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## THE DAVID ROCKEFELLER MEXICAN EXPEDITION OF THE AMERICAN MUSEUM OF NATURAL HISTORY

### INTRODUCTORY ACCOUNT

BY HERMAN T. SPIETH<sup>1</sup>

#### INTRODUCTION<sup>2</sup>

During the summer of 1947, the Department of Insects and Spiders of the American Museum of Natural History sent a five-man collecting team into the central plateau area of Mexico for a period of 13 weeks. This project was known as the David Rockefeller Mexican Expedition of the American Museum of Natural History, in honor of Dr. David Rockefeller whose generous aid made the trip possible. It had as its aim a general entomological and arachnological reconnaissance of the high plateau area.

The personnel of the group consisted of Dr. Mont A. Cazier, Dr. Charles D. Michener,<sup>3</sup> Dr. Willis J. Gertsch, Mr. Rudolph Schramel, and the author. In addition, Mr. and Mrs. George Bradt of Santa Barbara, Chihuahua, were members of the group from June 16 until August 10 (fig. 1). For transportation a Chevrolet "carry-all" truck and two Willys "jeeps"<sup>4</sup> were used. Each "jeep" drew a two-wheeled Bantam trailer upon which special plywood box-type bodies had been constructed. The Bradts had their own "jeep." It was thus possible to take all necessary

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<sup>2</sup> I wish to thank the several members of the expedition for their generous aid in the preparation of this paper, and especially Dr. Mont A. Cazier whose help and coöperation have been invaluable.

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<sup>4</sup> Furnished through the kindness and generosity of Mr. Herbert F. Schwarz.

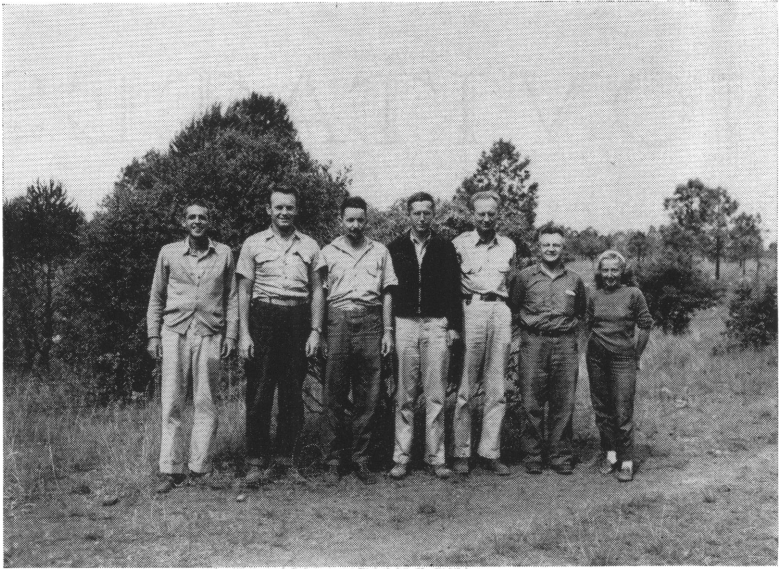


FIG. 1. Photograph of expedition personnel taken at Palos Colorado, Durango. Left to right: Bradt, Schramel, Cazier, Michener, Spieth, Gertsch, Mrs. Bradt. Photograph by George M. Bradt.

equipment for collecting, preserving, and properly storing insects, arachnids, plant samples, and other biological specimens; personal gear; canned, dried, and dehydrated food supplies; camping equipment; cameras and photographic supplies; plus five-gallon containers for extra gasoline and water. A fifty-gallon drum was stored in one of the "jeeps" to serve as a basic water reservoir. The physical equipment enabled the expedition to live as a self-contained unit and to penetrate relatively inaccessible areas. Furthermore the group was able to keep at a minimum the time and energy spent in actual moving from place to place and in the duties of housekeeping, such as pitching camp, cooking, etc. Most important, all specimens collected were easily and safely stored and transported without loss or damage.

#### GEOLOGICAL AND FAUNISTIC HISTORY OF THE MEXICAN PLATEAU

The reasons for selecting the Mexican plateau area for a major entomological expedition are numerous, the understanding of



which demands a brief review of the geological and faunistic history of the region.

One of the outstanding physiographic features of Mexico is the great, roughly wedge-shaped central plateau that extends southward from the Mexican-United States border. Physiographically and faunistically this region is a southward extension of the Arizona-New Mexico-west Texas section. Consisting of a high, bolson-studded region, it ranges in elevation from 3600 feet in the north along the border to 8600 feet south of Mexico City. On the east it is bounded by the Sierra Madre Oriental which are composed of highly flexed overthrusts of Cretaceous limestone; on the west, by the much higher and more rugged Sierra Madre Occidental which in places reach to over 10,000 feet. These latter mountains were produced by massive block faulting, volcanic extrusions, and subsequent severe erosion which resulted in the almost complete removal of the Cretaceous limestone strata which formerly overlay the region.

The broad intermontane area between the mountains, at least in the region north of a line drawn between Zacatecas on the west and Saltillo on the east, can be roughly divided into an eastern and a western region. The line of demarcation between these two areas has been called the Geomorphological Line by Leseur (1945). In the eastern area monoclinial faults, laccolithic intrusions, and volcanic eruptions have resulted in various Cretaceous limestone-capped topographical features. The intermontane basins of the area seem primarily the result of wind erosion, both constructive and destructive.

West of the Geomorphological Line and east of the Sierra Madre Occidental proper are a number of long connected ranges conforming with the typical northwest-southeast orientation that is characteristic of the mountains of the entire plateau. Between the ranges lie broad and extensive valleys, which are considerably higher than the basins east of the Geomorphological Line and are filled with adobe and gravel eroded from the surrounding mountains, plus scattered but vast amounts of intruded igneous materials.

The plateau area was elevated first at the beginning of the Tertiary. Following this there was an uninterrupted period of erosion lasting until the epeirogenetic activity of the Pliocene which, with the subsequent erosion and volcanic extrusions, gave rise to the present topography.

During the greater part of the Tertiary (Mayr, 1946) all of North America, including the Mexican plateau, was separated from South America. The isthmus between Colombia and the southern end of the plateau was broken into a number of islands so that various portals existed between the Pacific and Atlantic seas. These portals were of different durations, but probably the combined effect was such that a complete land connection between North and South America never existed from the Lower Eocene (50,000,000 to 60,000,000 years ago) and the Upper Pliocene (2,000,000 to 3,000,000 years ago). These gaps were of sufficient width to prevent almost completely an interchange of the mammalian fauna between the two continents (Simpson, 1940). Birds, as shown by Mayr (1946), were less hindered by the portals. Insects, being flying and passively air-borne creatures, also were probably less affected by water barriers.

During the Tertiary, while these water barriers were in existence, the climatic conditions of the Mexican plateau, plus all the rest of the southern half of North America, were subtropical to tropical. This has been emphasized by numerous investigators of mammals, birds, reptiles, fish, and plants (see Mayr, 1946; Chaney, 1947). Apparently the North American fauna and flora existing during this period were distinct and homogenous, not only for the Tropical and Subtropical, but also for the Northern Temperate, zones.

During the Pliocene two major events occurred that greatly changed the Tertiary faunal composition of western North America, i.e., (1) the large-scale mountain building of the post Middle Pliocene was accompanied by a trend towards lowered yearly rainfall, increased extremes as well as ranges of temperature, and a shifted seasonal distribution of the rainfall; (2) the water gaps between North and South America were closed.

The changed climatic conditions unquestionably eliminated many of the Subtropical and Tropical species in the western United States and allowed many of the species from more northern temperate regions to invade the more southern areas. At the same time the land bridge between North and South America enabled South American species to invade northward, particularly in the post-Pleistocene. Finally, as Axelrod (1948) has shown, the general climatic change in the western United States that followed mid-Pliocene time "essentially involved the disappearance of effective summer showers and the lowering of winter temperature."

In the Mexican plateau, however, effective summer showers are still a constant and regular feature of the climate.

Thus, entomologically, the Mexican plateau is of great interest since (1) either on it or upon its flanks should be found regions of interdigitation between the Neotropical species that have migrated northwards and the truly autochthonous forms that have survived and evolved during the period of climatic changes of the mid-Pliocene to the present; (2) if descendants of those Tertiary species that were eliminated in most parts of the western United States by the post mid-Pliocene climatic changes are to be found anywhere, they should be expected in exactly this area which probably now corresponds more nearly to lower Pliocene conditions than does any other part of North America. While evidence from plants, birds, mammals, and reptiles seems to confirm these ideas, the region has been practically unknown entomologically except for a few groups of insects.

It was from these points of view that the expedition was planned and executed. Cazier, leader of the group, Michener, and Gertsch all had had extensive collecting experience in the southwestern and western United States, and they had sufficient accumulated data and collections available from this area in their own particular fields of interest to enable them readily and accurately to evaluate the material collected in Mexico. The author was particularly interested in sampling the ephemerid and drosophilid fauna. He also wished to secure samples of *Drosophila pseudoobscura*, so that Dr. Theodosius Dobzhansky (1948) might be able to investigate the salivary chromosomes of specimens from this area, since it represented the largest geographical region from which the chromosomal races of this species were unknown.

#### RECORD OF THE EXPEDITION

On June 16 at 6 A.M. the expedition departed from New York City. The route selected took us through northern Georgia, and during the early afternoon of June 18 we reached Griffin, Georgia, and Lespedeza Farm, the estate of Mr. and Mrs. Frank Johnson with whom we spent the remainder of the afternoon and the night. By the evening of the twenty-first we had reached Sierra Blanca in the elevated, semi-arid country of western Texas. Previous to this we had collected casually in the evenings before retiring, but now systematic collections were undertaken. During this evening we used the electric head lamps that were found so useful through-



FIG. 2. View westward from dunes at Samalayuca, showing Desert Plains between mountains and dunes. Samalayuca lies in middle background.

out the trip for collecting arachnids and Coleoptera at night, and Cazier caught the first specimens of the cerambycid genus *Moneilema* which feeds on cacti.

El Paso, Texas, was reached early Sunday morning, June 22. Gertsch, who had been in Utah, joined the group at this point. A goodly number of hours were spent collecting in the vicinity north and west of the town where a large general collection was made, including an interesting wolf spider and more specimens of *Moneilema*. Michener (1948) also made some novel observations on the mating behavior of the harvester ant, *Pogonomyrmex barbatus* (Smith).

On June 24 the expedition crossed into Mexico at Ciudad Juarez, Chihuahua, and proceeded southward on the main road to Chihuahua city, which is marked in kilometers showing the distance from Juarez. The entire road from Juarez to Chihuahua city is a well-constructed, well-graded, asphalt highway. After leaving the valley of the Rio Grande, we entered a region of Desert Plain. These plains have two outstanding plant formations, i.e., Desert Grasslands and Desert Shrub. The grassland dominant is *Bouteloua eriopoda*, the black grama, and the shrub dominant is *Larrea tridentata*, the creosote bush. These two com-



FIG. 3. Dunes near Samalayuca.

munities grade into each other almost imperceptibly. Shantz (*in* Shantz and Raphael, 1924) says: "The line of demarcation between the southern desert shrub and the desert grassland is . . . difficult to draw. Over great stretches of grassland are scattered shrubs and other large southern desert plants." He places areas dominated by shrubs in the Desert Shrub community, "while areas which show only scattered shrubs over the grass cover have been mapped as Desert Grassland." Leseur (1945) feels that in northern Chihuahua much of the Desert Shrub represents climax vegetation, but that when the Desert Grasslands are overgrazed then the Desert Shrub invades as a subclimax. While much of the entire trip was spent in more mesic areas, repeatedly we shuttled back and forth between these two communities of the Desert Plains.

South of Juarez at kilometer 53 is Samalayuca (elevation 4360 feet), a village that is in the center of the bolson region. East of the town are vast expanses of high sand dunes which are 94 per cent silica (Leseur, 1945) and reach a height of at least 190 feet (figs. 2, 3). Farther east of the dunes lie the Sierra del Presidio over which the sand that forms the dunes is blown by the prevailing east winds. The dunes are virtually bare of vegetation, but scattered about the region are smaller stabilized dunes which have a sparse vegetation. We entered this area just before the start of

the summer rains, and the extremely dry, bare surface sand was easily moved by the winds. Leseur (1945) reports that during the rainy season the dunes settle and become green with seedlings. Within a short time the entire region then supports a luxuriant growth of annuals. Other than the dunes, the land around Samalayuca has been heavily overgrazed and is now invaded by the creosote bush, acacias, mesquites, and other shrubs (fig. 4).

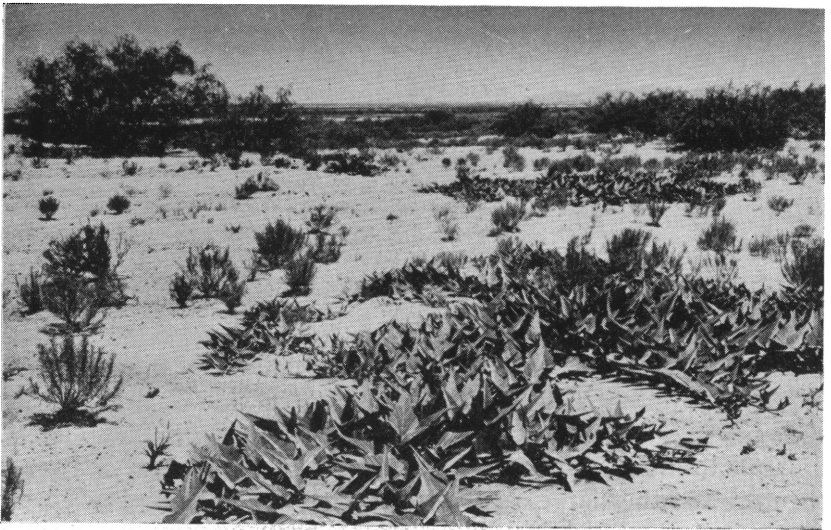


FIG. 4. Badly overgrazed area near Samalayuca.

Just on the eastern edge of Samalayuca we camped in a cleared space about 100 yards east of the house of Señor Pedro Moreno, taking advantage of a small, stabilized dune and some mesquite bushes. For four days we collected intensively in the area north, south, and east of the town. The resultant collections clearly show that the insect fauna of the area is predominantly made up of Sonoran zone species. During the day specimens were collected by the standard methods of beating, netting, and digging. After darkness had settled, collections were made with the aid of two types of lights: (1) Gasoline lanterns were set in the centers of 6- by 6-foot sheets of white canvas that were spread upon the ground. The organisms were attracted to the lights and upon landing on the sheets were picked up and placed in cyanide jars. Five lanterns and sheets were used throughout the entire trip in

this manner with excellent results. (2) Each member of the expedition was equipped with an electric head lamp. With the aid of these we were able to locate nocturnal specimens both on the ground and on the vegetation. The latter method was especially useful for collecting Coleoptera and Arachnida and was most rewarding between the hours from 9 P.M. to midnight. Michener was particularly desirous of collecting the bee fauna, creatures which are most active during the hours immediately after sunrise.



FIG. 5. Dunes near Samalayuca, showing vegetation growing in depressions.

