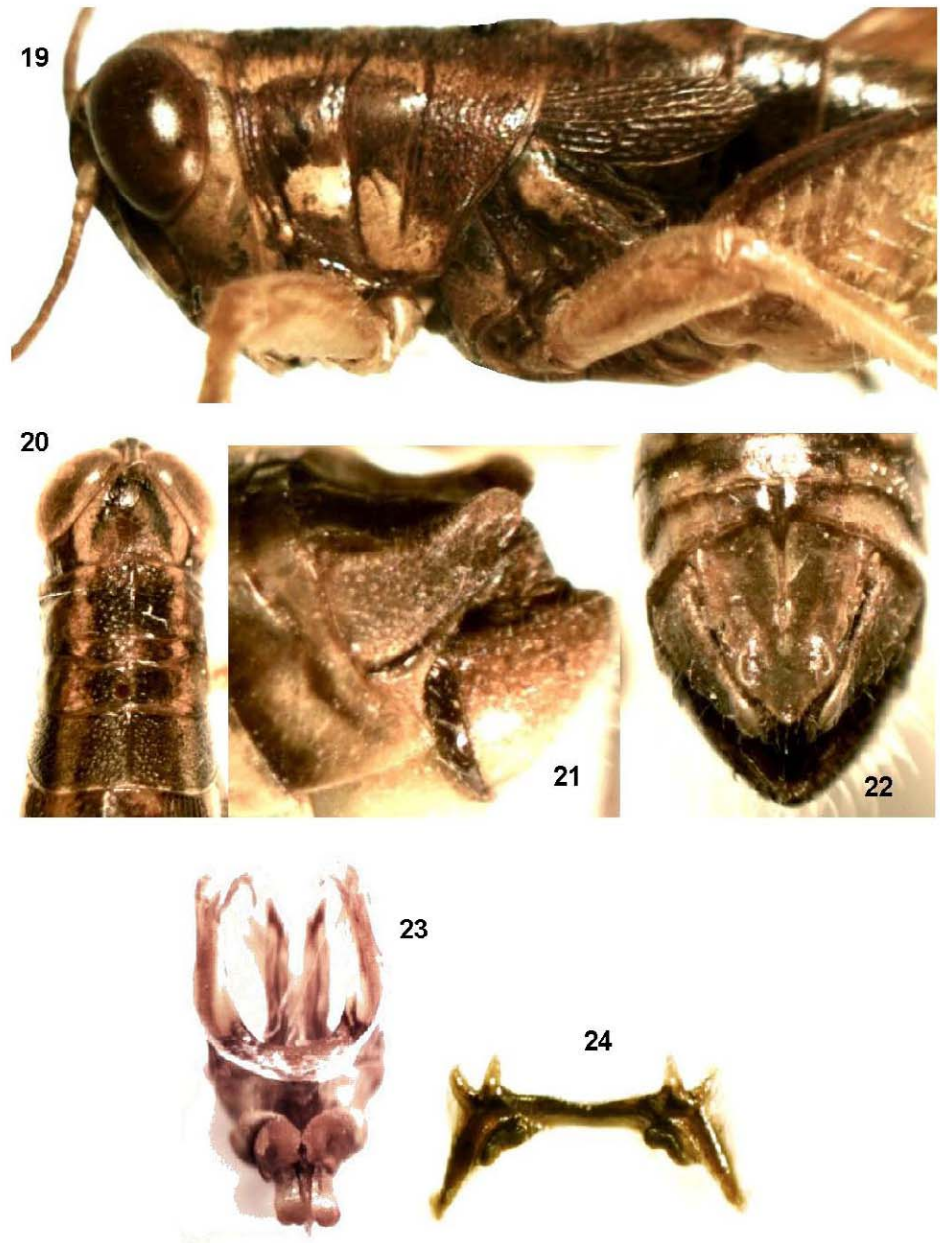
*Phaulotettix compressus* Barrientos-Lozano L., Medina R.F & Rocha-Sánchez A.Y. 2009. Jour. Orth. Res. 18(1): 50. *Phaulotettix compressus* Chintauan-Marquier, Jordan, Berthier, Amédégno & Pompanon. 2011. Mol. Phylogenet. Evol. 58: 28-29.

*Type locality*.—Mexico, Coahuila, Montelovez (= Monclova). 1 ♂ (juv.).

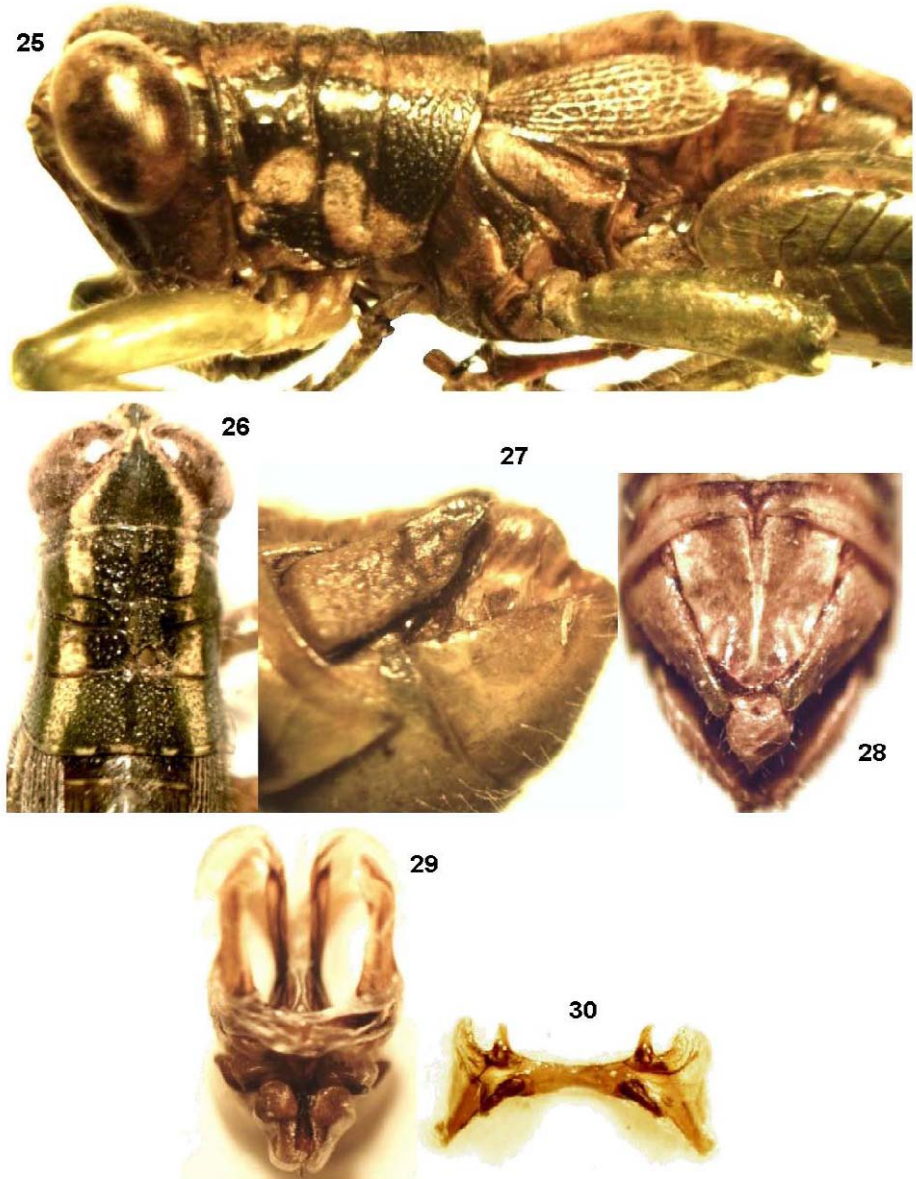
*Type*.—holotype male, ANSP-Philadelphia.

*Material examined*.—Texas: 1 ♂ and 1 ♀, Val Verde Co. Fawcett Ranch, 22 mi. (by rd.) NW Loma Alta, 45 air mi. N. Del Rio, 518 m, 31.VII.1958, Cohn T. J., coll. UMMZ. Coahuila: 1 ♂ and 1 ♀, Los Lirios, Arteaga, 2394 m, lat 25°21'32.5"N, long 100°35'58.8"W, 08.IX.2002, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 5 ♂ and 5 ♀, Hwy. 57, Saltillo-Monclova, El Marqués, km 141, 993 m, lat 26°28.791'N, long 101°21.230'W, 26.IX.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, between Arteaga and Los Lirios, El Cascajal, 1942 m, lat 25°22'59.1"N, long 100°46'17"W, 26.IX.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. Nuevo León: 1 ♂ and 2 ♀, Vitro Parque el Manzano, 1513 m, lat 25°22.017'N, long 100°11.879'W, 10.III.2001, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 2 ♂ and 10 ♀, Iturbide, Paradero Los Altares, 1290 m, lat 24°44.16'N, long 99°51.07'W, 20.X.2001, Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 4 ♀, Rancho El Viejo, km 23, 1953 m, lat 24°44.876'N, long 99°44.666'W, 11.XI.2003, Lumberras-Cepeda S., coll. L. Barrientos-Lozano-ITCV; 4 ♂, Iturbide, Cañón de Santa Rosa, 1080 m, lat 24°44.322'N, long 99°50.899'W, 22.X.2003, Zarate-Torres J.F., coll. L. Barrientos-Lozano-ITCV; 9 ♂ and 1 ♀, same locality, 25.IX.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♀, between Iturbide and Tokio, Hwy. to San Roberto, 2079 m, lat 24°40'33.4"N, long 100°8'46.9"W, 25.IX.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. Tamaulipas: 1 ♂, Victoria, Carretera (rd.) Interejidal, Ejido Santa Ana, km 12, 313 m, lat 23°51.910'N, long 99°14.629'W, 27.VIII.2004, Torres-Acosta R.I. & Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 6 ♀, Victoria, Cañón de Calamaco, 180 m, lat 23°43'00"N, long

99°17'00"W, 16.X.2005, Torres-Acosta R.I. & Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 4 ♀, Victoria, Cañón de la Peregrina, 200 m, 30.IX.2005, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♀, Victoria, Nuevo Centro de Población Altas Cumbres (NCP), 589 m, lat 23°40'00"N, long 99°11'6.94"W, 22.VII.2004, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 2 ♀, same locality, 12.X.2005, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 3 ♂ and 2 ♀, same locality, 23.IX.2007, Torres-Acosta R.I., coll. L. Barrientos-Lozano-ITCV; 1 ♂, rd. Mante-Ocampo, km 14, 650 m, 07.XII.2007, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♀, rd. Ocampo-Tula, Km 22, 1928 m, lat 22°54.693'N, long 99°29.437'W, 5.VIII.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Victoria, between NCP Altas Cumbres and Ejido La Joya, 916 m, lat 23°35'20.3"N, long 99°13'10.9"W, 12.VIII.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♀, Victoria, Cañón de la Libertad, 361 m, lat 23°46.630'N, long 99°13.029'W, 29.VII.2009,



**Figs 25-30.** *Phaulotettix opimus* n. sp. Male pronotum in left lateral view (25) and dorsal view (26); left cercus in lateral view (27); male abdomen apex in dorsal view (28); phallic complex in dorsal view (29) and epiphallus in dorsal view (30).



Barrientos-Lozano L. & Ramírez-Núñez J.B., coll. L. Barrientos-Lozano-ITCV; 2 ♂, old rd. Ciudad Victoria-Jaumave, km 156, 826 m, lat 23°38.165'N, long 99°11.735'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♀, Victoria, NCP Altas Cumbres, 927 m, lat 23°35.332'N, long 99°13.179'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂, Victoria, Ejido El Huizachal, 852 m, lat 23°35.284'N, long 99°13.463'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Hwy. 180, Soto La Marina-Aldama, km 113, 112 m, lat 23°37.666'N, long 98°22.126'W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Aldama, 9 Km prior to Cenote El Zacatón, 214 m, lat 22°59'55.70"N, long 98°10'09.00"W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 2 ♀, Hwy. 101, between Ciudad Victoria and San Antonio, 1065 m, lat 23°37.167'N, long 99°16.689'W, 27.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **San Luis Potosí:** 1 ♂ and 1 ♀, rd. Estación Manuel-El Ébano, Rancho El Gualul, 107 m, lat 22°31'57.8"N, long 98°24'39.7"W, 10.XI.2001, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Ébano, Hacienda Los Tullillos, 50 m, lat 22°13'N, long 98°23'W, 21.VIII.2002, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV. **Hidalgo:** 1 ♂, Hwy. 85, Km 254, Chapulhuacán, between Tamazunchale and Ixmiquilpan, 540 m, lat 21°13'17.7"N, long 98°53'52.6"W, 15.IX.2009, Barrientos-Lozano L. & Ramírez-Núñez J.B., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**—Differs from congeneric species by the slender, compressed cerci, tapering on the basal half, beyond subequal, lower outer margin obtuse-angulate, short rounded apex (Figs 3, 91). Supraanal plate (Figs 4, 91) subtriangular, slightly longer than wide. Epiphallus (Figs 6, 92: 1A, 2A): ancorae well developed, long and curved, exceeding the anterior process, lophi elongated; apodemes of cingulum (Figs 5, 92: 3A, 4A) basally very broad, then abruptly narrowing. Internal valves of aedeagus (Figs 5, 92: 3A, 4A): dorsal valve of aedeagus broad, long, interiorly concave, shell shaped, more expanded about middle; ventral valve of aedeagus broad basally, middle upper margin curved inwards, narrow, rounded apex (Figs 5, 3A, 4A).

**Redescription of males.**—General body color dark green; head brown, with a well-indicated cream stripe extending from back of eyes throughout pronotum; dark green postocular band on sides of head extending onto sides of pronotum; eyes large but not very prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, very large, shallow, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, surpassing slightly the second abdominal tergite, hind margin emarginated. Abdomen with triangular, cream marks dorsally. Hind femora with a line of yellow marks on lower carinula, ventral side cream-yellowish, dorsally dark green with three diffuse white spots. Hind tibiae, half basal portion bluish-green, distally red, tarsi red. Supraanal plate triangular, slightly longer than wide, rounded apex, median sulcus basally broad, extending beyond midlength. Furculae represented by two small, digitiform, thin projections slightly longer than broad, with rounded tip. Subgenital plate short, subconical. Male's cerci slender, basally broad, basal half tapering, beyond subequal, lower distal margin obtuse-angulate, broad-rounded-apex.



Figs 31-36. *Phaulotettix altissimus* n. sp. Male pronotum in left lateral view (31) and dorsal view (32); left cercus in lateral view (33); male abdomen apex in dorsal view (34); phallic complex in dorsal view (35) and epiphallus in dorsal view (36).

*Description of females.*—Medium sized, robust (Table 2), showing great sexual dimorphism in size and color, considerably larger than males, two color forms: green or light brown-grey. Eyes very large and subelliptical; fastigium subelliptical, about twice wider than long seen from above. Postocular band subobsolete on prozona, absent on metazona. Pronotum highly rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum prominent and percurrent, pronotal disk emarginate with white and dark marks, wings ovate not surpassing second abdominal segment. Light triangular markings on abdominal tergites diffuse. Two dark bands on hind femora not very pronounced. Hind tibiae, two basal thirds bluish-green, distally red, tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

*Measurements.*—(mm) **Males:** Body length from vertex to end of femur 3: 20.0 (19.0-21.0). Pronotum length: 3.8 (3.6-4.0). Tegmina length: 2.9 (2.4-3.4). Hind femur length: 10.5 (10.1-10.7). **Females:** Body length: 25.0 (23.0-26.0). Pronotum length: 5.4 (5.1-5.8). Tegmina length: 3.3 (2.9-3.8). Hind femur length: 13.6 (12.7-14.7).

*Distribution.*—Widespread from South Texas, USA through northeastern States of Mexico, from Coahuila to Hidalgo (Fig. 93). This species has been collected on the four Biogeographic Provinces that occupies northeastern México (TAM, ESM, GM, MHP).

*Habitat.*—This species is found through the year on grasses, roadsides, high mountain openings and wood margins; 50 to 2400 masl (Table 3).

It has been collected on *Helianthus annuus* L. (Asteraceae), *Mimosa biuncifera* Benth., (Fabaceae), *Cenchrus ciliaris* L. (Poaceae), *Cenchrus echinatus* L. (Poaceae), *Acacia farnesiana* (L.) Willd. (Fabaceae), *Prosopis glandulosa* T. (Fabaceae), *Opuntia engelmannii* Salm-Dyck ex Engelm. (Cactaceae).

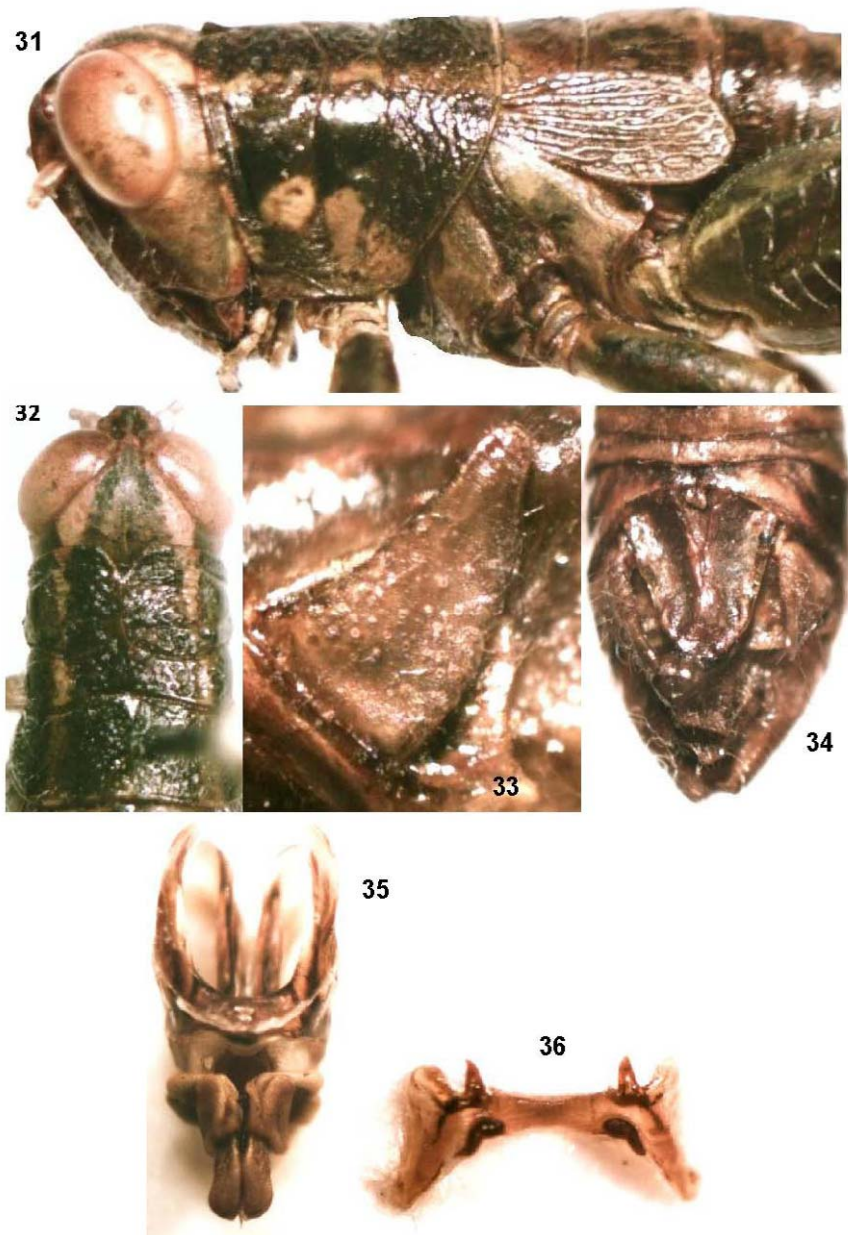
*Phaulotettix eurycercus* Hebard, 1918  
(Figs 7-12; 91; 92: 1B, 2B, 3B, 4B; 93; 96)

*Phaulotettix eurycercus* Hebard, M. 1918. Trans. Amer. Entomol. Soc. 44: 143.

*Phaulotettix eurycercus* Barrientos-Lozano, L. 2004. Orthoptera. In: Biodiversidad, Taxonomía y Biogeografía de Artrópodos de México. Vol. IV: 614.

*Phaulotettix eurycercus* Fontana, P. & Buzzetti, F. M. 2007. Atti Acc. Rov. Agiati VIII. Vol. 7(B): 104.

