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The Amphibians and Reptiles
of Sinaloa, México

BY

LAURENCE M. HARDY AND ROY W. McDIARMID

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INTRODUCTION

The Mexican state of Sinaloa supports a varied biota that reflects the intricate nature of the transition between the fluctuating temperate environments of North America and the stable tropical environments of Middle America. For more than 100 years biologists have been interested in the amphibian and reptile fauna of the region. Much recent attention has been due to increased accessibility of a major portion of the state. Mexican Highway 15 and its numerous side roads now extend the entire length of the coastal lowlands, facilitating work by herpetologists on zoogeographic problems posed by the merger of the tropical and temperate biotas. Consequently numerous collections have accumulated, permitting the present report.

The lowlands of Sinaloa were visited first by collectors from European museums early in the nineteenth century. The port of Mazatlán served as a shipping point for specimens from Sinaloa and other areas in northwestern México. Early reports by Wagler (1830) of specimens in the Munich Museum, by Gray (1831, 1855) of specimens in the British Museum, by Weigmann (1834) and Peters (1867) of specimens in the Berlin Museum, by Jan (1863) of specimens in the Leipzig Museum, and by Fischer (1883) of specimens in the Hamburg Museum, reflect the initiative of the early collectors and naturalists, such as F. Deppe.

A collection made at Mazatlán by Ferdinand Bishoff and deposited in the Smithsonian Institution was the subject of papers by Cope (1864, 1868).

In the early 1880's a noteworthy collection was accumulated by Alfonso Forrer from the vicinity of Mazatlán and Presidio. This collection, which includes several type specimens, was sent to the British Museum (Boulenger, 1882, 1883; Günther, 1882, 1885-1902). Evidently part of this collection also was sent to the United States National Museum (Stejneger, 1893).

Collections from Mazatlán made by Gustav Eisen and Frank H. Vaslit, and also by David Starr Jordan, that were deposited in the California Academy of Sciences and the Natural History Museum at Stanford University, were the subject of reports by Van Denburgh (1898) and McLain (1899).

During parts of 1897, 1898, and 1899, E. W. Nelson and Edward A. Goldman traversed the entire west coast of México from near Guaymas, Sonora, southward to San Blas, Nayarit (Goldman, 1951). Many specimens were secured by these men at Culiacán, Mazatlán,

Rosario, and Plomosas, and sent to the United States National Museum.

Two other small collections from near Mazatlán were made about 1920. Specimens collected by J. A. Kusche from "Venodido" (Venadillo) were sent to the United States National Museum and reptiles and amphibians collected by Paul D. R. Ruthling were deposited in the American Museum of Natural History.

During the past 30 years herpetologists have shown renewed interest in the herpetofauna of Sinaloa. The variety of species, many at the geographic limits of their distributions, has stimulated the publication of many reports pertaining to reptiles and amphibians from the state. The first work on the herpetofauna of Sinaloa was by Taylor (1938). Although Taylor's paper is limited in scope, it lists the species of amphibians and reptiles known from the state and includes a brief résumé of previous collections. Since Taylor's work, several papers have appeared that deal with various aspects of the herpetofauna—particularly notes on distributions, range extensions, ecology, life history, and taxonomy. Among these are reports by Martin del Campo (1941), Smith and Van Gelder (1955), Lewis and Johnson (1956), Duellman (1957b), Fugler and Dixon (1961), Campbell and Simmons (1962), and Scott (1962). Other reports dealing with one or a few species are mentioned in appropriate accounts beyond. It is important to realize that no author since Taylor has dealt with the total herpetofauna of Sinaloa, or even of large areas within the state; and yet, within the last ten years, increased collecting in Sinaloa has more than tripled the number of herpetological specimens previously available from the state.

For the past 20 years students of Mexican herpetology have relied heavily on the checklists by Smith and Taylor (1945, 1948, 1950b). Anyone interested in the reptiles and amphibians of México recognizes the value of the detailed studies by Bogert and Oliver (1945) on the herpetofauna of Sonora, by Martin (1958) on the herpetofauna of the Gómez Farías region in southern Tamaulipas, by Zweifel (1960) on the herpetofauna of the Tres Mariás Islands, and by Duellman (1960) on the amphibian fauna of the Isthmus of Tehuantepec and on the herpetofauna of Michoacán (1961, 1965).

In the summer of 1962, the second author began a four-month study of the lowland herpetofauna in northwestern México. Data gathered formed the basis for a study of the biogeography and

evolution of the amphibians and reptiles in the Pacific lowlands of western México. The following summer, the first author collected amphibians and reptiles in Sinaloa and made ecologic observations. On the basis of the latter material and preserved specimens in the collection of the University of Kansas, the first author initiated a study of the amphibians and reptiles of Sinaloa. Early in 1964 we started correspondence that pointed up the similarities of our studies, and as a result combined our efforts toward preparation of this publication based primarily on specimens readily available to us.

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University of Illinois, Museum of Natural History; Stanford University Natural History Museum; Robert C. Stebbins, Museum of Vertebrate Zoology, University of California, Berkeley; Charles F. Walker, University of Michigan, Museum of Zoology; Ernest E. Williams, Museum of Comparative Zoology, Harvard University; William H. Woodin and Merritt S. Keasey, Arizona-Sonora Desert Museum, Tucson; Richard G. Zweifel, American Museum of Natural History.

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DESCRIPTION OF THE AREA

Physiography

Sinaloa is a long, narrow state that is situated on the western coast of México between 22°30' and 27°00' north latitude and between 106°25' and 109°30' west longitude; northward from Mazatlán the coastline lies in a direction of approximately 315° from north. The state has an area of 58,092 square kilometers (Encyclo. Brit., 1967, 20:558) and a total relief of 2779 meters. Sinaloa is bounded by Sonora to the north, by Chihuahua and Durango to the east, and by Nayarit to the south.

The Sierra Madre Occidental lies along the entire length (about 560 kilometers) of the state on the east. In the northern part of the state the Sierra Madre Occidental is less rugged and slightly lower than in the southern half. A narrow coastal plain, which consists mainly of mature outwash slopes from the adjacent mountains and broad alluvial valleys associated with the major rivers, extends the entire length of the state. In general the lowlands are uniform except near Culiacán, where six small mountains (less than 900 meters in elevation) are separated from the sierra by lowlands less than 300 meters in elevation. Sinaloa has seven small moun-

tain peaks exceeding 2100 meters in elevation, but only one (east of San Ignacio) exceeds 2700 meters. The Gulf of California and the Pacific Ocean limit the state to the west. The coast is extensively divided into small islands and fringes of land that parallel the mainland (Fig. 1).

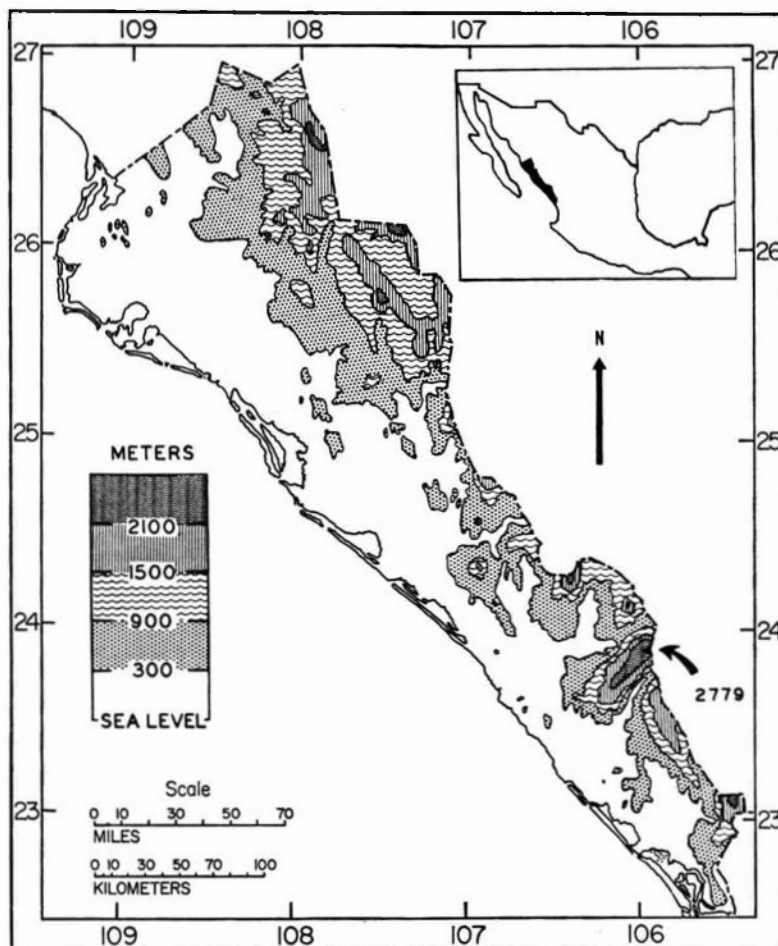


FIG. 1. Physiographic map of Sinaloa, México.

At least ten major rivers, all of which flow into the Gulf of California or the Pacific Ocean, drain the state. The most important rivers from north to south are: Río Fuerte, Río Sinaloa, Río Mocorito, Río Culiacán, Río San Lorenzo, Río Elota, Río Piaxtla, Río

Quelite, Río Presidio, and Río del Baluarte. Two river valleys (Culiacán and San Lorenzo) of less than 300 meters elevation extend into Durango, and another (Fuerte) transects the state in the north. The other rivers and their tributaries penetrate deeply into the mountains.

Climate

The climate of Sinaloa is characterized by marked wet and dry seasons. Three factors are important in controlling this climate. The first factor is the latitude of the state. The second is the temperature of the bordering Gulf of California and Pacific Ocean. The annual range in temperatures of the coastal waters increases from south to north and secondarily influences the annual temperatures on the coastal plain and foothills in the same direction. Another factor influencing the climate in Sinaloa is the direction of the prevailing winds. Winds blow from the northern arid regions of Sonora during the dry season and notably affect the vegetation. In the southern lowlands the winds are cooler because of more open access to the waters of the Pacific Ocean. The cooling effects of wind in local areas, for example Mazatlán, account for lower mean annual temperatures at these locales than in areas only a few miles inland. The velocities and direction of the winds vary with the season, higher velocities occurring during the dry season. At Mazatlán the wind velocities vary from 4.3 m/sec. to 6.1 m/sec. with a yearly average of 5.1 m/sec. The winds are northerly from November through April and southwesterly from May until October (Roden, 1958).

Climatic data (taken from Contreras Arias, 1942) at six localities in Sinaloa are presented graphically, illustrating the mean monthly temperature and mean monthly precipitation at three lowland and three highland sites. A lowland and highland site are compared in northern Sinaloa (Fig. 2), in central Sinaloa (Fig. 3), and in southern Sinaloa (Fig. 4). The three lowland sites of Ahome, Guamúchil, and Mazatlán are compared (Fig. 5), and the three highland sites of Choix, Badiraguato, and Pánuco are compared (Fig. 6).