On June 26 Gertsch and I hired horses from Señor Moreno and, with his son Ruden as a guide, we rode over to the dunes east of the ranch. The northern end of this great dune area is east of Samalayuca. The mass is at least 2 miles wide and possibly 30 miles long, stretching southward and approximately parallel to the main Juarez-Chihuahua highway. At the northern end just within the dunes a few cottonwood trees were growing; in one of the blowouts there was an open spring which had been boxed in with lumber and was the source of water for a small herd of cattle that ranged through the vicinity. Ruden showed us how, by digging in some of the blowouts, it was possible to reach water within 18 inches of the surface of the sand. Upon climbing to the highest dunes we could ascertain with field glasses that no vegetation was growing on the summits of the dunes (fig. 5), although squaw bush,

a composite known locally as "jara," and some other plants were growing in the depressions.

The end of June, just before the summer rains start, is the hottest season of the year for this vicinity, and the four days we spent there were very hot, especially during the hours from two to four o'clock each afternoon. The nights, particularly after midnight, were cool. Because of the high daytime temperatures, we erected only one tent which served as a place to store duffle. In addition we set up a flat canvas with poles at each corner to create shade and still allow the air to blow freely through, thus avoiding the



FIG. 6. Terrain between Samalayuca and Villa Ahumada, showing low, much eroded mountains in background.

hothouse effect of the tent. Under this canvas each afternoon between 2 P.M. and 4 P.M. the temperature reached  $46^{\circ}\text{C}$ . ( $126^{\circ}\text{F}$ .), but by 6 P.M. it fell to  $38.5^{\circ}\text{C}$ . ( $101.5^{\circ}\text{F}$ .).

We left Samalayuca on the morning of June 27. After passing through some partially stabilized dunes just south of the town, the road runs through Desert Plains until at kilometer 74 another *Bouteloua gracilis* mesa occurs. Leseur (1945) believes that the *B. gracilis* mesas south and north of Samalayuca are due to the watering of these areas by run-off from the surrounding hills. From time to time we stopped to collect. At one place we found an



open spring beside the road and collected a large series of tiger beetles representing four species, all Sonoran in relationship. A great deal of erosion has taken place throughout the region and the hills stand up as low, isolated sentinels, with broad, gently sloping plains all about their feet (fig. 6).

In the early afternoon we reached the town of Villa Ahumada (elevation 3874 feet). Near by is Laguna de los Patos which on occasion, Leseur (1945) reports, may partially fill with water. The town depends for water upon seven artesian wells, the water from which is used for extensive irrigation. Leseur (1945) reports the yearly average precipitation as 19.1 cm. which is 3 to 6 cm. lower than that reported from Chihuahua city or Texas stations of similar altitude. Of this precipitation, 60 per cent occurs during the July-August-September period. During the winter the lowest average temperature of  $-13.4^{\circ}$  C. occurs during January. At Villa Ahumada the days are hot and the nights cold as a rule. Sunshine occurs 80 per cent of the possible time. Evaporation is always high. Surprisingly enough, frost-free days occur only from about May 1 until October 1. Since the summer rainy season does not begin until the end of June, the growing season is only about 100 days, or 50 shorter than the frost-free period. With minor variations, the climatic picture probably is typical of the large Desert Plains area that occupies northern Chihuahua.

South of Villa Ahumada the elevation of the land becomes somewhat higher and the vegetation becomes more typical Desert Grassland with *Bouteloua* grasses and scattered mesquite bushes. The road swings westward and then southward again at kilometer 257, now paralleling a long range of mountains west of the road. At Parrita, 92 kilometers north of Chihuahua city, a road leads westward into Cañon de Santa Clara. East of the road lies Ojo Laguna, which is a region of dense mesquite at the edge of a dry lake.

Here we left the main highway and turned westward into Cañon de Santa Clara. Across the plain between the main road and the mountains the dirt road was comparatively good. When we entered the mountains, we found the road unimproved and often following the stream bed, even though it is one of the major east-west transportation arteries from the high llanos to the west. Down the road came a sparse but steady flow of trucks bearing produce from the ranches of the llanos, lumber from the sawmills of the higher elevations, and loads of wood suitable for fuel for the

people of Chihuahua. The combined effects of all these kept the road in a rough but passable condition. At first the valley was very narrow, but soon it broadened. The stream flowing through the valley is an intermittent one and at this time of year it was dry. At the mouth of the canyon the stream has poured onto the Desert Plain a large alluvial fan. The dry lake east of the Juarez-Chihuahua road in more mesic times must have been fed by the flow from Cañon de Santa Clara.

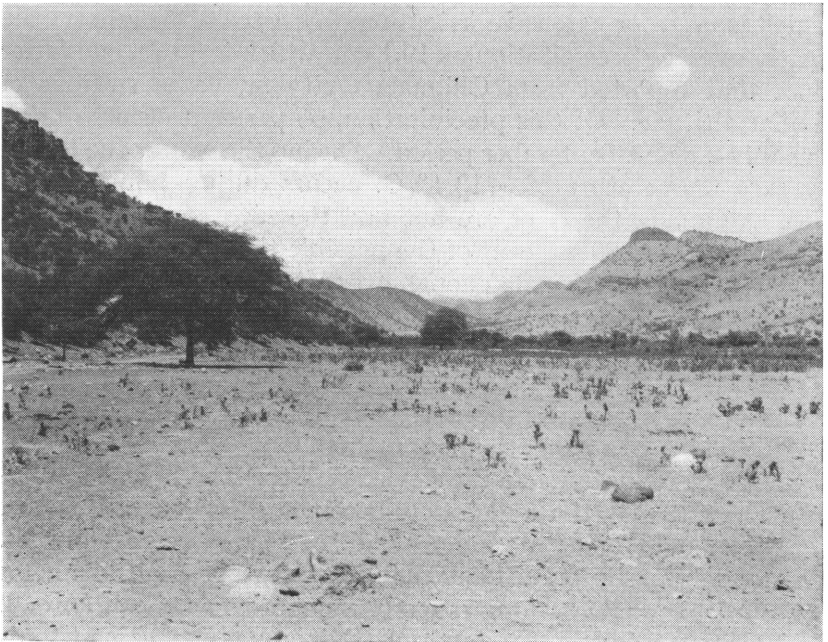


FIG. 7. Broad valley of Cañon de Santa Clara, showing road at left and also effects of overgrazing.

We located a suitable camp ground 5 miles west of Parrita at an elevation of approximately 5500 feet.<sup>1</sup> At its mouth, Cañon de Santa Clara is narrow, but above the place where we camped it widens out into a broad flat floor through which the stream follows a sinuous course. Here and there side canyons branch off, but only

<sup>1</sup> For the sake of determining elevation we carried an altimeter, which was kept set at 29.92 inches regardless of atmospheric conditions. All elevations that are indicated as "approximate" are derived from our altimeter readings. Other elevations were acquired from published works or from information from local residents.

one, Cañon Prieto, is large. At the junction of Cañon Prieto with the main canyon there is a small settlement known as Primavera. In addition to Primavera other habitations are scattered throughout the canyon. East of Primavera the main canyon becomes progressively narrower and the gradient increasingly steep until the height of land is reached at approximately 7200 feet. In much of the upper part of the canyon the road is so narrow that it is of one-car width only. The mileage as indicated on our cars from Parrita on the Juarez-Chihuahua highway to the 7200-foot crest is approximately 20 miles.



FIG. 8. Cañon de Santa Clara with gently sloping sides and *Quercus santa-clarensis* consociation.

The valley floor of the canyon is boulder strewn and in the broader parts filled with a coarse alluvium. On this floor grows a scattering of oaks, willows, junipers, platyopuntias, yuccas, and grasses. In the wider sections of the canyon (figs. 7, 8) the sides of the valley are not exceedingly steep and the vegetation is similar to that of the valley floor. The upper slopes and the tops of the mountains are covered with oaks, appearing to be a typical

*Quercus santaclarensis* consociation as described by Leseur (1945). On the rocky cliffs and the steep rocky hillsides ocotillo and various cacti grow in considerable numbers. The rocks themselves are brightly colored, mostly a rich deep red, and numerous brightly colored lichens grow on the exposed cliffs. The entire valley, especially the floor and lower hillsides, has been heavily overgrazed by burros, horses, sheep, goats, and cattle. While the oaks of the area are not suitable for lumber, they do furnish wood for fuel. In the upper parts of the canyon and particularly in Cañon Prieto wood collectors were active, hauling fuel wood out of the hills by means of burros.



FIG. 9. Cañon Prieto, showing general terrain and large pines.

Cañon Prieto is much narrower than Cañon de Santa Clara proper. The road, leading upward, crosses and recrosses a small stream in which at the end of June, 1947, were numerous pools of water. At approximately 6500 feet there are many large pines (fig. 9). From there on up the canyon the vegetation is of a mesic nature. At the head of Cañon Prieto there was an active sawmill. On the slopes and valley floor are pines of more than 3 feet in di-

ameter. In addition to *Pinus ponderosa*, another equally large species of *Pinus* and also numerous junipers of similar size are present. At this point the canyon walls are very steep. I climbed to a height of land and entered a level Oak Savanna. Mixed with the oaks were a few pines and junipers. In the surrounding areas, however, the north-facing slopes were clothed primarily by pines, while the southern exposures had a mixture of pines and oaks.

We spent June 27 to July 1 in the region of Cañon de Santa Clara, making collections on the Desert Plain both north and south of Parrita and at Ojo Laguna, in Cañon de Santa Clara between 5500 and 6000 feet, and in Cañon Prieto between 6500 and 6800 feet. Collections thus were made in four distinct plant communities, that is, the Desert Grasslands, the Desert Shrub, the *Quercus santaclarensis* consociation, and the Montane Forest. Around Ojo Laguna the fauna was definitely Sonoran zone in character, the species collected being those that are common to the desert areas of the southwestern United States. At our camp in Cañon de Santa Clara were found representatives of the transitional zone elements common to the lower portions of the mountains of Arizona, e.g., the lycid and longhorn beetles, while the Montane Forest area yielded species that are also found in the high mountain regions of Arizona.

The summer rains were just commencing during the period we spent in the region. At our camp at 5500 feet at about nine o'clock each morning, the wind started to blow from the east up the canyon. By midafternoon huge cumulus clouds built up, and thundershowers occurred at the higher elevations. Several times we had light showers late in the afternoon at camp. By sundown or shortly afterwards the clouds dissipated and, some time later, the wind reversed and blew down canyon. By early morning the wind died down and thus each morning was clear, bright, and calm. During the day the temperature at camp rose to 35° C., but the nights were cool. Out on the plains at the mouth of the canyon, the clouds rarely accumulated and the daily maxima of temperatures were much higher.

On the morning of July 2 we broke camp and trekked westward up the canyon. At the crest we entered a park-like area with oaks, pines, platyopuntias, and grasses as the dominant plants. From here the land slopes gently westward into the valley of the Rio de Santa Clara. As we dropped gradually to lower elevations, the trees became sparse and gave way to the grasslands known as

llanos that fill the center of the valley. Here and there tongues of oak woods extended for a short distance out into the grasslands. These grasslands fill the north-south oriented valleys that lie between the parallel mountain ranges flanking the eastern side of the Sierra Madre proper (see fig. 52). They represent the *Bouteloua gracilis* consociation of Leseur (1945).

Just as the road entered the grasslands it forked, and we chose the northern one. Arriving shortly at a Mennonite settlement, we were startled to see large amounts of mechanized, well-kept farm equipment. Great tracts of these grasslands are now being used for growing wheat and other grains. Although the land is fairly



FIG. 10. Llano de Rio Santa Clara.

level, the type of torrential rainfall that occurs here will cause, and even now is causing, destructive erosion in many parts of this magnificent grassland. Here and there protruding through the grassy covering are the remains of ancient volcanic activities: rotting cones and dikes, and large areas of decomposing lava flows. The road itself consists merely of wheel tracks across the llano (fig. 10). Whenever the ruts become too deep, a new route just beside the old is selected. The greatest danger in driving across this area is the series of "high centers" existing between the ruts and often striking the under parts of a car. We did not expect to find many insects in such a uniform and restricted habitat, but

we paused to collect and were all surprised to find that this virgin grassland was fairly teeming with insects.

In the center of the llano we came upon the Rio Santa Clara, at this season a small stream, which flows northward into Laguna de los Patos at Villa Ahumada. At the crossing the elevation was approximately 6000 feet. A few cottonwoods and willows grew along the stream in some places, but mostly the banks were treeless. Aquatic insects were abundant, but I was struck by the lack of ephemerid nymphs. In many ways the stream's aspects reminded me of the small rivers of the central United States during midsummer conditions.

West of the Rio Santa Clara we found very extensive cultivated tracts, and many large stacks of straw resulting from the threshing of wheat dotted the landscape. Leaving the llano, we again entered an Oak Savanna. The crest of the ridge was approximately 7100 feet and the distance by car from this crest to the crest of Cañon de Santa Clara was 37 miles. The llano proper I estimated to be 20 miles in width at this point. Crossing the pass, we again sloped downward into another llano. Lying closer to the Sierra Madre, it seemed more mesic than the preceding llano. The valley is drained by the Rio Santa Maria which flows northward into Laguna Santa Maria. Along the banks of the river lies the sprawling town of Namiquipa at an altitude of 5996 feet. The maximum temperature recorded for the town is  $39.8^{\circ}$  C., the minimum  $-18.8^{\circ}$  C., and the average annual rainfall is 17.2 inches, of which 11.3 inches fall during July, August, and September (Arias, 1942). Grazing, cultivation, irrigation, some mining, and the general effect of long-time human habitation have modified this llano greatly.

We pushed on to the woodland area at the western edge of the llano and camped for the night at an approximate elevation of 6600 feet. We were obviously at the foot of the long steep grade that would take us to the top of the next cordillera which was the continental divide. Early the next morning we broke camp and headed up the 4-mile-long grade that carried us to the top of the mountain. The continental divide is at 7700 feet at this point and is a beautiful, park-like area of the Montane Forest community (fig. 11). Here we collected for several hours, Cazier getting several subspecies of tiger beetles which are related to subspecies that are common in the southwestern United States not only at high, but also at low, elevations. Then we started downward into



FIG. 11. Continental divide east of San José Babicora, showing park-like pine area.

the next llano. Although we had passed the divide, the Sierra Madre Occidental were still to the west of us, and it was necessary to cross another llano before we reached them. In this llano and extending into the mountains was the vast Babicora Ranch.

At an elevation of approximately 7500 feet we reached a pond formed by the damming of a small stream and known locally as a "tank." At the tank there was a small meadow with a brilliantly green sod; the oak trees were sparse, the pines still rarer. The area obviously had received more rain recently than the regions to the east, and the grasses were pale green from fresh growth. Here again we stopped to collect, and Cazier gathered a large series of the brilliant blue scarabid *Phanaeus quadridens* and also *Cicindela obsoleta santaclarae*.

