

AN IDENTIFICATION KEY FOR THE MOST IMPORTANT GRASSHOOPERS OF MAPMI BIOSPHERE RESERVE (CHIHUAHUAN DESERT), MEXICO

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ABSTRACT. The Orthopteroidean fauna in Mapimi Biosphere Reserve (RBM) is represented by 60 species. Ensifera suborder are represented by 15 species grouped in next superfamilies: Tettigoniidae (eight species), Tettigonoidea (one), Stenopelmatoidea (one), Grylloidea (four) y Gryllotalpoidea (one), and six species recorded of Phasmatodea y Dytioptera orders. In Caelifera suborder, grasshopper fauna is composed of 39 recognized species. The family Acrididae is represented by the subfamilies Gomphocerinae (13 spp), Oedipodinae (10 spp), Melanoplinae (nine spp), Cyrthacantacridinae (two spp), Ommatolampinae (one sp), Leptysminae (one sp), and Romalcidae family (three spp). Three major life-form groups or guilds are found at MBR: 1) Ground-dwelling species (terrícolas), the most common of which are *Trimerotropis pallidipennis* (Burmeister 1883) and *Cibolacris parviceps* (Walker 1870). These species live on the soil surface, are generalist feeders and tend to specialize on specific soils associated with different geomorphic surfaces. 2) Grass-dwelling species (graminícolas), the most common being *Paropomala virgata* Brunner 1899, *Opeia obscura* (Thomas 1872), and frequent outbreaks of *Boopedon nubilum* (Say 1825). These species live and feed on grasses but have no specific hosts. 3) Shrub-dwelling species (arbustícolas), which are morphologically, behaviourally, and trophically distinct from ground-dwelling and grass-dwelling species. The most common are *Bootettix argentatus* Brunner 1889, *Ligurotettix planum* (Brunner 1905), *Hesperotettix viridis* (Thomas 1872), *Campylacantha olivacea* Scudder 1875, and *Clematodes larreae* Cockerell, 1901; shrub-dwelling species live and feed on shrubs and are host specific to particular shrub species. In general, the species composition and density of grasshopper assemblages vary with different landscape units (depending on soils type and conditions) and also depend on to the taxonomic and physical structure of vegetation and climate into MBR. This paper were made to do possible the identification of acridological fauna of RBM.

KEY WORDS: Orthoptera, Acridoidea, Mapimi Biosphere Reserve.

RESUMEN. La fauna de ortopteroideos en la Reserva de la Biosfera Mapimí (RBM), está formada por un total de 60 especies. El suborden Caelifera está representado por 39 especies de la superfamilia Acridoidea, repartidas en: 13 especies de Gomphocerinae, 10 de Oedipodinae, 9 Melanoplinae, dos Cyrthacantacridinae, una Ommatolampinae y una Leptysminae y la familia Romaleidae con tres especies. El suborden Ensifera está representado por 15 especies repartidas entre las superfamilias Tettigoniidae (8 especies), Tettigonoidea (una), Stenopelmatoidea (una), Grylloidea (cuatro) y Gryllotalpoidea (una). Además, se registraron seis especies de Phasmatodea y Dytioptera. En la RBM, los Acridoidea son el grupo más abundante y conspicuo de insectos herbívoros, se distinguen tres formas de vida o «guilds»: 1) Los que habitan en el suelo (terrícolas) representados por *Trimerotropis pallidipennis* (Burmeister 1883) y por *Cibolacris parviceps* (Walker 1870). 2) Los que habitan en hierbas y zacates (graminícolas), los más comunes son: *Paropomala virgata* Brunner 1899 y *Opeia obscura* (Thomas 1872) y se han registrado frecuentes disparos de población de *Boopedon nubilum* (Say 1825). 3) Los que habitan en arbustos (arbustícolas) grupo morfológica, conductual y tróficamente distinto a los anteriores, algunas especies muestran alta especificidad alimenticia y/o de hábitat como *Bootettix argentatus* Brunner 1889, *Ligurotettix planum* (Brunner 1905), *Hesperotettix viridis* (Thomas 1872), *Campylacantha olivacea* (Scudder 1875) y *Clematodes larreae* Cockerell, 1901. La composición de especies y las densidades de población en los distintos ensamblajes de acridoideos, muestran gran variabilidad interanual, varían considerablemente entre unidades de vegetación y ambiente, dependen principalmente de las condiciones del suelo, de los atributos taxonómicos y estructura física de la vegetación y del clima (Rivera 2006). El presente trabajo es una herramienta para la identificación de la acridofauna de la RBM.