Temperature

There is less than a degree difference among the mean yearly temperatures at the six sites, with Mazatlán registering the lowest at 23.6°C and Choix and Guamúchil showing the highest at 24.5°C. The hottest mean monthly temperatures in the lowlands occur in

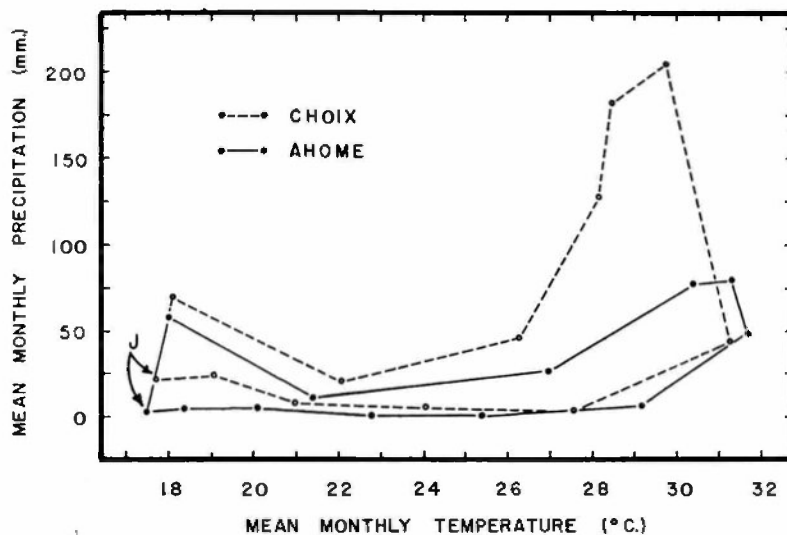


FIG. 2. Temperature-moisture climograph comparing a lowland (Ahome) and highland (Choix) locality in northern Sinaloa, México. Each point represents a month, proceeding counter-clockwise from January (J).

July and August, and decrease from 38.6°C at Ahome to 29.5°C at Mazatlán. In the highlands the warmest months are May and June, and the temperatures decrease southward from 39.1°C in June at Choix to 34.9°C in May at Pánuco. The highest daily temperatures decrease from north to south and usually are recorded in July, September, or October. The lowest mean monthly temperatures in the lowlands was 8.1°C for January at Guamúchil. The lowest lowland temperature recorded, -1.1°C, was also in January at Guamúchil. In the highlands the lowest mean monthly temperature was recorded from central Sinaloa, 6.2°C at Badiraguato. The lowest temperature reported in the state was at Badiraguato in January when the thermometer dipped to -2.5°C.

Temperatures fluctuate between monthly and daily extremes in northern Sinaloa but remain nearly constant in the southern part of the state. For brief periods during the dry season, temperatures in the north may show a daily fluctuation of 20°C. During the months of June to November the daily fluctuations rarely exceed 15°C and commonly remain near 11°C. Stability in temperature is characteristic of the southern limits of the state; at Mazatlán the greatest fluctuation is 5.1°C in April, and at Pánuco the greatest monthly fluctuation is 15.2°C in March. Temperatures are almost continu-

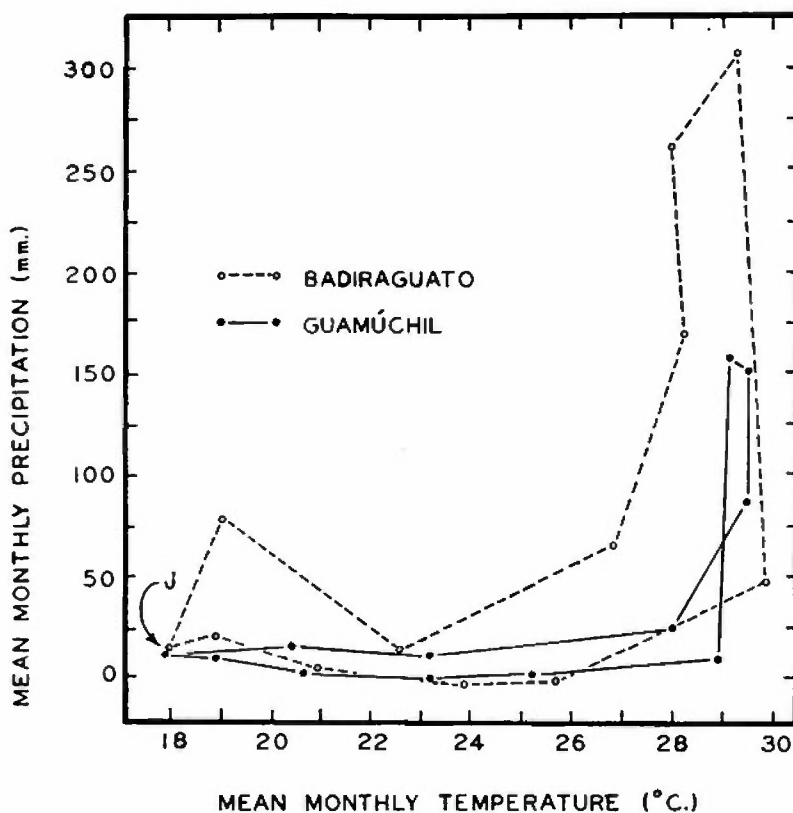


FIG. 3. Temperature-moisture climograph comparing a lowland (Guamúchil) and highland (Badiraguato) locality in central Sinaloa, México. Each point represents a month, proceeding counter-clockwise from January (J).

ously favorable to growth throughout the region, particularly during summer when water is readily available. Frost is not uncommon at higher elevations in the northern and central portions of the state but is unknown in the southern lowlands. Snowfalls are of almost yearly occurrence in January and February at high elevations along the northeastern border (Gentry, 1946b:453).

Rainfall

Annual precipitation increases from north to south. In the lowlands the annual totals increase from 321 mm at Ahome to 478 mm at Guamúchil to 851 mm at Mazatlán. In the highlands the annual rainfall increases from 767 at Choix to 982 at Badiraguato to 1279 at Pánuco. The highland sites receive more rain than comparable

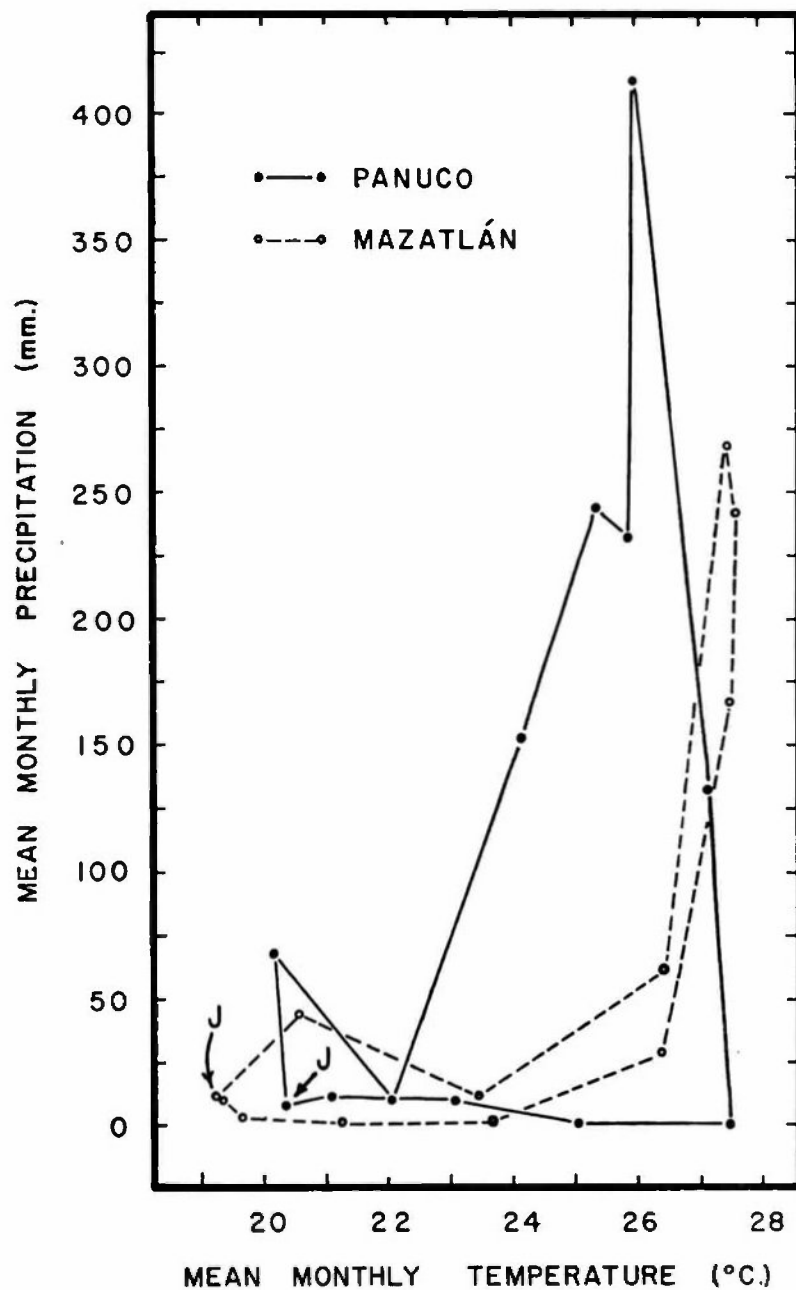


FIG. 4. Temperature-moisture climograph comparing a lowland (Mazatlán) and highland (Pánuco) locality in southern Sinaloa, México. Each point represents a month, proceeding counter-clockwise from January (J).

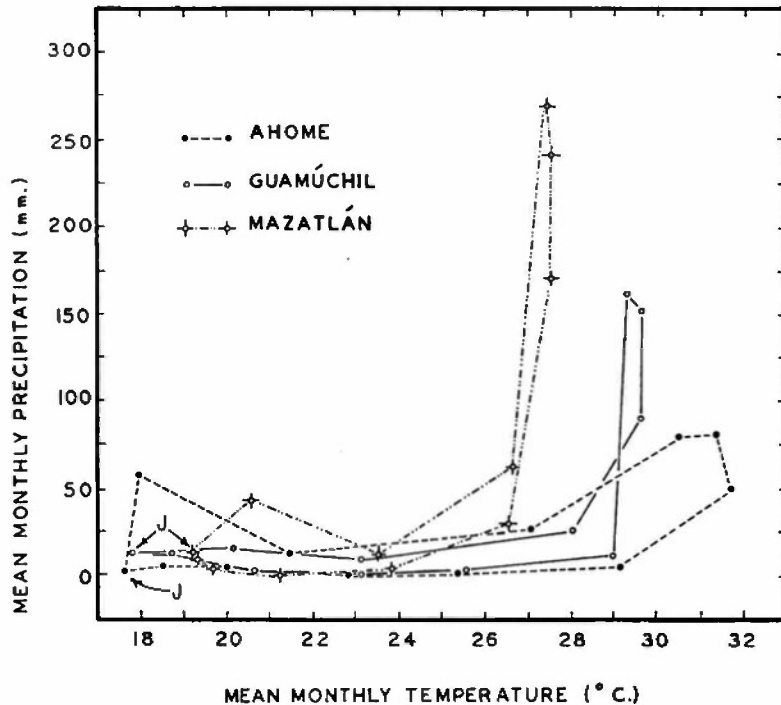


FIG. 5. Temperature-moisture climograph comparing the three lowland localities in northern (Ahome), central (Guamúchil), and southern (Mazatlán) Sinaloa, México. Each point represents a month, proceeding counter-clockwise from January (J).

sites in the lowlands. Precipitation is restricted mainly to the months of July, August, and September. All localities except Guamúchil exhibit a secondary peak of precipitation in December. Vegetative growth is dependent on heavy summer rains. The second author has traveled the length of the state in December and found the vegetation generally inactive and leafless, except along the rivers or in areas where the water table is unusually high, as in the extreme southwest near Teacapán. In making the same trip in July, he found the vegetation in a progressively advanced stage of leaf and general activity the further south he traveled.