*Phaulotettix eurycercus* Fontana, P. Buzzetti, F. M. & Mariño-Pérez, R. 2008. Chapulines, Langostas, Grillos y Esperanzas de México. Guía



Fotográfica. Grasshoppers, Locusts, Crickets & Katydid of Mexico. Photographic Guide, 188-189.

*Type locality.*— Laguna del Gato, three miles west of San Fordyce, Hidalgo, County, Texas, USA. 53-61m. 06.VIII.1912

*Type.*— Holotype male, ANSP-USA.

*Material examined.*— **Coahuila:** 2 ♀, Saltillo, Ejido Bellavista, 1620 m, lat 25°26'0"N, long 101°0'10" W, 30.VIII.2007, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 2 ♂ and 3 ♀, Hwy. 57, Saltillo-Monclova, El Marquez, km 141, 993 m, lat 26°28.791'N long 101°21.230'W, 26.IX.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

*Diagnosis.*—Easily distinguished from congeneric species by the smaller size, unique shape of cerci (Figs 9, 91) basally broad, basal half tapering, narrowing about midlength, distal half spatulate, broad

**Figs 37-42.** *Phaulotettix ablusus* n. sp. Male pronotum in left lateral view (37) and dorsal view (38); left cercus in lateral view (39); male abdomen apex in dorsal view (40); phallic complex in dorsal view (41) and epiphallus in dorsal view (42).

rounded apex. Supraanal plate (Figs 10, 91) subrectangular. Subgenital plate, seen from above, sphaerical. Epiphallus (Figs 12, 92: 1B, 2B): ancorae short, not exceeding the anterior process, lophi large and prominent. Valves of aedeagus (Figs 11, 92: 3B, 4B): dorsal valve of aedeagus long and tubular, stout, basally narrow, expanding towards the apex; ventral valve of aedeagus similar to dorsal valve, broad basally, expanding gradually towards a thick, distended apex.

*Redescription of males.*—General body color dark green; head light brown, with a cream stripe extending from the back of eyes on prozona, not so on metazona; dark green postocular band on sides of head extending on sides of pronotum; eyes large and prominent, more than half as long as broad, separated above by a very narrow space and the very prominent fastigial lateral ridges; fastigium octagonal, medium size, deep, middle groove. Pronotum truncated in both extremities. Tegmina ovate, not exceeding the second abdominal tergite, hind margins emarginated. Abdomen with triangular, cream marks, dorsally, on distal segments covering almost the entire tergite. Hind femora with a line of yellow marks on lower carinula, ventral side yellowish, dorsally cream with three well defined dark green or almost black bands, two distal bands extending to inner face. Hind tibiae basal fifth bluish-green, remaining portion and tarsi intense red. Supraanal plate subrectangular, basally broad, tapering gradually towards a pointed rounded apex, median sulcus very broad basally and deep until about midlength, then narrow and shallow, extending beyond midlength. Furculae represented by two, digitiform, thin, projections longer than broad, with rounded tip. Subgenital plate rounded, seen from above. Male's cerci very distinctive, slender, basally broad, gradually tapering, narrow at the middle, half distal portion spatulate and with broad, rounded-apex.

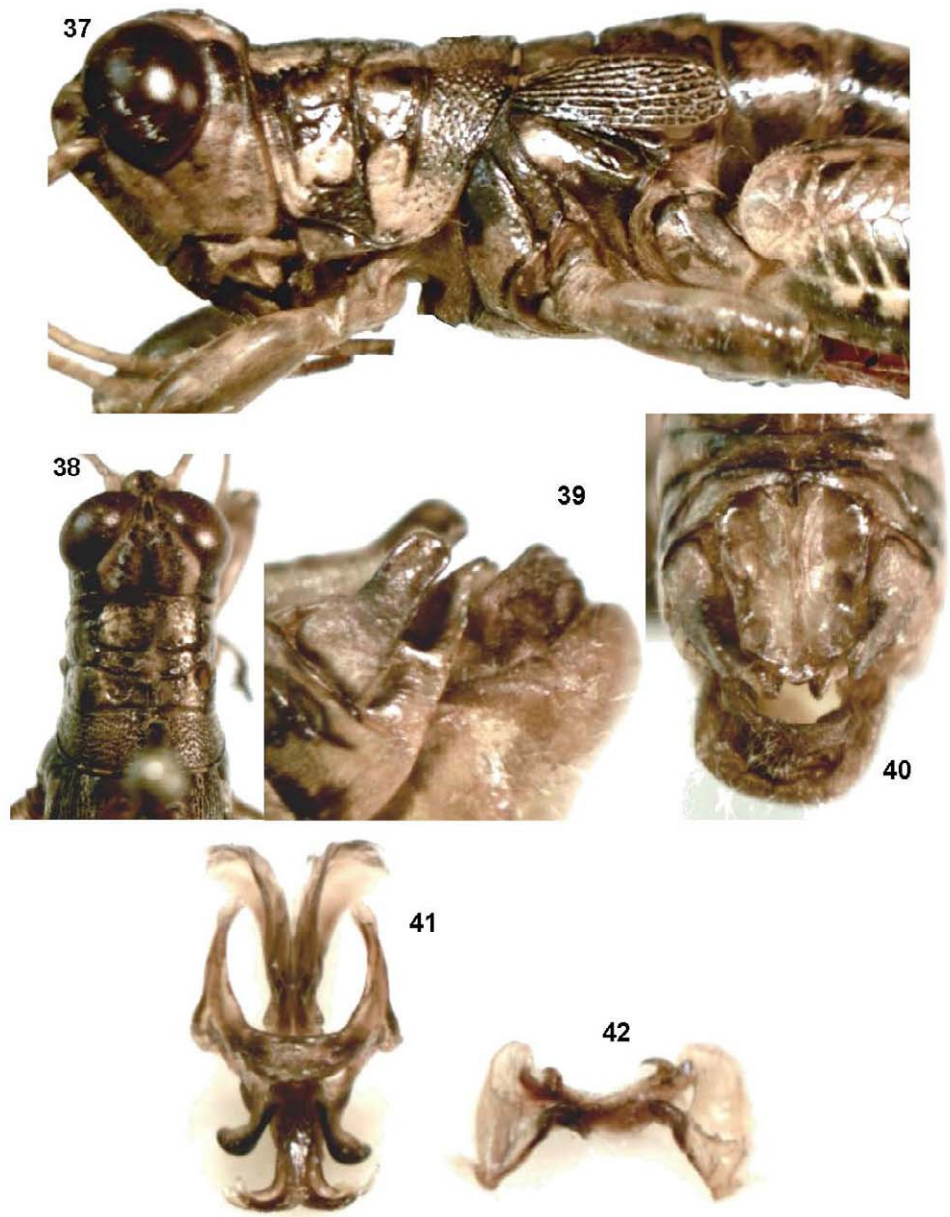
*Description of females.*—Small sized, robust (Table 2), exhibits sexual dimorphism in size and color, larger than males, two color forms—green and light brown. Eyes rounded and prominent, fastigium octagonal wider than long; seen from above. Postocular band prominent on prozona, absent on metazona. Pronotum slightly rugose and moderately punctate on prozona; densely punctate, not rugose on metazona; median carina of pronotum prominent on half basal portion of prozona, not so beyond; pronotal disk emarginated with white and dark marks. Ovate wings, not reaching the

posterior margin of the second abdominal segment. Light cream triangular markings on abdominal tergites very conspicuous. Two dark bands on the hind femora very pronounced. Hind tibiae basal fifth light bluish-green, remaining portion and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

*Measurements.*— (mm) **Males:** Body length from vertex to end of femur 3: 16.0 (15.0-16.0). Pronotum length: 3.0 (3.0-3.1). Tegmina length: 2.4 (2.3-2.5). Hind femur length: 8.5 (8.4-8.7). **Females:** Body length: 20.0 (20.0-21.0). Pronotum length: 3.9 (3.8-4.0). Tegmina length: 2.4 (2.3-2.5). Hind femur length: 11.1 (11.0-11.2).

*Distribution.*— From South Texas, USA through Coahuila and Nuevo León, México (Fig. 93). This species has been collected on three out of four Biogeographic Provinces that occupies northeastern Mexico (TAM, ESM and MHP).

*Habitat.*—*P. eurycercus* has been collected on patch-forming herba-



Figs 43-48. *Phaulotettix adiaphoros* n. sp. Male pronotum in left lateral view (43) and dorsal view (44); left cercus in lateral view (45); male abdomen apex in dorsal view (46); phallic complex in dorsal view (47) and epiphallus in dorsal view (48).

ceous plants and shrubs on roadsides; 50 to 1620 masl (Table 3). Typical habitat vegetation is as follows: *Artemisia ludoviciana* Nutt., (Asteraceae), *Asphodelus fistulosus* L. (Liliaceae), *Parthenium hysterophorus* L. (Asteraceae), *Ageratina zapalinama* Turner (Asteraceae), *Fouquieria splendens* Engelm., (Fouquieriaceae), *Euphorbia antisiphylitica* Zucc., (Euphorbiaceae), *Larrea tridentata* Coville (Zygophyllaceae).

*Phaulotettix huastecus* Buzzetti, Barrientos-Lozano & Fontana, 2010  
(Figs 13-18; 91; 92: 1C, 2C, 3C, 4C; 93; 96)

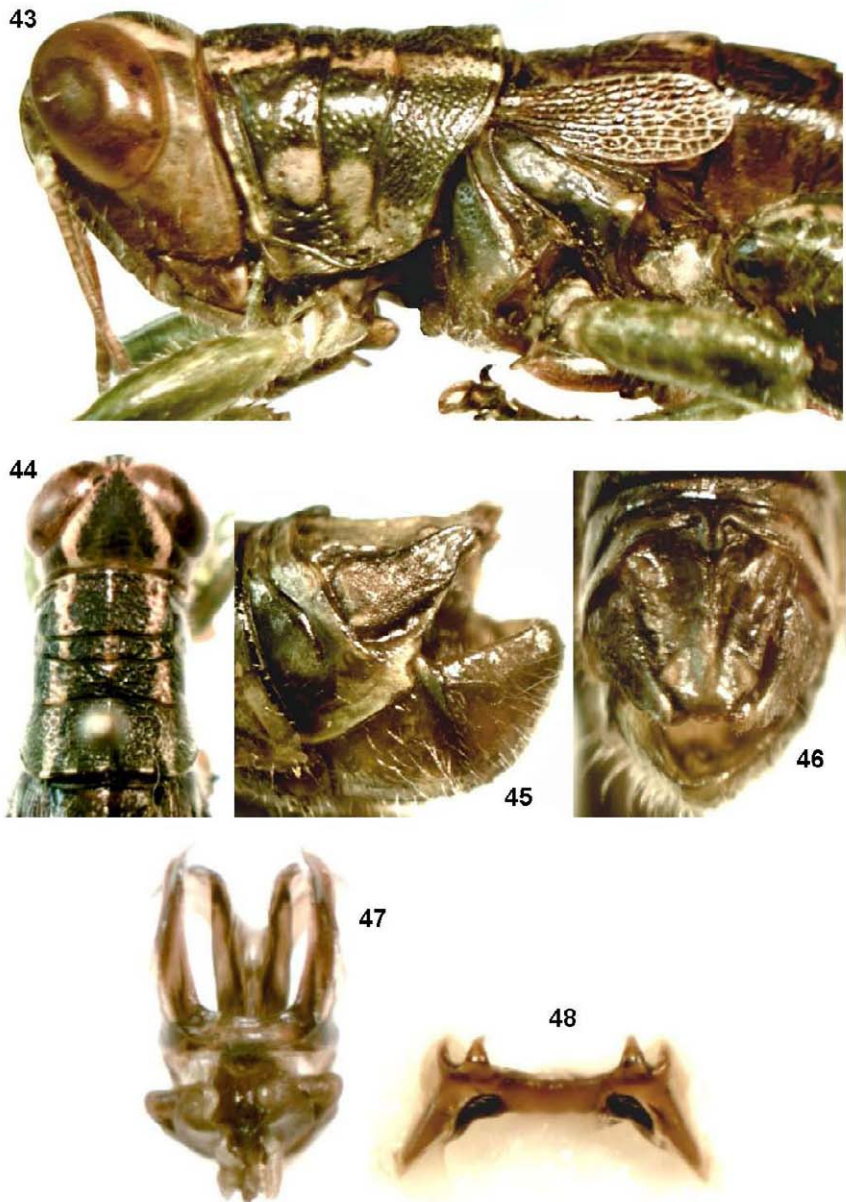
*Phaulotettix huastecus* Buzzetti, F. M., Barrientos-Lozano, L. & Fontana, P. 2010. Boll. Soc. Entomol. Ital. 142 (3): 100-101.

*Type locality*.—Mexico, Tamaulipas, Hwy. 85, Cañón El Abra, 260 m, lat 22°36'25"N, long 99°01'28"W, 25.XI.2008.

*Type*.— holotype male, allotype female, IB-UNAM.

*Material examined*.— **Nuevo León**: 1 ♂ and 4 ♀, Iturbide, Cañón de Santa Rosa, 1080 m, lat 24°44.322'N, long 99°50.899'W, 12.IX.2009, Barrientos-Lozano L. & Ramirez-Núñez J.B., coll. L. Barrientos-Lozano-ITCV. **Tamaulipas**: 1 ♂, Jaumave, 735 m, lat 23°24'N, long 99°24'W, 14.VI.2002, Barrientos-Lozano L. & Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Gómez Farías, RB. El Cielo, between Gómez Farías and Ejido Altacima, 1318 m, lat 23°03'7.01"N, long 99°12'3.47"W, 22.XI.2002, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 3 ♂, same locality, 19.VIII.2003, Zarate-Torres J.F., coll. L. Barrientos-Lozano-ITCV; 1 ♂, same locality, 24.X.2009, Barrientos-Lozano L., Méndez-Gómez B.R., Montelongo-Ruiz G. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Gómez Farías, 400 m, lat 23°02'80.8"N, long 99°09'30.8"W, 12.VII.2007, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Gómez Farías-Altacima, El Mirador, 530 m, lat 23°03.432'N, long 99°10.389'W, 23.X.2009, Barrientos-Lozano L., Méndez-Gómez B.R., Montelongo-Ruiz G. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Mante, Ejido Nueva Unión between Ejido Celaya and San Roberto, 12 m, lat 22°35.928'N, long 99°00.078'W, 10.VII.2007, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 2 ♂, rd. Mante-Ocampo, km 30, 650 m, lat 22°49'3.07"N, long 99°15'4.13"W, 12.VII.2007, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, rd. Ocampo-Tula, km 24, 897 m, lat 22°55.846'N, long 99°30.978'W, 23.X.2009, Barrientos-Lozano L., Méndez-Gómez B.R., Montelongo-Ruiz G. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂, rd. Ocampo-Mante, Puerto de la Virgen, 526 m, lat 22°49.007'N,

long 99°16.395'W, 23.X.2009, Barrientos-Lozano L., Méndez-Gómez B.R., Montelongo-Ruiz G. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂ and 1 ♀, Zaragoza, Hwy. 81, Fortín Agrario, 157 m, lat 23°2.383'N, long 98°44.764'W, 15.XII.2009, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 2 ♀, Hwy. 101, Ciudad Victoria-Jaumave, Ejido El Huizachal, 852 m, lat 23°35.284'N, long 99°13.467'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Hwy. 70, Villa de Casas-Soto La Marina, km 50, 223 m, lat 23°40.516'N, long 98°40.311'W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **San Luis Potosí**: 1 ♂ and 1 ♀, Hwy. 85, km 27, Laguna del Mante between Ciudad Mante and Ciudad Valles, 289 m, lat 22°13'16.6"N, long 98°59'58.7"W, 20.IX.2009, Barrientos-Lozano L. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 2 ♀, between Nuevo Morelos and El Naranjo, km 174, 366 m, lat 22°31.680'N, long 99°16.044'W, 20.VIII.2010, Barrientos-Lozano



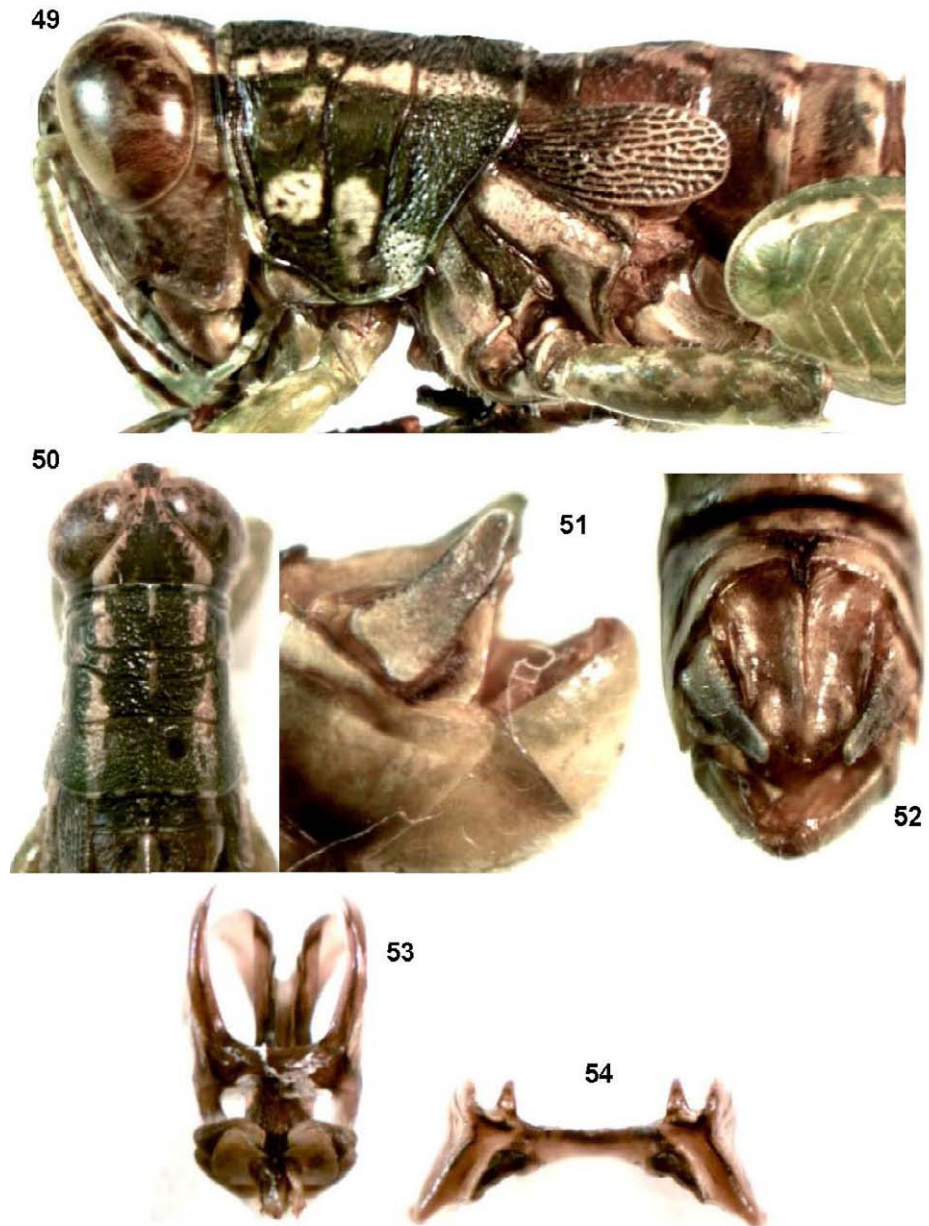
**Figs 49-54.** *Phaulotettix ambrosius* n. sp. Male pronotum in left lateral view (49) and dorsal view (50); left cercus in lateral view (51); male abdomen apex in dorsal view (52); phallic complex in dorsal view (53) and epiphallus in dorsal view (54).

L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**— This species may be differentiated from congeneric species as follows: males' cerci (Figs 15, 91) very simple, laminated, lower margin moderately obtuse-angulate distally. Supraanal plate (Figs 16, 91), triangular, about twice as long as wide. Epiphallus (Figs 18, 92: 1C, 2C): ancore, dorsal view, robust, slightly longer than anterior process, lophi very elongated. Valves of aedeagus (Figs 17, 92: 3C, 4C): dorsal valve subquadrate, half distal portion tumescent, internally concave, a minute apical projection; ventral valve subrectangular, conspicuously constrained about midlength.