We spent several days at Babicora Ranch, one of the high spots of the trip. Our genial host and hostess, Señor and Señora Frank Fry, know the country well and gave us much valuable information as to the history, the biota, and the geography of the region. The ranch headquarters, known as San José Babicora to dis-



tinguish it from a subheadquarters known as Santa Anna Babícora and also from another, more northern, completely unrelated Babícora, consisted of the ranch house, offices, stables, assorted buildings, and domiciles for the employees and their families. The ranch headquarters lie at an elevation of 7150 feet just within the edge of the llano. Westward a short distance lies a timbered area of mixed oaks, pines, and madrono (fig. 12). On the ranch were 17



FIG. 12. Forest area near San José Babícora.

active sawmills, one of which was close to the ranch headquarters. Many of the larger pines in the near-by forest had been recently felled. The tops that were still lying on the ground made an excellent collecting spot for large cerambycids, which were attracted to the fallen trees as ovipositional sites. On the night of July 4, Michener and Gertsch returned to the tank for night collecting, while Cazier, Schramel, and I investigated the treetops. Both parties had marvelous collecting, Michener and Gertsch getting hundreds of specimens, including a rare species of a silk moth and new species of crab spiders. We got numerous cerambycids and also, on the way back to the ranch house, we found on the large junipers growing in the grasslands many specimens of the ubiquitous scarabid genus *Diplotaxis*. Interestingly enough the cerambycids collected in the fallen trees were conspecific with

those found at higher elevations in the pine forests of southern Arizona.

In addition to the excellent night catches, the daytime collecting was good. Here at Babícora we were able to sample again three distinct plant communities, that is, the lower edge of the Montane Forest, the *Quercus santaclarensis* consociation, and the *Bouteloua gracilis* consociation. In comparison to the Cañon de Santa Clara collections, the *B. gracilis* community had now replaced the Desert Grasslands. Further, it should be noted that all three communities were closer together in this area than were the three at Cañon de Santa Clara.

On July 5 we left Babícora, driving westward and northward across the llano until we reached the railroad at a point just south of Estación Babícora which serves as the shipping point for the ranch. On this llano we collected a huge series of the meloid, *Pyrota postica*, which occurs also in Texas and New Mexico. Running from Juarez to Chihuahua city are two railroads. The first and shorter one follows the Desert Plains, while the second is much farther west and runs along the foot of the Sierra Madre Occidental, serving the needs of the lumber, livestock, and mining industries of the high llanos and mountains. Now the road turned left and roughly followed the railroad. It was our plan to collect in and along the edge of the great Sierra Madre. South and west of Babícora lies the highest and longest mass of the Sierra Madre, of which Mt. Mohenira is almost 12,000 feet high (Moore, 1945). The rainy season had started in earnest, and all afternoon we encountered showers. Camp was pitched at approximately 7200 feet in a small pine grove overlooking Madera, a town which lies in a llano at an elevation of 6800 feet. Collecting, except for *Drosophila*, was poor in general that evening, perhaps due to the low temperatures and the light rain.

Sunday, July 6, we drove through Madera, Yeponera, Temosachic (elevation 6095 feet), and Matachic. We were now in the Pacific drainage, the streams being tributaries of the Rio Arosa-Papigochic. The road led across small llanos, through the Oak Savannas, across streams beside irrigated land. The llano at Madera was given over mostly to cultivation, but llanos around the other towns seemed mainly used for grazing. Active and excessive erosion was obvious in many places. At Matachic a side road crosses the Rio Arosa-Papigochic and heads southwest towards the mining town of Ocampo in the high tumbled Sierras. We took

this road, forded the shallow river, which was about 100 feet wide, and passed through the grassland and juniper zone into the Oak Savanna. The road rose slowly, and about 2 miles from Matachic we found a good camp site. Around the camp were oaks, pines, junipers, and a few platyopuntias. The road to Ocampo rose sharply beyond our camp site and crossed a pass at 7200 feet. At this point it skirted along a peak that is probably over 8000 feet, but only on the north face were there pines of large size. Beyond the pass the road entered a huge, undulating valley whose floor is at about 6000 feet. This entire valley is covered with an Oak Savanna except for a small agricultural portion along the stream that drains the area. Some of the oaks were of the dry-season deciduous type and were just now, at the start of the wet season, leafing out.

Arriving in the late afternoon of July 6, we stayed here until the morning of July 9. During that time collections were made in the vicinity of the town of Matachic, along the Rio Arosa-Papigochic, in the oak-pine-juniper area around camp, and in the great Oak Savannas to the southwest. Gertsch and Cazier caught three specimens of the scarab genus *Plusiotis*, a number of species of rare cerambycids, and Gertsch also had excellent results by sifting detritus under the oaks for arachnids. I caught the first adult specimens of ephemerids as well as numerous nymphs and sub-imagoes. Again I was impressed by the fact that the facies and fauna of the streams showed a great apparent similarity to those of streams in the midwestern United States during late summer. The adult ephemerids (*Isonychia intermedius*) showed a remarkable ability to resist desiccation and were found sitting on bare acacia twigs in the bright midday sunshine.

On July 9 we broke camp and started for Chihuahua city. The road into the Ocampo region was so bad that we decided not to try to investigate that area. We were constantly troubled in many parts of Mexico by the almost completely unmarked road system, the fact that often the main roads were not so good as the local ones, and also by the difficulty of getting accurate and reliable information from the local population. In this case we took the "good" road instead of a couple of wheel tracks that represented the desired route. We eventually reached Chihuahua city via Cañon de Santa Clara.

Chihuahua is a pleasant, clean city located at an elevation of 4667 feet, surrounded by Desert Grassland and Desert Shrub.

Much of the surrounding area has been badly overgrazed. After the cool highlands we found the temperatures oppressively hot.

On July 11 we drove southward on the Chihuahua-Camargo highway, a well-planned modern road similar to that north of Chihuahua city. Michener had found bee collecting in the higher elevations to be relatively poor, but about 10 miles south of the city he struck a rich collecting spot where the bees were feeding on the flowers of *Cevallia sinuata* Lagasca. At Meoqui the road crosses the Rio San Pedros. A few miles to the east the San Pedros joins the Rio Conchos, a still larger river, which flows northeast and empties into the Rio Grande at Ojinaga. The waters of both rivers are used extensively for irrigation purposes, and recently large and extensive additions have been made to the irrigation system. We turned off the main highway south of Las Delicias and went eastward until we reached the Rio Conchos. After encountering a wind squall and rain that literally tore the license plate from the "carry-all," we finally found a suitable camp site on the banks of the river. The altitude was slightly lower than 4000 feet, the temperatures were high during the day, and the nights were warm. Owing to the stream, the irrigation, and the mesic nature of the vegetation, the humidity was relatively high. Before being irrigated this entire area was Desert Shrub. Along the river itself willows and cottonwoods grew in great numbers. We stayed here for two nights and a day. Aquatic collecting was poor, but terrestrial collecting was good. We found blister beetles in considerable numbers. While crossing the llano at Babícora we had collected great numbers of meloids, but no one had suffered any blisters even though in our eagerness we had picked up the insects with our fingers. One species at Las Delicias was different, and Schramel and Gertsch unintentionally and Cazier deliberately (testing the vesicant potencies of the beetles) acquired nasty blisters.

Sunday, July 13, we departed for Camargo en route to Parral. At first the highway led through irrigated country, and at one place we discovered thousands of meloids of the species *Pyrota akhurstiana* flying across the road and settling on the surrounding vegetation. We collected an adequate sample. It should be noted that at least nine meloid species collected at and around Las Delicias are also common to Texas and New Mexico.

Leaving the irrigated area, we were again in the Desert Shrub. Paralleling the road was a huge irrigation canal and at various

points we found irrigated sections, some in the process of being developed. Just north of the city of Camargo the paved highway ended and after crossing the river, we approached the town during a driving rain storm. Although there are great variations in the total annual precipitation for this region (6.7 to 19.1 inches; Shreve, 1944) the average is about 10 to 11 inches, and certainly the town received a high percentage of that during this one storm.

At first, owing to the heavy rain, the rough, poorly marked, desert road south of Camargo was slick and difficult, but gradually we reached drier terrain and easier traveling. About 25 miles southwest of Camargo we camped under some cottonwoods in a Desert Shrub area, dominated by mesquite, creosote bushes, and acacia (fig. 13). The elevation at the camp was approximately



FIG. 13. Gertsch collecting in Desert Shrub area between Camargo and Parral.

4500 feet. Although slightly higher than Las Delicias, the temperature was still high. The daytime collecting, especially for bees and beetles, was good at this arid desert location, with bees of the genus *Hemisia* being particularly abundant and conspicuous on some of the desert flowers. Night collecting with the lights added numerous specimens of saturniid moths and camel-backed crickets.

As we went farther southwest the elevation of the land rose gradually, almost imperceptibly. The country gave the impres-

sion of a vast level plain, but occasionally we passed through shallow depressions in which the waters of the recent rains had collected and softened the ground. Such spots were excellent collecting areas, especially for meloids of the genus *Megetra* and the beautiful *Cysteodemus wislizeni* (fig. 14). As the elevation

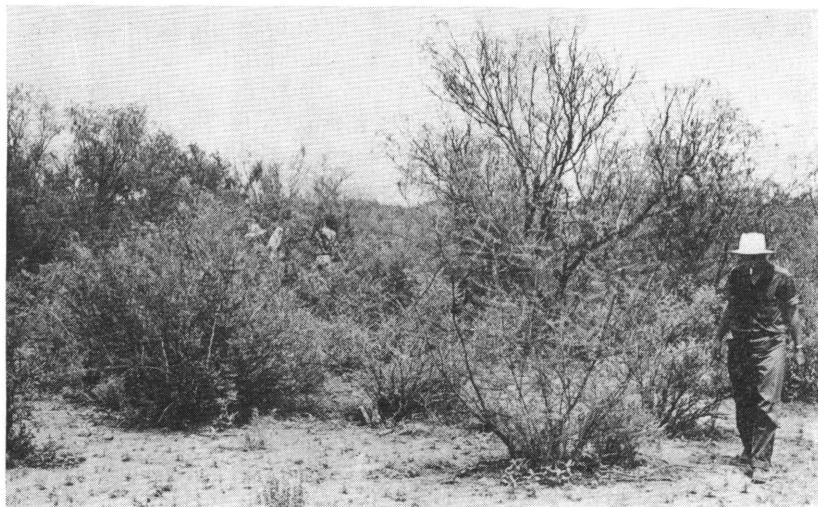


FIG. 14. Shallow depressed area on route between Camargo and Parral, showing heavy vegetation. Numerous meloids were congregated in such spots.

increased, patches of Desert Grassland began to appear here and there. Finally, after traversing a range of low hills, we came out upon the main Parral-Jeminez highway. Turning west we headed for Parral and finally made camp 15 miles east of the town. Here the slopes were dominated by creosote bushes, chollas, and platyopuntias, while mesquite grew at the bottoms of the slopes and a few oaks in the wetter places. We collected that night and the next morning before breaking camp.

Noon of the sixteenth found us in Parral, a city famous since the early days of the Spaniards as a mining center. West of Parral are two other mining centers, Santa Barbara and San Francisco del Oro. At the former place the American Smelting and Refining Company has a large mine. Mr. George Bradt and his wife were school teachers for the English-speaking colony, and we had made arrangements to visit with them. They are both interested in natural history and had explored the region thoroughly, taking

many pictures and collecting numerous specimens, especially reptiles, for the American Museum of Natural History. We arrived at Santa Barbara in midafternoon, going to the company's compound which, through Mr. Bradt's kindness and that of the company, served as our home and headquarters for the time we were in the region.

Santa Barbara lies near the Chihuahua-Durango border at an elevation of 6300 feet (fig. 15). It is almost surrounded by moun-

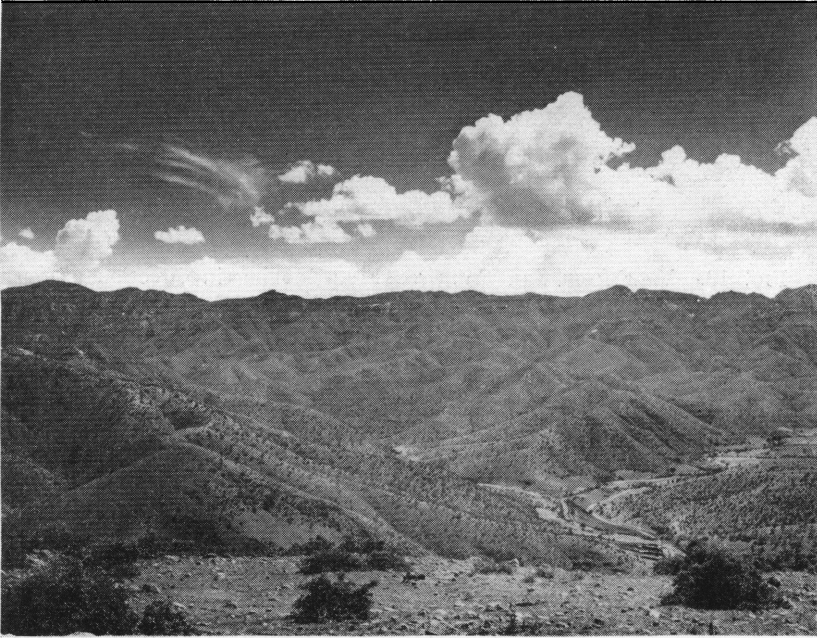


FIG. 15. View northwest from San Francisco Mesa, showing mountains between Santa Barbara and state of Durango border.

tains that are over 7500 feet high. Once these mountains were covered with trees, but these have almost all been cut, most of them many years ago. Now the mountain tops and slopes are covered with grasses, century plants, a few shrub junipers, and some cacti (fig. 16). The country between Santa Barbara and Parral is mostly grasslands, and much of it has been cultivated. Two days were spent collecting in the vicinity of Santa Barbara: in a narrow valley at a place known locally as Cobrisa, on the plains east of the town, and also on the San Francisco Mesa at an

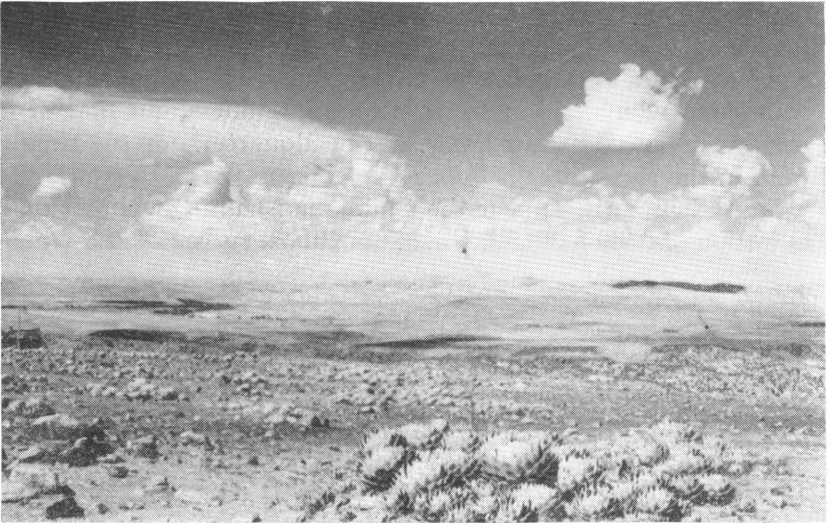


FIG. 16. View from San Francisco Mesa looking in direction of Parral. The foreground was formerly covered with oaks.

elevation of 7500 feet. The latter locality yielded many beetles, especially cicindelids of northern origin and scarabids of southern affinities. In addition an interesting series of bees (*Xenoglossa* and allies) was garnered from the flowers of the squash vines which grew in the Bradts' vegetable garden inside the town of Santa Barbara.

