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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. altissima n. sp., P. ablasus 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. jacundus 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 Neotropical 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 (Halfker 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 msl in the lowlands to about 3,750 msl at the highest peaks. Cerro Potosí (3,750 msl) and Cerro Peña Nevada (3,650 msl) are the highest mountains, both occuring on the western side by the border between Nuevo León and Tamaulipas. The climate varies from semiwarm to temperate, both occurring on the western side by the border between Nuevo Leon 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. reggie, 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 climactic 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 exceed 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 the Bolsón of Mapimi 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-FBGG-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. Male’s 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.
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.


Results

Genus Phaulotettix Scudder, 1897


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

**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°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.

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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, dorsal half tapering, beyond subequal, lower distal margin obtuse-angulate, broad-rounded-apex.
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 annus 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)


**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.


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
rounded apex. Supraanal plate (Figs 10, 91) subrectangular. Subgenital plate, seen from above, spherical. Ephiphallus (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. eurycerus has been collected on patch-forming herba-
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 antisiphyllitica* Zucc., (Euphorbiaceae), *Larrea tridentata* Coville (Zygophyllaceae).

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


**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.


**San Luis Potosí:** 1 ♂ and 1 ♂, Hwy. 85, km 22, Laguna del Mante between Ciudad Mante and Ciudad Valles, 289 m, lat 22°31.66.6''N, long 98°59.587''W, 20.VIII.2010, Barrientos-Lozano 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-angulated 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 obtuse-angulated.

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
typical shrubs 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 montane forest with oak presence.

**Phaulotettix adibilis** n. sp. 
(Figs 19-24; 91; 92: 1D, 2D, 3D, 4D; 93; 96)

**Type material.** 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.


**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 obtuse-angulate, 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
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, roadides and in openings and margin of woods; 450-1600 masl (Table 3). At the lowlands, typical vegetation is shrub suchs as Mimosa biuncifera Benth. (Fabaceae), Havardia pallens Bent., 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.

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 margined. 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,
in lateral view, broad basally, narrower beyond midlength, the lower distal margin moderately obtuse-angled, 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 mountains 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, Cabáñal de 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 v shaped, 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
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)  

**Etymology.**—From the Latin altíssimus 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 salapensis* 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, Coahuila, 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. eurycercus* Hebard, 1918, but differs as follows: males’ cerci are broader and more robust (Figs 39, 91), middle portion is not constrained as in *P. eurycercus*. Supraanal plate is subrectangular, slightly longer and narrower than in *P. eurycercus* (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. eurycercus*, 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
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.


Etymology.—From the Latin abhussus, 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. & Yucca filifera (Engelm.) Trel., (Agavaceae), Dasylirion cedrosanum Trel., (Nolinaceae), Agave spp., (Agavaceae).

Phaulotettix adiaphoros n. sp.
(Figs 43-48; 91: 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 ♂, Co-paxtitlan, 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
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. Male’s cerci slender, basally very broad, narrowing about midlength, lower margin moderately obtuse-angulate distally, rounded broad apex.

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., (Burseraceae), Cenchrus echinatus L. (Poaceae), Washingtonia robusta Wendl., (Areaceae), 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: 11, 21, 31, 41; 93; 96)

Type material.— (material examined) Holotype ♂ and allotype ♀. Mexico, Tamaulipas, Aldama, 9 Km prior to Cerente 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: 11, 21): narrower bridge, posterior process stouter, more widely developed. Internal valves of aedeagus (Figs 53, 92: 31, 41): dorsal valve fist shape, basally narrow gradually widening, internally concave, distal margin undulated; ventral valve sub quadratre, distal margin undulated, lower margin folded inwards.

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

Females not available.
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.


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 Bent., (Fabaceae), Prosopis gladiolosa 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)


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 that 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-
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.
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* Bent. (Fabaceae), *Leucophyllum frutescens* (Berl.), I.M. Johnst., (Scrophulariaceae), *Karwinskia humboldtiana* (Roem. & Schult.) Zucc. (Rhamnaceae), *Panicum maximum* 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's 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 zygome 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...
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 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.

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), Mimosas biuncifera Benth., (Fabaceae), Bursera simaruba (L.) Sarg., (Burseraceae), Cenchrus echinatus L. (Poaceae), Washingtonia robusta Wend., (Arecaceae), Pithecellobium flexicaule Bent., (Fabaceae), Prosopis gladulosa Torr., (Fabaceae), Acacia farnesiana Will., (Fabaceae), Cenchrus echinatus L. (Poaceae), Casimiroa edulis La Llave & Lex., (Rutaceae), Prunus

Fig. 92. Males’ phallic complex. 3. A-I. Endophallic plates (dorsal and ventral valves of aedeagus) and cingulum, dorsal view. species as indicated.
**Phaulotettix affinis** n. sp.

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


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. 

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 subrectangular 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).

**Phaulotettix adynatos** n. sp.

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


Etymology.—From the Latin *affinis*, meaning related to, neighboring.
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,
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 male’s 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.
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 Potosi, 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, 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; Tamaulipas: 3 ♂ and 2 ♀, 20 km S Antiguo Morelos, 316 m, lat 22°33′19.66″N, long 99°08′10.80″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.

**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 obtuse-angulate, 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.


**Phaulotettix jocundus** n. sp.

(Figs 85-90; 91, 20: 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., coll. UMMZ; 1 24°44'56.64''N, long 99°57'26.77''W, 27.IX.1958, Cohn T.J., coll. UMMZ; 2 24°47'55.27''W, 27.IX.1958, Cohn T.J., coll. UMMZ; 1 24°47'46.98''N, long 100°03'33.21''W, 11.VIII.1959, Cohn T.J., coll. UMMZ; 2 24°44'56.64''N, long 99°57'26.77''W, 27.IX.1958, Cohn T.J., coll. UMMZ; 2 24°47'55.27''W, 27.IX.1958, Cohn T.J., coll. UMMZ.

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

<table>
<thead>
<tr>
<th>Species</th>
<th>Body length</th>
<th>Pronotum length</th>
<th>Tegmina length</th>
<th>Hind femora length</th>
</tr>
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<tr>
<td></td>
<td>x</td>
<td>Range</td>
<td>SD</td>
<td>Range</td>
</tr>
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<td>0.97</td>
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</tr>
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<td>2.9</td>
<td>N.A.</td>
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<td>3.8</td>
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</table>

N.A. = Not available

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

<table>
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<th>Pronotum length</th>
<th>Tegmina length</th>
<th>Hind femora length</th>
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</thead>
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<td>SD</td>
<td>Range</td>
</tr>
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<td>5.1</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

N.A. = Not available

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 (ceri) 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. However, many Phaulotettix species are sympatric 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. abalusus and P. eurycercus are sympatric in Bellavista, Sátilllo; P. ambrosius and P. flaccidus are sympatric in Aldama Tamaulipas.

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. alissimus n. sp., of which only a few specimens have been collected from the lowlands of the Natural Protected Area "Cerro Potosi", southwest Nuevo Leon, at 2103 masl. Additional collections may show these species have a more extensive distribu-
tation 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.

References