**Redescription of males.**— General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and prominent, slightly longer than broad, separated above by a narrow space and well defined fastigial lateral ridges; fastigium octagonal, medium size, shallow, middle groove. Pronotum punctate, and rugose. Tegmina, widely ovate, not exceed the second abdominal tergite, hind margins emarginated. Abdomen with triangular cream marks, dorsally. Hind femur with a line of cream marks on lower carinula, ventral side light brown, dorsally dark green. Hind tibiae, half basal portion bluish-green, distally red, tarsus red. Supraanal plate triangular, slightly broader basally, tapering gradually towards a pointed rounded apex, median sulcus basally as broad as furculae, deep about one third, then narrow and shallow, extending beyond midlength. Furculae represented by two very small, dark, digitiform, projections, basally broad, pointed. Subgenital plate short and subconical. Male cerci distinctively laminated, very wide, lower margin obtuseangulate.

**Description of females.**— Medium sized, robust (Table 2), showing sexual dimorphism in size and color, slightly larger than males, two color forms: green and light brown. Eyes medium sized, subelliptical, not prominent; fastigium octagonal about three times wider than long; both eyes and fastigium seen from above. Postocular band subobsolete on prozona, absent on metazona. Pronotum moderately rugose and sparsely punctate on prozona, moderately punctate on metazona, median carina of pronotum percurrent but not prominent, pronotal disk emarginated with white and dark marks, wings ovate slightly surpassing the second abdominal segment. Light cream



triangular markings on abdominal tergites inconspicuous. Two dark bands on the hind femora well pronounced. Hind tibiae, two basal thirds bluish-green, distal portion and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 20.0 (19.0-21.0). Pronotum length: 3.6 (3.4-3.7). Tegmina length: 2.9 (2.7-3.1). Hind femur length: 10.3 (9.5-11.4). **Females:** Body length: 23.0 (21.0-24.0). Pronotum length: 4.8 (4.5-5.3). Tegmina length: 3.2 (2.6-3.4). Hind femur length: 12.3 (11.5-13.3).

**Distribution.**— Widespread through the northeastern states of Mexico: Nuevo León, Tamaulipas, San Luis Potosí (Fig. 93). This species has been collected in three out of the four Biogeographic Provinces that occupy northeastern Mexico (GM, ESM, MHP).

**Habitat.**— This species is found on grasses, roadsides and at medium elevations in openings and margins of woods; 12 to 1300-1400 masl (Table 3). At the lower elevations, 0-600 masl, the vegetation is

Figs 55-60. *Phaulotettix arcadius* n. sp. Male pronotum in left lateral view (55) and dorsal view (56); left cercus lateral view (57); male abdomen apex in dorsal view (58); phallic complex in dorsal view (59) and epiphallus in dorsal view (60).

typical shrub such as *Mimosa biuncifera* Benth. (Fabaceae), *Havardia pallens* Benth., Britton & Rose (Fabaceae), *Acacia farnesiana* (L.) (Fabaceae), *Prosopis glandulosa* T. (Fabaceae), *Opuntia engelmannii* Salm-Dyck ex Engelm. (Cactaceae), *Agave lechuguilla* T. (Agavaceae); at medium elevations, 700-1500, the habitat is tropical deciduous forest and montanae forest with oak presence.

*Phaulotettix adibilis* n. sp.

(Figs 19-24; 91; 92: 1D, 2D, 3D, 4D; 93; 96)

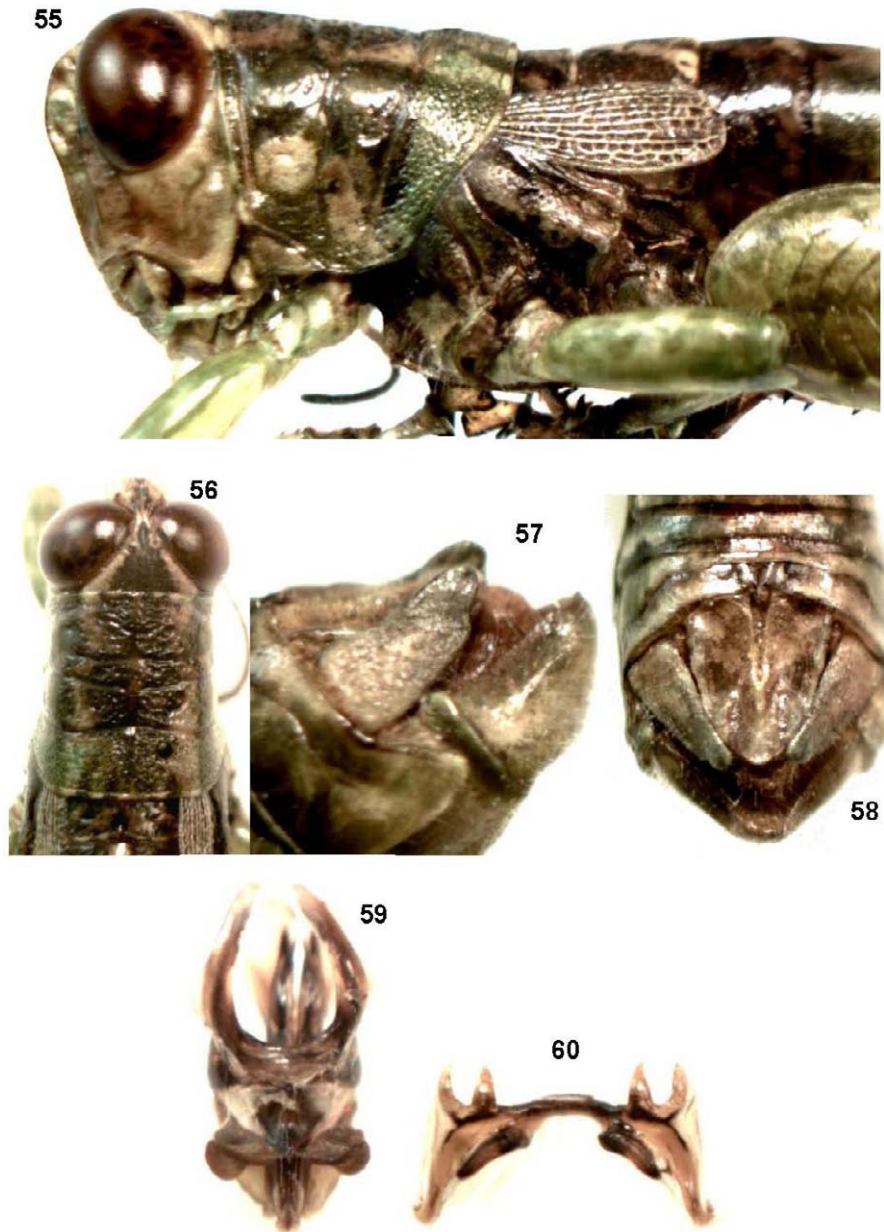
*Type material*.— (material examined) Holotype ♂ and allotype ♀. Mexico, Nuevo León, Santo Domingo, Rancho Acero, 459 m, lat 24° 47.104'N, long 99° 39.654'W, 11.XI.2003, Lumbreras-Cepeda S. & Barrientos-Lozano L. **Paratypes, Nuevo León:** 3 ♂, same data as holotype, coll. L. Barrientos Lozano-ITCV; 5 ♂ and 9 ♀, Vitro Parque El Manzano, 1513 m, lat 25° 22.017'N, long 99° 11.879'W, 03.X.2001, Barrientos-Lozano L. & Guerrero-Garza J. M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Iturbide, Paradero Los Altares, 1290 m, lat 24° 44.16'N, long 99° 51.07'W, 20.X.2001, Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, border between Nuevo León and Coahuila, Cañon de la Boca, 1560 m, lat 25° 23'08.92"N, long 100° 18'20.00"W, 20.VII.2001, Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV. **Coahuila:** 2 ♂, Hwy. 57, Saltillo-Monclova, El Marqués, km 141, 993 m, lat 26° 28.791'N, long 101° 21.230'W, 14.VIII.2009, Barrientos-Lozano L., Ramírez-Núñez J.B. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

*Diagnosis*.— Similar to *P. compressus* Scudder, 1897, but differs in the more robust and broader apex of male cerci (Figs 21, 91). Epiphallus (Figs 24, 92: 1D, 2D): ancorae shorter and more prominent, more widely developed anterior process; lophi smaller and more prominent. Cingulum (Figs 23, 92: 3D) dorsal view: half distal portion of apodemes stockier, rounded, broad tip (not so in *P. compressus*). Valves of aedeagus (Figs 23, 92: 3D, 4D): dorsal valve broad, stout, tubular shape, distal third internally concave and slightly broader, apical lower margin irregularly pointed in dorsal view, distal margin about middle exhibits a small ridge giving the appearance of two lobes; ventral valve rhomboidal shape.

*Description of males*.— General body color dark green; head brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, very large, not prominent, about twice as broad as

long; medium size, shallow, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, surpassing slightly the second abdominal segment, hind margin emarginated. Abdomen with triangular, cream marks dorsally. Hind femora with a line of yellow marks on lower carinula, ventral side cream-yellowish, dorsally light brown. Hind tibiae, half basal portion bluish-green, distally red, tarsi red. Supraanal plate triangular, basally broad, tapering gradually towards a pointed rounded apex; median sulcus basally broad and deep, extending about midlength. Subgenital plate short, subconical. Male's cerci slender, basally broad, narrowing about midlength, the lower distal margin obtuseangulate, broad-rounded-apex.

*Description of females*.— Small sized, robust (Table 2), comparable with *P. opimus* n. sp., (which is slightly smaller); exhibit sexual dimorphism in size and color, considerably larger than males, two color forms: green and light brown. Eyes large and subelliptical; fastigium subelliptical, distally very broad, more than twice as wide as long, seen from above. Postocular band extending to



**Figs 61-66.** *Phaulotettix flaccidus* n. sp. Male pronotum in left lateral view (61) and dorsal view (62); left cercus in lateral view (63); male abdomen apex in dorsal view (64); phallic complex in dorsal view (65) and epiphallus in dorsal view (66).

metazona. Pronotum strongly rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum prominent and percurrent, pronotal disk emarginated with white marks, wings ovate slightly surpassing the second abdominal segment. Light cream triangular markings on abdominal tergites conspicuous. Two dark bands on the hind femora well pronounced. Hind tibiae, two basal thirds bluish-green, distal portion and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**—(mm) **Males:** Body length from vertex to end of femur 3: 18.0 (18.0-19.0). Pronotum length: 3.8 (3.4-4.1). Tegmina length: 2.8 (2.5-3.3). Hind femur length: 9.7 (9.4-10.1). **Females:** Body length: 24.0 (22.0-26.0). Pronotum length: 5.5 (5.0-6.0). Tegmina length: 3.4 (2.9-4.1). Hind femur length: 12.7 (11.7-14.0).

**Etymology.**— From the Latin *adibilis*, meaning accessible.

**Distribution.**— Coahuila and Nuevo León, Mexico (Fig. 93). This species has been collected on two Biogeographic Provinces: MHP and towards the northern range of the ESM.

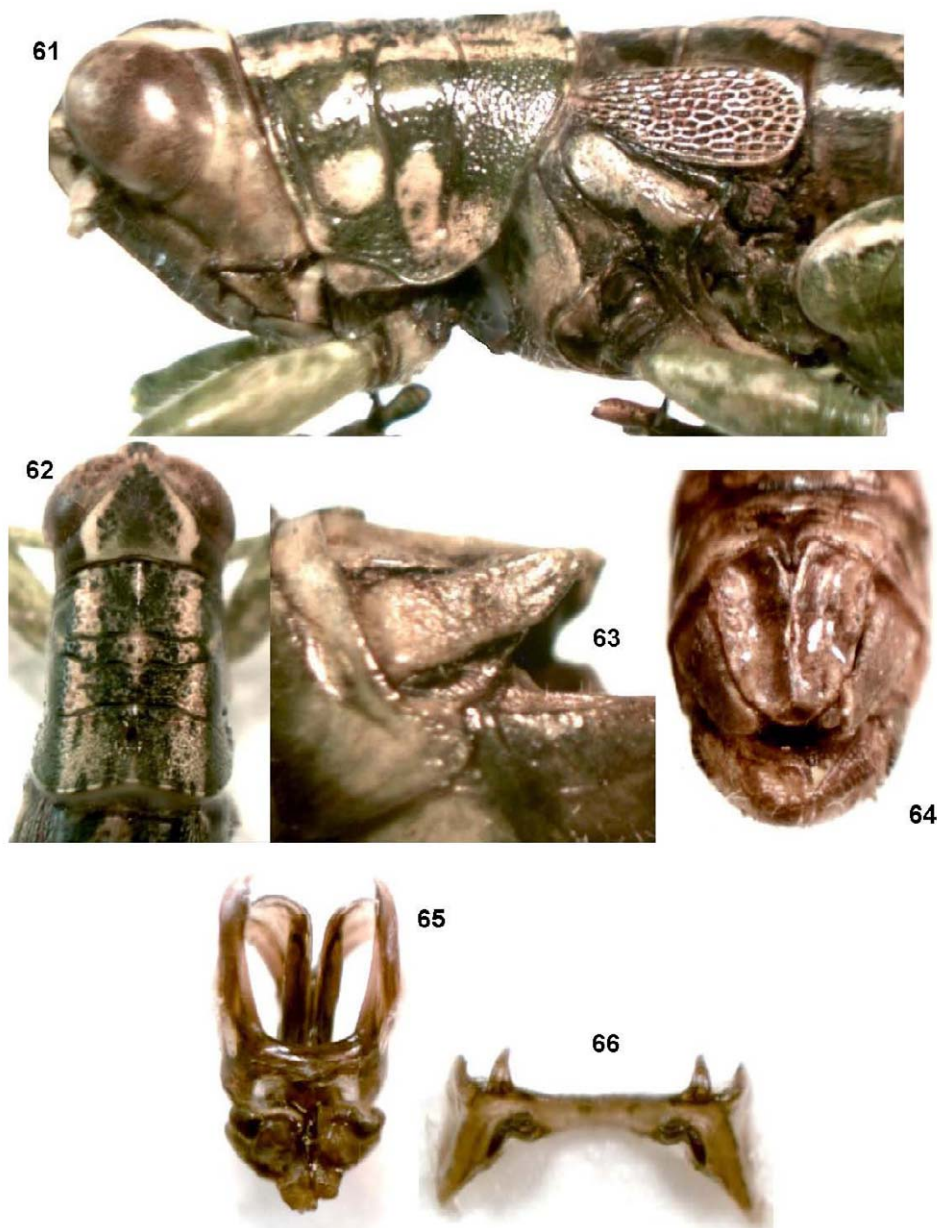
**Habitat.**— This species has been collected on grasses, roadsides and in openings and margin of woods; 450-1600 masl (Table 3). At the lowlands, typical vegetation is shrub such as *Mimosa biuncifera* Benth. (Fabaceae), *Havardia pallens* Benth., Britton & Rose (Fabaceae), *Acacia farnesiana* (L.) (Fabaceae), *Prosopis glandulosa* T. (Fabaceae), *Opuntia engelmannii* Salm-Dyck ex Engelm., (Cactaceae), *Agave lechuguilla* T. (Agavaceae); at ca. 1100-1800 juniper and oak-juniper woodland.

***Phaulotettix opimus* n. sp.**

(Figs 25-30; 91; 92: 1E, 2E, 3E, 4E; 93; 95; 96)

**Type material (material examined).**— Holotype ♂ and allotype ♀. **Mexico, Tamaulipas,** Cañón de Calamaco, 180 m, lat 23°43'00"N, long 99°17'00"W, 16.X.2005, Torres-Acosta R.I. & Barrientos-Lozano L. **Paratypes, Nuevo León:** 1 ♂, Iturbide, Paradero Los Altares, 1290 m, lat 24°44.16'N, long 99°51.07'W, 25.VII.2001, Barrientos-Lozano L. & Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, same locality, 20.X.2001, Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, same locality, 11.XI.2003, Lumbreras-Cepeda S., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Rancho El Rodeo, 1890

m, lat 24°44'88.2"N, long 99°59'26.8"W, 23.VII.2002, Guerrero A., coll. L. Barrientos-Lozano-ITCV; 1 ♂, rd. Galeana-Iturbide, Km 62, 1589 m, lat 24°46.487'N, long 100°04.357'W, 02.XI.2008, Barrientos-Lozano L., Méndez-Gómez B.R., Ramírez-Núñez J.B. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **Tamaulipas:** 6 ♂, Victoria, rd. Interejidal, Ejido Santa Ana, km 12, 313 m, lat 23°51.910'N, long 99°14.629'W, 02.X.2003, Zarate-Torres J.F., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Ciudad Victoria, Colonia El Mirador, 320 m, lat 23°45.594'N, long 99°07.929'W, Torres-Acosta R.I., coll. L. Barrientos-Lozano-ITCV; 2 ♂, Hwy. 85 Ciudad Victoria-Monterrey, km 9.5, Huerta cítrica de Guillermo Sámano, 196 m, lat 23°53'24.3"N, long 99°5'6.93"W, 19.XI.2004, Guevara-Alvarado G., coll. L. Barrientos-Lozano-ITCV; 1 ♂, Victoria, NCP Altas Cumbres, 589 m, lat 23°40'001"N, long 99°11'6.94"W, 23.IX.2005, Torres-Acosta R.I., coll. L. Barrientos-Lozano-ITCV; 2 ♀, Victoria, Cañón de Calamaco, 180 m, lat 23°43'00"N, long 99°17'00"W, 16.X.2005, Torres-Acosta R.I., coll. L. Barrientos-Lozano-ITCV; 8 ♂ and 2 ♀, Hwy. 101 Ciudad Victoria-Jaumave, Km 166, 460 m, lat 23°38.212'N, long 99°11.439'W, 31.VII.2010, Barrientos-Lozano L.,



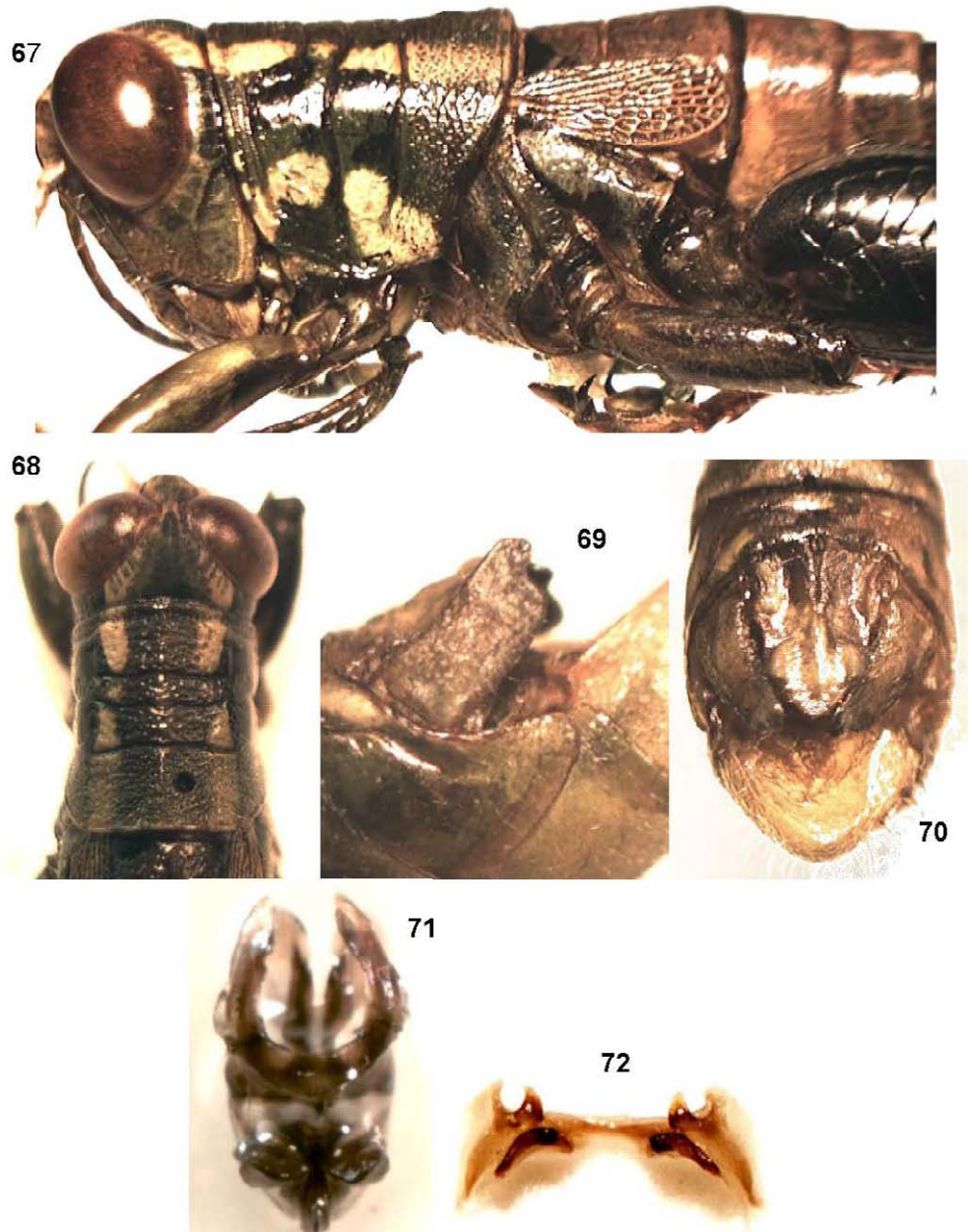
Figs 67-72. *Phaulotettix affinis* n. sp. Male pronotum in left lateral view (67) and dorsal view (68); left cercus lateral view (69); male abdomen apex in dorsal view (70); phallic complex in dorsal view (71) and epiphallus in dorsal view (72).

Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂ and 1 ♀, Victoria, NCP Altas Cumbres, 926 m, lat 23° 35.332'N, long 99° 13.179'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂, Hwy. 101 Ciudad Victoria-Jaumave, Ejido El Huizachal, 852 m, lat 23° 35.284'N, long 99° 13.463'W, 31.VII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, Aldama, 9 km prior to Cenote El Zacatón, 214 m, lat 22° 59'55.70"N, long 98° 10'09.00"W, 13.VIII.2010; 1 ♂, rd. Ciudad Victoria-Tampico, Ejido Maclovio Herrera, km 44, 57 m, lat 22° 29.919'N, long 98° 05.394'W, 02.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 3 ♂ and 7 ♀, same locality, 29.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♀, 28 mi. rd. SW Jaumave, 1714 m, lat 23° 17'39.41"N, long 99° 39'45.77"W, 17.VIII.1959, Cohn T.J., coll. UMMZ. **San Luis Potosí:** 1 ♂ and 1 ♀, rd. Estación Manuel-El Ébano, Rancho El Gualul, 107 m, lat 22° 31'57.8"N, long 98° 24'39.7"W, 10.XI.2001, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV; 1 ♂ and 1 ♀, 3 mi. rd. N Tamazunchale, 300-400 m, lat 21° 15'15.93"N, long 98° 47'19.22"W, 29.VIII.1955, Cantrall I.J. & Cohn T.J., coll. UMMZ; 2 ♂ and 5 ♀, 12 rd. mi. SW Ciudad del Maíz, (1 mi. S of Montebello), 1246 m, lat 22° 23'59.71"N, long 99° 36'10.70"W, 17.VIII.1959, Cantrall I.J. & Cohn T.J., coll. UMMZ; 2 ♀, 21 mi. E San Luis Potosí (Central plaza), 2194 m, 24.VIII.1959, Cantrall I.J. & Cohn T.J., coll. UMMZ. **Veracruz:** 1 ♂ and 1 ♀, Palma Real, 410 m, lat 20° 48.937'N, long 98° 08.391'W, 30.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **Hidalgo:** 2 ♂ and 3 ♀, 6.5 km N Durango (nr. minas), km 255.5, oak zone, 1981 m, lat 20° 53'60"N, long 99° 13'60"W, 29.VIII.1948, Hubbell T.H., coll. UMMZ.

**Diagnosis.**— This insect is related to *P. compressus*, but differs from this species as follows: males' cerci smaller, distal apex more produced and slightly pointed (Figs 27, 91). Supraanal plate subtriangular, smaller and longer than in *P. compressus* (Figs 28, 91). Epiphallus (Figs 30, 92: 1E, 2E): ancorae not exceeding the anterior process; apodemes of cingulum distally more robust and circular (Figs 29, 92: 3E, 4E). Valves of aedeagus (Figs 29, 92: 3E, 4E): dorsal valve

pentagonal shape, uniformly broad, apex moderately concave internally; ventral valve subrectangular.

**Description of males.**— General body color dark green; head brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large but not prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, medium size, shallow-middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, surpassing the second abdominal tergite, hind margin emarginated. Abdomen with triangular, cream marks dorsally. Hind femora with a line of yellow marks on lower carinula, ventral side cream-yellowish, dorsally light brown. Hind tibiae basal portion bluish-green, distal portion red; tarsi red. Supraanal plate triangular with lateral margins slightly sinuous, moderately pointed, rounded apex. Furculae represented by two small digitiform projections, slightly longer than broad. The subgenital plate is subconical, seen from above. Male's cerci,



**Figs 73-78.** *Phaulotettix adynatos* n. sp. Male pronotum in left lateral view (73) and dorsal view (74); left cercus in lateral view (75); male abdomen apex in dorsal view (76); phallic complex in dorsal view (77) and epiphallus in dorsal view (78).

in lateral view, broad basally, narrower beyond midlength, the lower distal margin moderately obtuseangulate, apex produced and broad.

**Description of females.**—Small sized, robust (Table 2), exhibiting sexual dimorphism in size and color, considerably larger than males, two color forms: green and light brown. Eyes large, subelliptical; fastigium subelliptical, about three times wider than long, seen from above. Postocular band extending on pronotum lateral lobes. Pronotum rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum prominent on prozona and beyond, less prominent towards caudal portion of metazona, percurrent; pronotal disk emarginated with white and dark marks, tegmina ovate surpassing moderately the second abdominal segment. Light cream triangular markings on abdominal tergites diffuse. Hind femora with two dark, conspicuous bands. Hind tibiae, basal two thirds bluish-green, distally red, tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 19.0 (18.0-20.0). Pronotum length: 3.9 (3.4-4.3). Tegmina length: 3.0 (2.9-3.1). Hind femur length: 10.5 (10.3-11.0). **Females:** Body length: 24.0 (22.0-26.0). Pronotum length: 5.6 (5.0-6.1). Tegmina length: 3.4 (2.8-4.1). Hind femur length: 12.6 (11.6-13.7).

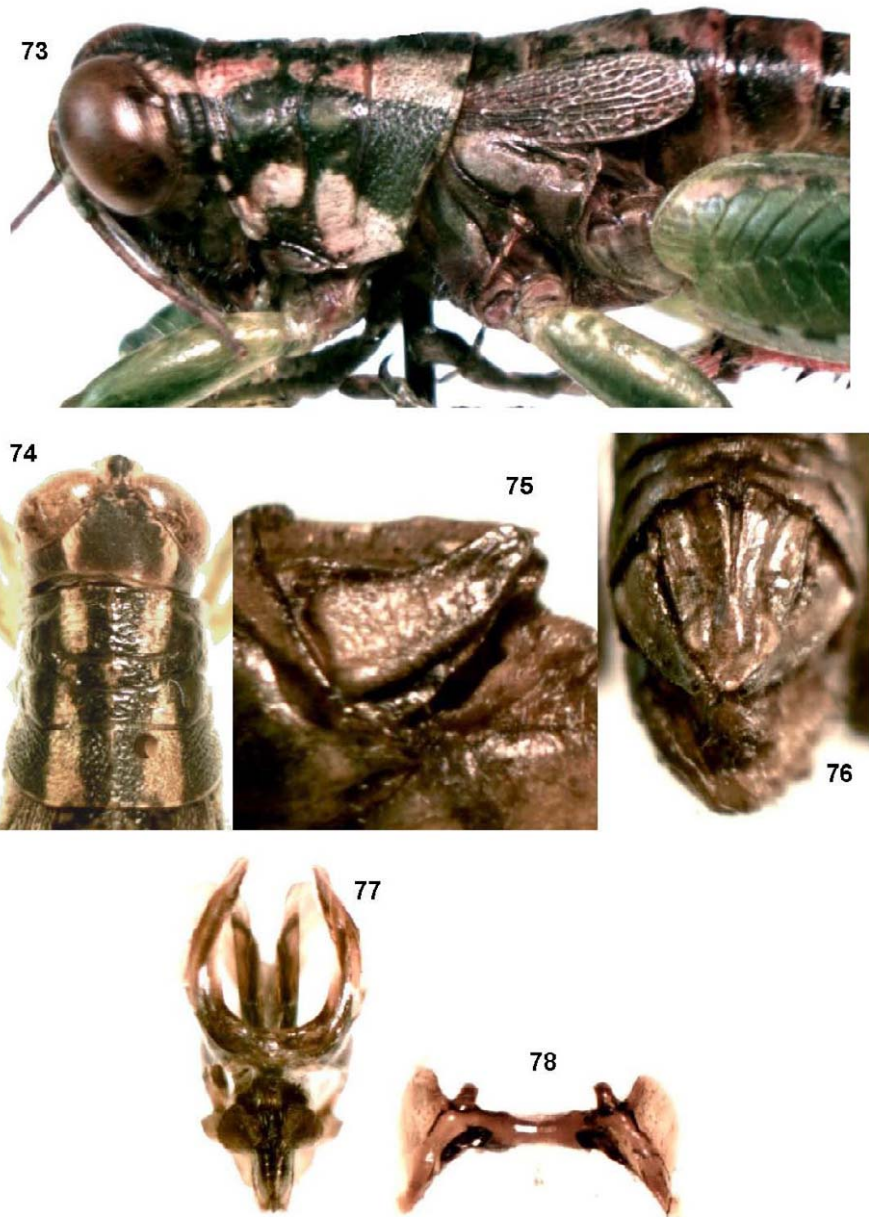
**Etymology.**— From the Latin *opimus*, meaning rich, abundant; this species is very common in northeastern Mexico.

**Distribution.**—Widespread through the northeastern States of Mexico: Nuevo León, Tamaulipas, San Luis Potosí, Hidalgo and north Veracruz (Fig. 93). This species has been collected on two Biogeographic Provinces: GM and ESM.

**Habitat.**— Collected on grasses, roadsides and high up into the mountain in openings and margin of woods; 100 to 2000 masl (Table 3). This species is found over a wide range of habitats from thorny shrub to tropical deciduous forest with oak presence.

***Phaulotettix altissimus* n. sp.**  
(Figs 31-36; 91; 92: 1F, 2F, 3F, 4F; 93)

**Type material (material examined).**— Holotype ♂. **Mexico, Nuevo León**, Galeana, Cerro Potosí, Cabaña del Aserradero, 2103 m, lat 24° 53.276'N, long 100° 11.187'W, 02.XI.2008, Barrientos-Lozano L., Méndez-Gómez B.R., Ramírez-Núñez J.B. & Rocha-Sánchez A.Y.



**Paratype**, 1 ♂, same data as holotype, coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**— Similar to *P. compressus* Scudder, 1897, differing mostly in the smaller size, anterior margin of pronotum vshaped, pronotum very rugose (Fig. 32). Broader basal half of male's cerci, distal half tapering towards the rounded apex (Figs 33, 91). Subgenital plate subconical, when seen from above, it is notched in the middle. Epiphallus (Figs 36, 92: 1F, 2F): ancorae stockier, anterior process more widely developed, lophi smaller and more prominent. Arch of cingulum circular (Figs 35, 92: 3F) (subquadrate in *P. compressus*). Internal valves of aedeagus (Figs 35; 92: 3F, 4F): dorsal valve shell shape but shorter than in *P. compressus*, distal margin sinuous; ventral valve subelliptical in shape, concave, basally narrow, expanding towards mid portion, then tapering towards a pointed apex.

**Description of male.**— General body color very dark green; head light brown; cream stripe behind the eyes well indicated, not so on pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large but not very prominent, more



Figs 79-84. *Phaulotettix nimius* n. sp. Male pronotum in left lateral view (79) and dorsal view (80); left cercus in lateral view (81); male abdomen apex in dorsal view (82); furcula (82a); phallic complex in dorsal view (83) and epiphallus in dorsal view (84).

than half as long as broad, intraocular space not as narrow as in *P. compressus*; fastigium medium size, octagonal, about twice as broad than long; large, shallow, middle groove. Pronotum, dorsal view: very rugose, anterior margin v-shape; posterior margin of pronotal disk with tenuous cream marks. Tegmina widely ovate, surpassing the second abdominal tergite, hind margin emarginated. Abdomen with triangular, cream marks dorsally. Hind femora dark green with a few yellow marks on lower carinula; knees almost entirely black, with a whitish mark on lower portion. Hind tibiae mostly blue, caudal fifth red; tarsi red. Supraanal plate triangular, the lateral margins slightly sinuous, broad rounded apex, with a conspicuous median sulcus extending beyond midlength. Furculae represented by two digitiform, robust, rounded projections. Subgenital plate subconical, notched at the tip, seen from above. Male's cerci basally very broad, tapering gradually towards a rounded apex, sinuous lower margin, in lateral view.

Females not available.

**Measurements.**—(mm) Males: Body length from vertex to end of femur 3: 17.0. Pronotum length: 2.9. Tegmina length: 2.8. Hind femur length: 8.9.

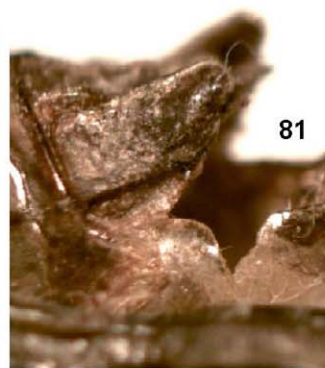
**Etymology.**— From the Latin *altissimus* meaning highest, Cerro Potosí is considered the highest point of the Eastern Sierra Madre in northeastern Mexico.

**Distribution.**—This species is known only from the type locality (Fig. 93). It has been collected at the ESM above 2000 masl.

**Habitat.**— This species has been collected in openings and margin of woods; 2100 masl (Table 3). It is associated with grasses and alpine and subalpine meadow, particularly *Asphodelus fistulosus* L. (Liliaceae), *Astranthium beamanii* DeJong (Asteraceae), *Senecio loratifolius* Greenm (Asteraceae), *Arbutus xalapensis* Kunth (Ericaceae), *Bidens muelleri* Sherff (Asteraceae), *Arenaria montana* (L.) (Caryophyllaceae), *Juniperus erythrocarpa* Cory (Cupressaceae), *Berberis trifoliata* Moric (Berberidaceae), *Trifolium schneideri* Standley (Fabaceae).

*Phaulotettix ablusus* n. sp.  
(Figs 37-42; 91; 92: 1G, 2G, 3G, 4G; 93)

**Type material.**— (material examined) Holotype ♂. Mexico, Coa-



huila, Saltillo, Bellavista, 1620 m, lat 25° 26' 0" N, long 101° 0' 10" W, 09.XI.2007, Torres-Acosta R.I. & Barrientos-Lozano L. Paratype, 1 ♂, same data as holotype, coll. L. Barrientos Lozano-ITCV.

**Diagnosis.**—Similar to *P. euryercus* Hebard, 1918, but differs as follows: males' cerci are broader and more robust (Figs 39, 91), middle portion is not constrained as in *P. euryercus*. Supraanal plate is subrectangular, slightly longer and narrower than in *P. euryercus* (Figs 40, 91). Subgenital plate subquadrate, half distal portion gibbous, seen from above. Epiphallus (Figs 42, 92: 1G, 2G): lateral plates more widely developed, bridge shorter with lower margin an inverted u-shape at middle. Internal valves of aedeagus (Figs 41, 92: 3G, 4G): dorsal valve tubular and longer than in *P. euryercus*, expanded bifid apex; ventral valve similar to dorsal valve but translucent.

**Description of male.**—General body color dark brown; head light brown, with a cream stripe extending from the back of eyes throughout pronotum, weakly on metazona; dark green postocular band

**Figs 85-90.** *Phaulotettix jocundus* n. sp. Male pronotum in left lateral view (85) and dorsal view (86); left cercus in lateral view (87); male abdomen apex in dorsal view (88); phallic complex in dorsal view (89) and epiphallus in dorsal view (90).

on sides of head extending on sides of pronotum; eyes large and prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, large-deep, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, surpassing slightly the second abdominal segment, hind margin emarginate. Abdomen with triangular, cream marks dorsally. Hind femora lower carinula cream with dark marks, ventral side cream-yellowish, dorsally light brown with three dark bands; lower marginal area bluish-green. Hind tibiae almost entirely red, except basal fifth which is dark bluish-green; tarsi red. Supraanal plate subrectangular, slightly broader basally, rounded apex, median sulcus broad basally, deep up to about midlength, then narrower and shallow, extending beyond midlength. Furculae represented by two small, digitiform, robust, projections slightly longer than broad, with rounded tip. Subgenital plate, seen from above, subrectangular, distally gibbous (*P. eurycercus* is not gibbous distally). Male's cerci, lateral view: very broad basally, basal half tapering, distal half spatulate, equally broad; in general stouter and broader than *P. eurycercus*.

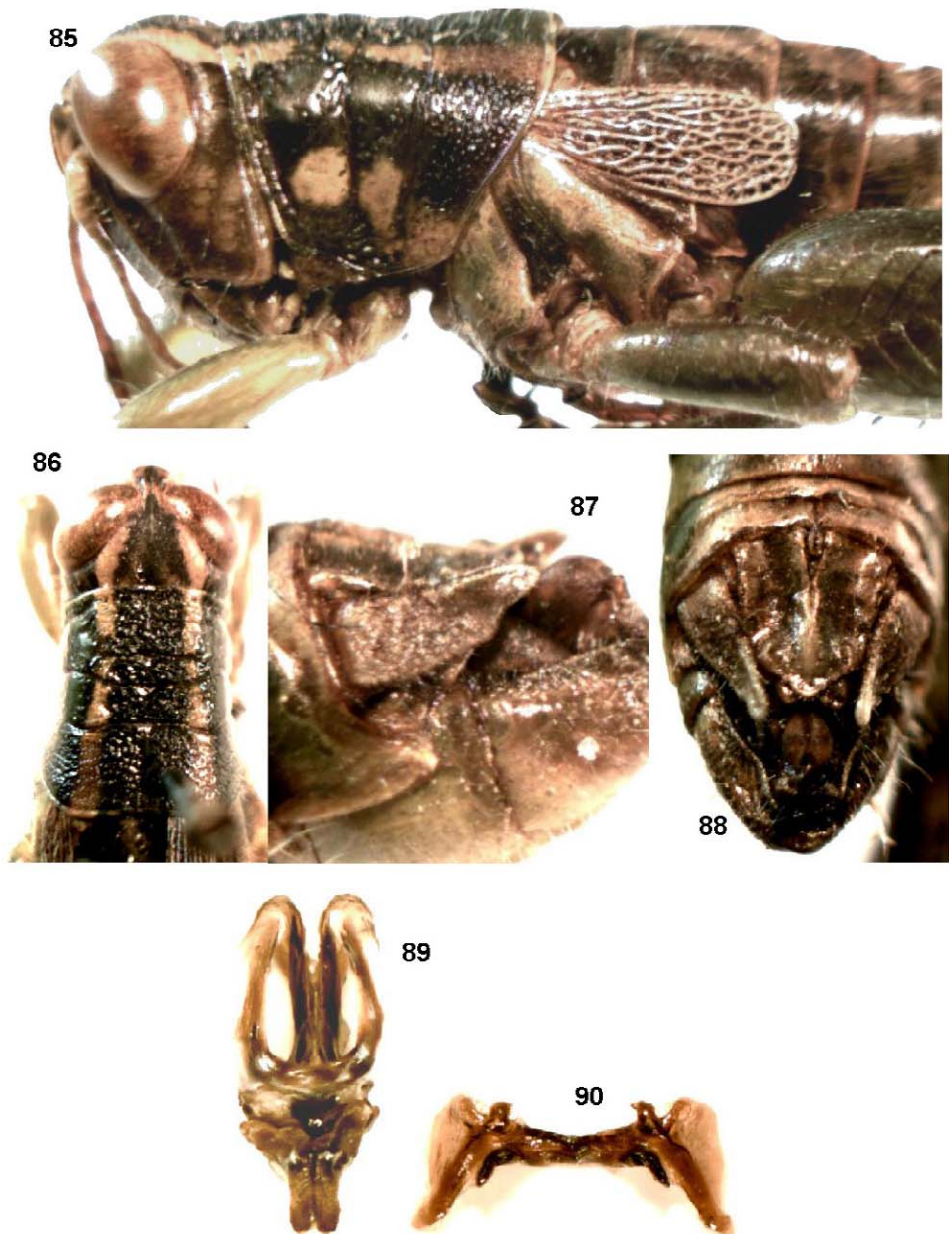
Females not available.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 18.0. Pronotum length: 3.4. Tegmina length: 2.8. Hind femur length: 9.2.

**Etymology.**—From the Latin *ablusus*, meaning different, alludes the males' cerci comparable only with *P. eurycercus*.