On the nineteenth we set out in company with the Bradts for the high mountains west of Santa Barbara. We hoped to get at least into the Montane Forests in the region of Gauchochic and, if possible, into the barranca region on the western side of the Sierra Madre. Our route took us past San Francisco del Oro, westward along an abandoned railroad, then northward up into the mountains via a well-graded road. After driving 20 miles from Santa Barbara we reached a crest at approximately 7150 feet. The mountains were clothed principally with oaks, but, at the top of the pass, pines were found. An extremely steep descent brought us into a narrow valley (elevation approximately 6300 feet) in which is located a ranch called La Saucedá. At our lunch stop we made a small collection in a region of oak, juniper, and mesquite. Dropping downward we entered a still larger valley whose floor stands at an elevation of approximately 5900 feet. While rela-



tively narrow, it is about 25 miles long. The floor of the valley is llano-like, except that here and there Oak Savannas exist in the wetter parts. The grassland appears to be virgin, has not been seriously overgrazed, and woodcutters probably have not touched the oak woods. The area is known as La Noria from the name of the largest ranch in the valley. After leaving the llano we passed through some rolling hills and entered a rather heavily populated agricultural area around the town of Huejotitlan.

A short distance west of Huejotitlan a side road turned north towards the Vallé de Olivos where there was a ranch called Pelayo which we wished to visit. There were rumors that mastodon bones had been found in the silt of a stream at that place. We therefore turned north over an obviously poor road and, with the aid of a Mexican guide who had accompanied the Bradts, drove over the most badly eroded land that we saw on the entire trip. Over vast areas the soil was extremely thin, the underlying rock strata stood on edge, and the roughness of the terrain was conducive to heavy erosion. Ocotillo and cacti were abundant; in the low spots mesquite was found. At Pelayo (approximate elevation, 5400 feet) we found an arroyo cutting deeply through a thick bed of black silt that once must have been deposited on a lake bottom. Here and there layers of marl could be seen in the silt. The present stream has cut through at least 20 feet of these deposits. After paying our respects at the ranch we went out some distance and found a camp site. Collecting both that night and the following morning was good, although we found no mastodon remains.

After retracing our tracks of yesterday we arrived at the junction just out of Huejotitlan, turned westward, and after about 12 miles' driving reached the Rio Belleza. This stream was about 100 yards wide and had two fords at this point. In the dry season these are easily passable, but, now that the rains had started, they were obviously too deep to attempt crossing, and the chances were that the water might rise higher during the next few days. During the rainy season all motor traffic to regions west of the stream normally stops. Sadly we decided that we must cancel our planned trip and return to Santa Barbara. Along the river were cottonwoods with mesquite and cacti on the slopes of the bank. After making a good collection we returned to Huejotitlan and then pushed on into the rolling oak-covered hills that lie on the road towards the valley of La Noria. Here late in the afternoon we pitched camp.

On July 21 we returned to Santa Barbara. En route we stopped in the llano of La Noria (fig. 17) and here again, just as in the virgin grassland of Santa Clara, we collected an almost unbelievable number of insects in the short grass. On arriving at the top of the pass we stopped for lunch and afterwards collected a series of embiids—strange, semi-social insects that spin silken tunnels under rocks (fig. 18). In addition to the embiids, a fine collection



FIG. 17. Virgin grassland at La Noria with summer storm sweeping valley in background.

of other insects was taken, among which were the first tiger beetles of Neotropical origin. Gertsch also collected numerous specimens of large whip-scorpions, or vinegararoons, which from now on constituted a prominent element in the arachnid ground fauna (fig. 19).

Later in the day Schramel, riding in the front "jeep," spotted a handsome specimen of a black-tailed rattler. We easily cornered it, and Bradt took a fine photograph of the snake (fig. 20).

When we reached Santa Barbara I received the disheartening news that the living specimens of *Drosophila* that I had been mail-

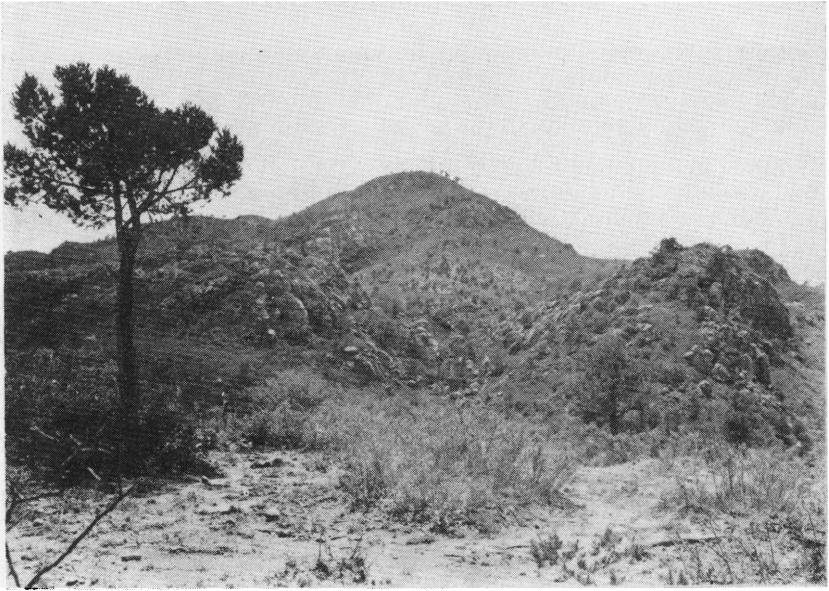


FIG. 18. Top of pass at La Saucedá, showing habitat where embiids were collected.

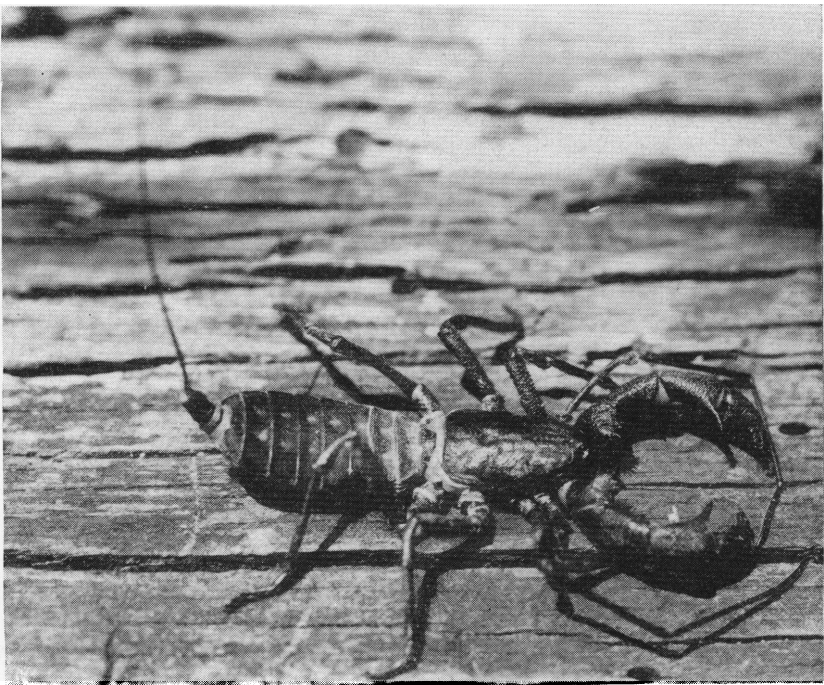


FIG. 19. Whip-scorpion or vinegaroon.



FIG. 20. Black-tailed rattler taken near La Sauceda. Photograph by Mr. George M. Bradt.

ing to Columbia University were dead upon reaching their destination. Thus one of the objectives of my summer's work was being frustrated because the specimens were being exposed to excessive heat in transit. At Santa Barbara I had been very successful in collecting large series of the species, and I resolved to fly the

specimens to El Paso myself. Thanks to the kind aid of President Harry N. Wright of the City College of New York, I had funds to cover such emergencies. The air route from Mexico City to El Paso included Parral, and I was thus able to execute my plan. Reaching El Paso, I air-expressed the insects to New York and returned to Parral by plane the next day.

In the meantime the other members of the group had been collecting in the area south of Parral at Salices. Here in addition to normal collecting, a large cave was investigated, and a new spider

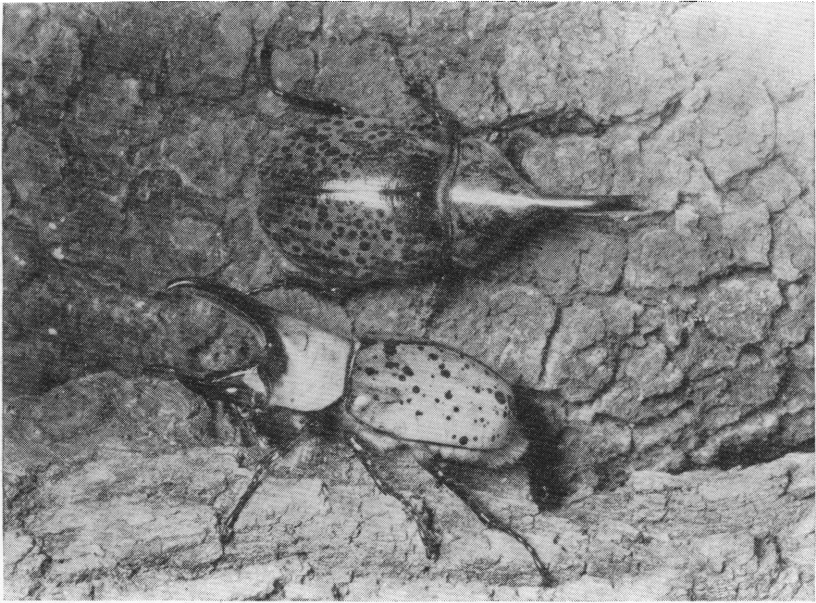


FIG. 21. *Dynastes granti*. Specimens and photograph taken by Mr. George Bradt at Santa Barbara, Chihuahua.

species of *Psilochorus* was taken, while at the mouth of the cave was found a large series of *Nesticus pallidus*, a species common in the caves of the southern United States. Outside the cave the cerambycid and buprestid fauna had affinity to the fauna of the southwestern United States (fig. 21).

By the time I reached Santa Barbara the expedition was packed and ready to leave for Durango. Again the Bradts were to accompany us. Swinging south we drove through grassland and farm land to the town of Las Cuevas, southeast of which we entered a

grassland area of great extent and beauty. Again the hills were covered with oak and the rocky places with ocotillos, acacias, and a few platyopuntias (fig. 22). Somewhat off the road at a place called Catarinas we found a fine camp site beside a large tank, almost large enough to be called a lake. Here, at an approximate elevation of 5900 feet, under the willows and cottonwoods we pitched camp. The summer rains had been sufficient to change the grasslands into beautiful green meadows, and along the streams numerous flowers were in bloom. The lower lands beside

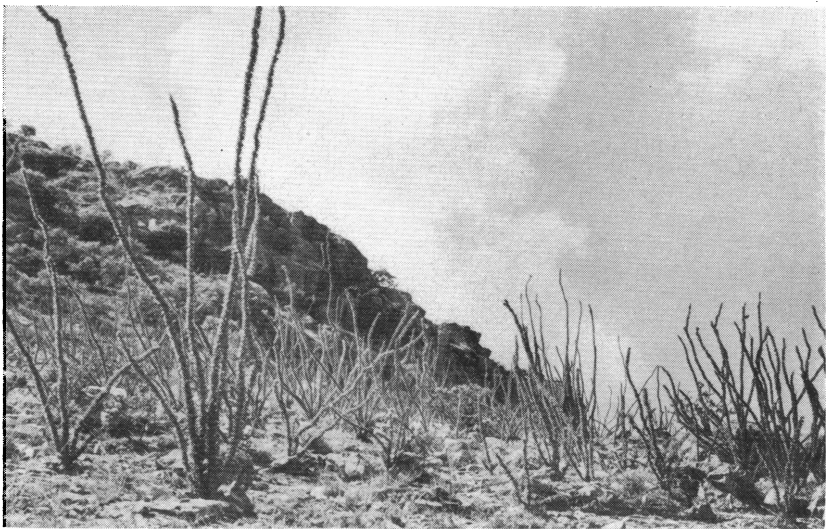


FIG. 22. Ocotillo and associated plants on rocky area at Catarinas camp.

the streams were under cultivation, but most of the area was devoted to pasture. July 25 and 26 were spent here collecting. On the twenty-sixth I climbed a small, cone-like mountain (fig. 23) and found the top carpeted with dead harvester ant males. Apparently their nuptial flight had occurred here, at the highest point in the surrounding country. At this camp Michener collected two large and beautiful green bees of the genus *Euglossa*, the northernmost record for bees of this group.

Sunday, the twenty-seventh, we moved southward through the grasslands, collecting as we went. At one point Cazier spotted the carcass of a cow that had reached just the proper stage of decomposition to attract certain scavenger beetles of the genus *Trox*.



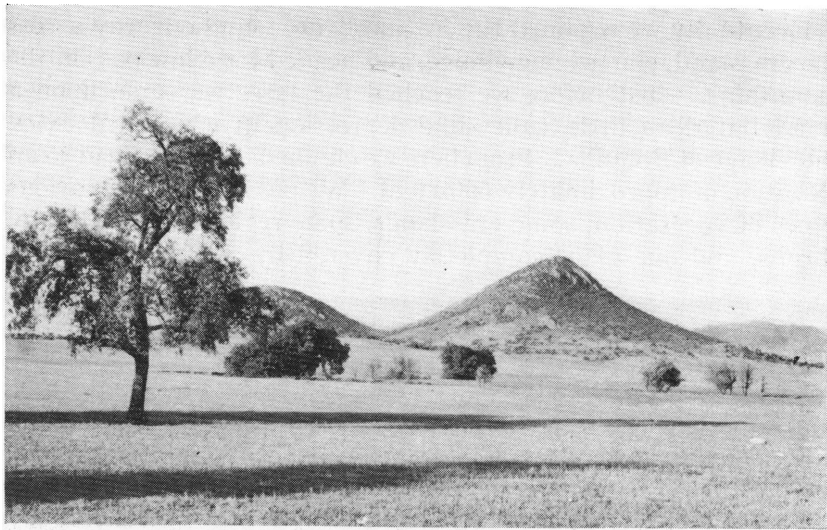


FIG. 23. View of region at Catarinas camp, showing grassland and small, cone-shaped mountain upon which innumerable dead *Pogomyrmex* males were found.

After crossing a low divide we dropped into another valley where Villa Ocampo is located, followed a small stream for some time, and finally turned away from it and entered a vast llano lying between the Sierra Guojolottes and the Sierra del Oro. Both of these mountains were covered with oaks. Continuing up the valley to the village of Encino we left the road and drove across the grasslands towards the Sierra Guojolottes until we reached a spring at the bottom of the oak-juniper zone. Our camp was at approximately 6200 feet elevation. The night was clear, cool, and windy, and collecting was poor.

