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STUDIES IN DESERT SAND DUNE ORTHOPTERA
PART I. A NEW SPECIES OF *PLAGIOSTIRA* FROM EASTERN
NEW MEXICO WITH KEY AND NOTES

Ernest R. Tinkham¹

The discovery of a large and handsome new species of *Plagios-tira* Scudder from the Mescalero Sands, 45 miles east of Roswell, New Mexico, and about 50 miles west of the Texas line, was made July 16-17, 1959, while the writer was conducting field investigations on the Desert Sand Dune Biota of the Great Chihuahuan Desert in the third summer of his three-year summer grant to study the Sand Dune Biotae of the North American Deserts under a National Science Foundation grant.

This article, Part I, will inaugurate a series of taxonomic papers with biological notes on the many new species of Sand Treader Camel Crickets (*Ammobaenetes*), sand dune acridids or grasshoppers and dectids or shield-backed katydids discovered during the course of the author's research into the Desert Sand Dune Biotae of the North American Deserts. These investigations were initiated in the spring of 1952 and carried on privately for five years until 1957. In that year the scope of the author's studies was greatly stimulated and expanded by the three-year summer grant from the National Science Foundation.

Upon receipt of this grant the spring and summer of 1957 was spent studying the Sand Dune Biota of the Great Sonoran Desert which includes the Colorado, Mohave, Gila, Sahuaro, Hermosillo and Gulf Coastal deserts. A similar period in 1958 was devoted to the Dune Biota of the Great Basin Desert of Nevada, Utah and northeastern Arizona. During the spring and summer of 1959, the writer explored the widely scattered dune areas of the Great Chihuahuan Desert of eastern New Mexico, southwestern Texas and northeastern Mexico.

The Mescalero Sands of eastern New Mexico possess the richest Orthopteran fauna of all the numerous dune areas of the North American Deserts. Its general location is 35 to 45 miles east of Roswell on Highway 380 which traverses the dunes in its northern half. These dunes are nine miles across (E to W) in this area with a long axis (NE to SW) of at least 35 to 40 miles. As creosote (*Larrea divaricata*), marking the eastern edge of the Great Chihuahuan Desert, was observed east of the Pecos River and 17 miles west of the western edge of the Mescalero Sands, and as this margin angles southeasterly while the western edge of the Mescalero Sands angles southwesterly, it is believed that at its southwestern tip the Mescalero Sands are contiguous with the creosote margin of the Great Chihuahuan Desert. Thus, the Mescalero Sands can be said to lie on the very periphery of this great desert and its fauna, consequently, derived not only from the desert but also from the prairies to the east.

1. Indio, California.

The Mescalero Sands are quite unusual as far as sand dunes are concerned for they are well covered with scrub oak which ranges from one to two feet in height. In places, bare sand dune ridges up to 20 feet in height are found, but for the most part the vast areas of these low-level dunes are semi-stabilized by scrub oak.