The percentage of annual precipitation that falls in July, August, and September, also increases gradually from north to south. The small amount of precipitation that falls from November through June results in a very dry period during the first six months of the year, especially in the northern lowlands (Shreve, 1944:108-09). It

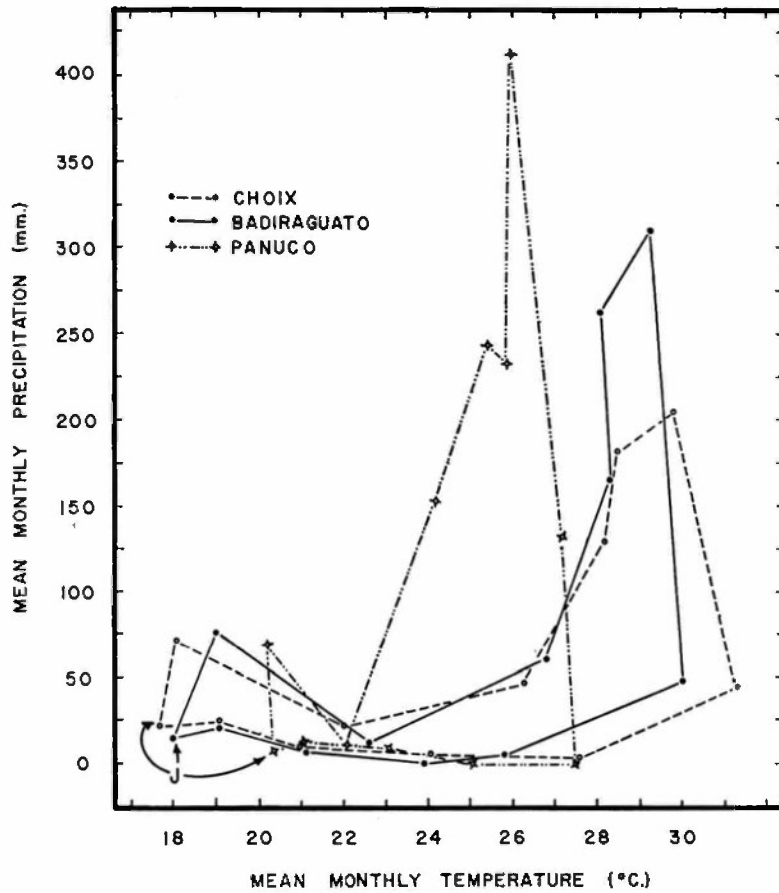


FIG. 6. Temperature-moisture climograph comparing the three highland localities in northern (Choix), central (Badiraguato), and southern (Pánuco) Sinaloa, México. Each point represents a month, proceeding counter-clockwise from January (J).

is noteworthy however that the first half of the year is nearly as dry in the southern highlands at Pánuco as it is in the northern lowlands at Ahome.

The distribution of rainfall is related to wind direction and ocean temperatures. The northern winds originate in the desert regions of Sonora and Baja California and carry little moisture. The southern winds carry moisture-laden clouds from the Pacific Ocean north into the Gulf. The mountainous terrain of Baja California prevents westerly winds off the Pacific Ocean from carrying rain into central Sinaloa and exerts a rain shadow effect on the northern portion of

the state. A comparison of wind-direction, seasonal rains, and migratory low pressure systems over western México indicates that northerly winds are associated with low pressure to the east and southerly winds are associated with low pressure to the northwest. The beginning of the rainy season coincides with the appearance of southerly winds that carry moist air into the Gulf of California and showers to the coastal lowlands. Although rain-laden clouds are carried overland by southerly onshore winds during July through September, the relief of the coastal plain is such that storm clouds do not release their rain until a slight increase in elevation is encountered. The coastal plain of Sinaloa is flat, and rain clouds often pass over without dropping moisture—for example, in central Sinaloa at Guamúchil and Badiraguato (Fig. 3). This contributes to the xeric conditions on the coastal plain as compared to the foothills, and is reflected in the composition of the flora and fauna.

Vegetation

The physiographic and climatic conditions in Sinaloa are reflected in the composition of the natural vegetation and together with it provide habitat for a rich and diverse amphibian and reptile fauna. The nature of the transition between the northern temperate and the southern tropical environments is gradual but clearly evident in a comparison of the xeric thorn woodland vegetation of the arid northern lowlands to the deciduous semiarid forest vegetation characteristic of the more mesic southern lowlands, or in a comparison of the pine forests of the northern highlands to the subtropical and tropical dry forests found at middle elevations in the southern portions of the state.

The vegetation of northwestern México, especially Sinaloa, has been studied by only a few workers. Brand (1936) summarized previous work and listed the more important references. Accordingly, a historic sketch prior to 1936 need not be repeated here. Brand recognized three different associations on the coastal plain as expressions of temperature and precipitation and a fourth association along the eastern border of the state. Shreve (1937) described the vegetation of the lowlands of Sinaloa and discussed the thorn forest with special reference to profile, density, foliation, stratification, and components.

The vegetation of the Río Mayo Valley, Sonora, was thoroughly studied by Gentry (1942). He recognized four major divisions: thorn forest from sea level to about 600 meters; short-tree forest in

areas from 300 to 1000 meters; oak forest from 900 to 1500 meters; and, pine forest at elevations from about 1500 to 2750 meters. Much of the information presented on the Río Mayo vegetation has been assimilated into the description of the vegetation of the northern and central sections of the state.

Two important papers by Gentry on the vegetation of two mountains in Sinaloa appeared in 1946. One dealt with the flora of Sierra Tacuichamona, an isolated peak in the central part of the state (Gentry, 1946a). The other pertained to the vegetation of Sierra Surotato in the northern highlands (Gentry, 1946b). General works (*e. g.*, Leopold, 1950) include Sinaloa in their coverage, but without specific details. Other than the papers by Shreve and Gentry, there are no detailed treatments of the flora of the state available at this time.

Because of the paucity of information pertaining to the vegetation of Sinaloa, we were faced with several problems in our attempt to present a vegetational classification that would be useful in interpreting the distributional patterns of the fauna and still meet the demands of most plant geographers by presenting a classification of the vegetation by type, rather than a classification of animal habitat based on vegetation, as proposed by Duellman (1965:640). Difficulty was encountered in those areas where the natural vegetation had been cleared and the land currently is being used for agricultural purposes. Agricultural development has been favored by the availability of hydroelectric power, and water resources made usable by the recent construction of dams on the Río Fuerte and on the Río Culiacán. As a result, large areas are under cultivation from Los Mochis south to Guasave, and extensive tracts are being cleared north and west of Culiacán. The floodplains of the northern rivers are mostly devoted to vast fields of sugar, cotton, garbanzos, tomatoes, and corn. In the agricultural areas the native vegetation has been almost completely destroyed, and it is nearly impossible to detect any changes in the physiognomy or composition of the natural vegetation, if such changes did exist.

A system of vegetation classification proposed by Holdridge (1947:367-368) is utilized in this study. Holdridge contended that a plant formation of a particular area is a reflection of the interaction between mean annual precipitation and mean annual biotemperature with respect to the amount of evaporation and transpiration. With the aid of the chart presented by Holdridge (1964:18), Sinaloa can be conveniently divided into five bioclimates.

Each bioclimate is characterized by a different plant formation. The five plant formations, all of which are in the tropical region, are: Tropical Thorn Woodland, Tropical Semiarid Forest, Tropical Dry Forest, Subtropical Dry Forest, and Lower Montane Dry Forest (Fig. 7).

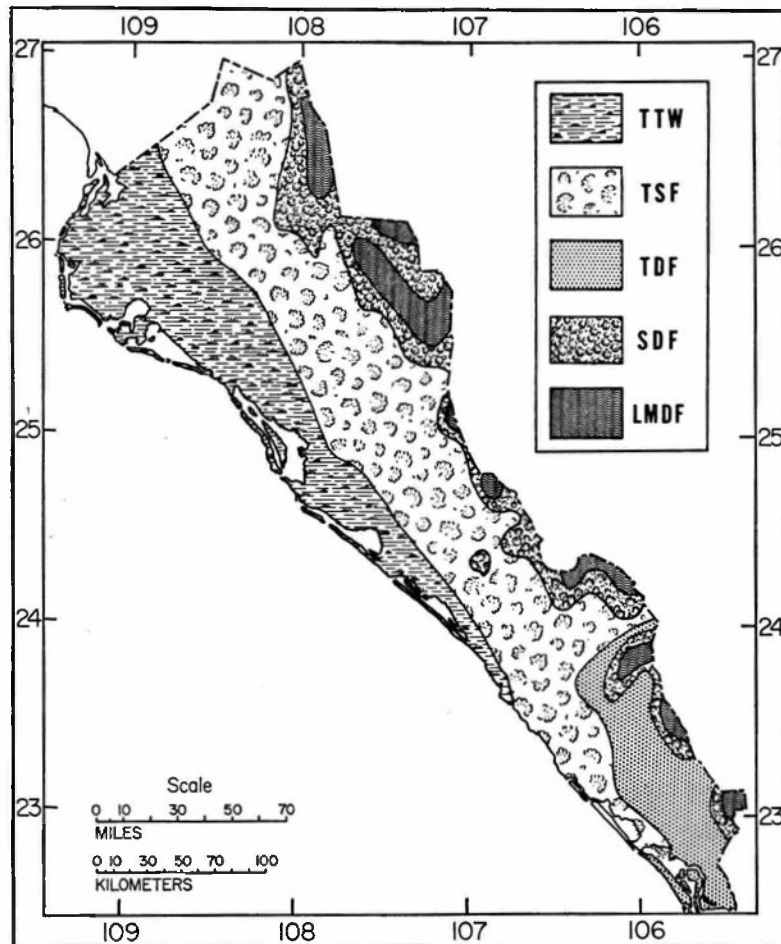


FIG. 7. Generalized vegetation map of Sinaloa, México. TTW = Tropical Thorn Woodland; TSF = Tropical Semiarid Forest; TDF = Tropical Dry Forest; SDF = Subtropical Dry Forest; LMDF = Lower Montane Dry Forest.

Tropical Thorn Woodland

Tropical Thorn Woodland vegetation as used in this discussion includes: the subtropical mimosaeae-cacti vegetation, as understood

by Brand (1936:24-25); the northern portions of the thorn forest, as presented by Shreve (1937:608-611); the thorn forest as interpreted by Gentry (1942:27-30); and part of the thorn forest as discussed by Leopold (1959:35-36). Thorn woodland vegetation is found from sea level to about 500 meters elevation throughout the northern lowlands, southward along the coast to near the mouth of the Río Elota (Fig. 7).

Thorn woodland vegetation is not uniformly distributed in Sinaloa but is arranged in clumps, becoming nearly continuous in moist habitats. Thorn woodland is found on the lowland basaltic hills and mesas and to a lesser extent in the lowland valleys. The vegetation of the mesas and slopes is uniform in type of growth with close spacing of the individuals (Plate 1, Fig. 1). The vegetation found along the margins of arroyos and in valleys is varied and irregular in formation and individual spacing (Plate 1, Fig. 2). The arroyos support a riparian vegetation composed of evergreens and partially deciduous types. The valleys are often dominated by pure stands of *Prosopis chilensis* (Gentry, 1942:29).

The belt immediately along the coast is more arid than the interior. Likewise, the vegetation is reduced and more open (Plate 2, Fig. 1).