Beyond Encino the valley reached an elevation of approximately 6500 feet. In this area much of the land was under cultivation. On crossing the divide at the head of the valley, the road drops off sharply into another valley where the town of Santa Maria del Oro is located at an approximate elevation of 5300 feet. From previous information we believed that a road led from del Oro to La Zarca, but the people in the town did not know about it, so back towards the llano we went. Fortunately we met a produce truck whose driver knew the country and could accurately tell us how to proceed to La Zarca. One of the passengers on top of the truck, a lad in his 'teens, volunteered to show us the correct road.

Eventually we regained the Encino llano, found our way across the grassland, skirted one village, and headed for a low pass in the mountains. Just before we reached the trees we came upon a small but deep little valley-like depression in which is located the village of Boquilla. From here we climbed a narrow road to an elevation of approximately 6900 feet. We passed through various types of vegetation, some grasslands, some regions dominated by shrubs, and one place completely covered by a dense thicket of

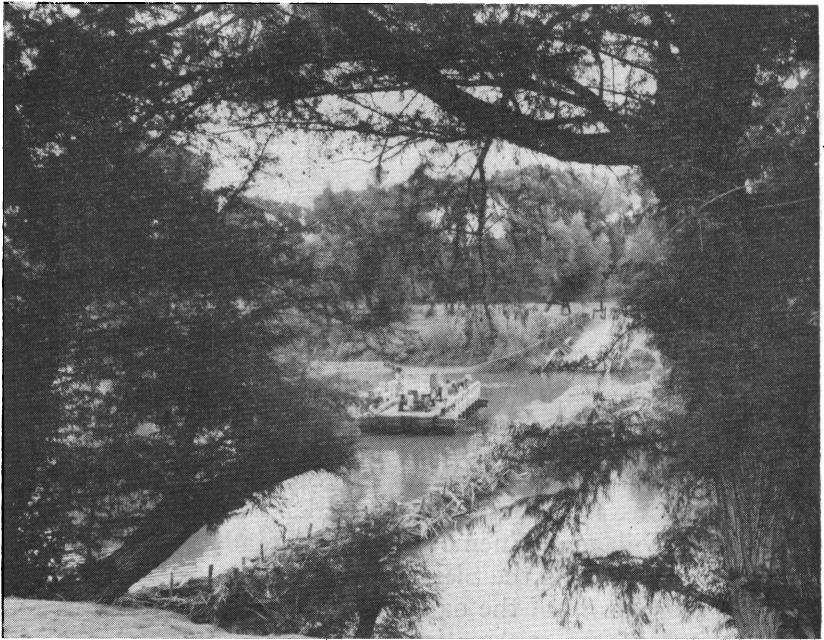


FIG. 24. "Jeep" being ferried across the Rio Nazas. In foreground are Mexican cypress trees; cottonwoods are in background.

junipers. Finally we came out on a vast undulating grassland known as the Meseta de la Zarca, where a modern highway was in the process of construction between Durango City and Parral. We wanted our guide to stay with us for the night, but he insisted on leaving, and he started off afoot across the plains at 6 P.M.; his home was at least 15 miles away.

That night we camped at Meseta de la Zarca at approximately 6400 feet in a small shrub growth of junipers and chollas. With the aid of our lights a good collection was garnered, including a



number of beetles of the genus *Moneilema* from the cactus and a new species of *Diplotaxis*, this latter species being endemic to Mexico. Also almost every cactus plant had webs of the orb-weaving spider of the genus *Metapeira*.

The next morning, July 29, we drove for 50 miles along a perfectly straight road with ranch land on either side. This vast meseta was all above 6000 feet in elevation. Apparently it was moist enough to support grassland, since Desert Shrub seemed absent. At the end of the meseta the road turned to the right, passed



FIG. 25. Camp site at Rodeo, showing equipment and terrain.

through rolling hills, and then dropped sharply into the valley of the Rio Nazas. The road down into this valley was unpaved but well graded. Once again we were in an arid, hot region, and the valley of the Rio Nazas was covered with Desert Shrub. Along the stream a dense human population dwells, depending on the stream for irrigation water. Willows, cottonwoods, and the huge Mexican cypress grow beside the stream. At the point where the road crosses the Rio Nazas, the elevation, according to a large sign on the bank, is 1380 meters, or 4527 feet. One by one our cars were taken across the river by a hand-powered ferry (fig. 24).

Late in the afternoon we completed the crossing, and now the road followed the river downstream for a number of miles. Upstream were rugged, spectacular mountains out of which the Rio Nazas flowed, but the country downstream consisted of a relatively broad valley filled with Desert Shrub. The soil was very rocky, and good camp sites were rare, but finally a suitable place was found just beyond the village of Rodeo (fig. 25).

This area was different from what we had seen previously. There were several chollas, including a "jumping cholla" with

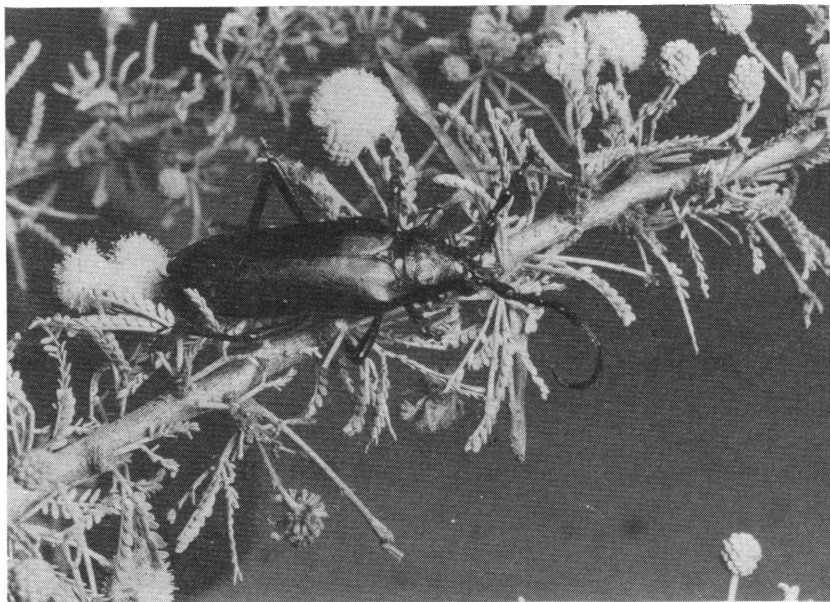


FIG. 26. *Stenapais solitaria* Say. Photograph by Mr. George Bradt.

very slender stalks. Also, new species of platyopuntias were present as well as the usual numerous acacia, mesquite, and ocotillo. Night collecting yielded some moneilemas but was not otherwise good.

On the morning of July 30 the group collected in the near-by vicinity. Gertsch caught numerous specimens of an unusual butterfly belonging to the family Riodinidae, which were feeding on several flowering shrubs. In the meantime Bradt took pictures of a cerambycid beetle (fig. 26).

After following the river for a time the road turns due south at

the point where the Rio San Juan joins the Nazas. This tributary of the Nazas has cut a deep gorge where it flows into the valley of the Rio Nazas. The road partially follows this gorge for several miles and then leaves it completely and winds back and forth until it reaches a plateau region covered with mesquite, acacia, and yucca. A little farther west the grasslands begin to appear, and then suddenly the road drops again into the valley of the Rio San Juan. At this point the stream has carved out a great wide valley, leaving here and there mesa-like remnants standing high above the valley floor. One (fig. 27) is particularly striking. In-

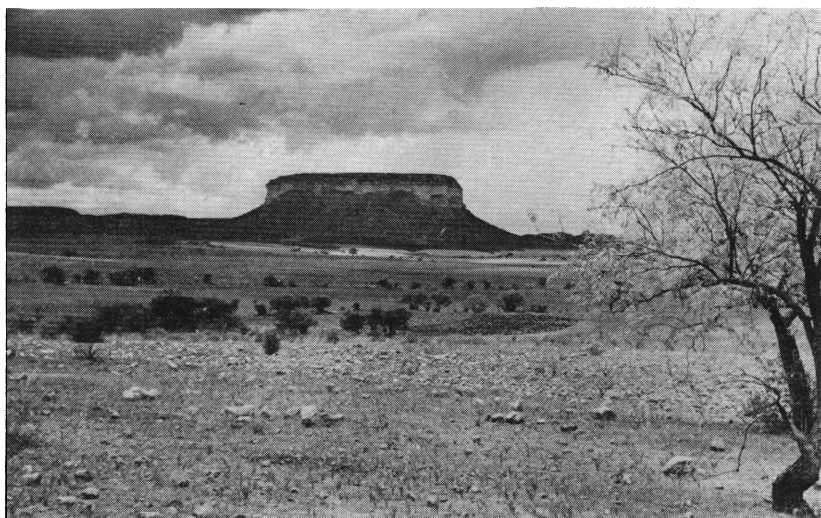


FIG. 27. Mesa in valley of San Juan del Rio.

spection showed that the exposed strata consist of soft limestone. This valley is one of the most diverse and interesting that we had seen. Along the stream were cottonwood, willow, and cypress trees; on the near-by slopes were oaks, mesquite, and in the drier places chollas in abundance and, also, numerous platyopuntias. In some places the platyopuntias formed a veritable forest that covered many acres of land. The plants grew 15 to 20 feet in height with trunks over a foot in diameter. Probably this whole valley in its virgin state was a Cactus Savanna (Shreve, 1940). Irrigation and accompanying agriculture have greatly modified the area, but from here to the higher grasslands the dominant plants are the cacti. Much of the valley's land was under cultiva-

tion and probably had been for several hundred years. Considerable areas were irrigated, but some seemed to depend exclusively upon the rainfall. The irrigation system was extensive but definitely showed signs of deterioration. The main town of the valley is San Juan del Rio (fig. 28), which lies beside the river but several miles off the main road.

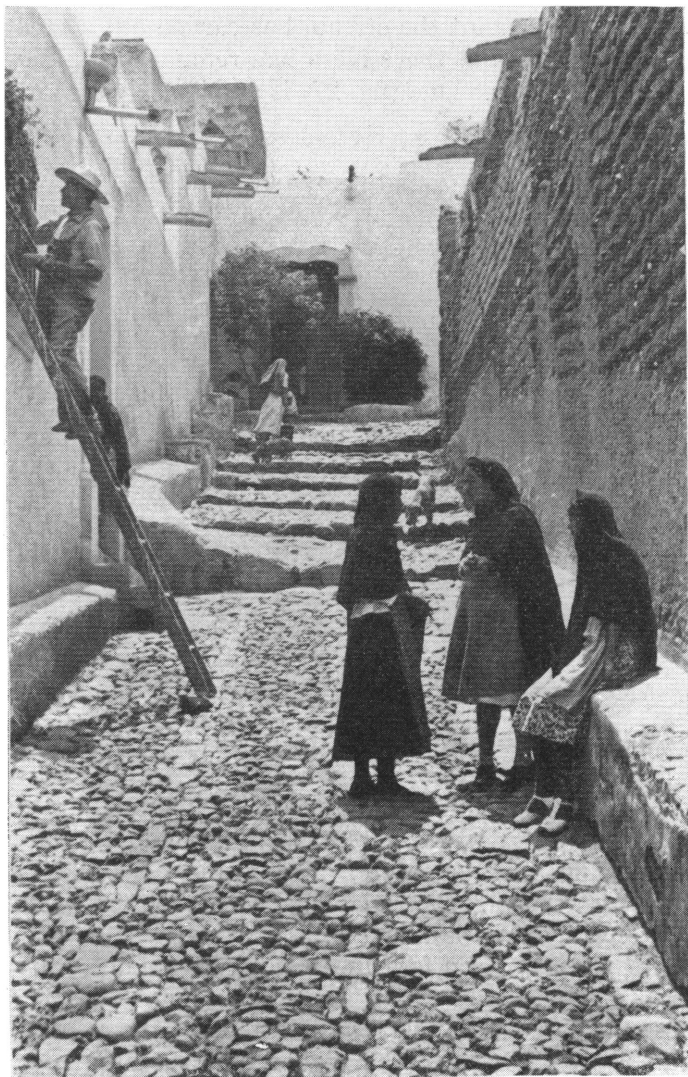


FIG. 28. Street scene in San Juan del Rio.

We camped near the foot of the hill leading into the valley on a terrace above the Rio San Juan (approximate elevation, 5200 feet). Here we stayed from July 30 to August 2. Insects of all sorts were abundant, but especially Cazier and Gertsch were happy over the great numbers of *Moneilema* (fig. 29) and trap door

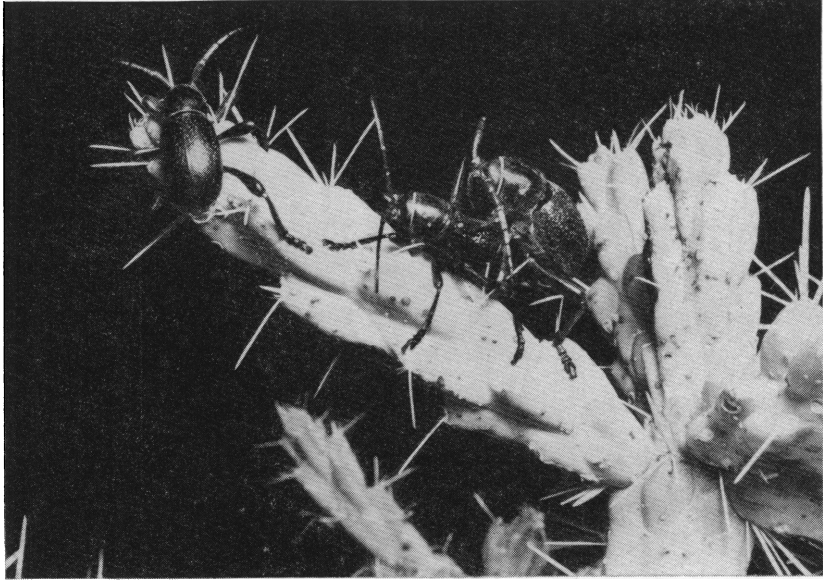


FIG. 29. *Moneilema* on cholla cactus. Flash photograph by Mr. George Bradt.

spiders, respectively. In a dry, pasture-like area near camp were found numerous specimens of trap door spiders, all belonging to a single species of the genus *Eucteniza* (fig. 30). A local farmer not only knew about these spiders, but also showed an uncanny ability to spot the closed trap doors (fig. 31). Cazier also found literally thousands of tiger beetles (a subspecies of which occurs in southern Arizona) congregated in small grassy spots along the bottom of the terrace on which we were camped (fig. 32). Gertsch collected a primitive four-eyed spider of the genus *Nopsides*, previously known only from Cerrallo Island in the Gulf of California. Each night we went hunting for *Moneilema*. These creatures hide by day but come out at night to feed, mate, and lay their eggs on their host plants, the cacti; here for the first time we found the beetles in considerable abundance.