**Distribution.**—This species is known only from type locality (Fig. 93) on the ESM Biogeographic Province.

**Habitat.**—Insects collected on grasses at 1600 masl (Table 3). Typical habitat is matorral and xeric shrub, dominant species: *Ageratina zapalinama* Turner (Asteraceae), *Flourensia microphylla* (A. Gray) Blake (Asteraceae), *Porophyllum amplexicaule* Gray (Asteraceae), *Acacia farnesiana* (L.) (Fabaceae), *Prosopis glandulosa* T. (Fabaceae), *Opuntia* spp. (Cactaceae), *Agave lechuguilla* T. (Agavaceae); *Yucca carnerosana* Trel. & *Yuca filifera* (Engelm.) Trel., (Agavaceae), *Dasyliirion cedrosanum* Trel., (Nolinaceae), *Agave* spp., (Agavaceae).



***Phaulotettix adiaphoros* n. sp.**  
(Figs 43-48; 91; 92: 1H, 2H, 3H, 4H; 93)

**Type material (material examined).**—Holotype ♂. Mexico, Tamaulipas, Aldama, 9 Km prior to Cenote El Zacatón, 214 m, lat 22° 59' 55.70" N, long 98° 10' 09.00" W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y. **Paratypes, Hidalgo:** 3 ♂, Copaxtitlan, 312 m, lat 21° 08.032' N, long 98° 32.855' W, 01.XI.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**—This species is most related to *P. compressus* Scudder, 1897, major differences are as follows: males' cerci (Figs 45, 91) basal half portion broader, lower outer margin curved inwards about midlength, then an obtuse angle not as wide as in *P. compressus*, more produced, broader rounded apex. Supraanal plate triangular longer than in *P. compressus* (Figs 46, 91). Epiphallus (Figs 48, 92: 1H, 2H): ancorae longer, stouter and more prominent, about same

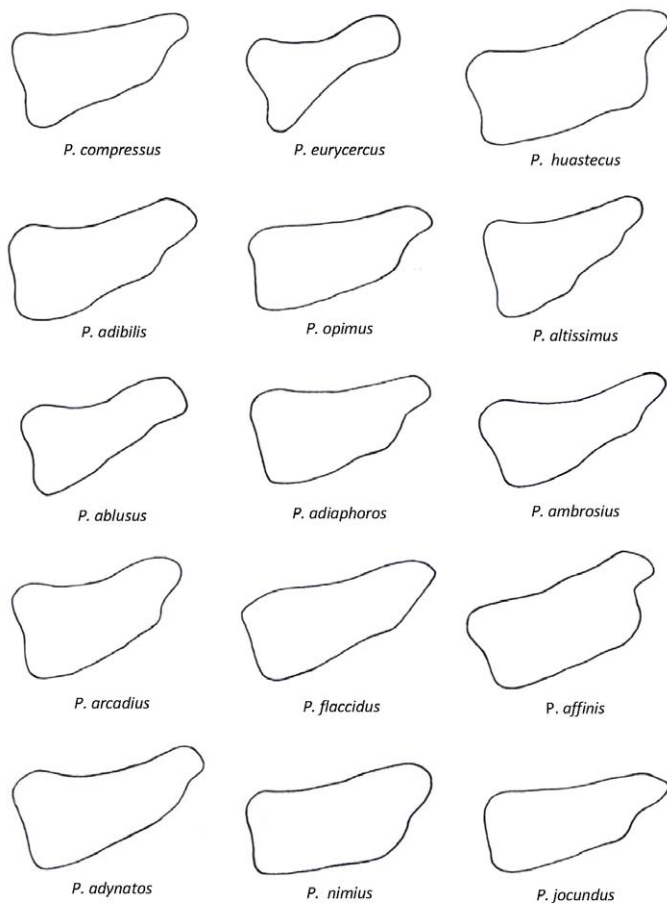


Fig. 91. *Phaulotettix* spp., males' cerci lateral view. Species as indicated.

length as the anterior process, broader bridge. Internal valves of aedeagus (Figs 47, 92: 3H, 4H): dorsal valve of aedeagus broad-leaf-shape, with distal margin undulated; ventral valve triangular, distally broad, folded inwards.

**Description of male.**—General body color dark green; head light brown, with a sharp, cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes very large and prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, wider than long, large-shallow, middle groove. Posterior margin of pronotal disk strongly emarginated with cream marks. Tegmina ovate, surpassing slightly the second abdominal segment, hind margin emarginated. Abdomen with triangular, cream marks dorsally. Hind femora, outer face, dark green, upper and lower carinula with white-cream and intense dark-green marks, ventral side cream-yellowish, dorsally light brown with three dark-green bands. Hind tibiae basal half bluish-green, distal half intense pink-red; tarsi pink-red. Supraanal plate triangular, sinuous margins, tapering gradually towards a rounded apex, median sulcus basally deep, but not very broad, extending beyond midlength. Furculae represented by two digitiform, robust, projections, longer than broad, with rounded tip. Subgenital plate, seen from above, subconical short, densely pilose. Males' cerci slender, basally very broad, narrowing about midlength, lower margin moderately obtuseangulate distally, rounded broad apex.

Females not available.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 17.0 (15.0-20.0). Pronotum length: 3.2 (2.9-3.8). Tegmina length: 2.6 (2.1-3.3). Hind femur length: 9.1 (8.5-10.0).

**Etymology.**—From the Greek *adiaphoros*, meaning indifferent.

**Distribution.**—This species has been collected on the GM Biogeographic Province, from south Tamaulipas to the State of Hidalgo lowlands (Fig. 93).

**Habitat.**—Insects collected on grasses and small bushes along roadsides; 200 to 350 masl (Table 3). Typical habitat is tall thorny shrub with presence of *Helianthus annuus* L. (Asteraceae), *Mimosa biuncifera* Benth, (Fabaceae), *Bursera simaruba* (L.) Sarg., (Burceraceae), *Cenchrus echinatus* L. (Poaceae), *Washingtonia robusta* Wendl., (Arecaceae), *Pithecellobium flexicaule* Bent., (Fabaceae), *Prosopis glandulosa* Torr., (Fabaceae), *Acacia farnesiana* Will., (Fabaceae), *Cenchrus echinatus* L., (Poaceae), *Casimiroa edulis* La Llave & Lex., (Rutaceae), *Prunus salicifolia* Kunth (Rosaceae).

***Phaulotettix ambrosius* n. sp.**

(Figs 49-54; 91; 92: 1I, 2I, 3I, 4I; 93; 96)

**Type material.**— (material examined) Holotype ♂ and allotype ♀. **Mexico, Tamaulipas**, Aldama, 9 Km prior to Cenote El Zacatón, 214 m, lat 22° 59' 55.70" N, long 98° 10' 09.00" W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y.

**Diagnosis.**—This species is most similar to *P. adiaphoros* n. sp., but distinctive in males' cerci, which is slender-laminate, but in general narrower and more elongated; distal half conspicuously narrower and more produced apex than *P. adiaphoros* (Figs 51, 91). Epiphallus (Figs 54, 92: 1I, 2I): narrower bridge, posterior process stouter, more widely developed. Internal valves of aedeagus (Figs 53, 92: 3I, 4I): dorsal valve fist shape, basally narrow gradually widening, internally concave, distal margin undulated; ventral valve subquadrate, distal margin undulated, lower margin folded inwards.

**Description of males.**—General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes very large and moderately prominent, more than half as long as broad, separated above by a narrow space; fastigium hexagonal, wider than long; large-shallow, middle groove. Posterior margin of pronotal disk emarginated, with cream marks. Tegmina ovate, basally narrow, surpassing remarkably the second abdominal tergite, hind margin slightly emarginated. Abdomen with triangular, cream marks dorsally. Hind femora green with white-cream marks on green lower carinula, ventral side cream-yellowish, and dorsally dark green with three light brown bands. Hind tibiae is basally bluish-green, distally red; tarsus red. Supraanal plate triangular, tapering gradually towards a rounded apex; basal quarter of median sulcus broad and moderately deep, then narrow and extending beyond midlength. Furculae represented by two small, digitiform, thin, projections longer than broad, with pointed tip. Subgenital plate subconical and pilose, seen from above. Male's cerci slender, basally broad and tapering, narrower about midlength, the lower margin distally obtuseangulate, clearly emarginated, and apex narrower and more produced than *P. adiaphoros*.

**Description of females.**—Larger size than any other of the *Phaulotettix* species, robust (Table 2), comparable in size with *P. flaccidus* n.sp.,

Fig. 91. *Phaulotettix* spp., males' supraanal plates dorsal view, species as indicated.

which is slightly smaller; shows sexual dimorphism in size and color, considerably larger than males, two color forms—green and light brown. Eyes medium sized, elliptical, not prominent, fastigium hexagonal more than twice wider than long; seen from above. Postocular band subobsolete extending on metazona. Pronotum moderately rugose and moderately punctate on prozona, densely punctate on metazona; median carina of pronotum prominent on basal two thirds, beyond subobsolete; pronotal disk emarginated with white and dark marks; tegmina short, ovate, not reaching the second abdominal segment. Light cream triangular markings on abdominal tergites very delicate. Two dark bands on the hind femora not very pronounced. Hind tibiae basal half bluish-green, distally red, tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 20.0. Pronotum length: 3.9. Tegmina length: 3.0. Hind femur length: 11.1. **Females:** Body length: 27.0. Pronotum length: 6.0. Tegmina length: 2.9. Hind femur length: 15.0.

**Etymology.**—From the Greek *ambrosius*, meaning divine, lovely.

**Distribution.**—This species is known only from type locality (Fig. 93) located at the GM Biogeographic Province.

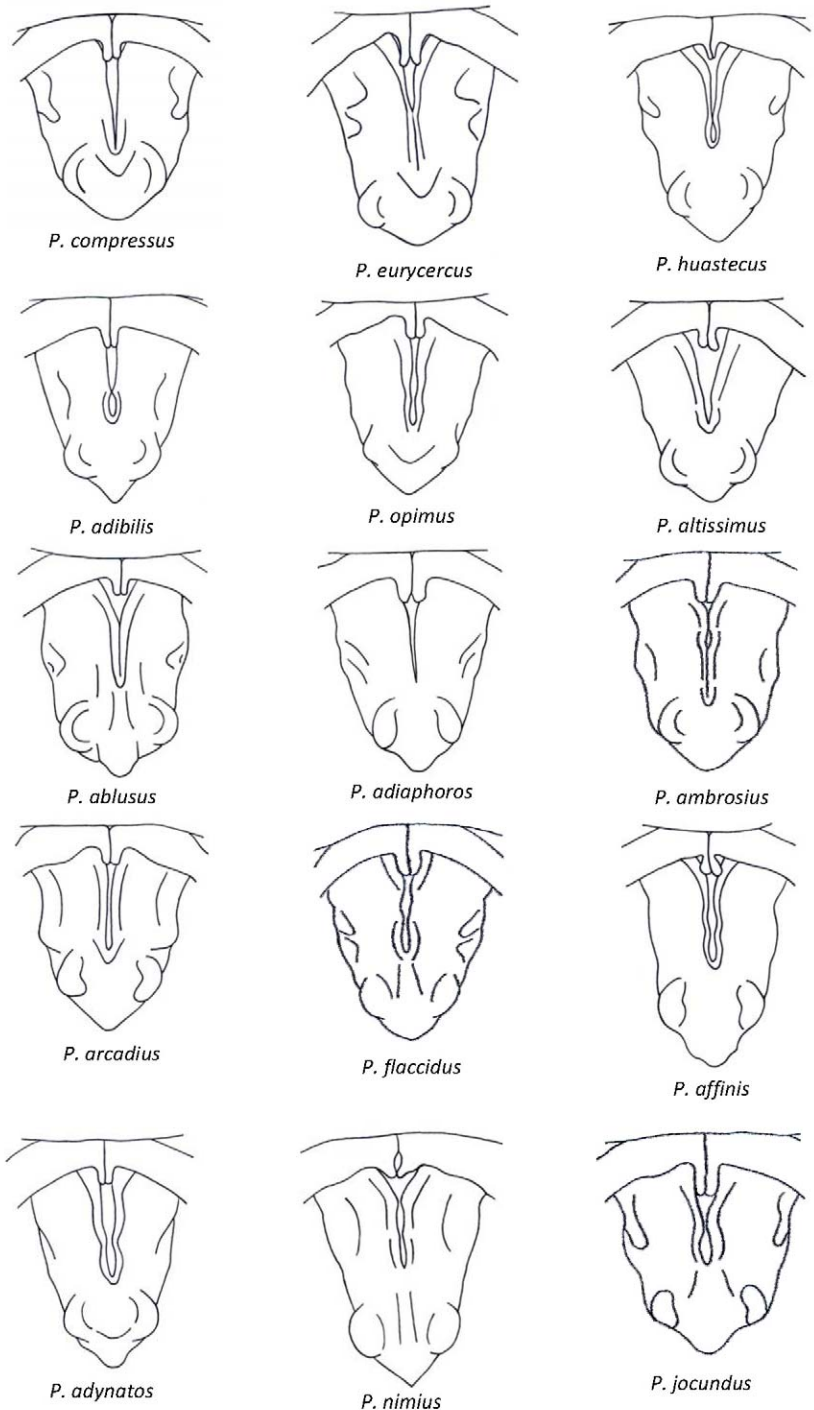
**Habitat.**—Insects collected on grasses and small bushes along roadsides; 200-250 masl (Table 3). Typical habitat is tall thorny shrub with presence of *Helianthus annuus* L. (Asteraceae), *Mimosa biuncifera* Benth. (Fabaceae), *Bursera simaruba* (L.) Sarg. (Burceraceae), *Cenchrus echinatus* L. (Poaceae), *Washingtonia robusta* Wendl. (Arecaceae), *Pithecellobium flexicaule* Benth. (Fabaceae), *Prosopis glandulosa* Torr. (Fabaceae), *Acacia farnesiana* Will. (Fabaceae), *Cenchrus echinatus* L. (Poaceae), *Casimiroa edulis* La Llave & Lex. (Rutaceae), *Prunus salicifolia* Kunth. (Rosaceae).

***Phaulotettix arcadius* n. sp.**

(Figs 55-60; 91; 92: 1J, 2J, 3J, 4J; 93; 96)

**Type material (material examined).**— Holotype ♂ and allotype ♀. **Mexico, Tamaulipas,** Hwy. 70, Villa de Casas-Soto La Marina, Km 74, 466 m, lat 23°34.316'N, long 98°30.917'W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y. **Paratypes, Tamaulipas:** 3 ♀, same data as holotype; 1 ♂, Hwy. 70, Villa de Casas-Soto La Marina, Km 50, 223 m, lat 23°40.516'N, long 98°40.311'W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **Veracruz:** 4 ♂ and 1 ♀, Palma Real, 410 m, lat 20°48.937'N, long 98°08.391'W, 30.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**— Similar to *P. nimius* n. sp., but males' cerci (Figs 57, 91)



are more slender and elongated; cerci are basally broad, tapering gently, upper margin conspicuously curved inward about midlength (in *P. nimius* cerci are broad, straight, equal; Figs 81, 91); apex stout but not as broad as in *P. nimius*. Epiphallus (Figs 60, 92: 1J, 2J: ancorae well developed, robust, not exceeding the anterior process, posterior process shorter and more widely developed than in *P. nimius*, narrower bridge with lower margin strongly curved inwards (not so in *P. nimius*). Internal valves of aedeagus (Figs 59, 92: 3J, 4J): dorsal valve broad, tectiform; ventral valve subrectangular, upper and lower margin curved inwards about middle.

**Description of male.**—General body color dark green; head light brown, with a cream stripe extending from the back of eyes through-

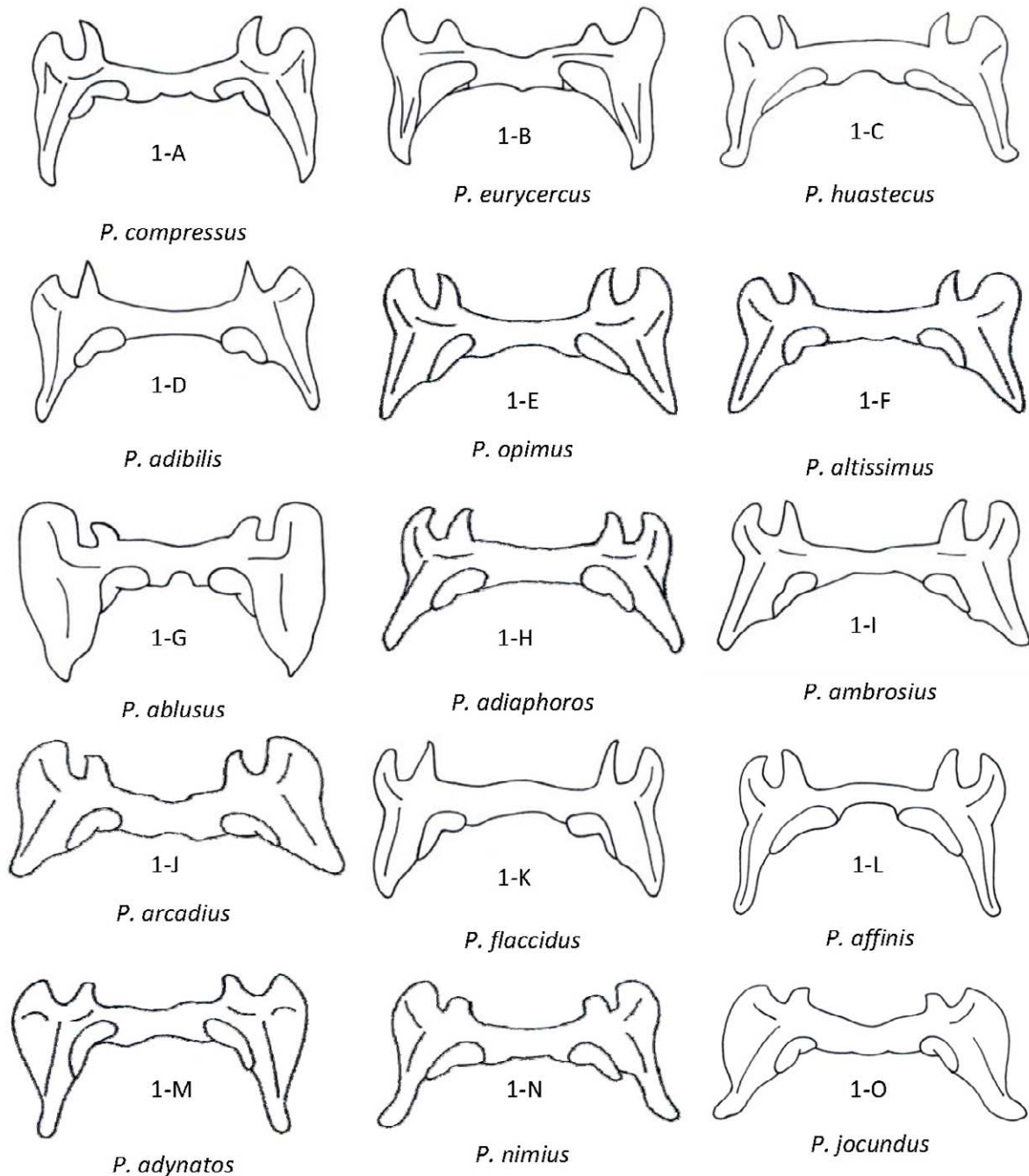


Fig. 92. Males' phallic complex. 1. Epiphallus dorsal view, species as indicated.

out pronotum, feeble on pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and very prominent, more than half as long as broad, separated above by a narrow space; fastigium hexagonal; very large-shallow, middle groove. Hind margin of pronotum emarginated, posterior margin of pronotal disk with cream marks. Tegmina ovate, highly surpassing the second abdominal segment, hind margin not emarginated. Abdomen with triangular, cream marks dorsally. Hind femora outer face dark green, lower carinula green with white-cream broad marks, ventral side yellowish-light green, dorsally dark green with three cream bands. Hind tibiae basally bluish-green, distal three quarters red; tarsi red. Supraanal plate triangular, slightly sinuous margins, tapering gradually towards a rounded apex, median sulcus basally broad and deep, extending slightly beyond midlength. Furculae

represented by two, very small, digitiform, projections. Subgenital plate short, subconical as seen from above. Male's cerci slender, basally broad, tapering gently, lower margin distally obtuse-angulate; broad and stout apex.