PALABRAS CLAVE: Orthoptera, Acridoidea, Reserva de la Biosfera Mapimí.

INTRODUCTION

This research field work began in 1980; the first results covered aspects relating to biology and descriptive ecology of the most common grasshopper species (the entire Acridoidea superfamily). The present study aims to update a taxonomic key for identification (Rivera 1986), and general information about them, published by Rivera (2006), considering now a identification key for the most important Acridoidea insects of Mapimi Biosphere Reserve (Chihuahuan Desert), México.

Study site

The Mapimi Biosphere Reserve (MBR) was established in 1979 but was later expanded (DOF 2000). It includes part of the states of Durango, Chihuahua, and Coahuila in northern Mexico, its irregular polygonal-shaped area is located between parallels 27° 00' and 26° 10' latitude north and meridians 104° 05' and 103° 25' longitude west. The total surface area is over 342 000 hectares, covering parts of the states of Durango (63%), Coahuila (23%) and Chihuahua (14%). The Reserve has two nucleus zones with a surface of 28,532 hectares (together) and a buffer zone with 313, 855 hectares. At present the RBM is administered by the National Commission of Protected Areas (CONANP-SEMARNAT). It is common to observe topographic profiles on the reserve, with dominant SE-NW directions. The study area corresponds to a surface of approximately 25,000 has, and includes a representative topographic gradient that has been considered for other studies. This gradient is located in the central part of the Reserve; it takes as altitudinal references the «Cerro San Ignacio» and the floodplains of «La India» stream (locally named «La Vega»). The gradient is composed mainly of four forms of relief properly defined by Montaña and Breimer (1988).

Accord to Rivera (2006), the Orthopteroidean fauna in RBM is represented by 60 species. En-

sifera suborder are represented by 15 species grouped in next superfamilies: Tettigoniidae (eight species), Tettigonoidea (one), Stenopelmatodea (one), Grylloidea (four) y Gryllotalpoidea (one), and six species recorded of Phasmatodea y Dytioptera orders. In Caelifera suborder, grasshopper fauna is composed of 39 recognized species. The family Acrididae is represented by the subfamilies Gomphocerinae (13 spp), Oedipodinae (10 spp), Melanoplinae (nine spp), Cyrthacantacridinae (two spp), Ommatolampinae (one sp), Leptysminae (one sp), and Romaleidae family (three spp). Three major life-form groups or guilds are found at MBR: 1) Ground-dwelling species (terricoles), the most common of which are *Trimerotropis pallidipennis* (Burmeister 1883) and *Cibolacris parviceps* (Walker 1870). These species live on the soil surface, are generalist feeders and tend to specialize on specific soils associated with different geomorphic surfaces. 2) Grass-dwelling species (graminicoles), the most common being *Paropomala virgata* Brunner 1899, *Opeia obscura* (Thomas 1872), and frequent outbreaks of *Boopedon nubilum* (Say 1825). These species live and feed on grasses but have no specific hosts. 3) Shrub-dwelling species (arbusticoles), which are morphologically, behaviourally, and trophically distinct from ground-dwelling and grass-dwelling species. The most common are *Bootettix argentatus* Brunner 1889, *Ligurotettix planum* (Brunner 1905), *Hesperotettix viridis* (Thomas 1872), *Campylacantha olivacea* Scudder 1875, and *Clematodes larreae* Cockerell, 1901; shrub-dwelling species live and feed on shrubs and are host specific to particular shrub species. In general, the species composition and density of grasshopper assemblages vary with different landscape units (depending on soils type and conditions) and also depend on to the taxonomic and physical structure of vegetation and climate into RBM.

MATERIAL AND METHODS

From the beginning (80's) intensive and extensive collections were made, next only the new species were collected and preserved, at last when the RBM were grow, the collections were made in all new locations located inside the new irregular polygonal-shaped area. All material was identified and used for made this key from the following texts: Alexander (1941); Alexander and Hilliard (1969); Ball, *et al.* (1942); Blatchely (1920); Brooks (1958); Brusven (1967, 1972); Capinera and Sechrist (1981); Campbell *et al.* (1974); Cantrall (1943); Cohn (1965); Helfer (1987), Hubbell and Norton

(1978); Otte (1981, 1984); Pfadt (1986); Rhen and Eades (1961); Rhen and Grant (1961); Richman *et al.* (1993); Rivera (1986); Stroecker *et al.* (1968); Thinkham (1938, 1948).