The average height of thorn woodland vegetation is about seven meters. There is a strong influx of succulent and thorny plants giving rise to a heterogeneous vegetation dominated by xeromorphic deciduous leaf types (Plate 2, Fig. 2). Creosote bush, saguaro, and ocotillo, common to the north in Sonora, are virtually unknown, being replaced by numerous species of *Caesalpinia*, *Cassia*, *Acacia*, *Cercidium*, *Jatropha*, and *Mimosa*. *Acacia cymbispina* forms about 60 per cent of the cover in thorn woodland (Shreve, 1937:609). Gentry (1942:30) mentioned *Acacia cymbispina* as the dominating successionist in *Milpa* clearings and along roads and trails in the valley of the Río Mayo, Sonora. Species of *Ficus*, *Enterolobium*, and *Taxodium*, and other tropical trees become increasingly numerous in the river valleys. Thickets of the characteristic desert plants including *Cercidium*, *Encelia*, and *Opuntia* have been reported in the valley of the Río Fuerte (Shreve, 1934:377). Other species of common plants found in the thorn woodland are: *Zizyphus sonorensis*, *Pithecollobium sonorae*, *Cercidium floridum*, *Pachycereus pecten-aboriginum*, *Franseria cordifolia*, *Karwinskia humboldtiana*, and *Croton alamosanus*.

Tropical Semiarid Forest

The Tropical Semiarid Forest vegetation as used here is essentially the same as: the semi-arid scrub, as described by Brand (1936:25-27); the southern part of the thorn forest (Shreve, 1937: 608-610; Leopold, 1959:35-36); the short-tree forest (Gentry, 1942: 30-34); the tropical deciduous forest (Leopold, 1959:34-35). Semiarid forest is found between 300 and 1000 meters elevation in northern Sinaloa and continues south along the foothills to the coast near La Cruz, and then into southern Sinaloa on the coastal plain. Semiarid forest is bordered on the south by dry forest and on the east by subtropical dry forest. In several places tropical vegetation advances far into the Sierra Madre along deep barrancas and river valleys that extend at low elevations for many miles inland from the coastal plain (Fig. 7).

The semiarid forest is characterized by taller and more closely spaced vegetation than thorn woodland. The change in physiognomy is primarily due to the general increase in mean annual precipitation. There is an overall increase in density, particularly of shrubs and other undergrowth, which continues southward through the formation. In the north the vegetation is more xeric than along the slopes or in the southern lowland (Plate 3, Fig. 1; Plate 3, Fig. 2). The prevalent height of the vegetation is about 10 meters, although in some areas it is often less.

The dominant plants of the semiarid forest belong to the family Leguminosae. The subfamilies Mimosoideae and Caesalpinioideae contain more than a quarter of the total tree and scrub species of the formation, and possibly contribute three-quarters of the individuals comprising the vegetation (Brand, 1936:26). Trees are the dominant plants and tend to a uniform height. Succulents are relatively unimportant except for the large columnar cactus, *Pachycereus pecten-arboriginum*, which is an abundant and conspicuous species in the semiarid forest (Plate 4). None of the desert shrubs, such as *Atriplex*, *Encelia*, *Franseria*, and *Viguiera* is found in southern Sinaloa. *Acacia cymbispina*, with its boat-shaped spines, dominates the vegetation and frequently forms 90 per cent of the stand in lowland areas (Plate 5). In certain regions the abundance of *Acacia cymbispina* determines the level of the forest canopy, as is the case in an extensive stand 40 kilometers south of Culiacán. Terrestrial bromeliads and epiphytic species of *Tillandsia* are more abundant in the semiarid forest than in the thorn woodland to the north. The floodplains and valleys support *Ficus*, *Enterolobium*,

Taxodium, *Chlorophora*, *Pithecollobium*, *Haematoxylon* and *Caesalpinia*. Some of these trees reach a height of 30 meters or more. Palms are locally abundant especially on the floodplains. Smaller cacti are far less important in the composition of the vegetation of the semiarid forest than in the plant formations to the north. The slender *Rathbunia alamosensis* and the erect, dark green *Opuntia fuliginosa* are frequently found, but never in large colonies (Shreve, 1937:612). Most of the common cacti all seem to be shade-enduring species.

A dense shrub vegetation occurs along the coast, especially bordering lagoons. This vegetation consists primarily of mangrove (*Rhizophora mangle*), which is found as far north as Tiburón Island, Sonora. Various palms, especially *Cocos nucifera*, are common near the beach. The dense and nearly continuous forest of this coastal association occurs from Mazatlán southward. To the north of Mazatlán the coastal association is more open and separated by long stretches of sandy beach.

Some of the common plants of the semiarid forest are: *Acacia cymbispina*, *Ipomoea arborescens*, *Pachycereus pecten-arboriginum*, *Caesalpinia platyloba*, *Pithecollobium sonorae*, *Cassia emarginata*, and *Bursera simaruba*.

Tropical Dry Forest

The Tropical Dry Forest, as used here, is homologous in part with Brand's Humid Scrub (1936:26-27); Shreve's Thorn Forest (1937:208-210); and Leopold's Tropical Deciduous Forest (1959:34-35). The Tropical Dry Forest in Sinaloa occurs from sea level to about 1000 meters elevation in the southern portion of the state (Fig. 7). The differences between dry forest and semiarid forest result from increase in mean annual precipitation. Greater rainfall causes the more mesic plants to be major constituents of the flora, whereas these same plants were restricted to water courses in the northern, more arid portions of the state.

The physiognomy of the dry forest indicates a general overall increase in height and density (Plate 6) of the component plants. Shreve (1937:608) pointed out the marked increase of trees with broad leaves in southern Sinaloa and northern Nayarit in contrast to the xeromorphic leaves characteristic of trees in the thorn woodland and semiarid forest. The vegetation is a relatively low forest, 15 to 25 meters high, of stocky, broad-leaved trees (Plate 7, Fig. 1). Along water courses the dry forest assumes the dense character of

tropical evergreen forest. Interspersed throughout the lower vegetation are trees, *Enterolobium*, *Ficus*, and *Taxodium mucronatum*, that often reach a height of 30 meters or more. Many trees and shrubs carry epiphytes and parasites. Orchids are abundant along many of the waterways in southern Sinaloa and northern Nayarit. Plants common in the semiarid forest (*e. g.*, *Pachycereus pecten-arboriginum*) are much less abundant in the more moist dry forest.

The flat coastal plain of extreme southern Sinaloa supports a savanna type vegetation (Leopold, 1959:33). This formation is not a climatic climax but rather a result of the edaphic conditions of high water-table and poor drainage. In some regions, as near Teacapán, the plants utilize the subsurface water and remain leaved and green throughout the year; however, the high water-table prevents this forest from attaining the stature characteristic of the dry forest farther inland (Scott, 1962:8). Where forest is absent, the dominant plants of the savanna are coarse tropical grasses. Scattered trees may occur irregularly in the grassland. Palms and jicaros (*Crescentia alata*) are characteristic of the savanna in northern Nayarit.

Some of the common plants found in the dry forest of Sinaloa are: *Haematoxylum brasiletto*, *Erythrina occidentalis*, *Bursera grandifolia*, *Ceiba aesculifolia*, *Sapium lateriflorum*, *Castilla elastica*, *Cordia sonora*, *Jatropha cinerea*, *Sideroxylon capiri*, and *Ficus petiolaris*.

Subtropical Dry Forest

The subtropical Dry Forest occupies the central elevations along the western slope of the Sierra Madre Occidental between 1000 and 1500 meters (Fig. 7). This vegetation, equivalent to the Tropical Montane Forest of Gentry (1946a:359; 1946b:462), lies in about the same belt as the oak forest but has a different physiognomy and consists of different species. The presence of subtropical dry forest is attributed to conditions of exposure, soil, and local climate as affected by terrain.

This vegetation is generally limited to canyons and slopes where the greater amount of precipitation is retained by good soil and evaporation is reduced by cloud-cover. Gentry (1946b:453) credits the rain clouds and fog as a chief factor in supporting the abundant epiphytic growth and the varied forest of tropical nature. Shrubs are more dense than in the semiarid or dry forests at lower elevations (Plate 7, Fig. 2). Nearly all of the commonest species in the

canyons are shade-tolerant forms. The canyons are generally lined with trees as tall as 20 meters, including *Lysiloma*, *Brosimum*, *Platanus*, and *Oreopanax* (Plate 8, Fig. 1). There is a strong infusion of barranca and lowland trees in these canyons; *Ceiba acuminata*, *Ipomoea arborescens*, and *Inga eriocarpa* are often intermingled with highland species. Shrubbery is protected under the forest and is composed of numerous species. The moist slopes and canyon bottoms are thickly carpeted with shade-tolerant, broad-leaved herbs (Gentry, 1946b:460).

Plants characteristic of the subtropical dry forest are: *Lysiloma divaricata*, *Brosimum alicastrum*, *Ceiba acuminata*, *Bursera simaruba*, *Psidium sartorianum*, *Urera caracasana*, and *Phenax hirtus*.

Lower Montane Dry Forest

The Lower Montane Dry Forest vegetation includes the vegetation in Sinaloa referred to: the oak-agave-juniper association by Brand (1936:21); oak grassland and pine oak forest (Gentry, 1946a:361-362; 1946b:458-462); and pine-oak forest (Leopold, 1959:23-25). Oak forest is found in a relatively narrow strip along the western slope of the Sierra Madre, and is dominated by deciduous oaks and harsh bunch grasses. The oak forest occurs over the southern slopes at elevations of 1000 to 2000 meters and on the eastern side of Sierra Tacuichamona (Gentry, 1946a:361). At higher elevations, 1500 to 2400 meters, the dominant forest is a mixture of pine and oak (Plate 8, Fig. 2). There are only a few pure stands of pine in Sinaloa, and these are found only at the highest elevations. The oak and pine forests are all considered part of the Lower Montane Dry Forest (Fig. 7).

Gentry (1946a:361-362) listed four species of oak found on the eastern side of Sierra Tacuichamona: *Quercus albocincta*, *Q. tuberculata*, *Q. chihuahuensis*, and *Q. gentryi*. These same oaks are found on the southern exposures of the Sierra Surotato (Gentry, 1946b:460). On the more arid northern slope, a large part of the oak belt is occupied by harsh-leaved grasses, principally *Muhlenbergia*, *Tripsacum*, *Andropogon*, and *Heteropogon*.

At slightly higher elevations in the Sierra Surotato the forest is a mixture of pine and oak. *Pinus macrophylla*, *P. ayacahuite*, *P. oocarpa*, and *P. lumholtzii* are the common species of pine in northern Sinaloa. The species of oaks are different from those found on the Sierra Tacuichamona. *Quercus epileuca* is most abundant on moist, shady slopes and reaches a height of 20 meters.

Quercus pallescens, *Q. durifolia*, and *Q. candicans* are other common species in the oak-pine forest. *Arbutus xalapensis* is found with pines and oaks in some places in northern Sinaloa. No specific information is available concerning the pine and oak forests in the southern highlands of Sinaloa.

COMPOSITION OF THE HERPETOFAUNA

As presently understood, the herpetofauna of Sinaloa includes 131 species: 32 frogs (24.4% of the total number of species, 10 turtles (7.6%), 33 lizards (25.2%), 55 snakes (42.0%), and one crocodylian (0.8%). Although no salamanders have been reported from Sinaloa, additional collecting in the Lower Montane Dry Forest in the eastern part of the state will probably reveal their presence.