*Description of females.*—Medium sized, robust (Table 2), exhibiting sexual dimorphism in size and color, considerably larger than males, two color forms: green and light brown. Eyes small, elliptical; fastigium hexagonal, more than twice wider than long, seen from above. Postocular band subobsolete on prozona, absent on metazona. Pronotum highly rugose, moderately punctate on prozona, densely punctate on metazona, median carina of pronotum prominent and percurrent, pronotal disk emarginated with white marks, tegmina ovate surpassing the second abdominal segment.

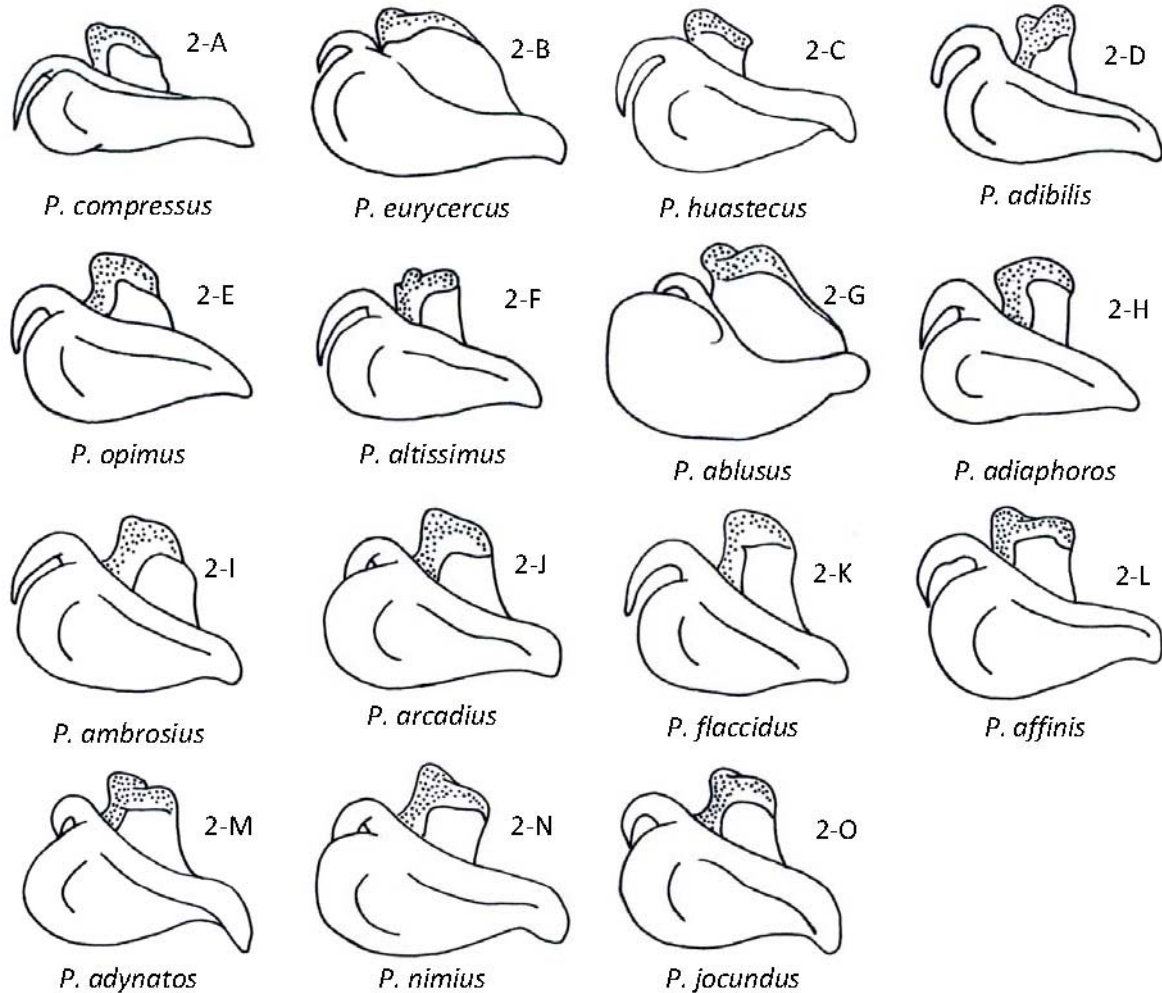


Fig. 92. Males' phallic complex. 2. Epiphallus lateral view. species as indicated.

Light cream triangular markings on abdominal tergites conspicuous. Two dark bands on the hind femora not very pronounced. Hind tibiae basal half bluish-green, distally red; tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**—(mm) **Males:** Body length from vertex to end of femur 3: 19.0 (17.0-20.0). Pronotum length: 3.5 (3.0-3.9). Tegmina length: 2.7 (2.4-3.1). Hind femur length: 10.1 (9.2-10.7). **Females:** Body length: 27.0 (23.0-29.0). Pronotum length: 5.4 (4.5-6.2). Tegmina length: 3.8 (3.6-4.0). Hind femur length: 14.5 (12.7-15.8).

**Etymology.**—From the Latin *arcadius*, meaning rustic.

**Distribution.**—Northeastern Mexico: Tamaulipas and Veracruz (Fig. 93), GM Biogeographic Province.

**Habitat.**—Insects collected on grasses and small bushes along roadsides; 200 to 500 masl (Table 3). Habitat: Tropical deciduous forest, dominant vegetation: *Lysiloma divaricata* (Jacq.) Macbr. (Fabaceae), *Prosopis glandulosa* Torr. (Fabaceae), *Acacia farnesiana* Will. (Fabaceae), *Mimosa biuncifera* Benth. (Fabaceae), *Leucophyllum frutescens* (Berl.), I.M. Johnst., (Scrophulariaceae), *Karwinskia humboldtiana* (Roem. & Schult.) Zucc. (Rhamnaceae), *Panicum máximum* Jacq., (Poaceae)

and *Digitaria decumbens* Stend., (Poaceae).

***Phaulotettix flaccidus* n. sp.**

(Figs 61-66; 91; 92: 1K, 2K, 3K, 4K; 93; 96)

**Type material (material examined).**—Holotype ♂ and allotype ♀. **Mexico, Tamaulipas**, Aldama, 9 Km prior to Cenote El Zacatón, 214 m, lat 22°59'55.70"N, long 98°10'09.00"W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y. **Paratypes, Tamaulipas:** 3 ♂ and 1 ♀, same data as holotype; 1 ♂ and 1 ♀, same locality as holotype, 29.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**—This species is most related to *P. ambrosius* n. sp., it could be separated as follows: males' cerci (Figs 63, 91) slender, but in general broader and more robust than in *P. ambrosius*. Epiphallus (Figs 66, 91, 92: 1K, 2K): ancorae well developed, long, exceeding slightly the anterior process; broader bridge and more prominent lophi than in *P. ambrosius*. Apodemes of cingulum (Figs 65, 92: 3K, 4K) and zygone stouter. Valves of internal genitalia (Figs 65, 92: 3K, 4K): dorsal valve rectangular basally, upper and lower margins curved inwards in the last third to form a rounded apex, half distal portion covered with a fold forming a projection downwards; ventral valve

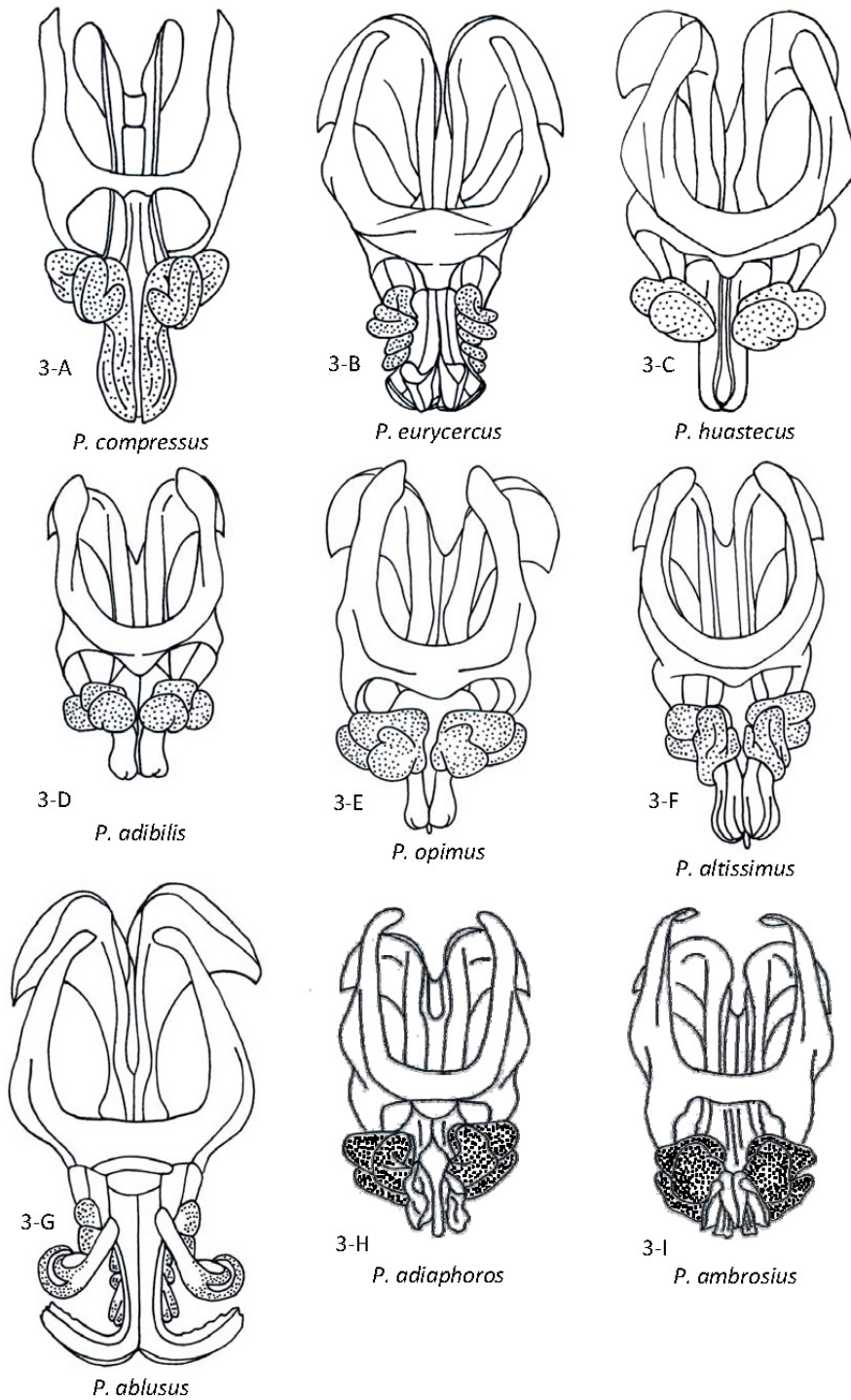


Fig. 92. Males' phallic complex. 3. A-I. Endophallic plates (dorsal and ventral valves of aedeagus) and cingulum, dorsal view. species as indicated.

light brown with three dark green bands. Hind tibiae bluish-green basally, distal three quarters red; tarsus red. Supraanal plate triangular, sinuous margins, tapering moderately towards a rounded apex, median sulcus basally broad and deep, extending slightly beyond midlength, distally very shallow. Furculae represented by two, digitiform projections, basally wide, longer than broad, rounded tip. Subgenital plate subconical, seen from above. Male's cerci slender, tapering gradually, upper and lower margins gently curved inwards beyond midlength, lower margin distally obtuse-angulate, broad acute-angulate apex.

*Description of females.*—Large sized compared to other *Phaulotettix* species, except *P. ambrosius*, the females of which are about the same size or scarcely larger, robust (Table 2), presenting sexual dimorphism in size and color, considerably larger than males; two color forms: green and light brown. Eyes medium sized, elliptical; fastigium subelliptical more than twice as wide as long; seen from above. Postocular band conspicuous on prozona, diffuse on metazona. Pronotum slightly rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum prominent and percurrent, pronotal disk emarginate with white marks, tegmina ovate, surpassing the second abdominal segment. Light cream triangular markings on abdominal tergites evident. Two dark bands on the hind femora very pronounced. Hind tibiae basal half bluish-green, distally and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

*Measurements.*—(mm). **Males:** Body length from vertex to end of femur 3: 20.0 (17.0-21.0). Pronotum length: 3.8 (3.3-4.2). Tegmina length: 2.7 (2.3-2.9). Hind femur length: 10.5 (9.1-11.2). **Females:** Body length: 27.0 (26.0-30.0). Pronotum length: 5.8 (5.7-5.9). Tegmina length: 3.9 (3.5-4.1). Hind femur length: 13.9 (13.3-14.4).

*Etymology.*—From the Latin *flaccidus*, meaning languid, alluding to the shape of the males' cerci.

subrectangulate, broad basally, lower distal margin folded inwards.

*Description of males.*—General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum, widening on metazona; dark green postocular band on sides of head extending on sides of pronotum; eyes large but not very prominent, almost twice as long as broad, separated above by a narrow space; fastigium subelliptical, medium size-shallow middle groove. Posterior margin of pronotal disk with cream marks. Tegmina widely ovate, not exceeding the second abdominal segment, hind margin slightly emarginated. Abdomen with triangular, cream marks dorsally. Hind femora outer face dark-green, lower carinula green, with white-cream marks, ventral side yellowish-green, dorsally

*Distribution.*—This species is known only from type locality (Fig. 93); collected at the GM Biogeographic Province.

*Habitat.*—Insects collected on grasses and small bushes along roadsides; 200-250 masl (Table 3). Typical habitat is tall thorny shrub with presence of *Helianthus annuus* L. (Asteraceae), *Mimosa biuncifera* Benth., (Fabaceae), *Bursera simaruba* (L.) Sarg., (Burceraceae), *Cenchrus echinatus* L. (Poaceae), *Washingtonia robusta* Wendl., (Arecaceae), *Pithecellobium flexicaule* Bent., (Fabaceae), *Prosopis glandulosa* Torr., (Fabaceae), *Acacia farnesiana* Will., (Fabaceae), *Cenchrus echinatus* L. (Poaceae), *Casimiroa edulis* La Llave & Lex., (Rutaceae), *Prunus*

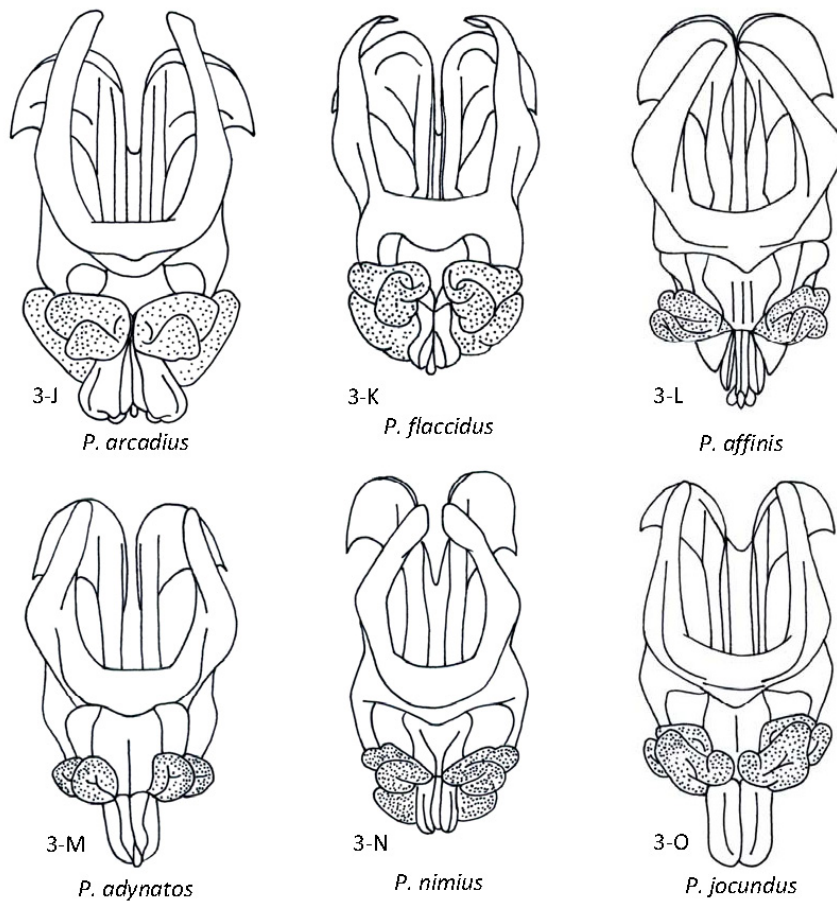


Fig. 92. Males' phallic complex. 3. J-O. Endophallic plates (dorsal and ventral valves of aedeagus) and cingulum, dorsal view, species as indicated.

*Description of males.*—General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and prominent, more than half as long as broad, separated above by a narrow space; fastigium hexagonal; medium size-shallow middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, not exceeding the second abdominal tergite, hind margins not emarginated. Abdomen with triangular, cream marks dorsally. Hind femora dark green, lower carinula with cream marks, ventral side yellowish-light green. Hind tibiae, third basal portion bluish-green, distally red; tarsi red. Supraanal plate triangular, about one quarter longer than broad, sinuous margins, tapering gradually towards rounded apex, median sulcus basally broad and deep, extending beyond midlength. Furculae represented by two, small, digitiform, projections slightly longer than broad, with rounded tip. Sub-genital plate subconical, densely pilose. Male's cerci slender, broad, the lower margin subrectangulate distally, apex stout, rounded.

Females not available.

*Measurements.*— (mm). **Males:** Body length from vertex to end of femur 3: 20.0 (19.0-21.0). Pronotum length: 3.8 (3.7-4.0). Tegmina length: 2.8 (2.7-3.1). Hind femur length: 10.8 (10.5-11.0).

*Etymology.*—From the Latin *affinis*, meaning related to, neighboring.

*Distribution.*—Northeastern Mexico: South Tamaulipas (Fig. 93), GM Biogeographic Province.

*Habitat.*—Insects collected on grasses and small bushes along roadsides; 50 to 350 masl (Table 3). Typical habitat is tall thorny shrub with presence of *Helianthus annuus* L. (Asteraceae), *Mimosa biuncifera* Benth., (Fabaceae), *Prosopis velutina* Wootton (Fabaceae), *Bursera simaruba* (L.) Sarg., (Burceraceae), *Cenchrus echinatus* L. (Poaceae), *Bouteloua hirsuta* Lag., (Poaceae), *Brachiaria* spp. (Trin.) Griseb., (Poaceae) and *Cynodon dactylon* (L.) Pers., (Poaceae).

*Phaulotettix adynatos* n. sp.

(Figs 73-78; 91; 92: 1M, 2M, 3M, 4M; 93; 96)

*Type material.*— (material examined). Holotype ♂ and allotype ♀. **Mexico, Tamaulipas**, Hwy. 180, Soto La Marina-Aldama, Km 113, 312 m, lat 23° 37.666'N, long 98° 22.126'W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y. **Paratypes, Tamaulipas:** 1 ♂ and 3 ♀, Tampico, 7 m, lat 22° 17.029'N, long 97° 53.716'W, 01.XI.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **Veracruz:** 2 ♂ and 4 ♀, Palma Real, 410 m, lat 20° 48.937'N, long 98° 08.391'W, 30.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV. **Hidalgo:** 10 ♂ and 7

*salicifolia* Kunth., (Rosaceae).

*Phaulotettix affinis* n. sp.

(Figs 67-72; 91; 92: 1L, 2L, 3L, 4L; 93)

*Type material.*—(material examined) Holotype ♂. **Mexico, Tamaulipas**, Aldama, 9 Km prior to Cenote El Zacatón, 214 m, lat 22° 59'55.70"N, long 98° 10'09.00"W, 13.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y. **Paratypes, Tamaulipas:** 1 ♂, same data as holotype; 1 ♂, rd. Ciudad Victoria-Tampico, Ejido Maclovio Herrera, km 44, 57 m, lat 22° 29.919'N, long 98° 05.394'W, 02.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂, after Antiguo Morelos, Km 193, 316 m, lat 22° 33.196'N, long 99° 08.108'W, 20.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

*Diagnosis.*—This species is most related to *P. huastecus* Buzzetti, Barrientos-Lozano & Fontana, 2010. Major differences are as follows: males' cerci (Figs 69, 91) slender, but less elongated; apex shorter and broader; lower margin distal angle almost rect (in *P. huastecus* is obtuse-angulate). The supraanal plate (Figs 70, 91) is triangular, approximately one third longer than in *P. huastecus*. Epiphallus (Figs 72, 92: 1L, 2L): ancorae well developed, robust, not exceeding the anterior process, lophi very elongated and more prominent, bridge shorter and narrower. Internal valves of aedeagus (Figs 71, 92: 3L, 4L): dorsal valve subquadrate, laminate, narrower than in *P. huastecus*; ventral valve subrectangular but considerably more elongated than in *P. huastecus*, slightly constricted beyond midlength, widening towards an undulated tip.