Biologically this valley seemed different from the regions in Chihuahua. It was hard to evaluate just what the differences were, and study of published temperatures and precipitation records gave few clues. Probably a mild climate, a long growing season, and a consistently uniform precipitation pattern may be mainly responsible. Arias (1942) gives data that show that the growing season at San Juan del Rio extends well into late October or even early November. The fact that orange trees were numerous in the protected gardens and patios of the town shows that the

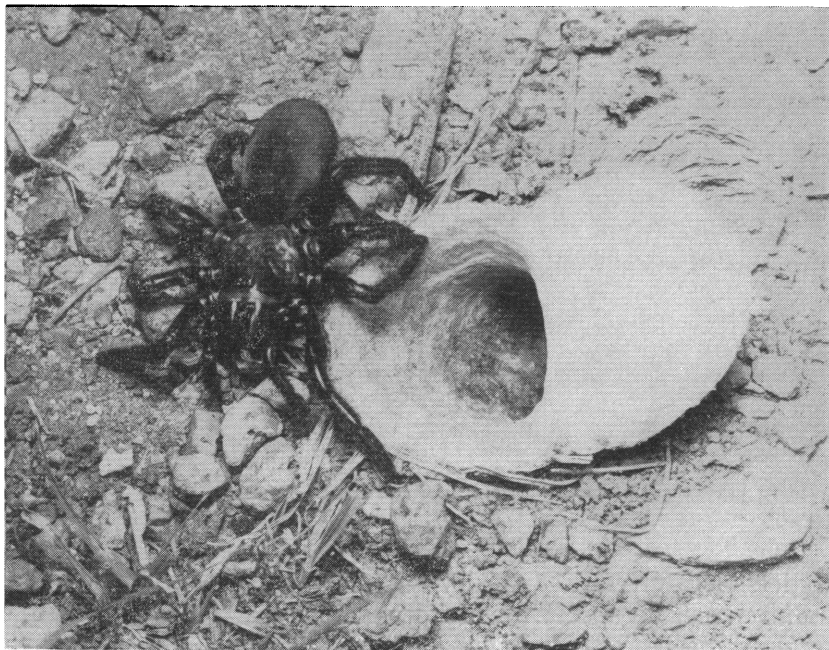


FIG. 30. Trap door spider female. Photograph by Mr. George Bradt.

winters must not be too severe, although freezing temperatures are known to occur. Finally, it should be noted that the creosote bush seemed totally lacking. Obviously this whole area represents a broad transition between the Desert and the Cactus Savanna.

On August 2 we left the valley and headed southwestward through semi-arid country. Gradually the road went upward until, at approximately 6700 feet, we came out on a high, level grassland between two mountain ranges. The summer rains had been heavy in this area, and numerous marshy places and a lake, known





FIG. 31. Closed trap door of trap door spider domicile. Photograph by Mr. George Bradt.



FIG. 32. Cazier collecting tiger beetles at San Juan del Rio camp.

as Laguna de Santiaguillo, were seen in the center of the llano. Here there was a great deal of agriculture in addition to large herds of cattle. We got general collections, including trap door spiders of two genera, *Pachylomerides* and *Eucteniza*, and hundreds of beetles of the genus *Pelecyphorus*. These latter creatures were crawling across the road, and we had only to pick them up. At an earlier stop on a semi-arid hillside we saw the openings in the ground that led into the nests of leaf cutter ants. Some of the en-



FIG. 33. Grassland on escarpment west of Durango, showing typical rainy season, late afternoon storm in background.

trances were fully 3 inches in diameter. Drainage was poor, and the road often passed through areas that were marshy at this time of year. In such places the road was well built up above the surrounding countryside. Gradually the terrain dropped in elevation and we were back again in the Cactus Savanna country. We passed through a few rolling hills and were on the outskirts of the city of Durango.

Sunday was spent in Durango and on Monday, August 4, we took the road westward towards Mazatlan on the Pacific. This time we knew we could get into the high Montane Forests of the Sierra Madre and we had hopes, faint ones it is true, that we might be able to traverse the mountains, drop down through the barrancas on the west side, and reach the Pacific. We knew roads



were being built through this area, but we could not learn just how far the construction had progressed. Mazatlan surprisingly enough is the closest Pacific port to New York City.

Durango (elevation 6226 feet) lies in the Cactus Savanna, but just west of town is a high escarpment that represents the eastern edge of the Sierra Madre Occidental. The gradient up the escarpment is steep, and within 25 miles an elevation of 8000 feet or more was reached. In doing so we passed through a narrow grassland zone (fig. 33), then through a fragmentary Oak Savanna, and finally into an area predominantly covered by pines with some oaks and junipers. Doubtless wood cutting, lumbering, and agriculture have modified the relationships of these zones to one

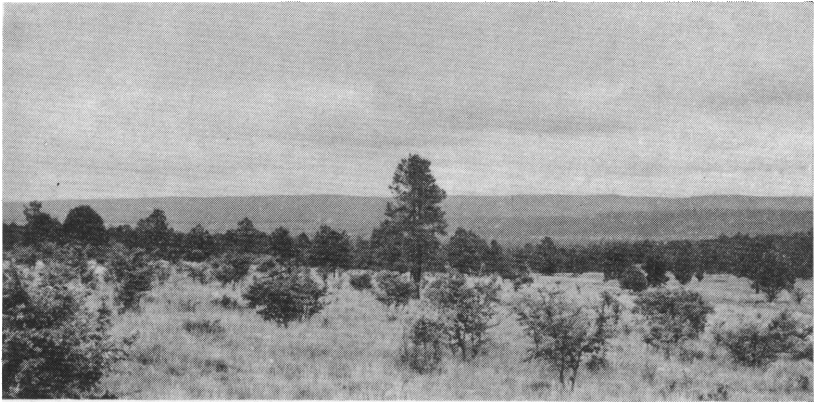


FIG. 34. View at Palos Colorados, showing park-like area with grassland, oaks, and pines.

another, but it would seem that the effect of such activities has been the widening of the grassland zone at the expense of the woodlands. Westward into this high region runs a railroad from Durango to El Salto.

Twenty-five miles by road from Durango we camped at an elevation of over 8000 feet within a mile of a railroad siding and station called Palos Colorados. Here we found an amazing floral spectrum, the species of which grew side by side (fig. 34): oaks, three species of pines, madrono, manzanita, platyopuntias, small, barrel-type cacti, and grasses. The general appearance is now park- or savanna-like, but this is probably owing to the lumbering off of the original forest. Just how much of the present floristic

and faunistic pattern is due to the effects of man and how much to the interdigitating of the three vegetational types (that is, Cactus Savanna, Grassland, and Montane Forests) it is impossible to estimate. Since the rainy season was under way the grasses were growing rapidly, and the annuals were blooming in profusion. Among the many flowers were a beautiful white lily, probably *Calochortas*, a magnificent cosmos, and a small orchid.



FIG. 35. Pair of individuals of *Plusiotis* sp. Photograph by Mr. George Braddt.

Collecting was excellent. Despite the rains and cloudiness Michener got goodly numbers of bees and also some interesting Lepidoptera, including many saturniids (*Automeris* and *Eupackardia calleta*) that came to the lights even during heavy rains. Gertsch collected the famous Durango scorpion and many other arachnid species. Cazier collected quantities of beetles, including numerous tiger beetles and a large series of *Plusiotis*. No longer were the moneilemas present, and our head-light collecting on the vegetation was mostly for the large and brilliantly colored *Plusiotis* (fig. 35) and dull-colored *Diplotaxis*. I found *Drosophila pseudoobscura* plentiful.

Here we also saw for the first time on the trip the famous madrono paper. On the limbs of the madrono trees (*Arbutus*) here and there were white to cream-colored, irregular, hollow, bag-shaped structures varying from a pint to a half gallon in size. There was always an opening on the under side. In many ways it was intermediate in construction between a tent caterpillar's tent and a hornet's nest. Actually it is the communal larval home of a butterfly, *Fucheira socialis* (fig. 36). A number of larvae spin the

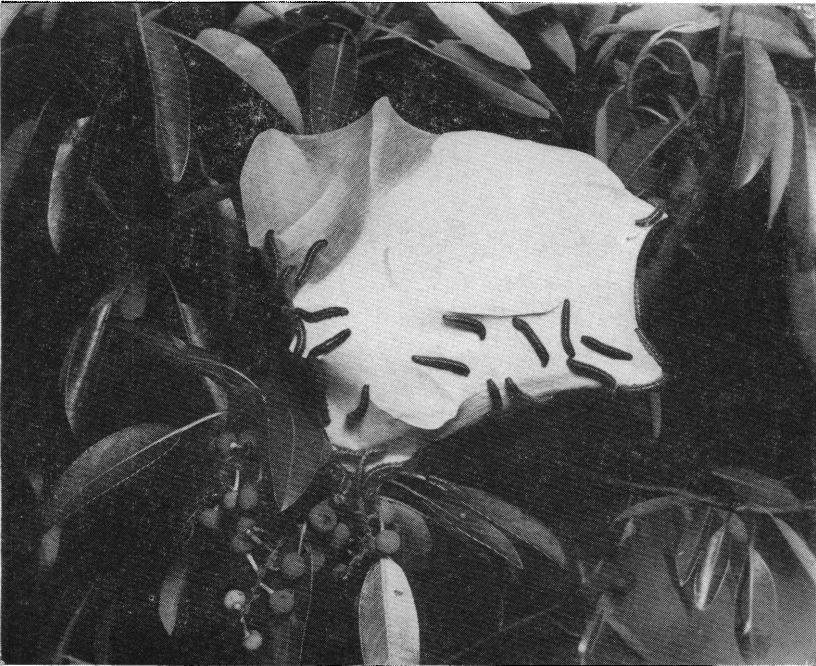


FIG. 36. Bag-shaped home of madrono caterpillars. Photograph by Mr. George Bradt.

bag and eventually pupate inside. The pupae are naked, held to the inside of the bag by a few silken strands. The hole at the bottom allows the adult butterflies to escape.

Much rain fell while we were camped at Palos Colorados. Mostly the sky was partially filled with clouds, but some days during the morning the sun shone for variable periods. During the afternoons, the clouds built up and invariably covered the sky, and often rain fell. Nights usually brought more rains. The

elevation and the rains were sufficient to give us cool temperatures. Three nights, August 4, 5, and 6, we camped at Palos Colorados and on August 7 started on towards El Salto. West of Palos Colorados the elevation falls off as the Rio Chicos, a tributary of the Rio Mezquital, is approached. The elevation where the road fords the stream is something more than 7000 feet, and the surrounding area is grassland with oaks on the hillsides (fig. 37). The



FIG. 37. Bradt "jeep" crossing Rio Pico. In the background are grasslands with scattered oaks.

rains had raised the stream and, although it appeared to be falling, we debated whether it would be possible to get the vehicles across. The "carry-all" was our greatest concern and it was sent across first. The "jeeps" had no trouble (fig. 37).

West of the river and on the edge of the grassland and the mixed oak-pine woodland, at an elevation of approximately 7500 feet, lies the lumber town of Otinapa. Several miles west of Otinapa we came to an abrupt escarpment. On arriving at the top we were again at an elevation of over 8000 feet. From here to El Salto the country was one vast undulating region of alternating valleys and plateaus. Parts of the valleys were grasslands and often had small settlements with some surrounding agriculture. Despite the high elevation, frosts come late in this area, normally not until

late October or early November. Much of the corn was still less than 2 feet high when we saw it in early August. The plateaus were covered with pines and oaks. Where edaphic conditions were proper the oaks were the dominant trees. Finally there were the upland meadows, beautiful swales, covered at this time of year with masses of flowers. On one of these plateau areas we reached an approximate elevation of 8850 feet, the highest of the trip.

In the late afternoon of August 7 we camped about 6 miles east of the lumber town of Coyote. All during the day we had crossed

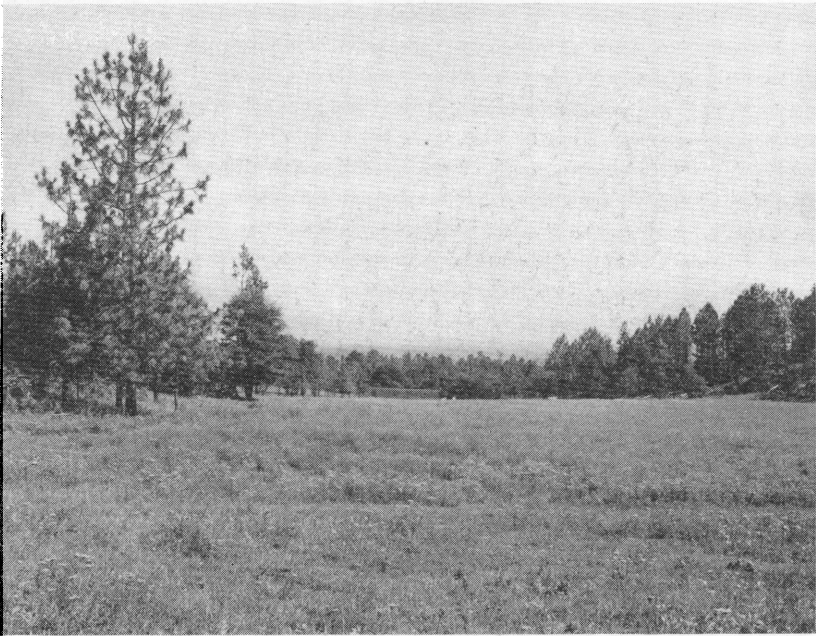


FIG. 38. Meadow near Coyote, Durango, showing summer flowers and pines.

and recrossed the railroad, and the vehicular road had become progressively poorer. Construction of a new road was going on both at Mazatlan and at Durango, but this central unimproved section was really poor. Our camp was made in a pine woods on the edge of a little valley. In the floor of the valley was a little meadow (fig. 38) where collecting was good. New species, some of them striking ones, appeared in the catches. Schramel got two specimens of a neotropical cerambycid. Michener and Gertsch discovered a beautiful *Argynnis* in the little meadow, and

Michener and Cazier each collected a female of this wily and elusive new subspecies representing a rare group which is found in the United States only in the extreme southwestern part of the country. I found *Drosophila* collecting good. Another species of *Plusiotis* (fig. 39), a Neotropical one, was discovered as well as a

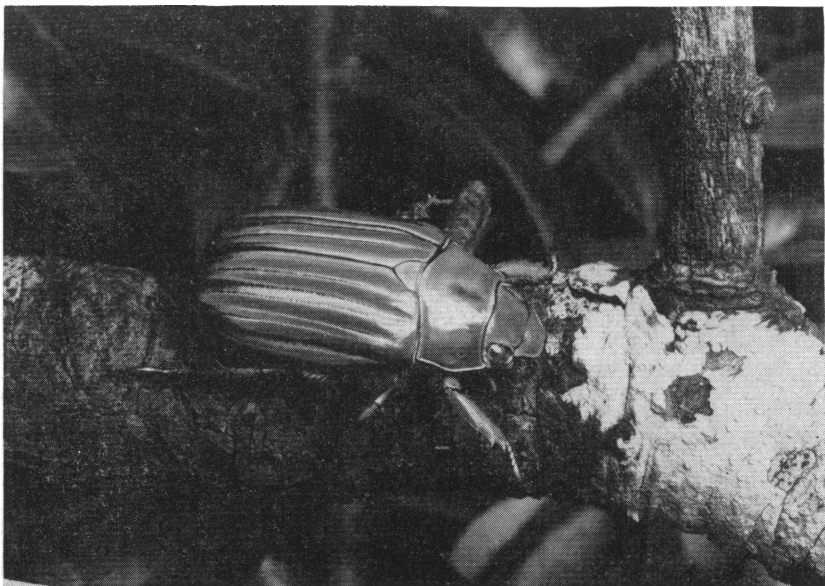


FIG. 39. *Plusiotis* species taken at Coyote, Durango. Photograph by Mr. George Bradt.

couple of specimens of *Ergates* (fig. 40). Here also numerous tabanid, cyrtid, and cuterebrid specimens were taken. Night collecting was good, especially with the head lamps.