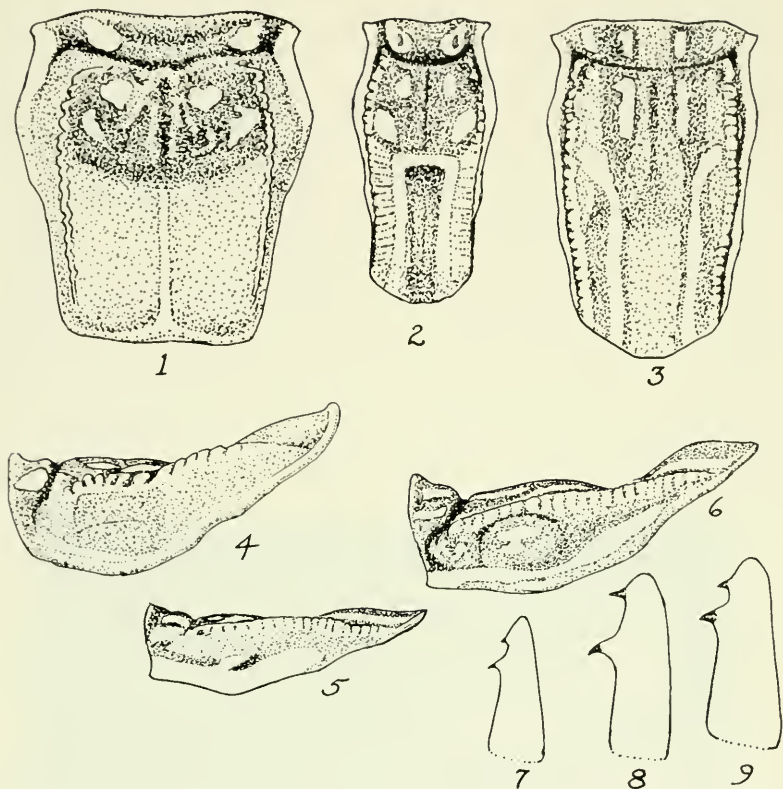
The Orthopteran fauna consists of at least 33 species taken on the two trips in July and September of 1959, thus attesting to its great richness.

PLAGIOSTIRA MESCALEROENSIS n. sp.

In size relationships, *Plagiostira mescaleroensis* is closest to *P. gillettei* Caudell 1907 from the Great Basin Desert, but in morphological features it is more closely allied to the much smaller *P. albonotata* Scudder 1876 of northern Arizona. The new species differs from *P. gillettei* by the following features: males slightly smaller and much more slender; fastigium more prominent and broader at the apex; metazonal streaks, so prominent in the new species, lacking in *gillettei*; dorsum of the pronotum narrower and longer than in *gillettei*; and in the female slenderer than in *gillettei* with color markings as in the male; abdominal markings more prominent and the ovipositor of about the same length as in *gillettei*. The new species of *Plagiostira* differs from *albonotata* by its much larger size, by the conformation of the markings on the disc of the pronotum (compare figures 2 and 3, 5 and 6) and by the shape of the pronotum when viewed from above and the side.

Description: typical of the genus. Male with the occiput rounding moderately into the fastigium which is as broad as the basal segment of the antennae above the scrobes, squarely truncate and broken at its base by a sulcus from the smooth curvature of the face. Head, above the clypeus, as broad as deep. Pronotum with a shallow sulcus just caudad of the truncate front margin, the lateral portions of this sulcus curving gently forward (see figures 3 and 4) to deeply notch the very prominent lateral margins of the pronotum which are hardly carinate but rather a rounded swollen boss with a crenulated appearance. This lateral rolled margin is parallel in its anterior half with maximum breadth at its middle, thence tapering or converging gently towards the posterior margin of the pronotum which is quite angularly rounded. Lateral lobes of the pronotum very shallow, the ventral margin gently bent at the posterior angle. Seen in profile and compared with *albonotata* (see figures 5 and 6) the anterior portion of the prozona and the posterior half of the metazona are much more strongly reflexed in the new species than in *albonotata* which has the plane of the pronotum almost flat. When similar comparisons are made with the new species and *gillettei* considerable differences are easily noted.

Tegmina with the front margin straight and about half the length of the pronotum when seen in lateral profile but only half its length as observed from above. Wings shining with smooth surface, jet black, completely covered by the tegmina with portions of the foremargin sometimes visible. Penultimate tergite of the abdomen