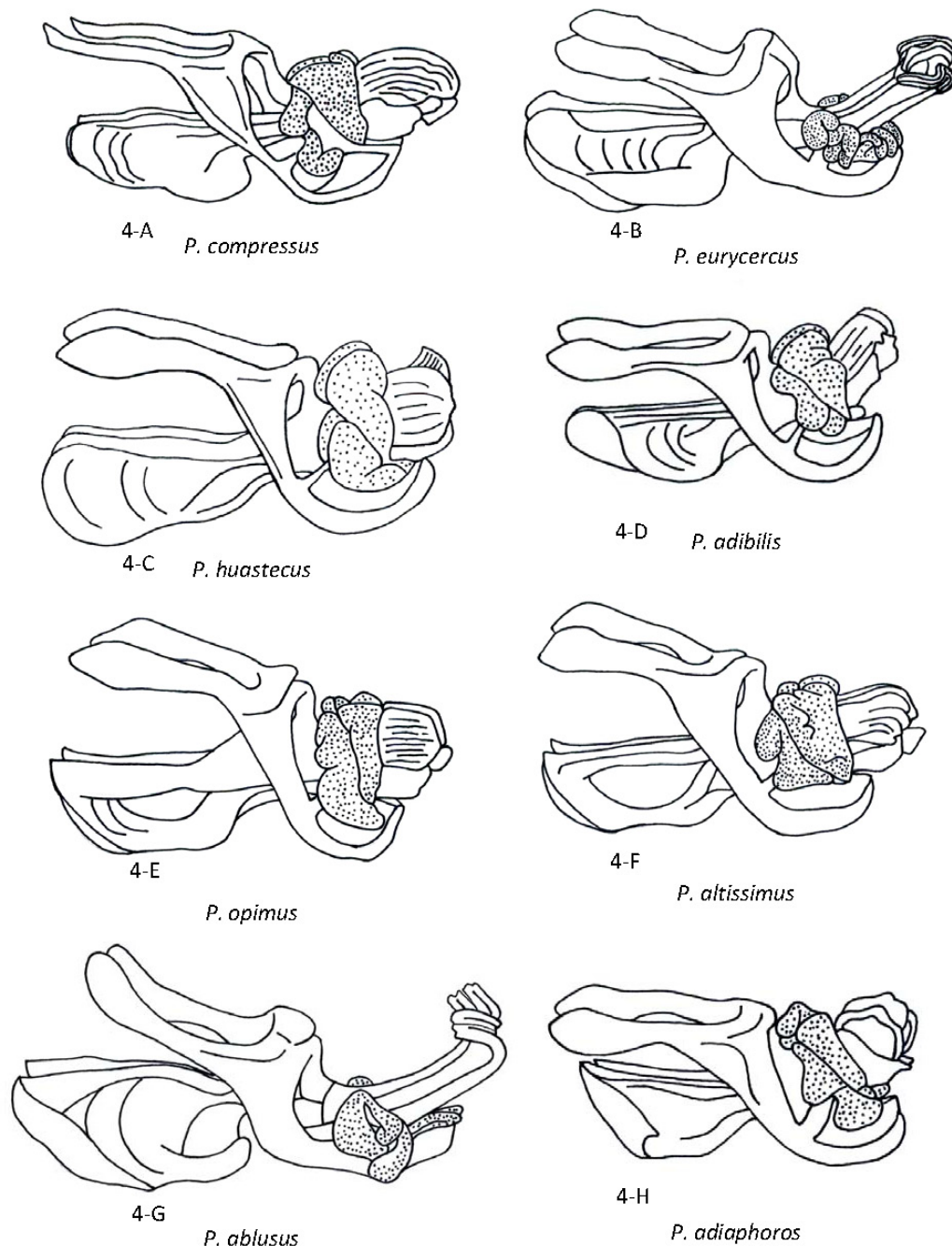


Fig. 92. Males' phallic complex. 4. A-H. Endophallic plates (dorsal and ventral valves of aedeagus) and cingulum lateral view, species as indicated.

♀, Atlapexco, 451 m, lat 20° 58.371'N, long 98° 19.130'W, 30.X.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 4 ♂ and 6 ♀, Copaxtitlan, 312 m, lat 21° 08.032'N, long 98° 32.855'W, 01.XI.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

**Diagnosis.**—This species is most related to *P. adiaphoros* n. sp., but males' cerci (Figs 75, 91) half distal portion is narrower, with a more robust and shorter apex. Supranal plate (Figs 76, 91) triangular, slightly longer. Epiphallus (Figs 78, 92: 1M, 2M): ancorae shorter, not exceeding the anterior process, anterior process more widely developed. Apodemes of cingulum (Figs 77, 92: 3M, 4M) dorsal view: elbow shape and stouter, not so in *P. adiaphoros*. Valves of

aedeagus (Figs 77, 92: 3M, 4M): dorsal valve very broad uniformly, internally concave, lower distal margin curved inward, forming an apical projection; ventral valve of subrectangular with rounded distal portion.

**Description of males.**—General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum, widening on metazona (not so in *P. adiaphoros*); dark green postocular band on sides of head extending on sides of pronotum; eyes large, not very prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, large, shallow, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, far surpassing the second abdominal tergite, hind margin not emarginated. Abdomen with triangular,

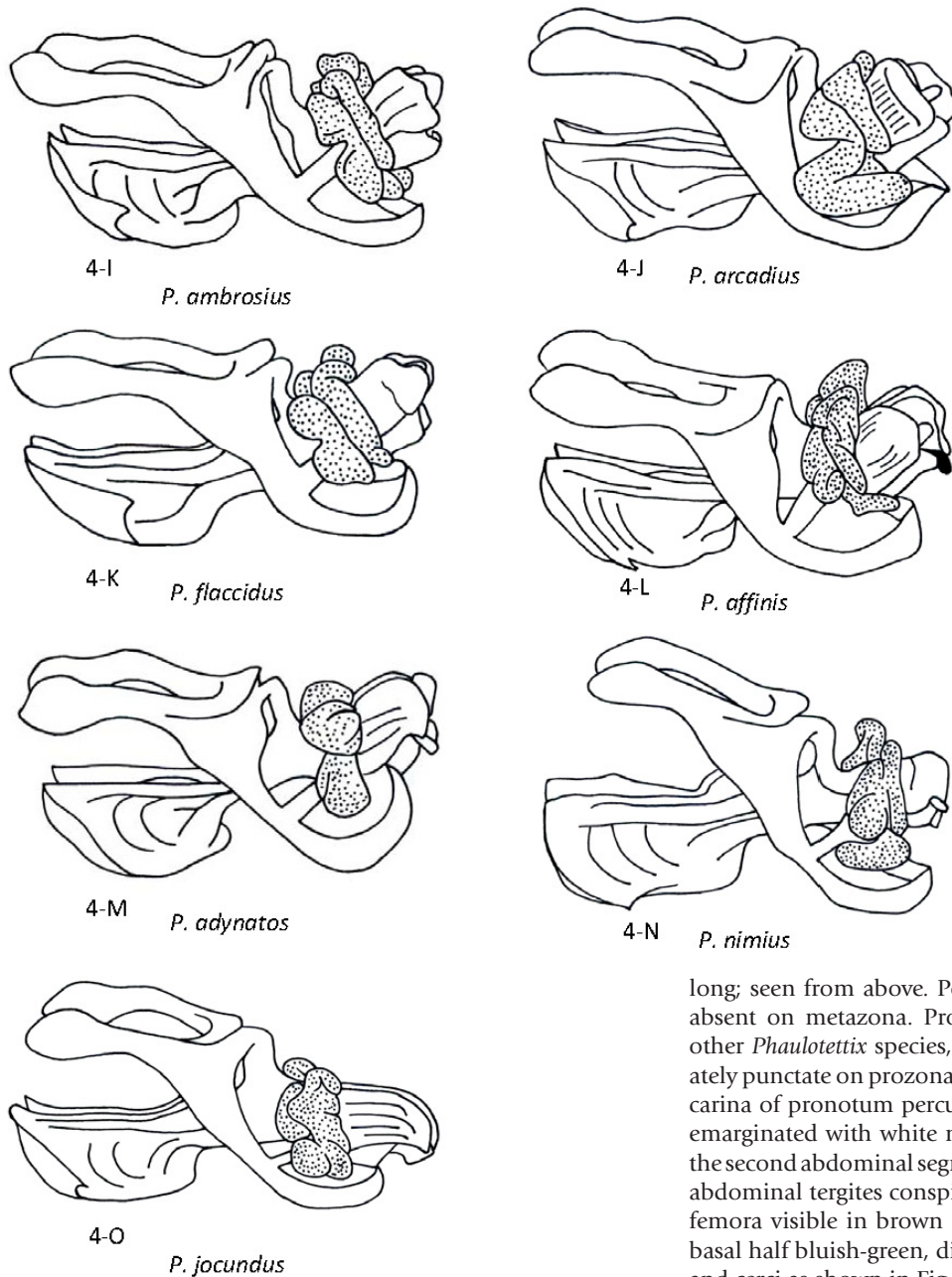


Fig. 92. Males' phallic complex. 4. I-O. Endophallic plates (dorsal and ventral valves of aedeagus) and cingulum, lateral view, species as indicated.

cream marks dorsally. Hind femora outer face dark green, lower carinula with broad white-cream marks, ventral side yellowish-green, dorsally light brown with three dark green bands. Hind tibiae half basal portion bluish-green, distally intense red; tarsi red. Supraanal plate triangular, about half as long as broad, sinuous margins, tapering gradually towards a rounded apex, median sulcus basally very broad and deep, extending beyond midlength (Fig. 46). Furcula represented by two, digitiform, robust projections as long as broad, with rounded apex. The subgenital plate subconical and densely pilose. Male's cerci slender, basally very broad, tapering gradually towards a broad short rounded apex, lower margin widely obtuse-angulate distally; apex shorter and stouter than in *P. adiaphoros*.

**Description of females.**— Medium sized, robust (Table 2), exhibiting sexual dimorphism in size and color, considerably larger than males, two color forms: green and light brown. Eyes medium sized, prominent, elliptical, fastigium subelliptical about twice wider than

long; seen from above. Postocular band very bright on prozona, absent on metazona. Pronotum considerably narrower than in other *Phaulotettix* species, cylindrical, slightly rugose and moderately punctate on prozona, densely punctate on metazona; median carina of pronotum percurrent but not prominent, pronotal disk emarginated with white marks, tegmina ovate, slightly exceeding the second abdominal segment. Light cream triangular markings on abdominal tergites conspicuous. The two dark bands on the hind femora visible in brown form, not so in green form. Hind tibiae basal half bluish-green, distal half and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (mm). **Males:** Body length from vertex to end of femur 3: 19.0 (17.0-21.0). Pronotum length: 3.5 (2.9-4.2). Tegmina length: 2.8 (2.3-3.2). Hind femur length: 10.1 (9.2-10.9). **Females:** Body length: 23.0 (20.0-29.0). Pronotum length: 4.7 (4.4-5.7). Tegmina length: 3.3 (2.9-3.8). Hind femora length: 12.7 (11.0-15.4).

**Etymology.**— From the Greek *adynatos*, meaning without strength, weak, alluding to the males' cerci lower margin angle.

**Distribution.**— Northeastern Mexico: Tamaulipas, Hidalgo and Veracruz (Fig. 93), GM Biogeographic Province.

**Habitat.**— Insects collected at lowlands on grasses and small bushes along roadsides; 0-500 masl (Table 3). Typical habitat vegetation: *Acacia farnesiana* (L.) Willd., (Fabaceae), *Digitaria decumbens* Stend., (Poaceae), *Cynodon dactylon* (L.) Pers., (Poaceae), *Aristida wrightii*

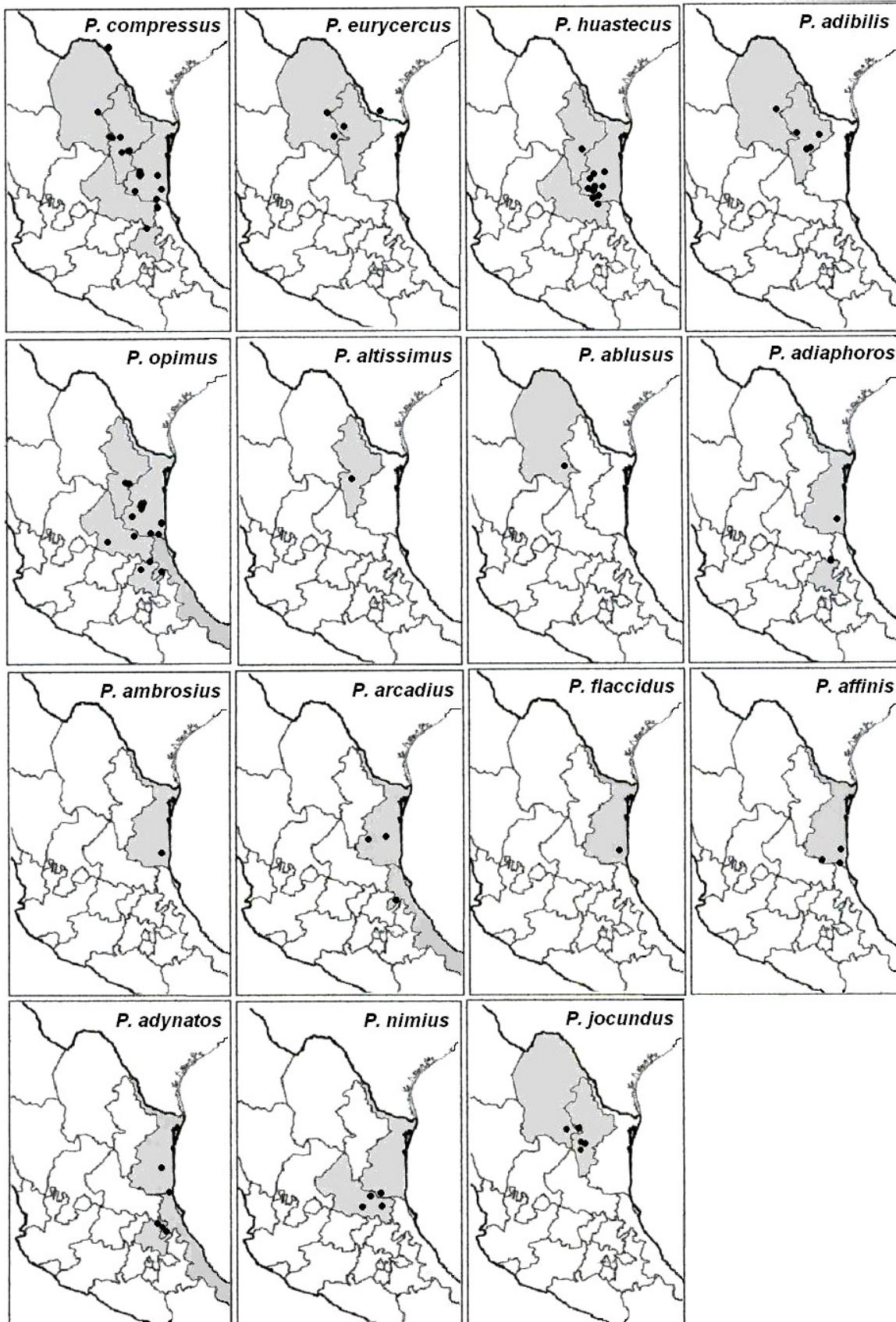


Fig. 93. Distributions of species of the genus *Phaulotettix*; species as indicated.



Fig. 94. *Phaulotettix compressus* mating pair (above), female green form (below). For color version, see Plate I.



Fig. 95. *Phaulotettix opimus* n. sp., living male (above) and female (below). For color version, see Plate II.

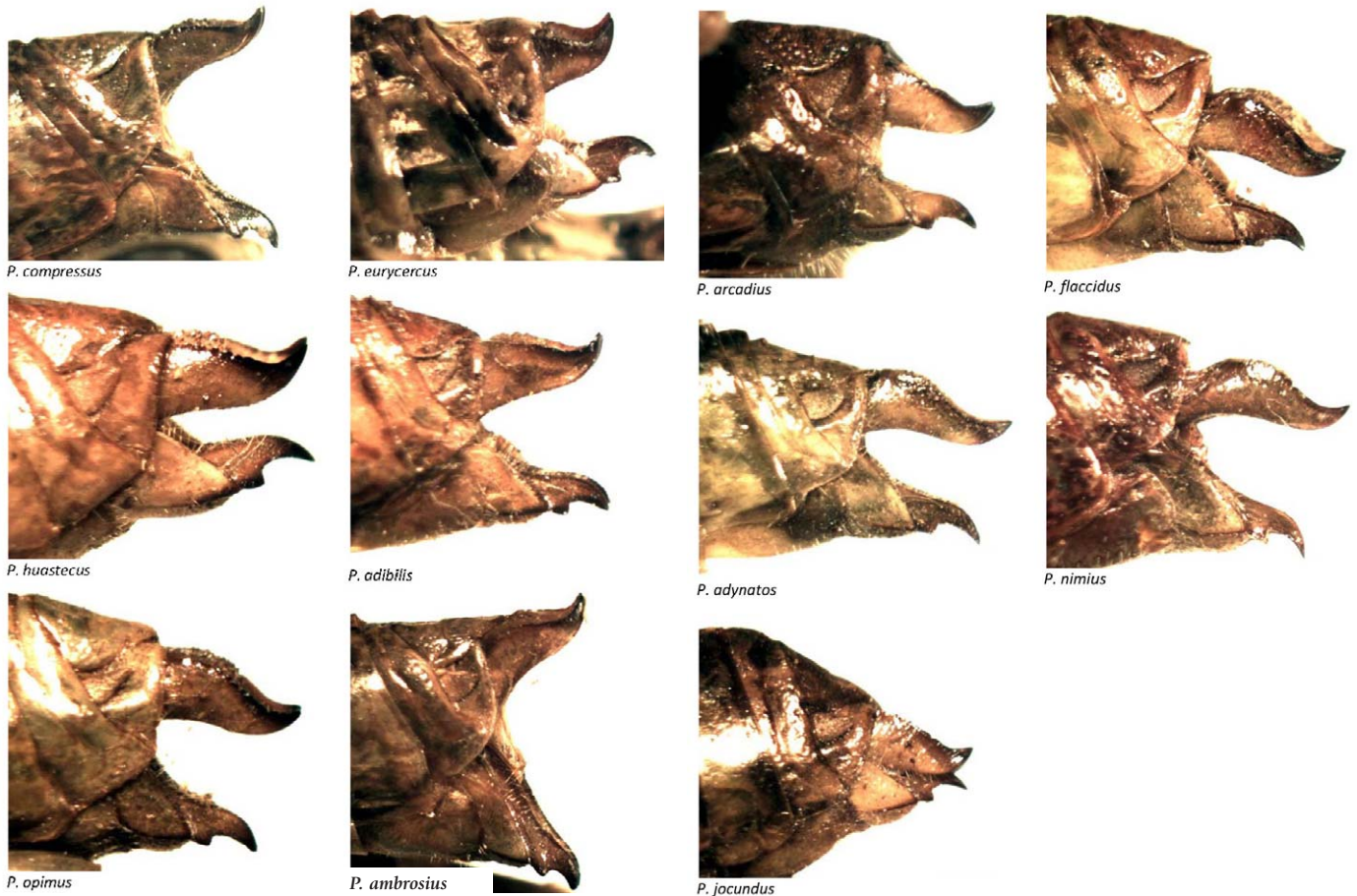


Fig. 96. *Phaulotettix* spp., females' valves and cerci.

Nash (Poaceae), *Saccharum officinarum* (L.) (Poaceae), *Sorghum halepense* (L.) (Poaceae), *Tagetes erecta* (L.) (Asteraceae), *Sphaeralcea angustifolia* (Cav.) G. Don (Malvaceae) and *Gomphrena globosa* L. (Amaranthaceae).

*Phaulotettix nimius* n. sp.