In the woods near the camp and by the meadow, woodmen were cutting pines with diameters of 9 to 12 inches. Having felled the trees, they immediately peeled all the bark and then cut the logs into about 8-foot lengths. We learned that these were to be used as mine props, but could not understand the reason for peeling the bark until we inspected the tree tops that were left behind and found that within a matter of a few days they were thoroughly infested by cerambycid beetles. Inspection of the countryside showed that cacti, both platyopuntias and small barrel types, were present. In addition to at least three species of pines, several species of oaks and some junipers were present.

The meadows were filled with blooming annuals of many species, and the whole countryside was bright with color. Late in the afternoon of our last day at Coyote a terrific rain storm hit the area; all night rain fell at a steady rate, not ceasing until early morning. During the night the temperature dropped to 59° F.



FIG. 40. *Ergates neomexicanus* Casey, collected at Coyote, Durango.

The Bradts now decided that they must leave us and return to Santa Barbara. As they turned back we pushed on towards El Salto. The road into Coyote was horrible; between Coyote and El Salto it improved somewhat but not much—it was full of holes, ruts, rocks, ledges, and soft spots. We were constantly concerned about either getting hopelessly stuck or cracking a crank case or gear housing. Late in the afternoon we camped in a pine woods overlooking a magnificent valley of pines and meadows (fig. 41). Gertsch and I then drove one of the “jeeps” to the lumber town of El Salto (elevation 8325 feet) where a Mrs. Bishop at the lumber company’s compound told us that we could go still farther west to





FIG. 41. Area just east of El Salto.

the edge of the barranca, but that the road to Mazatlan was not yet completed. Foiled again in our attempts to get into the barranca areas, we decided to return to Durango city.

Collecting at the El Salto camp was good, including a new subspecies of tiger beetle. Again we got *Plusiotis*, a different species than previously taken, plus a number of species of Tropical affinities. Apparently the Tropical fauna that lives along the coast at lower elevations pushes up the valleys onto the plateaus. At Palos Colorados we found few species of Tropical affinity, but as we worked westward these increased in number. This applied also to animals other than arthropods; for example, we saw parrots for the first time between Coyote and El Salto. Here at El Salto we found numerous species of insects of Tropical affinity. Gertsch, for example, found two phalangids of the family Cosmetidae, a group very sparsely represented in northwestern Mexico. In general the fauna of the region from Palos Colorados to El Salto appeared to be a mixture of Neotropical and Nearctic elements plus a number of Mexican endemics.

On August 11 we headed back for Durango, collecting at intervals along the way. The day was warm and clear, and many insects were active, especially those that visit flowers. We made a large collection of the flower-loving beetles of the genus *Acmaeo-*



*dera*, including the rare species *A. cuprina*, plus numerous other insects. We camped west of Otinapa that night in an Oak Savanna and the next afternoon reached Durango.

The trip west of Durango had been extremely productive.



FIG. 42. Inside the gorge of the Rio Mesquital at Nombre de Dios.

Within nine days we had collected about 10,000 specimens, excluding living *Drosophila*, arachnids, and reptiles. Of the latter we had 20 different species, mostly snakes and lizards. Many insect species were taken for the first time on the trip, many repre-

sented rare or little-known species, and, finally, we had seen how the tropical and plateau faunas had interdigitated.

On August 13 we started southeast following a good, well-graded, modern road to Zacatecas, running through relatively level countryside, skirting along the north side of low mountains, and turning southeastward at the eastern end of the range. About 25 miles from Durango the road suddenly dropped down into a narrow, steep-walled little valley, almost a canyon, at the bottom of which lies the Rio Mesquital. This river drains the eastern face of

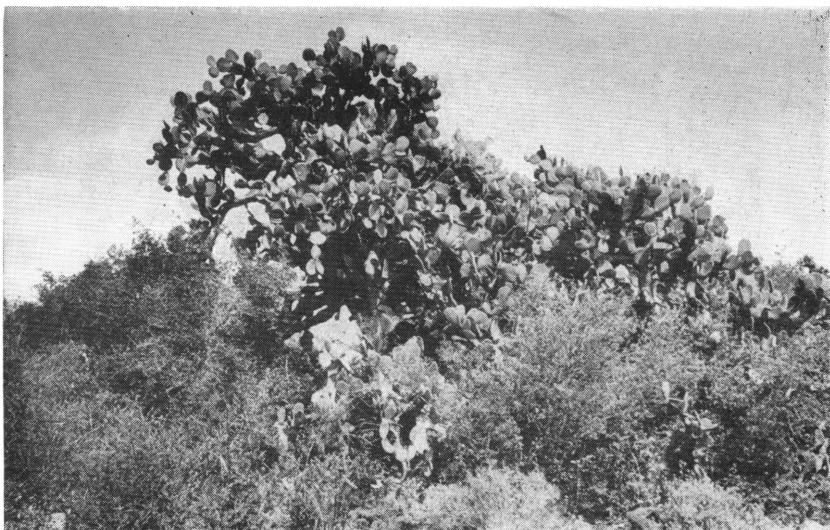


FIG. 43. Giant nopal cactus at Nombre de Dios.

the Sierra Madre and the area east of Durango, then turns and cuts back through the mountains south of Durango, and empties into the Pacific. The road crosses this river at the town of Nombre de Dios (figs. 42, 43). Here the river gorge is about 100 feet deep and 500 to 800 feet wide. The countryside, except for the irrigated parts, was Cactus Savanna and semi-arid, but the bottom of the gorge was semi-tropical. In the gorge were cypress trees, fig trees, tropical plants, leaf cutter ants, and other insects with obvious Neotropical affinities, while a wholly different fauna was found in the surrounding countryside. After collecting in the gorge for some time our clothes were wet from perspiration due to the high humidity, but they quickly dried in the just as hot but less humid areas above

the gorge. Naturally we wished to collect in these habitats and therefore located our camp near the river. *Moneilemas* were found, not in great numbers, but a species of *Tetraopes* was abundant, and I collected ephemerids in the river.

After collecting during the forenoon of August 14, we traveled southeastward through country that is rolling and arid, dominated mainly by cacti, mesquite, and grasses. Near the Durango-Zacatecas boundary the road rose steadily, following a broad valley until it topped a crest of approximately 8100 feet. On this upgrade we stopped near the town of Canutillo, Zacatecas, where pines, junipers, chollas, platyopuntias, yuccas, and oaks all form a savanna-like vegetation. The soil is very thin, and the underlying strata are limestone. We found embiids again, the first time since the collection taken at La Sauceda northwest of Santa Barbara. As we approached this valley we saw to the east a low range of mountains capped by spectacular saw-toothed formations. The road skirted to the south of these as it climbed to the top of the crest. Once across this height we were in a vast rolling plain in many ways similar to the Meseta de la Zarca. On the slopes there are some oaks, but the whole region is mainly one vast grassland, cultivated in the lower moist places and with cacti invading the drier areas.

Crossing this country we came suddenly upon a relatively narrow valley in which is located the city of Sombrerete (elevation 7708 feet), an ancient mining town, dominated by numerous huge churches. East of Sombrerete at Arenal we made a small roadside collection at an approximate elevation of 7900 feet. The vegetation here was mostly grassland, but a few oaks and numerous cacti were to be found. At Sain Alto, a number of miles farther on, we camped at an elevation of approximately 7000 feet. Now we were definitely in the Cactus Savanna again (fig. 44). The high rolling plains thus alternate between grassland and Cactus Savanna, with the grasslands at the higher elevations and in the more mesic situations. Mixed with the cacti were mesquites and other shrubs, on which grew numerous small epiphytes.

From Sain Alto to Fresnillo the country is relatively level and at an elevation of about 7000 feet. Just before reaching Fresnillo we came into an area dominated by large yucca trees that seemed similar to the Joshua trees of the southwestern United States. They were quite numerous and very spectacular. From these Schramel made good collections of weevils. The day was

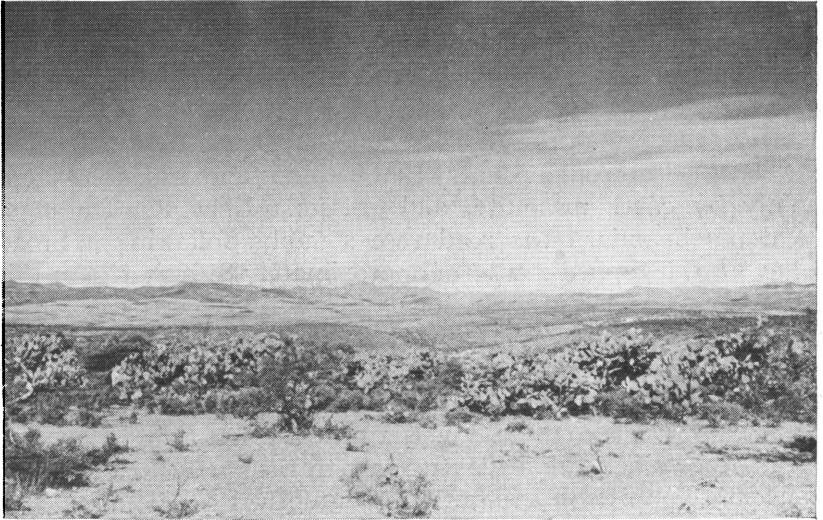


FIG. 44. Cactus Savanna at Sain Alto.

bright and sunny and the bees were active so that Michener got a fine collection from the flowers along the roadside. Fresnillo (elevation 7380 feet), like Sombrerete, is a famous mining town. From Fresnillo to Zacatecas the road ran through an agricultural area, with the result that we found no good collecting.

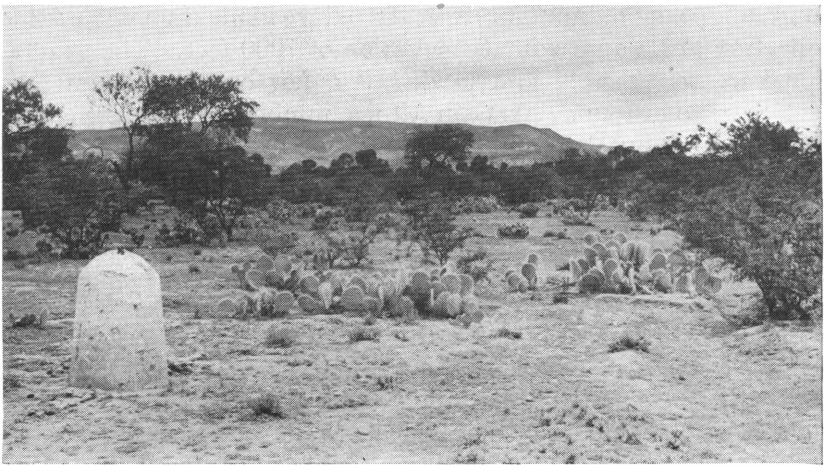


FIG. 45. Area at Guadalupe camp.

On the outer edge of the neighboring town of Guadalupe we found a good camp ground. Here at an approximate elevation of 7400 feet in a primarily agricultural region was an open pasture which offered a likely collecting spot (fig. 45). Three species of platyopuntias (fig. 46) were growing in great numbers, plus

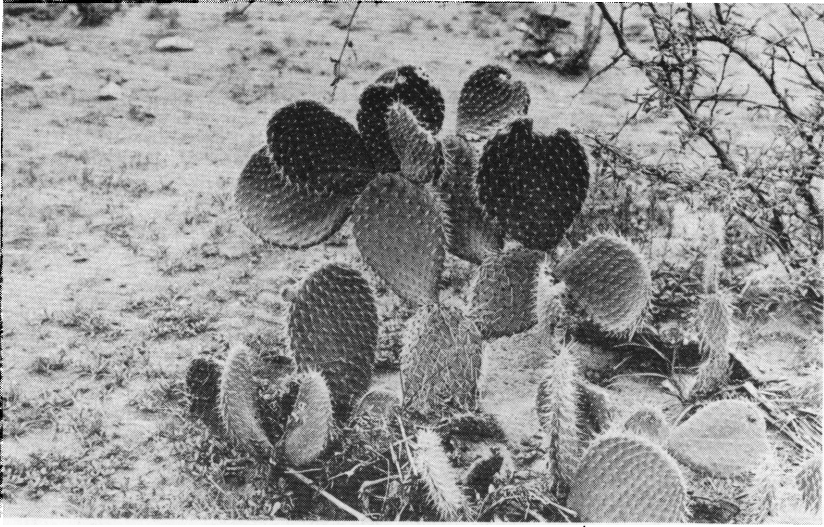


FIG. 46. Small nopal cactus, showing feeding marks of *Moneilema*.

numerous chollas (fig. 47), cat claws, acacias, desert gourds, many flowering annuals, and numerous large pepper trees, a couple of which served us well as shade for our camp. It was our first meeting on this trip with the "pepper" tree and clearly indicated that, despite the altitude, we were now in a milder climate than that farther north.

With all these cacti there must be moneilemas about, and as soon as darkness fell we donned the head lamps and started out in search of these fascinating black beetles. By midnight we had 73, of which Cazier got 31. Saturday, the sixteenth, was also spent collecting here. I had caught some *Drosophila* the evening before, and both the morning and evening catches on Saturday were excellent. Since the *Moneilema* collecting had been good, we decided now to inspect the countryside in preparation for making a really thorough collection Saturday night. Near by was a small village, and we noted that a large cactus patch was beside it.



FIG. 47. Cholla cactus, showing excrement from *Moneilema* larva.

Since the fruits of the large platypuntia are eaten and the young leaves are cooked for food, this cactus is of considerable economic importance to the natives and usually a number of plants are grown near the habitations. Collecting here and in the surrounding area netted 146 beetles that evening.

Sunday found us retracing our route to Durango. We had reached the southernmost limit of our trip and now planned to work north via Torreon and Saltillo towards the United States. That night we camped again at Nombre de Dios beside the Rio Mesquital, added to our collections, and on Monday, August 18, reached Durango. Between Nombre de Dios and Durango a

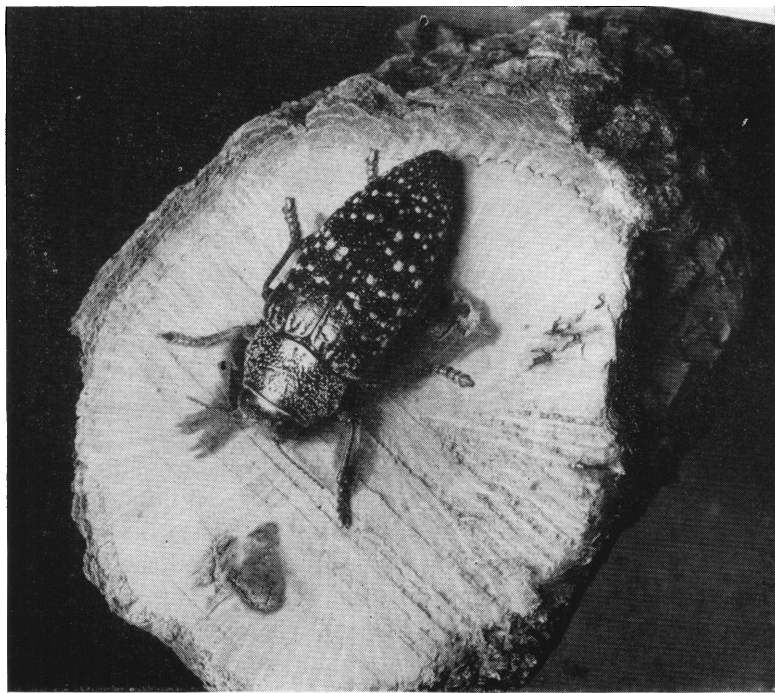


FIG. 48. *Psiloptera drummondi webbi* LeConte. Photograph by Mr. George Bradt.

roadside collection gave us a large series of bees belonging to the Tropical genus *Euglossa*. Again we were meeting with the interdigitating of the northern and southern faunas.