All material described were deposited in INE-COL-CRD, Durango Mapimí, Collection along with 680 specimens and other wet preserved (Formic Aldehyde Alcohol). The identification key was elaborated using like principal Taxonomic reference Orthoptera Species File Online (Version 2.2) made by D. Otte, Eades D. C. and Naskerecki P. (<http://osf2x.orthoptera.org/osf2.2/OSF2X2-Frameset.htm>).

Key to most common Acridoidean species from Mapimí Biosphere Reserve

| | |
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| 1. Antennae long and slender, usually longer than body. Ovipositor sometimes longer than body, slender (Suborder ENSIFERA) | |
| 1'. Antennae no longer than all the body long. Ovipositor short. (Suborder CAELIFERA) | 2 |
| 2. Last spine in the external border of hind tibiae in apical position. (Romaleidae: Romaleinae) | 3 |
| 2'. Last spine in the external border of hind tibiae in sub apical position. | |
| (Acrididae) | 5 |
| 3. Wings well developed | Taeniopoda eques (Burmeister) |
| 3'. Braquipterous, tegminae and wings reduced | 4 |
| 4. Pronotum rugose, grayish color, with or without dark spots on surface | Phrynotettix robustus (Bruner) |
| 4'. Pronotum smooth, yellowish, with blue or green spots on the head | Brachystola magna (Girard) |
| 5. Without a prosternal spine | 6 |
| 5'. With a prosternal spine | 26 |
| 6. Males with stridulatory pegs in the inner side of posterior femora (Gomphocerinae) | 7 |
| 6'. Males without stridulatory pegs in the inner side of posterior femora (Oedipodinae) | 20 |
| 7. Vertex faveolae or faveolar area of the head not visible from the top | 8 |
| 7'. Vertex faveolae or faveolar area of the head visible from the top | 15 |
| 8. Lateral pronotum borders parallel between them | 9 |
| 8'. Lateral pronotum borders contracted to the middle or divergent to wards metazone | 18 |
| 9. Pronotal postocular lateral strip, dark color and extending to all the body length, hind tibiae usually pinkish | |
| | Mermiria bivittata (Serville) |
| 9'. Pronotal postocular lateral stripe, grayish or without it, hind tibiae usually grayish or yellowish | 10 |
| 10. Ventral view, with a protuberance between frontal legs | Paropomala virgata Bruner |
| 10'. Ventral view, without a protuberance between frontal legs | 11 |
| 11. With similar amplitude along all pronotum, almost parallel from top view, tegminae more shorter than body | |
| | Opeia obscura (Thomas) |
| 11'. Pronotum with more amplitud distally than frontally, tegmen longer than the abdomen | Eritettix simplex (Scudder) |
| 12. Hind tibiae with black and white proximal third, the next two distal thirds orange color | Acantherus piperatus Scudder & Cockerell |
| 12'. Hind tibiae without above characteristics | 13 |
| 13. Rostrum strongly slanting | 14 |

An identification key for the most important grasshoppers of mapmi biosphere reserve