EXPLANATION OF PLATE

1. *Plagiostira gillettei*. Smith Valley, Lyon Co., Nevada. Dorsal view of male pronotum.
2. *Plagiostira albonotata*. Headquarters, Petrified Forest, Arizona. Dorsal view of male pronotum.
3. *Plagiostira mescaleroensis* n. sp. Mescalero Sands, Chaves Co., New Mexico. Dorsal view of Holotype male pronotum.
4. *Plagiostira gillettei*. Smith Valley, Lyon County, Nevada. Lateral view of male pronotum.
5. *Plagiostira albonotata*. Headquarters, Petrified Forest, Arizona. Lateral view of male pronotum.
6. *Plagiostira mescaleroensis* n. sp. Mescalero Sands, Chaves County, New Mexico. Lateral view of pronotum of Holotype male.
7. *Plagiostira albonotata*. Coral Pink Dunes, Kane County, Utah. Dorsal view of male cercus.
8. *Plagiostira mescaleroensis* n. sp. Mescalero Sands, Chaves County, New Mexico. Dorsal view of cercus of Paratype male.
9. *Plagiostira gillettei*. Smith Valley, Lyon County, Nevada. Dorsal view of male cercus.

considerably produced centrally with a deep median "U-shaped" notch, the lateral processes produced by this emargination rather acute. Subgenital plate with a narrow deep cleft, centrally. Cerci typical of the genus with one minute, almost apical tooth and another similar tooth situated just beyond the middle on the internal margin of the cercus. Caudal femora closely approximating the body length.

Leg Spination as follows: Fore femora with the internal inferior keel bearing 5-6 small, dark-tipped teeth; fore tibiae with 5-7 long, external, and 6 long internal teeth on the inforeior keels and 0 to 2 external dorsal teeth. Meso-femora with 4 internal teeth on the inferior keel (when leg is in forward position) and mesotibiae with 6-7 internal and 6 external long teeth on the inferior keels and two pairs of dorsal spines (below in folded leg). Caudal femora with 4-5 external and 5-6 internal teeth on the inferior keels. Caudal tibiae with 12-13 external, 14-15 internal, plus apical spines on the dorsal keels (below in folded leg) and 7 external and 6 internal teeth on the ventral keels (above in folded legs) plus the apical spines.

Living Coloration: Entire body foliage green with nacreous or silvery white markings located as follows: occiput with two longi-

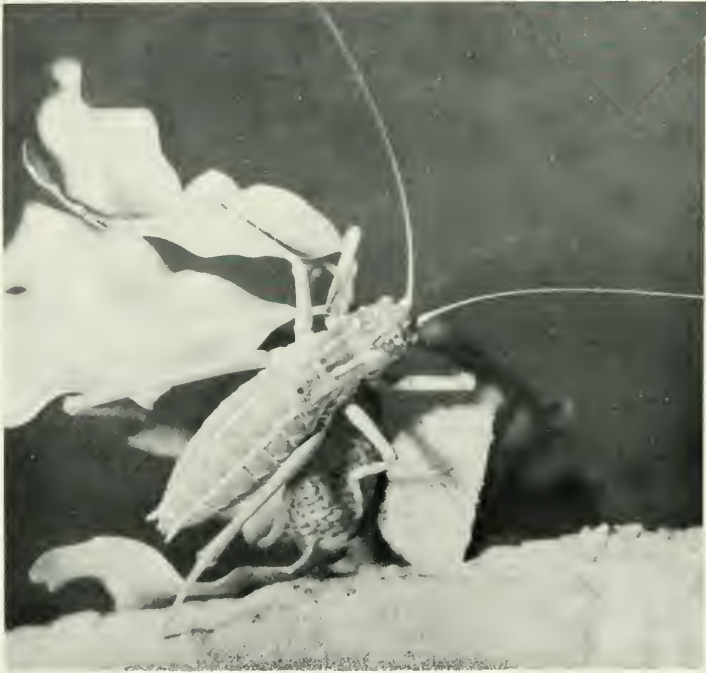


Fig. 10. Male *Plagiostira mescaleroensis* Tinkham n. sp. resting on scrub oak *Quercus harvardii* of its type locality. Photo illustrated pronotal and abdominal markings in living creature Ca 1.5 x.

tudinal stripes on either side of the dorsal line and a quadrate patch just caudad of the eye. A long broad band edging the lower margin of the eye carries irregularly forward onto the front of the face below the antennal scrobes. Another almost complete band extends from the posterior margin of the genae forward to cross the face except for a short break centrally above the clypeus. Pronotum above with silvery dashes (as illustrated in the figure 3) which are edged with vinaceous brown. The subocular cephalic strip extends caudally to form a broad band just above the interior margin of the lateral lobes of the pronotum. Centrally on these lateral lobes are suggestions of silvery areas (see figure 3). The rolled and crenulated lateral margins of the pronotum are a beautiful, clear, foliage green while the general tone of the pronotum dorsally is foliage green but paler laterally on the lobes of the pronotum.