A comparison of the herpetofaunal diversity of Sinaloa with that of Michoacán and of Arizona is presented in Table 1. The data

TABLE 1.—Comparison of the Herpetofaunas of Arizona, Sinaloa, and Michoacán by Major Components.

	Arizona (295,024 sq. km.)		Sinaloa (58,092 sq. km.)		Michoacán (60,093 sq. km.)	
	Number	Percent	Number	Percent	Number	Percent
Salamanders.....	1	0.9	0	0.0	6	3.7
Anurans.....	20	17.5	31	25.6	38	23.4
Turtles.....	4	3.5	5	4.1	3	1.8
Crocodylians.....	0	0.0	1	0.8	1	0.6
Lizards.....	41	36.0	31	25.6	46	28.2
Snakes.....	48	42.1	53	43.9	69	42.3
Totals.....	114	100.0	121	100.0	163	100.0

for Michoacán are from Duellman (1965); those for Arizona are from Lowe (1964). Only the native terrestrial species are pertinent to the discussion. The marine turtles, the sea snake, and those forms which are known to be introduced are excluded.

There is an increase in the number of species of amphibians and reptiles from Arizona (114 species) through Sinaloa (121 species) to Michoacán (154 species) independent of total area. This cline in herpetofaunal diversity along a latitudinal gradient generally conforms to the results expected in moving from temperate to tropical environments. However, it should be noted that not all components conform to the north-south increase in diversity. The

lizards, for example, exhibit the least diversity in Sinaloa; they are more numerous in Michoacán than in Arizona but constitute a larger percentage of the herpetofauna in the latter region. In contrast, the number and percentage of turtles are lowest in Michoacán and highest in Sinaloa. Both frogs and snakes follow the expected pattern, increasing in number from Arizona to Michoacán. It is interesting to note that while snakes increase in number from north to south, their percentage of the total fauna is nearly the same in all three areas.

Distribution Within Habitats

The distribution of amphibians and reptiles in the five vegetation zones in Sinaloa is summarized in Table 2. Each species and subspecies has been designated as being abundant (A), moderately abundant (M), apparently rare (R), or absent (—) in each habitat. Locality records that we consider questionable are designated (?). The altitudinal distribution is based primarily on locality data associated with specimens examined, rounded off to the nearest 100-meter interval. If specimens lacked data as to elevation of capture, the locality is designated by the nearest of the following altitudes: 300, 900, 1500, 2100 meters (see Fig. 1).

Records on or very near the boundary between the two vegetation zones generally were assigned to a zone on the basis of total distributions. For example, a species which is moderately abundant in the Tropical Semiarid Forest and recorded from the Tropical Thorn Woodland only at a border locality is not included in the Tropical Thorn Woodland herpetofauna. This procedure compensates for the transition and interdigitation of borders between two vegetation zones and emphasizes the ecotonal nature of each boundary line.

Tropical Thorn Woodland.—Thorn woodland forest occurs in the most arid parts of Sinaloa along the northern Pacific coast. Sixty-one species and subspecies of amphibians and reptiles are known from this zone; of these 16 are considered abundant. They include: *Scaphiopus couchii*, *Leptodactylus occidentalis*, *Bufo kelloggi*, *B. marinus*, *B. mazatlanensis*, *Rana pipiens*, *Holbrookia maculata*, *Sceloporus clarkii boulengeri*, *Urosaurus ornatus lateralis*, *Cnemidophorus costatus griseocephalus*, *Leptodeira punctata*, *Masticophis flagellum piceus*, *M. striolatus*, *Natrix v. valida*, *Thamnophis cyrtopsis collaris*, and *Crotalus b. basiliscus*.

Many species characteristic of this area have exploited the new

TABLE 2.—Distribution of Amphibians and Reptiles in Sinaloa by Vegetation Types and Altitude. A, abundant; M, moderately abundant; R, apparently rare; —, absent; ?, questionable record; *, introduced.

SPECIES	Tropical Thorn Woodland	Tropical Semiarid Forest	Tropical Dry Forest	Subtropical Dry Forest	Lower Montane Dry Forest	Altitudinal Range, Meters
ORDER SALIENTIA						
Family Pelobatidae						
<i>Scaphiopus couchii</i>	A	A	M	—	—	0-400
Family Leptodactylidae						
<i>Eleutherodactylus augusti cactorum</i>	—	R	R	M	—	100-1500
<i>Eleutherodactylus hobartsmithi</i>	—	R	R	R	—	500-1100
<i>Eleutherodactylus occidentalis</i>	—	R	R	R	—	200-1500
<i>Eleutherodactylus vocalis</i>	—	R	M	M	R	400-1200
<i>Leptodactylus occidentalis</i>	A	A	A	—	—	0-700
<i>Syrrophus interorbitalis</i>	—	R	—	—	—	0-400
<i>Syrrophus modestus</i>	—	—	M	R	R	300-1500
<i>Tomodactylus niditus petersi</i>	—	—	—	M	R	900-1900
<i>Tomodactylus saxatilis</i>	—	—	—	—	R	1900
Family Bufonidae						
<i>Bufo alvarius</i>	M	?	—	—	—	0-300
<i>Bufo kelloggi</i>	A	A	M	—	—	0-200
<i>Bufo marinus</i>	A	A	A	—	—	0-500
<i>Bufo marmoratus</i>	R	A	M	—	—	0-400
<i>Bufo mazatlanensis</i>	A	A	A	R	—	0-1000
<i>Bufo occidentalis</i>	—	—	—	M	M	1100-2000
<i>Bufo punctatus</i>	R	R	—	—	R	0-2100
Family Hylidae						
<i>Diaglena spatulata</i>	—	M	M	—	—	0-300
<i>Hyla arenicolor</i>	—	—	R	R	R	1500-2100
<i>Hyla smaragdina</i>	—	—	R	M	R	500-1500
<i>Hyla smithi</i>	R	A	A	R	—	0-800
<i>Phrynohyas venulosa</i>	—	—	R	—	—	0-300
<i>Phyllomedusa dacnicolor</i>	M	A	A	—	—	0-500
<i>Pternohyla fodiens</i>	M	A	A	—	—	0-300
<i>Smilisca baudini</i>	M	A	A	R	—	0-800
Family Microhylidae						
<i>Gastrophryne olivacea mazatlanensis</i>	M	A	—	—	—	0-300
<i>Gastrophryne usta usta</i>	—	R	M	—	—	0-300
<i>Hypopachus oxyrrhinus oxyrrhinus</i>	—	M	M	—	—	0-300
Family Ranidae						
<i>Rana calesbeiana</i> *.....	M	—	—	—	—	0-200
<i>Rana pipiens</i>	A	A	A	M	R	0-1700
<i>Rana pustulosa</i>	—	?	—	R	R	1000-1500
<i>Rana sinaloae</i>	—	—	M	M	M	700-2000
ORDER TESTUDINES						
Family Kinosternidae						
<i>Kinosternon integrum</i>	M	A	A	R	—	0-1100
Family Emydidae						
<i>Chrysemys scripta hiltoni</i>	M	—	—	—	—	0-100
<i>Chrysemys scripta ornata</i>	—	M	M	—	—	0-200
<i>Rhinoclemys pulcherrima pulcherrima</i>	?	R	R	R	—	0-1100
<i>Terrapene nelsoni klaubers</i>	—	R	—	—	—	0-300
Family Testudinidae						
<i>Gopherus agassizii</i>	R	—	—	—	—	0-300
Family Chelonidae						
<i>Caretta caretta gigas</i>	—	—	—	—	—	Marine
<i>Chelonia mydas</i>	—	—	—	—	—	Marine
<i>Eretmochelys imbricata</i>	—	—	—	—	—	Marine
<i>Lepidochelys olivacea</i>	—	—	—	—	—	Marine
Family Dermochelyidae						
<i>Dermochelys coriacea</i>	—	—	—	—	—	Marine

TABLE 2.—Distribution of Amphibians and Reptiles in Sinaloa by Vegetation Types and Altitude.—Continued

SPECIES	Tropical Thorn Woodland	Tropical Semiarid Forest	Tropical Dry Forest	Subtropical Dry Forest	Lower Montane Dry Forest	Altitudinal Range, Meters
ORDER SQAMATA						
Suborder Sauria						
Family Gekkonidae						
<i>Coleonyx variegatus fasciatus</i>	R	R	R	—	—	0-300
<i>Gehyra mutilata</i> *.....	R	R	—	—	—	0-100
<i>Hemidactylus frenatus</i> *.....	R	R	—	—	—	0-100
<i>Phyllodactylus homolepidurus homolepidurus</i>	R	—	—	—	—	0-100
<i>Phyllodactylus tuberculatus saxatilis</i>	M	A	A	R	—	0-1700
Family Iguanidae						
<i>Anolis nebulosus</i>	M	A	A	M	R	0-2000
<i>Anolis utowanae</i>	—	R	—	—	—	50
<i>Callisaurus draconoides bogerti</i>	M	M	R	—	—	0-100
<i>Callisaurus draconoides brevipes</i>	—	M	—	—	—	150-400
<i>Ctenosaura hemilopha</i>	M	A	—	—	—	0-900
<i>Ctenosaura pectinata</i>	R	A	A	—	—	0-900
<i>Dipsosaurus dorsalis sonoriensis</i>	M	A	—	—	—	0-300
<i>Holbrookia maculata elegans</i>	A	A	M	—	—	0-600
<i>Iguana iguana rhinolopha</i>	M	A	—	—	—	0-300
<i>Phrynosoma solare</i>	M	M	—	—	—	0-900
<i>Sceloporus bulleri</i>	—	—	—	M	M	1000-2000
<i>Sceloporus clarkii boulengeri</i>	A	A	A	M	R	0-1700
<i>Sceloporus horridus albiventris</i>	—	M	M	—	—	0-600
<i>Sceloporus jarrovi jarrovi</i>	—	—	—	R	R	1100-2000
<i>Sceloporus magister magister</i>	M	—	—	—	—	0-300
<i>Sceloporus nelsoni</i>	—	A	A	M	R	0-1900
<i>Sceloporus shannonorum</i>	—	—	—	R	R	1800-2000
<i>Sceloporus utiformis</i>	—	M	M	R	—	0-1800
<i>Urosaurus bicarinatus tuberculatus</i>	R	A	M	—	—	0-1100
<i>Urosaurus ornatus lateralis</i>	A	M	—	—	—	0-500
Family Scincidae						
<i>Eumeces callicephalus</i>	—	M	R	—	—	0-600
<i>Eumeces colimensis</i>	—	—	—	R	R	1700
<i>Eumeces parvulus</i>	—	—	—	—	R	800-1500
Family Teiidae						
<i>Cnemidophorus costatus griseocephalus</i>	A	M	—	R	—	0-900
<i>Cnemidophorus costatus huico</i>	—	R	A	R	—	0-1200
<i>Cnemidophorus costatus mazatlanensis</i>	—	A	R	R	R	0-2000
<i>Cnemidophorus costatus nigrigularis</i>	R	A	—	R	—	0-900
<i>Cnemidophorus tigris</i>	M	M	—	—	—	0-200
Family Anguillidae						
<i>Gerrhonotus kingii ferrugineus</i>	—	—	—	R	—	1150
<i>Gerrhonotus liocephalus liocephalus</i>	—	—	—	—	R	1900-2200
Family Helodermatidae						
<i>Heloderma horridum ezasperatum</i>	R	R	—	—	—	100-400
<i>Heloderma horridum horridum</i>	—	A	M	R	—	0-500
<i>Heloderma suspectum suspectum</i>	R	—	—	—	—	0-100
SUBORDER SERPENTES						
Family Typhlopidae						
<i>Typhlops braminus</i> *.....	—	R	—	—	—	0-100
Family Leptotyphlopidae						
<i>Leptotyphlops humilis dugesii</i>	—	M	R	—	—	0-300
Family Boidae						
<i>Boa constrictor imperator</i>	M	A	A	—	—	0-400