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| 13'. Rostrum vertical | 15 |
| 14. Slender body, wings well developed with a tanner color than the body (Leptysmiinae) | Leptysma margicolis Serville |
| 14'. Slender body dark brown color, braquipterous or apterous (Ommatolampinae)..... | Clematodes larreae Cockerell |
| 15. Frontal part of the head sharped | Acrolophitus maculipennis (Scudder) |
| 15'. Frontal part of the head not sharped | 16 |
| 16. Body olive green color with little dark spots and bright white pearl spots in both sides of body..... | Boottettix argentatus Bruner |
| 16'. Body grayish or green color, with a little dark spot behind the eyes, present only in the head | Syrbula montezuma (Saussure) |
| 17. Posterior part of pronotal disk with a triangle or elongated ribbons shape | Psoolessa texana Scudder |
| 17'. Posterior part of pronotal disk continued..... | 18 |
| 18. Pronotum without lateral carinae | 19 |
| 18'. Pronotum with lateral carinae..... | Boopedon nubilum (Say) |
| 19. Body dark grayish or pale brown in both sides..... | Ligurotettix planum (Bruner) |
| 19'. Body with variable color, usually blue-gray or pink-gray..... | Cibolacris parviceps (Walter) |
| 20. Medial pronotal carinae cristata, with tooth borders..... | Tropidolophus formosus (Say) |
| 20'. Medial pronotal carinae with low smooth borders | 21 |
| 21. Hind wings sky blue color..... | Anconia hebaridi Rhen |
| 21'. Hind wings yellow, red or orange color | 22 |
| 22. Slender body | 23 |
| 22'. Robust body | 24 |
| 23. Hind wings yellow-orange to orange-red color..... | Arphia conspersa Scudder |
| 23'. Hind wings bright red color | Arphia pseudonietana (Thomas) |
| 24. Pronotal metazone weakly rugose or smooth | 25 |
| 24'. Pronotal metazone strongly rugose | 28 |
| 25. Hind tibiae bright orange color | 26 |
| 25'. Hind tibiae pale yellow or white | 27 |
| 26. Inner face of posterior femora with almost two pale color stripes, without little projections in the lower posterior border of pronotal lateral lobules | Trimerotropis latifaciata (Scudder) |
| 26'. Inner face of hind femora with two pale stripes alternate with three darker stripes, with little projections in the lower of posterior borders of pronotal lateral lobules..... | Trimerotropis californica (Bruner) |
| 27. With a high contrast bright and dark color in the transversal stripes of the tegmina..... | Trimerotropis pistrinaria Saussure |
| 27'. Lower contrast than above, hind femora inner surface with two pale stripes | Trimerotropis pallidipennis (Burmeister) |
| 28. With two well marked dark stripes in the forward border of tegmina | Conozoa texana (Bruner) |
| 28'. Without above characteristics | Trimerotropis sp. |
| 29. Mesosternal lobules longer than wide..... | (Cyrtacanthacridinae) |
| 30 | |
| 29'. Mesosternal lobules transversal | (Melanoplinae) |
| 31 | |
| 30. Body plumber-gray or dark gray colour..... | Schistocerca nitens (Thunberg) |
| 30'. Body gray-yellow or yellowish..... | Schistocerca americana (Drury) |
| 31. Wings well developed or reduced..... | 32 |
| 31'. Apterous..... | Netrosoma nigropleura Scudder |
| 32. Body olive green or grass green color..... | 33 |
| 32'. Body light brown grayish | 34 |
| 33. Body surface with many hairs and wings reduced | Campylacantha olivacea (Scudder) |
| 33'. Body surface without hairs and wings well Developer..... | 35 |
| 34. With a yellow stripe on both tegmina forming a triangle in the joint of them | Melanoplus thomasi Scudder |

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| 34'. With red or pinky spots behind the pronotum, with black marked sulcus | Hesperotettix viridis (Thomas) |
| 35. Hind tibiae red colour..... | 36 |
| 35'. Hind tibiae blue color, wings well developed..... | Melanoplus femurrubrum (De Geer) |
| 36. Wings reduced or braquipterous | Melanoplus lakinus (Scudder) |
| 36'. Wings well developed or size reduced but always present..... | 37 |
| 37. Tegminae longer than body, fore and middle femora robust, hind femora with a black dark spot pattern along them... | Melanoplus differentialis (Thomas) |
| 37'. Male subgenital plate no triangular from behind view..... | 38 |
| 38. Hind tibiae highly variably in color red to blue, cerci finger shaped..... | Melanoplus sanguinipes (Fabricius) |
| 38'. Tegmina reduced size, dark brown color | Melanoplus sp (2 spp). |

Taxonomic list

Order: Orthoptera; Suborder: Caelifera; Infraorder: Acridoidea; Superfamily: Acridoidea;

Family: Romaleidae;

Tribe: Romaleini

Tribe: Brachistolini

Tribe: Phrynotettigini

Family: Acrididae:

Tribe Acrolophitini

Tribe: Amblytropidinni

Tribe Aulocarini

Tribe: Cibolacrini

Tribe: Eritettigini

Tribe: Paropomalini

Tribe: Mermirini

Tribe: Anconiini

Tribe: Arphini

Tribe: Psinidiini

Tribe: Tropidolophini

Tribe: Sphingonotini

Subfamily Romaleinae.