Tegmina deep vinaceous brown with veins greenish or greenish white, the wing surface smooth and shining jet-black.

Abdomen with dorso-lateral white stripe with intrusions of same dorsally along the posterior margin of each segment and an oblique lateral stripe of silvery white as well as white along the lateral sternal fold. Legs foliage green in life. Thoracic sternites bearing the spines silvery white, remainder green; abdominal sternites green (see figure 10).

In death, colors vary according to the excellency of the preservation and the technique used. When perfectly preserved the colors closely approximate the living coloration but more often the greens fade to varying shades of brown even though the creature is well preserved.

Holotype Male: Mescalero Sands, Chaves County, New Mexico, 45 miles east of Roswell on Highway #380, night of July 16-17, 1959. Ernest R. Tinkham on *Quercus harvardii*. Measurements in millimeters made by Glogau callipers: Body length 26.4; length to apices of caudal femora 40.5; pronotum 11.0 x 6.5; lateral lobes of pronotum 4.0; caudal femora 24.3; caudal tibiae 25.2 mms. Holotype deposited in the Tinkham Eremological Collection.

Description of Female: features of the head, fastigium, pronotum, tegmina and legs as described in the male. Ovipositor straight, subgenital plate with a deeply rounded "V"-shaped notch. Coloration as in the male.

Leg Spination as follows: Fore femora with 5 small teeth on the internal inferior keel; foretibiae with 5 long paired teeth on the external and internal inferior keels and 3 dorsal (basal, median and apical) teeth on the dorsal surface. Meso-femora with 5 paired teeth on external and internal inferior keels plus the apical teeth and 2 pairs of dorsal teeth on internal and external faces. Caudal femora with 2-3 minute teeth on the external and 6 larger teeth on the internal inferior keels. Caudal tibiae with 13-15 external and 13-14 internal teeth on the dorsal keels plus the usual apical spine and 7 external and 6 internal teeth, plus an apical tooth, on the ventral keels.

Allotype Female: Same location as the male. Measurements in millimeters with Glogau callipers: body length 28.0; body length to apex of caudal femur 40.8, length to apex of ovipositor 55.7; ovipositor 30.0; pronotum 12.0 x 6.2; depth of lateral lobes of pronotum 3.8; caudal femora 25.5 and caudal tibiae 26.2 mms. Allotype Female deposited in the Tinkham Eremological Collection.

Paratype Males: 4, same data as the types. Range in measurements in millimeters: Body length 25.2 to 30.0; pronotum 10.8 x 6.3 x 4.0 to 11.2 x 7.6 x 4.0; caudal femora 23.5 to 25.2, caudal tibiae 25.2 to 26.8 mms. Paratypes similar to the Holotype in every respect.

Paratype Females: 7, same data as the Types. Range in measurements in millimeters: body length 28.5 to 31.5; length to apex of ovipositor 57.5 to 61.0; ovipositor 29.2 to 31.4; pronotum 10.6 x 6.5 x 4.0 to 11.0 x 6.5 x 4.0; caudal femora 25.8 to 25.0; caudal tibiae 25.4 to 27.0 mms. Paratypes similar to the Allotype female in every respect, except that in four of the six paratypes the ovipositors show a very slight decurvature. Paratypes will be deposited in the major Orthopterological Museums of this country.