TABLE 2.—Distribution of Amphibians and Reptiles in Sinaloa by Vegetation Types and Altitude.—Concluded

SPECIES	Tropical Thorn Woodland	Tropical Semiarid Forest	Tropical Dry Forest	Subtropical Dry Forest	Lower Montane Dry Forest	Altitudinal Range, Meters
Family Colubridae						
<i>Arizona elegans noctivaga</i>	—	R	—	—	—	0-100
<i>Contiophanes lateritis lateritis</i>	—	RR	R	—	—	0-500
<i>Conopsis nasus nasus</i>	—	—	—	R	R	1500-2000
<i>Dryadophis clifforti</i>	—	—	—	R	M	700-2000
<i>Dryadophis melanolomus stuarti</i>	—	R	A	R	—	0-300
<i>Drymarchon corais rubidus</i>	R	A	M	A	—	0-1200
<i>Drymobius margaritiferus fistulosus</i>	—	—	—	M	—	0-500
<i>Elaphe tricaepis intermedia</i>	—	—	—	M	—	0-1000
<i>Geophis redimitus</i>	—	—	—	—	—	0-100
<i>Geophis duperii</i>	—	—	—	—	R	1800-2000
<i>Gyalopion quadrangularis</i>	M	A	—	M	—	0-1200
<i>Hypsiglena torquata</i>	M	A	A	M	—	0-500
<i>Imantodes gemmistratus latistratus</i>	R	A	—	A	—	0-1200
<i>Lampropeltis getulus nigrilus</i>	R	—	—	A	—	0-300
<i>Lampropeltis triangulum nelsoni</i>	M	—	—	A	—	0-1000
<i>Leptodeira maculata</i>	—	A	R	A	—	0-1000
<i>Leptodeira punctata</i>	A	—	—	A	—	0-300
<i>Leptodeira septentrionalis polysetica</i>	—	—	R	—	—	0-300
<i>Leptodeira splendida ephippiata</i>	—	—	—	M	—	100-1500
<i>Leptodeira diplostropis</i>	R	M	A	A	M	0-2000
<i>Masticophis bilineatus</i>	M	A	A	—	—	0-600
<i>Masticophis flagellum piceus</i>	A	A	M	A	—	0-500
<i>Masticophis striolatus</i>	A	A	—	A	M	0-2000
<i>Natrix valida valida</i>	A	A	A	A	—	0-300
<i>Oryzopsis aeneus auratus</i>	—	A	A	A	—	0-600
<i>Phyllorhynchus browni</i>	M	A	—	—	—	0-300
<i>Phyllorhynchus decurtatus</i>	—	R	—	—	—	0-300
<i>Pituophis melanoleucus affinis</i>	M	M	M	—	—	0-500
<i>Pseudocimex frontalis</i>	—	—	—	R	—	0-500
<i>Rhadinaea hesperia hesperoides</i>	—	—	—	R	R	700-1900
<i>Rhinocheilus lecontei antonii</i>	M	A	A	—	—	0-200
<i>Salvadora bairdii</i>	—	R	—	R	R	500-2000
<i>Salvadora hexalepis deserticola</i>	M	M	R	—	—	0-500
<i>Sonora aemula</i>	R	R	—	—	—	0-300
<i>Storeria storerioides</i>	—	—	—	—	R	1900-2000
<i>Symphotis lippiens</i>	—	M	R	—	—	0-300
<i>Tantilla calamarina</i>	—	R	—	—	—	0-300
<i>Tantilla yaguoa</i>	—	M	R	—	—	0-1000
<i>Thamnophis cyrtopsis collaris</i>	A	A	M	M	M	0-2000
<i>Trimorphodon lambda paucimaculatus</i>	M	A	A	A	R	0-1300
<i>Trimorphodon tau</i>	—	A	—	—	—	0-900
<i>Tropidodipsas annulifera</i>	—	M	R	R	—	0-1200
<i>Tropidodipsas philippii</i>	—	M	R	—	—	0-300
Family Elapidae						
<i>Micruroides euryzanthus neglectus</i>	—	R	—	—	—	0-300
<i>Micrurus distans distans</i>	R	M	M	—	—	0-300
Family Hydrophiidae						
<i>Pelamis platurus</i>	—	—	—	—	—	Marine
Family Viperidae						
<i>Agkistrodon bilineatus bilineatus</i>	—	M	M	—	—	0-300
<i>Crotalus atrox</i>	M	A	—	—	—	0-300
<i>Crotalus basiliscus basiliscus</i>	A	—	A	M	R	0-2000
<i>Crotalus lepidus</i>	—	R	—	—	R	1800-2000
<i>Crotalus molossus molossus</i>	—	—	—	—	—	0-300
<i>Crotalus stejnegeri</i>	—	—	—	R	—	800-1200
ORDER CROCODYLIA						
Family Crocodylidae						
<i>Crocodylus acutus</i>	—	M	M	—	—	0-100

habitats created by irrigation projects associated with the tremendous agricultural development in the Los Mochis and Guasave areas. This is especially true of the frogs *Leptodactylus occidentalis*, *Rana catesbeiana*, and *R. pipiens*, and the snakes *Leptodeira punctata*, *Natrix v. valida*, and *Thamnophis cyrtopsis collaris*.

Most of the amphibians are nocturnal and generally are found close to permanent water. Many of the lizards, however, including several species whose ranges lie primarily in northern desert regions, are diurnal and terrestrial. Characteristic species exhibiting this distributional pattern are *Dipsosaurus dorsalis*, *Urosaurus ornatus*, *Phrynosoma solare*, *Sceloporus magister* and *Cnemidophorus tigris*. Nocturnal lizards with similar distributions to the north are *Phyllodactylus homolepidurus* and *Heloderma suspectum*.

With the exception of the three species associated with irrigation ditches and the two large diurnal racers, *Masticophis flagellum* and *M. striolatus*, snakes are not particularly abundant in the thorn woodland zone.

Tropical Semiarid Forest.—Semiarid forest is the most extensive plant formation in Sinaloa, covering nearly one-half of the state. The number of amphibian and reptilian species is correspondingly large. Of the 96 species and subspecies recorded from this zone, 43 are considered abundant.

The amphibians that were listed as abundant in the thorn woodland, as well as the following species, are abundant in the semiarid forest: *Bufo marmoratus*, *Hyla smithi*, *Phyllomedusa dacnicolor*, *Pternohyla fodiens*, *Smilisca baudinii*, and *Gastrophryne olivacea*. Hyliid frogs constitute the major additions.

Among the lizards, the increase in relative density of *Anolis nebulosus*, *Ctenosaura pectinata*, *Iguana iguana*, *Sceloporus nelsoni*, *Urosaurus bicarinatus*, and probably *Eumeces callicephalus* is correlated with the increase in vegetation density and number of suitable habitats therein.

Several species of snakes are more abundant in the semiarid forest than in the thorn woodland. Included are *Boa constrictor*, *Drymarchon corais*, *Elaphe triaspis*, *Imantodes gemmistratus*, *Lampropeltis triangulum*, *Leptophis diplotropis*, and *Oxybelis aeneus*. The appearance or increase of these species probably reflects change from a dry to a more moist environment. Several of these species are primarily arboreal and appear in response to the greater complexity and density of the semiarid forest vegetation.

Tropical Dry Forest.—The dry forest is found in the southern parts of the state. This environment is characteristically more moist than the other lowland zones and is inhabited by 73 species and subspecies of amphibians and reptiles. Most species that are abundant in the semiarid forest are also abundant in the dry forest; additionally, *Iguana iguana* and *Drymobius margaritiferus* are considered abundant in dry forest. In the lowlands certain species are almost restricted to the dry forest. Among these are *Phrynohyas venulosa*, *Syrrhophus modestus*, *Gastrophryne usta*, and *Leptodeira maculata*. Other species that occur to the north are conspicuously rare or absent in the dry forest. Included are *Gastrophryne olivacea*, *Coleonyx variegatus*, *Callisaurus draconoides*, *Holbrookia maculata*, *Phyllorhynchus browni*, and *Salvadora hexalepis*.

Subtropical Dry Forest.—Relatively little is known about the herpetofauna of this vegetation type in Sinaloa, due to the inaccessibility of areas having subtropical dry forest. As presently understood 54 species and subspecies have been recorded in this zone. Many records are from localities at the periphery of the range of primarily lowland species. There is, however, a distinctive group of species characteristic of this vegetation type. Included are *Eleutherodactylus hobartsmithi*, *E. occidentalis*, *E. vocalis*, *Tomodactylus niditus*, *T. saxatilis*, *Hyla smaragdina*, *Rana pustulosa*, *R. sinaloae*, *Eumeces colimensis*, *E. parvulus*, *Gerrhonotus kingii*, *Dryadophis cliftoni*, *Leptodeira splendida*, *Rhadinaea hesperia*, and *Crotalus stejnegeri*. Some of these species range into the lowlands, usually along riparian habitats. Others are recorded from higher elevations. An increase in moisture and a well developed litter on the forest floor probably are important factors determining the distributions of these forms in the subtropical dry forest as opposed to zones previously discussed.

Lower Montane Dry Forest.—This vegetation type is restricted to high elevation in scattered localities along the Sierra Madre Occidental in eastern Sinaloa. The only site visited in the montane forest was on Highway 40 near the Durango border. Ten species of amphibians and 21 species of reptiles have been collected in this habitat. Characteristic species include *Bufo occidentalis*, *Hyla arenicolor*, *Sceloporus bulleri*, *S. jarrovii*, *S. shannorum*, *Gerrhonotus liocephalus*, *Conopsis nasus*, *Geophis dugesii*, *Storeria storerioides*, and *Crotalus lepidus*. Most of these are widely distributed on the Mexican plateau, or are restricted to high elevations in the mountains of western México.

Lizards of the genus *Sceloporus* are the most conspicuous reptiles in this formation. *Sceloporus jarrovi* and *S. bulleri* are found on logs and on tree trunks; *S. shannonum* apparently is entirely arboreal. The small snakes of the genera *Conopsis*, *Geophis*, and *Storeria* are semifossorial, usually being found under logs or in the litter of the forest.

Faunal Assemblages

There are two major faunal assemblages in Sinaloa, one in the lowlands and one in the highlands. The lowland assemblage, comprising 105 species, will be discussed in detail elsewhere (McDiarmid, MS). The highland assemblage consists of 58 species that can be divided into two groups: foothill and canyon species generally associated with the subtropical dry forest vegetation; and highland species generally associated with the pine and oak forests characteristic of the lower montane dry forest. Species indicative of each assemblage were mentioned in the preceding discussion of distributions by vegetation types.

ACCOUNTS OF SPECIES AND SUBSPECIES

Each kind of amphibian and reptile known to occur in Sinaloa is discussed with reference to its systematic status, variation, and distribution. Observations pertaining to life history and ecology also are presented. Some taxonomic usages herein are not in accord with the current systematic arrangement; we have included in the species accounts sufficient data to justify the changes or synonymies presented. Some systematic problems remain, either because of insufficient data to support changes that we think warranted or because the problems were inherently impractical to undertake within the scope of our study. These problems are mentioned in the hope that our ideas might stimulate investigations by other workers.