Taeniopoda eques (Burmeister 1889)

Brachystola magna (Girard 1853)

Phrynotettix robustus (Bruner 1889)

Subfamily Gomphocerinae.

Acrolophitus maculipennis (Scudder 1890)

Bootettix argentatus Bruner 1889

Boopedon nubilum (Say 1825)

Syrbula montezuma (Saussure 1861)

Aulocara elliotti (Thomas 1870)

Psoloessa texana Scudder 1875

Cibolacris parviceps (Walker 1870)

Ligurotettix planum (Bruner 1905)

Eritettix simplex (Scudder 1889)

Opeia obscura (Thomas 1872)

Paropomala virgata Scudder 1899

Acantherus piperatus Scudder and Cockerell 1902

Mermiria bivittata (Serville 1839)

Subfamily: Oedipodinae

Anconia hebari Rhen 1919

Arphia conspersa Scudder 1875

Arphia pseudonietana (Thomas 1870)

Mestobregma plateii (Thomas 1873)

Mestobregma terricolor Rhen 1919

Tropidolophus formosus (Say 1825)

Trimerotropis pallidipennis (Burmester 1838)

Trimerotropis pistrinaria Saussure 1884

Trimerotropis latifaciata Scudder 1881

Trimerotropis californica Bruner 1889

Conozoa texana (Bruner 1889)

An identification key for the most important grasshoppers of mapmi biosphere reserve

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|---------------------------|--|
| Tribe: Dactyloini | Subfamily: Melanoplinae Campylacantha olivacea (Scudder 1875) Hesperotettix viridis (Thomas 1872) |
| Tribe: Melanoplinae | Netrosoma nigropleura Scudder 1897 Melanoplus differentialis (Thomas 1865) Melanoplus femurrubrum (De Geer 1773) Melanoplus glandstoni Scudder 1897 Melanoplus lakinus (Scudder 1878) Melanoplus thomasi Scudder 1897 |
| Tribe: Cyrtacanthacridini | Subfamily: Cyrtacanthacridinae Schistocerca americana (Drury 1773) Schistocerca nitens (Thunberg 1815) |
| Tribe: Clematodini | Subfamily: Ommatolampinae Clematodes larreae Cockerell 1901 |
| Tribe: Leptysminae | Subfamily: Leptysminae Leptysma margicolis Serville 1839 |

DISCUSSION

The species recorded on RBM is lower than reported (around 60 species) by Tinkham (1948) in the Big Bend region (Trans-Pecos, Texas), the low species richness recorded at MBR (39 species) were due by altitude (average 1100 m) with high monotony on the physiognomic plant species composition (Montaña 1988). In the RBM ecosystem, grasshoppers have many predators and parasites from spring to fall offering a principal source of meal when outbreaks are recorded (Rivera 2006), sometimes with a great synchronization between the breeding season of some avian predators with grasshopper abundance.

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LITERATURE CITED

- ALEXANDER, G. 1941. *Keys for the identification of Colorado Orthoptera*. Univ. of Col. Studies, Series D. 1(3): 129-164.
- ALEXANDER, G. AND HILLIARD, JR. 1969. Altitudinal and seasonal distribution of Orthoptera in the Rocky Mountains of northern Colorado. *Ecol. Monographs*. 30: 385-431.
- BALL, E. D., E. R. TINKHAM, R. FLOCK AND C. T. VORHIES. 1942. The grasshoppers and other Orthoptera of Arizona. *Agric. Exp. Sta. Tech. Bull.* 93: 255-373.
- BLATCHELY, W. S. 1920. *Orthoptera of North-Eastern America*. The Nature Pub. Co. Indianapolis. U. S. A.
- BROOKS, A. R. 1958. *Acridoidea of Southern Alberta, Saskatchewan, and Manitoba (Orthoptera)*. Supp. 9. Canadian Entomologist. 90 pp.
- BRUSVEN, M. A. 1967. *Differentiation, ecology, and distribution of immature slant-faced grasshoppers (Acridinae) in Kansas*. Kansas. Agric. Exp. Sta. Tech. Bull. No. 149.
- BRUSVEN, M. A. 1972. Differentiation of common Catantopinae and Cyrtacanthacridinae nymphs (Orthoptera: Acrididae) of Idaho and adjacent areas. *Melandieria*. 9: 1-31.
- CAMPBELL, J. B., W. H. ARNETT, J. D. LAMBLEY, O. K. JANTZ AND H. KNUTSON. 1974. *Grasshoppers (Acrididae) of the Flint Hills tall grass prairie in Kansas*. Kansas Agric. Exp. Sta. Manhattan, Res. Paper. No. 19.
- CANTRALL, I. J. 1943. *The ecology of the Orthoptera and Dermaptera of George Reserve, Michigan*. Univ. of Mich. Misc. Pub., Mus. of Zool. No. 54.
- CAPINERA, J. L. AND T. S. SECHRIST. 1981. *Grasshoppers (Acrididae) of Colorado, identification, biology and management*. Col. State. Univ. Exp. Sta. Bull. 584S.