Biological Notes: At 9:00 p.m. July 16, 1959, shortly after my arrival at the eastern edge of the Mescalero sands, I found the first female of *P. mescaleroensis* ovipositing in a small area of bare sand which was surrounded by scrub oak one to two feet high. The temperature was: air 25.0° C. and the sand surface 25.5° C.; its surface dry for one quarter of an inch and damp below that. A breeze was freshening as a black thundercloud was growing in the northwest with frequent flashings of lightning.

The song of the male trilling in the scrub oak was a "zee-zee-zee-zee-zee—" long continued. Two males were located.

The Mescalero Sands were ringing with katydid songs. I heard the song of *Rehnia* but my evening's work, barely begun, was suddenly terminated about 10:00 p.m. by the arrival of a blast of very cold air which quickly silenced all katydid sounds and had me running for the car as a downpour struck. The drizzle continued most of the night and as it was beginning to lighten in the east I drove east again to my collecting spot long before the sun appeared. Most of the *Plagiostira* material came from several, cone-shaped, scrub-oak hummocks about ten feet high. Here, in the early dawn, I observed a female *Plagiostira* catch a *Melanoplus glaucipes* which, after some violent struggling, managed to escape by leaving a hind leg in the mouth of its would-be captor.

The orthopteran fauna was the richest ever observed on any sand dune area of the vast expanse of the North American Deserts, comprising a total of 33 species taken on two visits in mid-July and mid-September of 1959. There were four species of Decticids, the new *Plagiostira* with *Rehnia cerberus* in the few isolated mesquite clumps and *Pediocetes haldmanii* and *P. stevensonii* common in the denser scrub oak thickets, and these apparently preyed upon the abundant acridid life which showered out of the scrub oak. There were several species of *Melanoplus* and one *Schistocerca*, as well as quite a few

oedipodines and acridines, Phasmids, Mantids, phanerotropids and stenoplematids on the sands at night. At 6:45 a.m. the temperature had warmed to 18° C. for the air and wet sand surface. It had probably cooled to 12 or 14° C. during the wet hours of the night.

Plagiostira mescaleroensis was more restricted in habitat and numbers than the other three dectidids. On my second trip, September 12-14, I could not find a single *Plagiostira* by long and diligent searching over the type locality, although *P. haldmanii* and *P. stevensonii* were still common and *R. cerberus* still inhabited the same mesquite clumps as in July.

Egg: One female contained 80 perfectly developed ova which like those of all Dectidids exhibit a shining, pale, pearly pink chorion. The length, measured under the binocular microscope was 6.2 mms. long x 1.9 mms in breadth. The outline, typical of all Dectidid eggs, was much the shape of acridid eggs, elongate, narrowly elliptical with well rounded ends. The chorionic sculpturation exhibits under the reflected light of the microscope, minute hexagonal cells, covered completely with this pearly pink covering material except in the center where each cell is pierced by a variably sized circular opening. Only at the cap end and along the margin of the cap is the true nature of these cells revealed. Here some small areas were not covered with the pearly pink chorionic material and only the cell walls remained, thus revealing their hexagonal form.

Nymphs: Due to the high elevation of these dunes, around 4500 feet elevation, and the very cold winters in this section of eastern New Mexico, it is almost certain that the eggs hatch in mid-spring and by late June or early July, these nymphs have reached maturity. No nymphs were found on July 16-17, 1959.

KEY TO THE GENUS *PLAGIOSTIRA* SCUDDER

1. Size large, length of pronotum about one and one-half times its dorsal breadth. No nacreous markings on the metazona. Eastern Utah and western Nevada *gillettei*
- Size medium-large to small. Nacreous markings on the metazona as well as the prozona of the pronotum 2
2. Size medium-large. Pronotum in profile distinctly subsellate. Nacreous markings on the prozona consisting of two short parallel streaks and with 2 long parallel streaks on the metazona, the cephalic apices of which flare outwardly. Eastern New Mexico *mescaleroensis n. sp.*
- Size small. Pronotum in profile almost flat. Pronotal length more than twice the pronotal breadth. Prozona with two pairs of nacreous spots and metazona with an inverted, white, straight-bottomed "U" shaped design. Northern Arizona east to the Rio Grande in New Mexico *albonotata*

PLAGIOSTIRA GILLETTEI Caudell 1907

This very large and distinct species exhibits a discontinuous distribution being found in western Nevada and also southeastern Utah.