This study is based primarily on specimens deposited in the Museum of Natural History at the University of Kansas and in the Los Angeles County Museum of Natural History. Additional information taken from the literature is included when appropriate. We have made a special effort to examine or list all available specimens of amphibians and reptiles collected in the state.

A synonymy is provided at the beginning of each species account. It includes reference to the original proposal of the specific epithet, the first usage of the name-combination used by us, and in a few

cases, other names or combinations that have been used in the past when their inclusion is considered important in clarifying the presentation (these references are not included in the literature cited). A statement of the type locality as originally designated follows the reference to the original description.

Remarks.—The majority of the specimens discussed in this section are in the Museum of Natural History, University of Kansas. Other specimens that were examined and that contributed information to the discussion are listed by museum numbers. Most of the notes on ecology and natural history are based on observations by the second author and on specimens in the Los Angeles County Museum. All measurements are in millimeters. Measurements and counts are presented as the range of variation followed by the mean (in parentheses); where no mean is given the measurements are listed individually. In some cases damaged or poorly preserved specimens were examined for some characteristics but not for others; these specimens are designated by museum numbers. Paired characteristics are presented as left-right.

Distribution in Sinaloa.—The distribution of each species or subspecies in Sinaloa is briefly stated. The distribution of highland taxa is not so well known as is the distribution of those in the lowlands.

Specimens examined.—This section includes all specimens that were seen by either or both of us. If data from a specimen or series of specimens are presented in the remarks section of the species account, then the appropriate museum numbers are designated by an asterisk in the list of specimens examined. Numbers not preceded by an asterisk refer to specimens that were examined but only contributed information pertaining to life history, ecology, or distribution.

Literature records.—In most cases when a species was reported from a single locality in different papers, some of the older literature citations are omitted. If pertinent information was presented, then the citation is listed.

Additional records.—This list includes locality records based on specimens in museums, institutions, or private collections that were not examined by us and that have not been previously reported in the literature. Most of these records were supplied by curators or were taken from the catalogs of the different collections.

All place names are in alphabetical order. The localities based

on a certain place name are listed in a clockwise direction starting from north and at increasing distances (*i. e.*, Mazatlán; N Mazatlán; 5 mi. N Mazatlán; 7 mi. N Mazatlán; 3 mi. NE Mazatlán). Some distances and elevations cited for *specimens examined* have been converted to the metric system, but all distances and elevations listed in *literature records* and *additional records* are retained in their original form. A map of the distribution of each species or subspecies is included. Open symbols indicate either *literature records* or *additional records*; solid symbols indicate *specimens examined*. In some instances, a single symbol represents several records or specimens depending on the distances between localities.

Abbreviations used for various museums, institutions, and private collections are as follows:

AMNH	American Museum of Natural History, New York
ASDM	Arizona-Sonora Desert Museum, Tucson
CAS	California Academy of Sciences, San Francisco
CSCCLB	California State College at Long Beach
EHT-HMS	Edward H. Taylor-Hobart M. Smith, private collections (now in Field Museum of Natural History and University of Illinois Museum of Natural History)
FAS	Frederick A. Shannon, private collection (now in University of Illinois Museum of Natural History)
FMNH	Field Museum of Natural History, Chicago
JFC	Joseph F. Copp, private collection, La Jolla, California
JLC	James L. Christiansen, private collection (now in the collection of the University of Utah)
JMS	Jay M. Savage, osteology collection, University of Southern California
JRM	John R. Meyer, private collection (now in the Texas Cooperative Wildlife Collection)
KU	University of Kansas, Museum of Natural History
LACM	Los Angeles County Museum of Natural History
LMK	Laurence M. Klauber, private collection, San Diego
LSU	Louisiana State University
MCZ	Museum of Comparative Zoology, Harvard University
MVZ	Museum of Vertebrate Zoology, University of California
PR	Philip J. Regal, private collection, Los Angeles, California
RGW	Robert G. Webb, private collection, El Paso, Texas
RSF	Richard S. Funk, private collection, Yuma, Arizona
SDSC	San Diego State College
SDSNH	San Diego Society of Natural History
SM	Strecker Museum, Baylor University, Waco, Texas
SU	Stanford University
TCWC	Texas Cooperative Wildlife Collection, Texas A. and M.
TMM	Texas Memorial Museum, Austin, Texas
TNHC	Texas Natural History Collection, University of Texas, Austin
UAZ	University of Arizona
UCLA	University of California at Los Angeles
UF	Florida State Museum, Gainesville
UIMNH	University of Illinois, Museum of Natural History
UMMZ	University of Michigan, Museum of Zoology
UNM	University of New Mexico
USNM	United States National Museum
UU	University of Utah

No new taxa are described in this paper. The following 21 species or subspecies are reported from Sinaloa for the first time: *Eleutherodactylus hobartsmithi*, *Syrrophus modestus*, *Rana pustulosa*, *Hyla smaragdina*, *Chrysemys scripta hiltoni*, *Hemidactylus frenatus*, *Phyllodactylus homolepidurus homolepidurus*, *Sceloporus magister magister*, *Cnemidophorus tigris*, *Gerrhonotus kingii ferrugineus*, *Gerrhonotus liocephalus liocephalus*, *Heloderma suspectum suspectum*, *Coniophanes lateritius lateritius*, *Dryadophis melanolomus stuarti*, *Geophis dugesii*, *Leptodeira septentrionalis polysticta*, *Phyllorhynchus decurtatus*, *Salvadora bairdii*, *Sonora aemula*, *Storeria storerioides*, *Crotalus molossus molossus*.

The type localities of the following 35 nominal species or subspecies are in Sinaloa:

- Syrrophus interorbitalis* Langebartel and Shannon, 1956:161.—Thirty-six miles north of Mazatlán.
- Tomodactylus saxatilis* Webb, 1962a:177.—Eight miles west of El Palmito [Durango].
- Bufo kelloggi* Taylor, 1938:510.—Two miles east of Mazatlán.
- Bufo mazatlanensis* Taylor, 1940c:492.—Two miles east of Mazatlán.
- Diaglena spatulata* (Günther), 1882:279.—Presidio, México.
- Prynohyas latifasciata* Duellman [= *P. venulosa* (Laurenti)] according to McDiarmid, 1968], 1956:24—Presidio.
- Pternohyla fodiens* Boulenger, 1882:326.—Presidio, W. México.
- Gastrophryne olivacea mazatlanensis* Taylor, 1943:355.—Two miles east of Mazatlán.
- Hypopachus oxyrrhinus oxyrrhinus* Boulenger, 1883:344.—Presidio de Mazatlán.
- Rana forreri* Boulenger [= *R. pipiens* Schreber], 1883:343.—Presidio.
- Rana sinaloae* Zweifel, 1954a:131.—Fourteen miles by (road) southwest of El Batel, 4200 feet.
- Chrysemys scripta ornata* (Gray), 1831:30.—Mazatlán.
- Phyllodactylus tuberculatus saxatilis* Dixon, 1964:31.—Eight miles northeast of Villa Unión, 200 feet.
- Anolis utowanae* Barbour, 1932:12.—About ten miles north of Mazatlán.
- Callisaurus draconoides bogerti* Martín del Campo, 1943:619.—Isla de los Chivos, en el Puerto de Mazatlán.
- Ctenosaura teres brachylopha* Cope [= *C. pectinata* (Wiegmann)], 1886:269.—Mazatlán.
- Holbrookia maculata elegans* Bocourt, 1874:164.—Mazatlán.
- Sceloporus clarkii boulengeri* Stejneger, 1893:180.—Presidio.
- Sceloporus nelsoni* Cochran, 1923:185.—Plomosas.
- Sceloporus shannonorum* Langebartel, 1959:25.—Thirty-seven miles by road from Concordia, near the Durango-Sinaloa border, state not determined.
- Eumeces humilis* Boulenger [= *E. callicephalus* Bocourt, according to Loomis and Stephens, M.S.] 1887:377.—Presidio.
- Cnemidophorus costatus mazatlanensis* Zweifel, 1959a:89.—Two miles north Coyotitán.
- Cnemidophorus costatus nigrigularis* Zweifel, 1959a:93.—Ten and one-half miles northwest of Culiacán.
- Dryadophis cliftoni* Hardy, 1964:714.—Plomosas, 22 kilometers east of Matatán, 762.5 meters.

- Drymarchon corais rubidus* Smith, 1941d:474.—Rosario.
Gyalopion quadrangularis (Günther), 1893:99.—Presidio.
Leptodeira pacifica Cope [= *L. punctata* (Peters)], 1868:310.—Mazatlán.
Leptodeira personata Cope [= *L. maculata* (Hallowell)], 1868:310.—Mazatlán.
Salvadora hexalepis celeris Smith [= *S. h. deserticola* Schmidt], 1941a:9.—San Blas.
Sphenocalamus lineolatus Fischer [= *Geagras redimitus* Cope], 1883:5.—Mazatlán.
Tantilla bimaculata Cope [= *T. calamarina* Cope], 1876:143.—Mazatlán.
Trimorphodon lambda paucimaculata Taylor, 1938:527.—Mazatlán.
Tropidodipsas philippii (Jan), 1863:101.—Mazatlán.
Tropidonotus quadriserialis Fischer [= *Natrix valida* (Kennicott)], 1879:82.—Mazatlán.
Micruroides euryxanthus neglectus Roze, 1967:4.—Sixteen and three-tenths miles north-northwest of Mazatlán.
Crotalus stejnegeri Dunn, 1919:214.—Plomosas.

The type localities of the following six forms have been restricted to Sinaloa:

- Kinosternon hirtipes hirtipes* Wagler, 1830:37.—Mazatlán (by Smith and Taylor, 1950a:343).
Rhinoclemmys pulcherrima (Gray), 1855:25.—Presidio de Mazatlán (by Smith and Taylor, 1950a:343).
Anolis nebulosus (Wiegmann), 1834:47.—Mazatlán (by Smith and Taylor, 1950a:343).
Urosaurus ornatus lateralis (Boulenger), 1885b:214.—Presidio (by Oliver, 1943:97).
Leptodeira punctata (Peters), 1867:93.—Mazatlán (by Smith and Taylor, 1950a:343).
Masticophis striolatus (Mertens), 1934:190.—Presidio de Mazatlán (by Smith and Taylor, 1950a:343).

In this work we do not accept type locality restrictions that are not substantiated by evidence (*i. e.*, Smith and Taylor, 1950a); such restrictions are not included in the synonymies.

Class AMPHIBIA

Order SALIENTIA

Family Pelobatidae

Scaphiopus couchii Baird

Scaphiopus couchii Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:62, 1856 (based on specimens from Río Nazas in Coahuila, and Matamoros in Tamaulipas).

Remarks.—Several authors have suggested that *Scaphiopus couchii* in western México differs from *S. couchii* in eastern México by having the skin of the occipital and interorbital region almost

completely co-ossified with the skull, a wider metatarsal tubercle, larger eye, wider skull (Taylor, 1938:508), fewer large cream-colored blotches (Davis and Dixon, 1957b:145), and the absence of vaguely outlined paravertebral light lines (Smith and Sanders, 1952:209). Based on an examination of 101 specimens from Sinaloa, Tamaulipas, and Texas, no consistent differences warranting sub-specific designation of the population in western México were observed.

Spadefoot toads were collected at night on the road or at temporary ponds throughout the lowlands. Breeding commences with the first heavy rains and continues through September. Calling males were collected in the first week of July and amplexing pairs were secured at La Cruz on August 18 and 20. All calling males were floating in the water.