(Figs 79-84; 91; 92: 1N, 2N, 3N, 4N; 93; 96)

*Type material*.—(material examined) Holotype ♂ and allotype ♀. Mexico, San Luis Potosí, 7 Hwy. mi. NE, Ciudad del Maíz, 1188 m, lat 22° 23' 59.71"N, long 99° 36' 10.70"W, 21.VIII.1959, Cohn T.J. & Cantrall I.J. Paratypes, San Luis Potosí: 2 ♂ and 1 ♀, 18 mi. S Antiguo Morelos, 213 m, lat 21° 57' 07.48"N, long 99° 05' 12.65"W, Cohn T.J., coll. UMMZ; 1 ♂, 6 mi. W, San José de Gallinas (22 mi NW. Rio Verde), 1158 m, lat 21° 56' 31.98"N, long 100° 00' 39.26"W, 25.VIII.1959, Cantrall I.J. & Cohn T.J., coll. UMMZ; 13 ♂ and 12 ♀, 3.5 mi. SE San José de Gallinas (13 mi NW. Rio Verde), 1051 m, lat 22° 06' 26.95"N, long 100° 05' 28.09"W, 25.VIII.1959, Cantrall I.J. & Cohn T.J., coll. UMMZ; 1 ♂ and 3 ♀, 10 mi. NW Rio Verde, 1082 m, lat 22° 08' 20.47"N, long 100° 06' 39.83"W, 25.VIII.1959, Cantrall I.J. & Cohn T.J., coll. UMMZ; Tamaulipas: 3 ♂ and 2 ♀, 20 km S Antiguo Morelos, 316 m, lat 22° 33.196'N, long 99° 08.108'W, 20.VIII.2010, Barrientos-Lozano L., Méndez-Gómez B.R. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV.

*Diagnosis*.— Similar to *P. affinis* n. sp., major differences are as follows: males' cerci (Figs 81, 91) with a broader, more robust, rounded apex; supraanal plate (Figs 82, 91) triangular, about one third shorter.

Epiphallus (Figs 84, 92: 1N, 2N): anchorae shorter, not exceeding the anterior process, anterior process more widely developed. Valves of internal genitalia (Figs 83, 92: 3N, 4N): dorsal valve subquadrate; ventral valve subrectangular with expanded apex.

*Description of males*.—General body color dark green; head light brown, with a cream stripe extending from the back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and prominent, more than half as long as broad, separated above by a narrow space; fastigium hexagonal, large, shallow, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina basally narrow, ovate, exceeding slightly the second abdominal segment, hind margin not emarginated (Fig. 79). Abdomen without triangular, cream marks dorsally. Hind femora dark-green, lower carinula entirely green without cream marks, ventral side, yellowish-green, dorsal side light brown-without dark bands. The hind tibiae are basally bluish-green, distal three quarters intense red, tarsi red. Supraanal plate triangular, about half as long as broad, sinuous margins, tapering gradually towards a pointed-rounded apex, median sulcus basally broad and deep, extending about midlength (Fig. 82). Furcula represented by two, short, elbowed projections broader than long, with rounded apex (Figs 82, 82a). Subgenital plate is subsphaerical, seen from above. Male's cerci slender, very broad, the lower margin distally obtuseangulate, broad-stout-rounded apex (Fig. 81).

*Description of females*.—Medium sized, robust (Table 2), showing sexual dimorphism in size and color, larger than males, two color

forms: green and light brown. Eyes medium sized, elliptical, fastigium hexagonal about twice wider than long; seen from above. Postocular band subobsolete on prozona, absent on metazona. Pronotum very rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum percurrent, not prominent, pronotal disk emarginated with white marks, tegmina ovate scarcely exceeding the second abdominal segment. Light cream triangular markings on abdominal tergites diffuse. The two dark bands on the hind femora are evident. The hind tibiae two basal thirds are bluish-green, distal portion and tarsi red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (In mm) **Males:** Body length from vertex to end of femur 3: 19.0 (19.0-20.0). Pronotum length: 3.6 (3.6-3.7). Tegmina length: 2.7 (2.2-3.2). Hind femur length: 10.5 (10.4-10.5). **Females:** Body length: 23.0. Pronotum length: 4.9. Tegmina length: 3.5. Hind femur length: 12.7.

**Etymology.**—From the Latin *nimius*, meaning too much excessive, alluding to the very broad and simple cerci of males.

**Distribution.**—Northeastern Mexico: southwest Tamaulipas and northeast San Luis Potosí (Fig. 93), ESM Biogeographic Province.

**Habitat.**—Collected on grasses, roadsides and in openings and margin of woods; 200-1200 masl (Table 3). Habitat dominant vegetation: *Saccharum officinarum* (L.), (Poaceae), *Cynodon dactylon* (L.) Pers., (Poaceae), *Agave lechuguilla* Torr., (Agavaceae), *Agave scabra* Salm-Dyck., (Agavaceae), *Hechtia glomerata* Zucc., (Bromeliaceae), *Larrea tridentata* (DC.) Coville., (Zygophyllaceae), *Prosopis glandulosa* Torr., (Fabaceae), *Acacia farnesiana* (L.) Willd., (Fabaceae), *Cassia angustifolia* Vahl., (Fabaceae), *Quercus* sp. (Fagaceae) and *Pinus* sp. (Pinaceae).

***Phaulotettix jocundus* n. sp.**

(Figs 85-90; 91; 92: 1O, 2O, 3O, 4O; 93; 96)

**Type material.**—(material examined) Holotype ♂ and allotype ♀. **Mexico, Nuevo León,** 7 mi. rd. SE, Galeana, 1630 m, lat 24°47'46.98"N, long 100°03'33.21"W, 11.VIII.1959, Cohn T.J. **Paratypes, Nuevo León:** 3 ♂, same data as holotype; 1 ♂, 24 mi. NW Montemorelos, 484 m, lat 25°25'37.14"N, long 100°09'06.55"W, 03.IX.1955, Cohn T.J., coll. UMMZ; 2 ♂ and 2 ♀, Horse Tail Falls, 5 mi. SW Santiago, 701 m, lat 25°23'06.15"N, long 100°09'40.39"W, 29.IX.1958, Cohn T.J., coll. UMMZ; 1 ♂ and 1 ♀, 0.5 mi. W Iturbide, 1524 m, lat 24°43'25.34"N, long 99°54'02.32"W, 11.VIII.1959, Cohn T.J., coll. UMMZ; 1 ♂, 5.4 mi. rd. NW Iturbide, 1783 m, lat 24°44'56.64"N, long 99°57'26.77"W, 11.VIII.1959, Cohn T.J., coll. UMMZ; 1 ♂, Iturbide, Paradero Los Altares, 1290 m, lat 24°44.16'N, long 99°51.07'W, 20.X.2001, L. Barrientos-Lozano & Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, same locality, 25.VII.2001, L. Barrientos-Lozano & Guerrero-Garza J.M., coll. L. Barrientos-Lozano-ITCV; 1 ♂, rd. Galeana-Iturbide, km 62, 1589 m, lat 24°26.487'N, long 100°04.357'W, 02.XI.2008, Barrientos-Lozano L., Méndez-Gómez B.R., Ramírez-Núñez J.B. & Rocha-Sánchez A.Y., coll. L. Barrientos-Lozano-ITCV; 2 ♂ and 3 ♀, Linares-Iturbide, km 30-31, 870 m, lat 24°44.570'N, long 99°49.232'W, 05.IX.2008, Barrientos-Lozano L., coll. L. Barrientos-Lozano-ITCV. **Coahuila:** 4 ♂ and 1 ♀, 21 mi. rd. SE Arteaga, 1996 m, lat 25°22'26.90"N, long 100°47'57.42"W, 04.VIII.1959, Cohn T.J., coll. UMMZ; 4 ♂ and 2 ♀, 20 mi. rd. SE Arteaga, 1889 m, lat 25°22'29.98"N, long

100°47'55.27"W, 27.IX.1958, Cohn T.J., coll. UMMZ.

**Diagnosis.**—This species is most related to *P. opimus* n. sp., from which it may be separated by the cerci's lower margin (Figs 87, 91) almost rectangulate (obtuseangulate in *P. opimus*) and the more produced acute-angular apex. The supraanal plate (Figs 88, 91) triangular noticeably wider. Epiphallus (Figs 90, 92: 1O, 2O): ancorae shorter, anterior process more widely developed. Apodemes of cingulum (Figs 89; 92: 3O, 4O) half distal portion tapering (not so in *P. opimus*). Valves of aedeagus (Figs 89; 92: 3O, 4O): dorsal valve subrectangular, upper margin distally curved downwards; ventral valve of aedeagus trapezoidal shape.

**Description of males.**—General body color dark green; head light brown, with a cream stripe extending from back of eyes throughout pronotum; dark green postocular band on sides of head extending on sides of pronotum; eyes large and not very prominent, more than half as long as broad, separated above by a narrow space; fastigium subelliptical, medium size, shallow, middle groove. Posterior margin of pronotal disk with cream marks. Tegmina ovate, basally narrow, highly surpassing second abdominal segment, hind margin not emarginated (Fig. 85). Abdomen with triangular, cream marks dorsally. The hind femora are dark green, lower carinula with diffuse white-cream marks, ventral side yellowish-green, dorsal side light brown without dorsal bands. The hind tibiae are almost entirely bluish-green, distal tenth red; tarsi red. Supraanal plate triangular, short, about as long as wide, sinuous margins, tapering gradually towards a rounded apex; median sulcus basally broad and deep, distally shallow, extending slightly beyond midlength (Fig. 88). Furcula represented by two digitiform, long projections: longer than broad, with rounded apex (Fig. 88). The subgenital plate is subconical. Male's cerci slender, basally broad, tapering gently towards a broad, robust, pointed apex, the lower distal margin subrectangulate (Fig. 87).

**Description of females.**—Medium sized, robust (Table 2), exhibiting sexual dimorphism in size and color, considerably larger than males, two color forms: green and light brown. Eyes medium sized, elliptical, not prominent, fastigium subelliptical, more than twice wider than long seen from above. Postocular band subobsolete on prozona, absent on metazona. Pronotum very dark, narrow, cylindrical, highly rugose and moderately punctate on prozona, densely punctate on metazona, median carina of pronotum percurrent but not prominent, pronotal disk emarginated with white and dark marks, tegmina ovate not reaching the posterior margin of the second abdominal segment. Light cream triangular markings on abdominal tergites inconspicuous. Two dark bands on the hind femora absent. Hind tibiae almost entirely bluish-green, only about one tenth distally red, tarsi are red. Ovipositor valves and cerci as shown in Fig. 96.

**Measurements.**— (mm) **Males:** Body length from vertex to end of femur 3: 19.0 (18.0-19.0). Pronotum length: 3.8 (3.8-3.9). Tegmina length: 3.0 (2.7-3.3). Hind femur length: 10.0 (9.9-10.2). **Females:** Body length: 24.0. Pronotum length: 5.1. Tegmina length: 3.2. Hind femur length: 12.6.

**Etymology.**—From the Latin *jocundus*, meaning delightful.

**Distribution.**—Northeastern Mexico: Nuevo León and Coahuila (Fig.

Table 1. *Phaulotettix* spp., males' measurements (mm).

Species	Body length			Pronotum length			Tegmina length			Hind femora length		
	<i>x</i>	Range	SD		Range	SD		Range	SD		Range	SD
<i>P. compressus</i>	20	19-21	0.9	3.8	3.6-4.0	0.17	2.9	2.4-3.4	0.4	10.5	10.1-10.7	0.24
<i>P. eurycercus</i>	16	15-16	0.5	3	3.0-3.1	0.02	2.4	2.3-2.5	0.11	8.5	8.4-8.7	0.15
<i>P. huastecus</i>	20	19-21	1.19	3.6	3.4-3.7	0.14	2.9	2.7-3.1	0.14	10.3	9.5-11.4	0.7
<i>P. adibilis</i>	18	18-19	0.79	3.8	3.4-4.1	0.31	2.8	2.5-3.3	0.32	9.7	9.4-10.1	0.31
<i>P. opimus</i>	19	18-20	0.97	3.9	3.4-4.3	0.32	3	2.9-3.1	0.09	10.5	10.3-11.0	0.28
<i>P. altissimus</i>	17	N.A.	N.A.	2.9	N.A.	N.A.	2.8	N.A.	N.A.	8.9	N.A.	N.A.
<i>P. ablusus</i>	18	N.A.	N.A.	3.4	N.A.	N.A.	2.8	N.A.	N.A.	9.2	N.A.	N.A.
<i>P. adiaphoros</i>	17	15-20	2.04	3.2	2.9-3.8	0.42	2.6	2.1-3.3	0.5	9.1	8.5-10.0	0.68
<i>P. ambrosius</i>	20	N.A.	N.A.	3.9	N.A.	N.A.	3	N.A.	N.A.	11.1	N.A.	N.A.
<i>P. arcadius</i>	19	17-20	1.21	3.5	3.0-3.9	0.39	2.7	2.4-3.1	0.26	10.1	9.2-10.7	0.73
<i>P. flaccidus</i>	20	17-21	1.74	3.8	3.3-4.2	0.4	2.7	2.3-2.9	0.23	10.5	9.1-11.2	0.98
<i>P. affinis</i>	20	19-21	0.88	3.8	3.7-4.0	0.14	2.8	2.7-3.1	0.23	10.8	10.5-11.0	0.26
<i>P. adynatos</i>	19	17-21	1.35	3.5	2.9-4.2	0.47	2.8	2.3-3.2	0.41	10.1	9.2-10.9	0.59
<i>P. nimius</i>	19	19-20	0.09	3.6	3.6-3.7	0.03	2.7	2.2-3.2	0.67	10.5	10.4-10.5	0.01
<i>P. jocundus</i>	19	18-19	0.28	3.8	3.8-3.9	0.01	3	2.7-3.3	0.42	10.1	9.9-10.2	0.21

N.A.= Not available

Table 2. *Phaulotettix* spp., females' measurements (mm).

Species	Body length			Pronotum length			Tegmina length			Hind femora length		
		Range	SD		Range	SD		Range	SD		Range	SD
<i>P. compressus</i>	25	23-26	1.7	5.4	5.1-5.8	0.13	3.3	2.9-3.8	0.5	13.6	12.7-14.7	0.98
<i>P. eurycercus</i>	20	20-21	0.13	3.9	3.8-4.0	0.11	2.4	2.3-2.5	0.11	11.1	11.0-11.2	0.1
<i>P. huastecus</i>	23	21-24	0.63	4.8	4.5-5.3	0.36	3.2	2.6-3.4	0.2	12.28	11.5-13.3	0.37
<i>P. adibilis</i>	24	22-26	1.75	5.5	5.0-6.0	0.44	3.4	2.9-4.1	0.48	12.72	11.7-14.0	0.92
<i>P. opimus</i>	24	22-26	1.89	5.6	5.0-6.1	0.48	3.4	2.8-4.1	0.48	12.63	11.6-13.7	0.93
<i>P. ambrosius</i>	27	N.A.	N.A.	6	N.A.	N.A.	2.9	N.A.	N.A.	15	N.A.	N.A.
<i>P. arcadius</i>	27	23-29	1.6	5.4	4.5-6.2	0.4	3.8	3.6-4.0	0.05	14.48	12.7-15.8	1.19
<i>P. flaccidus</i>	27	26-30	1.66	5.8	5.7-5.9	0.09	3.9	3.5-4.1	0.31	13.9	13.3-14.4	0.52
<i>P. adynatos</i>	23	20-29	3.32	4.7	4.4-5.7	0.57	3.3	2.9-3.8	0.43	12.68	11.0-15.4	1.64
<i>P. nimius</i>	23	N.A.	N.A.	4.9	N.A.	N.A.	3.5	N.A.	N.A.	12.68	N.A.	N.A.
<i>P. jocundus</i>	24	N.A.	N.A.	5.1	N.A.	N.A.	3.2	N.A.	N.A.	12.59	N.A.	N.A.

N.A.= Not available

93), TAM and ESM Biogeographic Provinces.

**Habitat.**—Collected on grasses, roadsides and high up into the mountain in openings and margins of woods; 400-2000 masl (Table 3). Habitat dominant vegetation: *Hordeum vulgare* L. (Poaceae), *Cenchrus ciliaris* L. (Poaceae), *Cynodon dactylon* (L.) Pers. (Poaceae), *Atriplex canescens* (Pursh) Nutt. (Amaranthaceae), *Acacia rigidula* Benth. (Fabaceae), *Lippia mexicana* Nesom. (Verbenaceae), *Juniperus monosperma* (Engelm.) Sarg., (Cupressaceae) and *Taraxacum officinale* Weber (Asteraceae).

## Discussion

The genus *Phaulotettix* is restricted primarily to northeastern Mexico. Only two of the 15 species are known to occur in south Texas, USA (*i.e.*, 87% of the species are endemic to Mexico). Furthermore, most *Phaulotettix* species exhibit very similar external morphology. These three features (restricted distribution of the genus, high local speciation, and low external morphological divergence) suggest rapid, recent and local diversification of this genus in northeastern Mexico.

Male *Phaulotettix* can be distinguished based on external (cerci) and internal (phallic complex) morphology. But females are extremely difficult to identify to species. Making matters worse in most species, both males and females express a green vs brown color dimorphism. For example, three of our five female *P. eurycercus*

were green, and two were brown. Hebard (1918) suggested that this species had only a green form.

How the species of *Phaulotettix* have differentiated and what mechanisms maintain reproductive isolation are not yet clear. Because of the apparent recent and perhaps ongoing speciation in this genus, we would expect some hybridization between adjacent species and subspecies, as is seen in some other groups of Melanoplinae (Tosto & Bidau 1991, Bidau & Martí 2008). However, many *Phaulotettix* species are syntopic and broadly sympatric and a number occur together at several localities and sometimes even in the same habitat, yet they appear to have maintained their distinct morphologies: *P. ablusus* and *P. eurycercus* are sympatric in Bellavista, Saltillo; *P. ambrosius* and *P. flaccidus* are sympatric in Aldama, Tamaulipas. A similar situation was reported by Otte & Cohn (2002) for the genus *Sinaloa* Scudder (Acrididae: Melanoplinae) which is endemic to western Mexico.

Our study shows great variation in range and population density among the 15 *Phaulotettix* species. *P. compressus*, *P. huastecus* and *P. opimus* n. sp., are very common and abundant, and inhabit a wide altitudinal gradient, ranging from 10 to 2400 masl (Table 3). In contrast, other species are currently known only from their type locality, *i.e.*, *P. altissimus* n. sp., of which only a few specimens have been collected from the lowlands of the Natural Protected Area "Cerro Potosí", southwest Nuevo León, at 2103 masl. Additional collections may show these species have a more extensive distribu-



Table 3. *Phaulotettix* spp., altitudinal range (masl).

<i>P. compressus</i>	<i>P. eurycerus</i>	<i>P. huastecus</i>	<i>P. adbillis</i>	<i>P. opimus</i>	<i>P. altissimus</i>	<i>P. ablusus</i>	<i>P. adiphoros</i>	<i>P. ambrosius</i>	<i>P. arcadius</i>	<i>P. flaccidus</i>	<i>P. affinis</i>	<i>P. adynatos</i>	<i>P. nimius</i>	<i>P. jocundus</i>
50	53	12	459	57	2103	1620	214	214	223	214	57	7	213	484
112	993	157	993	107			312		410		214	312	316	701
180	1620	223	1290	180					466		316	410	1051	870
200		260	1513	180								451	1082	1290
214		289	1560	196									1158	1524
313		366		214									1188	1589
361		400		313										1630
518		526		320										1783
540		530		400										1889
589		650		410										1996
650		735		460										
826		852		589										
852		897		852										
916		1080		926										
927		1318		1246										
993				1290										
1065				1589										
1080				1714										
1290				1890										
1513				1981										
1928				2194										
1942														
1953														
2079														
2394														

tion in northeastern Mexico.

Why is there such high diversity of *Phaulotettix* in northeastern Mexico? We suggest that a combination of factors has encouraged speciation among *Phaulotettix* in this area, including varied climate, soils, and topography with current and historical fragmentation and displacement during climatic and geological changes. Orographic, edaphic, and climatic diversity lead to ecological diversity, fragmentation, and allopatry, which may have stimulated diversification in *Phaulotettix*. Hence, we favor the *In Situ* Speciation Hypothesis to explain diversification in this genus.

### Acknowledgements

We greatly appreciate the generous help and assistance of Dr. Theodore J. Cohn. Ted not only allowed revision of his wonderful collection of Mexican Orthoptera at the University of Michigan-Museum of Zoology (UMMZ), but also provided all the facilities to work and invaluable help and assistance. Special thanks are given to the Dirección General de Educación Superior Tecnológica (DGEST) for funding the following projects: Systematics and Biogeography of Mexican Melanoplinae, Orthoptera Diversity in Natural Protected Areas of Northeastern Mexico (3495.10-P), Redes Académicas and Cuerpos Académicos. This work was carried out within the framework of these projects.

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