- COHN, T. 1965. *The arid land Katydid of the North American Genus Neobarrettia (Orthoptera: Tettigoniidae): Their systematics and a reconstruction of their History*. Miscellaneous Publications. Museum of Zoology, University of Michigan. No. 126.
- DIARIO OFICIAL DE LA FEDERACIÓN. Fecha: noviembre 26 del 2000. México, D. F.
- HELPER, J. R. 1987. *How to know the grasshoppers, crickets, cockroaches and their allies*. Dover Pub. New York.
- HUBELL, T. H. AND R. M. NORTON. 1978. *The Systematics and Biology of cave-crickets of North American Tribe Hadenocici (Orthoptera: Saltatoria: Ensifera: Rhaphidophoridae: Dolichopodinae)*. Misc. Pub. Museum of Zool. Univ. of Mich. No. 156.
- MONTAÑA, C. AND R. F. BREIMER. 1988. Major Vegetation units. In: Montaña C. (ed). *Estudio Integrado de los Recursos Vegetación Suelo y Agua en la Reserva de la Biosfera de Mapimí*. Instituto de Ecología, A. C. México, D. F. 99-114.
- OTTE, D. 1981. *The North American Grasshoppers*. Vol. 1, Acrididae: Gomphocerinae and Acridinae. Harvard Univ. Press, Cambridge.
- OTTE, D. 1984. *The North American Grasshoppers*. Vol. 2, Acrididae: Oedipodinae. Harvard Univ. Press, Cambridge.
- PFADT, R. E. 1986. *Key to the Wyoming grasshoppers: Acrididae and Tetrigidae*. Univ. Wyoming, Agric. Exp. Sta. Mimeo. Circ. No. 210.
- RHEN J. A. G. AND D. C. EADES. 1961. The tribe Leptysmini (Orthoptera: Acrididae: Cyrtacanthacridinae) as found in North America and Mexico. *Proc. of Acad. of Nat. Sci. of Phila.* 113(5): 81-134.
- RHEN, J. A. AND H. J. GRANT JR. 1961. *A monograph of the Orthoptera of North America (North of Mexico)*. Monographs of Academy of Natural Science of Philadelphia. U. S. A. No. 12.
- RICHMAN, D. B., D. C. LIGHTFOOT, C. A. SUTHERLAND, D. J. FERGUSON, AND L. BLACK. 1993. *A manual of the grasshoppers of New Mexico (Orthoptera: Acrididae and Romaleidae)*. New Mexico State University, Handbook No. 7.
- RIVERA, E. 1986. Estudio Faunístico de los Acridoidea de la Reserva de la Biosfera de Mapimí, Dgo., México. *Acta Zool. Mex. (n. s.)* 14: 1-42.
- RIVERA, G. E. 2006. An Annotated checklist of some Orthopteroid insects of Mapimi Biosphere Reserve (Chihuahuan Desert), Mexico. *Acta Zool. Mex. (n. s.)* 22(3): 131-149.
- STROECKER, H. F., W. W. MIDDLEKAUFF AND D. C. RENTZ. 1968. *The grasshoppers of California (Orthoptera: Acrididae)*. Bulletin of California Insect Survey. No. 10.
- TINKHAM, E. R. 1938. Western Orthoptera attracted to lights. *Jour. of New York Entomol. Soc.* 46: 339-353.
- TINKHAM, E. R. 1948. Faunistic and ecological studies on the Orthoptera of the Big Bend region of Trans - Pecos Texas, with special reference to the Orthopteran zones and fauna of Midwestern North America. *The Amer. Midd. Nat.* 40: 521-663.