The Nevada specimens, taken by Tinkham, came from the Sand Springs Dunes, a mountainous ridge of sand, 28 miles east of Fallon, Nevada. Here, a few specimens were taken the night of June 23-24,

1958. On June 24, about 11 a.m. one female, with one missing hind leg, lay dying on the hot sands which were 49.5° C. The host plant was *Tetradymia comosa*. Dr. Ira LaRivers obtained a goodly series the night of July 21, 1949, on Nevada Highway #3, between Central and Wilson Canyons, Smith Valley, Lyon County, Nevada. This was a very good year, the best in the past two decades as far as moisture was concerned. In this section of its distribution, *P. gillettei* is a member of the fauna of what the writer calls the Lahontan Desert, one of three eremological components of the Great Basin Desert; the other two being the Great Salt Lake Desert and the third, the San Raphael Desert of southeastern Utah. The Great Salt Lake Desert appears to separate the distribution of *P. gillettei* into two distinct portions. Nevada specimens exhibit the nacreous markings as portrayed in the drawing.

In the eastern section of its range, *P. gillettei* is a member of the San Raphael Desert fauna. Specimens from this desert show little or no white markings on the prozona of the pronotum, but there seems to be no criterion worthy of racial separation between the Nevada and Utah specimens. My specimens came from the Cane Spring Dunes, 19 miles north of Hanksville, Utah, where on the night of August 3-4, 1958, they were found on a species of *Chenopodium*. A few nights later, one dwarf male, was taken, the night of August 5-6, 1958, on rabbit brush (*Chrysothamnus* sp.) on the Coral Pink Dunes. These dunes lies in the Pine Zone at a high elevation (6000-6500 feet) and the cold nights probably account for the dwarf male. One other specimen before me, a male, was taken by Dr. Vasco M. Tanner, at Willow Tanks, Kane County, in the so-called Escalante Desert, Utah, June, 1936. The type male (Cat. No. 10188, USNM) was described from Grand Junction, Colorado and collected by C. P. Gillette, June 20, 1905. Thus we see there are no specimens of the Utah species found west of the great Wasatch massif. *P. gillettei* has not yet been taken in Arizona, although the Coral Pink Dunes specimen is only about 10 miles north of the Arizona boundary. These dunes are 3 miles SE and 10 miles SW of Mt. Carmel Junction, Utah.

PLAGIOSTIRA ALBONOTATA Scudder 1876

This small species is found principally in the so-called Painted Desert region of Arizona, whose fauna is closely allied, if not similar to that of the San Raphael Desert. The writer has taken it in the Winslow area and at the headquarters of the Petrified Forest on rabbit brush. It ranges west to invade the eastern edge of the Western Pine Zone, some ten miles east of Flagstaff, Arizona. Eastward it has been recorded as far as Albuquerque, New Mexico, and southeastward to Pindale (correct Pinedale) which is 15 miles west of Showlow, Arizona. The writer took one pair of large size at the Mittens area of Monument valley the night of August, 1958, on a plant related to Sheppard's Purse, growing in a patch of deep red sand. Another male was taken the night of August 5-6, in the *Artemisia tridentata* zone edging the Coral Pink Dunes. These three specimens

may be the first Utah records. Caudell in 1907, also reported the species from Dolores and Durango, Colorado.

PLAGIOSTIRA MESCALEROENSIS n. sp.

This beautiful and large new species is known only from a small area of oak covered sand dunes, the Mescalero Sands, about 45 miles east of Roswell, New Mexico. It is a member of the Pecos Desert fauna, one of three eremological components of the Great Chihuahuan Desert, the other two being the Coahuila Desert of the Big Bend region and northeastern Mexico and the Salado Desert of eastern Zacatecas and western Nuevo Leon.

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