The Durango-Torreon road leads northeast through a broad valley (elevation of from 6200 to 7000 feet) in which numerous small towns are located. The moister sections of the valley were under cultivation, while the drier places were grazing lands. At San Isidro, 60 miles from Durango, at an approximate elevation of 6700 feet, we camped on an open hillside. Here again cacti—



platyopuntias, small barrel types, and many chollas—were present. This whole valley seemed primarily to be a Cactus Savanna. Except for the mountain region west of Durango, we had been in a uniform type of environment ever since we entered the valley of Rio de San Juan: at higher elevations, grasslands with some oaks; at lower elevations, cacti; and at intermediate spots, a mixture of grasslands and cacti. A rain early in the night drove us from our collecting, but the next morning we were able to make a few additions, especially bees.

At Yervanis (approximate elevation 6700 feet), about 80 miles northeast of Durango, a fine roadside collection was made, especially bees, beetles, and trap door spiders of the genus *Pachylomerides*. Many female spiders were dug out of their holes, with numerous half-grown offspring which were atypically still in the burrows with them. Schramel also got several tarantulas after some laborious digging, and also numerous examples of two species of buprestids from the acacia plants (figs. 48, 49). The terrain seemed much more xeric than that at San Isidro, even though the elevation was almost similar. At 100 miles (by road) north of Durango the road dropped sharply into a broad, hot, arid valley. Here we came to the village of Cuencame (elevation 5461 feet). Floristically the area was much like the valley of the Rio Nazas at Rodeo. Here again we found creosote bush, trembling cholla, and small agaves; thus we were now back in the Desert Shrub, having left the Cactus Savanna region when we descended the long grade into the town. Late in the evening we found a camp site near the town of Pedricena (elevation 4293 feet), where night collecting was fair and included a series of spiders and an enormous solpugid.

Since leaving Santa Barbara I had collected a great many *Drosophila*, mostly *pseudoobscura* and *azteca*, but in consideration of the previous disasters I had experienced with shipping the specimens I had decided to carry all subsequent collections with me. For this purpose I had constructed an insulated box which now became my chief concern, since the adult specimens could not tolerate more than 27° C. At each stop I placed the box in the coolest place I could find and also kept the box covered with a wet cloth, counting on the evaporation to keep it cool.

From Pedricena to Torreon the road descended gradually, going through increasingly arid country. Collecting along this stretch was good, especially for bees and some beetles (of Sonoran zone affinity). Shortly after lunch we reached the Rio Nazas just





FIG. 49. *Hippomelas caelata* LeConte. Photograph by Mr. George Bradt.

west of Torreon. Although a modern roadbed had been completed from Durango to Torreon and some of it paved, a bridge across the river was non-existent. We therefore had to follow a narrow and hideous little road along the south side of the river for a number of miles. In places it was filled with mud and water; in other places it went over steep hillsides, across rocky ledges, and down boulder-strewn gullies. Finally, without mishap, we arrived at Torreon (elevation 2560 feet).

East of Torreon lies Laguna de Mayran, a depression into which for millions of years the Rio Nazas has spilled its silt and now has almost filled the basin. Known as the "Laguna District" it has been turned into one vast, irrigated, agricultural area. Originally it was covered with a wilderness of *Prosopis*, *Atriplex*, *Suaeda*, and other halophytic plants, but now it is cultivated land, used chiefly for growing wheat and cotton. In addition to Torreon, which is on the edge of the irrigated area, a number of agricultural villages are located along the road just east of the city. Near one of these, San Pedro, we found an unirrigated, grass-covered region off the road where we camped in the midst of mesquites and oaks. Here night collecting, especially with the lanterns, was good, and Schramel chased a mature tarantula into its hole and then dug it out. From Samalayuca where Gertsch took the first specimens of tarantulas we had occasionally seen and taken examples of the group. Because of their habits only the mature males are seen walking about during the day.

From San Pedro the road swings to the south towards the northern flank of the Sierra de Baicuco, a dry, east-west oriented mountain that lies along the southern shore of Laguna de Mayran. We passed outliers of this sierra that were almost covered by the delta that had been laid down in the lake. Protruding from the vast level plain, these looked much like the upturned hulls of huge sunken ships. At various points along the road we stopped and collected. At the sides of the roads many annuals were in bloom, especially composites. At one place great masses of sunflowers grew along an irrigation ditch. At all these places we collected great numbers of giant grasshoppers, bees, beetles, flies, and some spiders. East of Laguna de Mayran the road runs through very arid desert, with the elevation rising gradually. For many miles the drainage is west into Laguna de Mayran so that these streams also have deposited their silt in the lake. For a hundred miles or so we drove through this country, which receives an annual average rainfall of 3 inches. There is sufficient water for mesquite only in the low spots. Much of the area is bare, and only a sparse cover of acacia, creosote bush, and agave is found. The human population is correspondingly thin. Here and there we saw a few people in temporary shelters, collecting the fibers of the agave. The highway is good, a well-paved road carrying a great deal of traffic between Torreon and the eastern cities of Saltillo and Monterrey. Low mountains running in an east-west

direction could be seen during the day south of the road, but in the late afternoon we could see a solid range of mountains ahead of us that ran north and south. These we knew were the Sierra Madre Oriental. In the late afternoon we found a camp site (approximate elevation 4000 feet) near the village of Cabos just a few miles west of the Sierra Madre. Here there seemed to be a bit more moisture; large mesquite trees were growing in some spots, and some land was under cultivation with the use of dry farming techniques, since not enough permanent water was available for irrigation. Coming across the desert we had at various stops collected monilemas. At the Cabos camp there were numerous cacti, especially cholla, and, true to expectation, we got a good collection of the beetles.

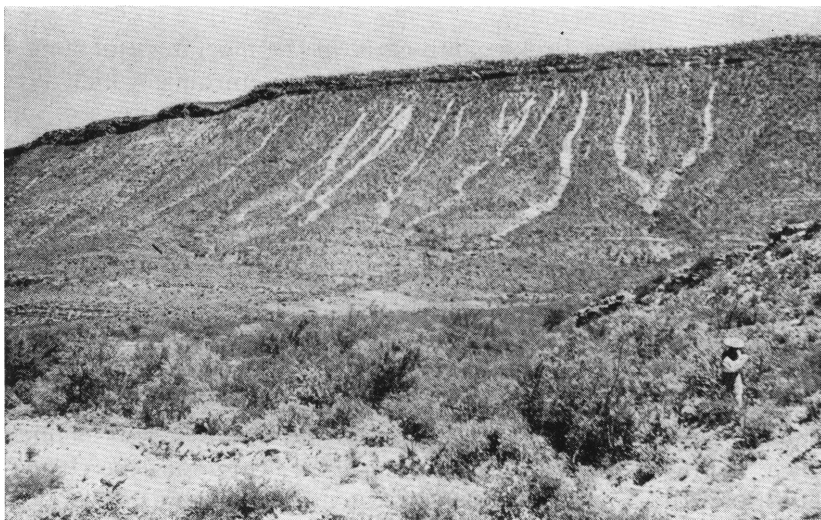


FIG. 50. Terrain just west of Saltillo.

On the morning of August 22 we collected for several hours and then started eastward. Seemingly the mountains we were approaching were one vast impenetrable mass, but when we reached them we found that the road ascended a relatively broad valley surrounded by almost barren mountains. We climbed gradually to about 5600 feet (fig. 50) and then suddenly on the other side, lying nestled in a broad valley surrounded by mountains, we saw the beautiful city of Saltillo (elevation 5278 feet).

From Saltillo we took the road to Piedras Negras by way of Monclova. Some distance out of the city we found a camp site in an area dominated by mesquite and creosote bush. Here were a number of species of cacti, especially echinocacti, which we had not seen previously on the trip. That night a specimen of *Saturnia* (*Agopema*) *galbina*, a pretty little saturniid moth, came to light. Clearly we were now entering another type of vegetation from that previously encountered. It was difficult to say just what the change was, but we all recognized it. Obviously this area receives more rain than the basin to the west, which we had just passed through, and, although we were still in semi-arid to arid country, there was enough moisture for dry farming in the lower places. According to Arias (1942), Saltillo receives 13.34 inches of precipitation, while Ciudad Lerdo (just west of Torreon) receives 9.6 inches.

On August 23 we broke camp early in the morning and started northward. The road ran through low mountains, which bore very scanty vegetation. Gradually the elevation decreased, and within 30 miles we had dropped to approximately 3100 feet. With the decreased elevation for a time the countryside seemed drier, but 60 to 70 miles (by road) north of Saltillo the mountains became much lower, were dispersed with broad valleys, and the vegetation was much denser. Summer rainfall in these regions is torrential, and all along the route most of the bridges, huge reënforced concrete structures spanning tiny stream beds, had been completely washed out.

Along the sides of the pavement great masses of annuals were in bloom. Joshua tree yuccas appeared and great masses of mesquite. Shreve (1942) notes that this area "combines the characteristics of the desert with those of the arid brushlands of Tamaulipas." Now we decided to try a new method of collecting. There was little traffic on the road, so the passenger in each "jeep" was given a net and, while the driver drove very slowly, the net was swept through the mass of flowers growing beside the pavement. Occasionally we stopped, shook out the larger pieces of vegetation, and dumped the remainder of the catch into large cyanide jars. The method was successful, and over a stretch of 10 to 15 miles we collected several thousand specimens.

After passing through the beautiful Cañon de San Lazaro we entered a still more mesic area with relatively heavy vegetation. That evening, August 23, we camped south of Monclova near the

town of Gloria at an approximate elevation of 3000 feet in a dense thicket (fig. 51). Here collecting was excellent, and Gertsch and Michener collected numerous examples of diurnal Lepidoptera. Cazier as usual was the expert on moneilemas, getting 127 the first night, while the rest of us got 119, for a total of 246. The temperature and humidity were high, and I had great trouble keeping the *Drosophila* box cool. The next day investigation showed the flora to be an amazing combination of creosote bushes, large yuccas, mesquites, and many cacti, plus many bushy and

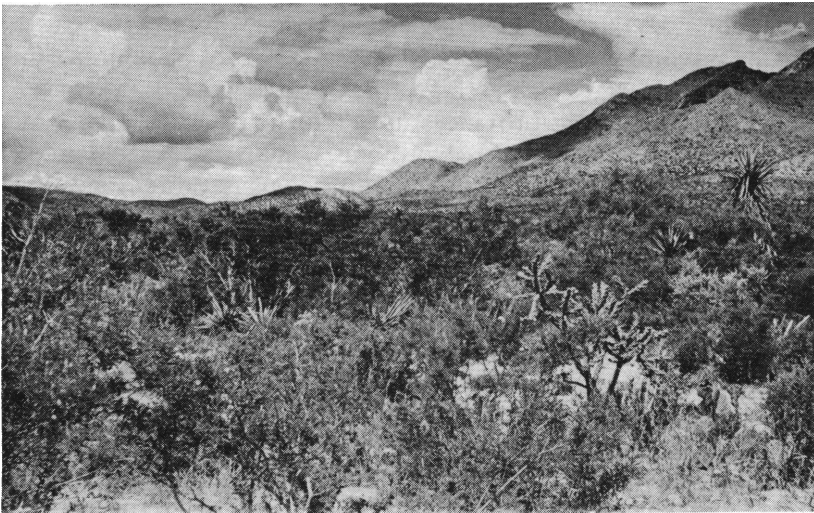


FIG. 51. Vegetation at Monclova camp.

herbaceous flowering plants. Orange butterflies of the genus *Anaea* were rather abundant. We spent all August 24 collecting here. Previously, as we had crossed from Durango to Saltillo, we had found a few moneilemas sitting on chollas during the day, which was surprising as they normally hide by day and come forth to feed, copulate, and oviposit on the cacti only at night. Here we found numbers of them sitting on the chollas, and, in spite of a heavy thundershower during the evening, we made a large collection, giving us almost 600 specimens of the genus at this single locality.

Early next morning we broke camp and, after a short stop at Monclova, headed for the United States-Mexican border. Occasionally that day we made short stops to collect, and late in the

afternoon we reached Piedras Negras, passed through customs, and into Eagle Pass, Texas. Monday morning the long trek homeward was started, and, by driving hard, we reached New York at noon, Sunday, August 31.

#### SUMMARY

In 11 weeks we collected over 100,000 specimens of insects and arachnids, plus several hundred reptiles of various sorts. The collections were made from a variety of major habitats: the bolson area of Chihuahua with its Desert Shrub and Desert Grassland, the woodland oak region, the high llanos, the Montane Forest, the Cactus Savanna, the extremely arid desert of Coahuila, and finally the mesquite bush area around Monclova.

Utilizing the biotic provinces as set forth by Dice (1943), we collected extensively in three provinces, i.e., the Apachian, the Durangan, and the Chihuahuan, and touched the edges of the Potosian and Tamaulipan. The Chihuahuan, which embraces the Chihuahua Desert as mapped by Shreve (1942), was crossed twice, from El Paso to Santa Barbara and from Cuernavaca to Saltillo. Collections were made where it merged with the grasslands on the west, with the Cactus Savanna on the southwest and south, and with the mesquite on the east. By themselves, these collections are of great biological value not only because they contain many new species and subspecies, but also because of the information they give concerning the interrelationships of the faunas, showing how the Tropical and Temperate faunas interdigitate and also indicating the relationships of the insect faunas to the question of the biotic provinces. The subsequent papers that are now in preparation will discuss these matters fully. Suffice it to point out here that in *Drosophila pseudoobscura*, which was studied by Dobzhansky (1948), it was shown that this area contained a new chromosome pattern and also that a remarkably steep gradient of change must exist between the *pseudoobscura* population of the high plateau area and that of the region immediately to the south.

Valuable as these collections are, their intrinsic worth will be considerably increased if in subsequent years collections can be made along the western side of the Sierra Madre Occidental, across the great transvolcanic region south of Zacatecas, and along the eastern side of the Sierra Madre Oriental. This expedition tapped the heart of the Mexican plateau area. Collections from the



three flanks and especially from the barrancas of the Sierra Madre Occidental would add immeasurably to the value of what has been collected on this expedition.

Through the kindness of Dr. David Rockefeller the collections are now prepared for study and will be made available to specialists. It is hoped that through a study of this material, correlated with that from the United States and other sections of Mexico, a better understanding of the relationships between the Nearctic and Neotropical faunas will be gained.

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