Distribution in Sinaloa.—Known from throughout the lowlands of the state. See Fig. 13.

Specimens examined.—Aguapepe (CAS 89756); 2.1 mi. NE Concordia (CSCLB 1850-53); 4.7 mi. NE Concordia (CSCLB 1859); 14 mi. N Culiacán (CSCLB 1869); 21.4 mi. S Culiacán (LACM 6043); 2.9 mi. N Elota (CSCLB 1862, 1866); 3 mi. S Espinal (CSCLB 1855); Guamúchil (UCLA 14806); La Cruz, 9 m. (* KU 73772-74; LACM 6000-03); 5 mi. NE La Cruz (LACM 6039-40); 10 mi. NE La Cruz (LACM 6025-33); 61 km. N Los Mochis (* KU 62201); 18.4 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 7657, 7660-67); 20.7 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 7669-70); 30 km. NNW Los Mochis (* KU 37826); Matatán, 170 m. (* KU 73771); 7.3 km. SW Matatán, 155 m. (* KU 78251-52); Mazatlán (CAS 89709-10; CSCLB 1861); N Mazatlán (LACM 6011); 5 mi. N Mazatlán (CSCLB 1846-48); 8 mi. N Mazatlán (CSCLB 1854); 10.3 mi. N Mazatlán (LACM 6006-07); 10.6 mi. N Mazatlán (CSCLB 1864); 11.3 mi. N Mazatlán (LACM 6044); 13.5 mi. N Mazatlán (UAZ 7668); 16.7 mi. N Mazatlán (CSCLB 1867); 20.7 mi. N Mazatlán (JMS osteo. coll.); 22.5 mi. N Mazatlán (LACM 6010); 41 mi. N Mazatlán (LACM 6041); 1.2 mi. W hwy. 15 [ca. 55 mi. N Mazatlán] nr. Río Piaxtla (CSCLB 1863, 1865); 8 km. SSE Rosario (* KU 29888-89); San Ignacio (LACM 6034-37); 1.5 km. ENE San Lorenzo (* KU 48045-71); Teacapán (LACM 6508-14); 9.5 mi. S Tropic of Cancer [on hwy. 15] (CSCLB 1856-58); 9 km. NE Villa Unión (* KU 75199); 12.8 mi. SE Villa Unión (LACM 6038).

Literature records.—Concordia, 400 ft.; 20 mi. N Mazatlán, 150 ft. (Davis and Dixon, 1957b:145); 2 mi. E Mazatlán (Taylor, 1938:508).

Additional records.—23.3 mi. S Caitime (FAS 8588-89); 1.1 mi. E Concordia (CAS 99617-8); 2 mi. N Culiacán (AMNH 59285); 7-8 mi. N Culiacán (FAS 12620); 1 mi. NE El Fuerte (UIMNH 40681-82); 1.3 mi. S Río Elota (CAS 99644-5); West half La Cruz Rd. (CAS 99655); 13 mi. NNE Los Mochis (UIMNH 40654-55); Mazatlán (CAS 95735-39; FMNH 110607, 110610, 110616-17, 110620, 110622-23, 110627, 110629, 110632; UIMNH 31815-21; UMMZ 115392 [6 spec.]); 8.5 mi. N Mazatlán (CAS 99385); 9.6 mi. N Mazatlán (CAS 99393); 9.8 mi. N Mazatlán (CAS 99395-96); 10.7 mi. N Mazatlán (CAS 99400-01); 10.9 mi. N Mazatlán (CAS 99402); 11.0 mi. N Mazatlán (CAS 99403); 12.3 mi. N Mazatlán (CAS 99404); 14.1 mi. N Mazatlán (CAS 99406); 22.1 mi. N Mazatlán (CAS 99413-15); 22.3 mi. N Mazatlán (CAS 99416-17); 22.4 mi. N Mazatlán (CAS 99421-22); 22.7 mi. N Mazatlán (CAS 99424); 22.7-37.4 mi. N Mazatlán (CAS 99425); 43.9 mi.

N Mazatlán (CAS 99426-27); 44.0 mi. N Mazatlán (CAS 99428); 44.6 mi. N Mazatlán (CAS 99429); 61.0 mi. N Mazatlán (CAS 99431); 61.4 mi. N Mazatlán (CAS 99432); 62.9 mi. N Mazatlán (CAS 99433); 63.3 mi. N Mazatlán (CAS 99434); 63.7 mi. N Mazatlán (CAS 99435); 2.5 mi. SE Mazatlán (FAS 7906-09); 10-15 mi. S Mazatlán (FAS 12621); 3.5 mi. NNW Mazatlán, 25 ft. (UMMZ 115393); 11.8 mi. NNW Mazatlán, 150 ft. (UMMZ 115394 [10 spec.]); 15.6 mi. NNW Mazatlán, 200 ft. (UMMZ 115395 [8 spec.]); 18.6 mi. NNW Mazatlán, 200 ft. (UMMZ 115396); 18.6 mi. S Río Presidio (CAS 99690); Rosario (UIMNH 8020).

Family Leptodactylidae

Eleutherodactylus augusti cactorum Taylor

Eleutherodactylus cactorum Taylor, Univ. Kansas Sci. Bull., 25:391, July 10, 1939 (type locality, kilometer 226, 20 miles northwest Tehuacán, Puebla).

Eleutherodactylus augusti cactorum: Zweifel, Amer. Mus. Novitates, 1813:20, December 23, 1956.

Remarks.—In eight specimens the diameter of tympanum is 2.7-4.3 (3.4) and greatest width of head 19.4-32.9 (24.8). The diameter of the tympanum averages 13.6 per cent of the width of the head.

Dark purplish gray color dorsally (in preservative) is one of the diagnostic characters of this subspecies (Zweifel, 1956:20). Of the specimens examined, three collected in the summer of 1963 are purplish gray dorsally; those collected in 1955 and earlier are brown dorsally. All specimens examined by us agree with the description by Zweifel (1956:2-24).

One individual was found in a mine shaft in a corn field, and two were in tropical deciduous forest less than 200 meters from a boulder-strewn stream inhabited by *Hyla smaragdina* and *Syrrophus modestus*. A specimen (LACM 6201) was found on the road following a heavy rain on July 12. The road passes through a hilly area, suggesting that the frogs are inhabitants of rocky canyons and arroyos in the region north of Mazatlán.

Distribution in Sinaloa.—Along the foothills of the Sierra Madre Occidental and in the canyons and arroyos in the southern part of the state. See Fig. 14.

Specimens examined.—8.8 mi. N Coyotitán (LACM 6201); 41 mi. N Mazatlán (LACM 6202); San Ignacio, 210 m. (KU 73813); Santa Lucía, 1100 m. (* KU 75238); 1 km. NE Santa Lucía, 1155 m. (* KU 78253); 2.2 km. NE Santa Lucía, 1155 m. (* KU 78254); 2.4 km. E Santa Lucía (* KU 41552-56).

Literature record.—36 mi. N Mazatlán (Zweifel, 1956:21).

Additional records.—6-7 mi. NE Concordia (UMMZ 123026); 1.5 km. S El Cajón, 750 m. (KU 93465-66).

Eleutherodactylus hobartsmithi Taylor

Eleutherodactylus hobartsmithi Taylor, Trans. Kansas Acad. Sci., 39:355, April 3, 1936 (type locality, "Near Uruapan, Michoacán").

Remarks.—Ten males differ from the original description in having the limbs distinctly barred with dark gray to black; the bars are more conspicuous on the forelimbs. There is no dark line from tip of snout to the eye, the tips of the digits are definitely widened, and the tympanum is distinctly larger (1.7-2.2; mean 1.9) than the eye (1.6-1.8; mean 1.7). In two specimens the testes are white (captured 13 July 1960 and 12 July 1963); in the others the testes are heavily pigmented with black.

In life, the back and legs are orange to orangish brown with an inverted brown "V"-shaped mark between the shoulders, and with brown bands on the legs. The iris is a rose-gold, the belly yellow. The dorsal coloration in life is pinkish gray according to Taylor (1940c:501). Smith (1947:408) reported a frog of this species from "near Aquiapan, México" that possessed vestiges of vomerine teeth. All the specimens examined by us lack any trace of vomerine teeth. The tarsal tubercles are distinct. Reference of this species to *Eleutherodactylus* follows Lynch (1965:3).

Distribution in Sinaloa.—Known only from the southern highlands near Santa Lucía. See Fig. 19.

Specimens examined.—2.4 mi. E Chupaderos (JFC 62:71); Santa Lucía, 1100 m. (* KU 75253-62); 4 mi. W Santa Lucía (JFC 62:4-13).

Additional records.—Santa Lucía, 1100 m. (KU 80324); Highway 40, 24.8 mi. E Junc. Hwy. 15 and 40 (Villa Unión) (CAS 99313, 99315).

Eleutherodactylus occidentalis Taylor

Eleutherodactylus occidentalis Taylor, Proc. Biol. Soc. Washington, 54:91, July 31, 1941 (type locality, Hacienda El Florencio, Zacatecas).

Remarks.—A male (KU 78255) has a snout-vent length of 28 mm., white testicular membranes, first finger longer than second, vomerine teeth, and an inner metatarsal tubercle strongly compressed and cream-colored. This frog, and several others, probably of the same species, called from a deep, dry, thickly wooded ravine during a light rain on July 19. The frogs were clinging horizontally to small twigs of bushes 0.3 to one meter above the ground. The call was a single-note peep emitted at intervals of one to ten minutes. Peters (1954:6) described the call for this species in Michoacán as a piercing whistle of five or six single notes.

Another specimen, a juvenile, was active in wet grass at the edge

of the forest about 10 a. m. This was one of the few Sinaloan frogs exhibiting a diurnal activity period.

Distribution in Sinaloa.—Known only from intermediate elevations in the southern part of the state. See Fig. 15.

Specimens examined.—San Ignacio (LACM 6203); 5 km. SW San Ignacio, 200 m. (* KU 78255).

Literature records.—Plomosas (Kellogg, 1932:111; Smith and Taylor, 1948:62).

Additional records.—7.1 mi. E Concordia (CAS 99622); 9.8 mi. E Concordia (CAS 99613); 15.7 mi. E Concordia (CAS 99610).

Eleutherodactylus vocalis Taylor

Eleutherodactylus vocalis Taylor, Univ. Kansas Sci. Bull., 26:401, pl. 44, Fig. 8, November 27, 1940 (type locality, Hacienda El Sabino, Michoacán); Lynch, Herpetologica, 21:105, June 25, 1965.

Remarks.—According to Taylor (1940a:401) the tibiotarsal articulation reaches to between the eye and the nostril, and the heels do not touch when the limbs are folded. The heels do not touch in 13 of 25 specimens examined from Sinaloa, but of the remaining 12, 11 overlap (KU 41531 excluded). The tibiotarsal articulation reaches to the eye in two, beyond the eye in four, to the snout in 17, and beyond the snout in two. Duellman (1958b:7) obtained similar results for specimens from Colima. Zweifel (1959c:2) reported sexual dimorphism in specimens from Nayarit; the length of tympanum (including ring) divided by width of head was 0.24-0.26 (0.254) in three males and 0.15-0.18 (0.170) in eight females; in these specimens the snout-vent length ranged from 31 to 58 mm. The same ratio for 19 adults (snout-vent lengths of more than 32 mm.) from Sinaloa is 0.16-0.18 (0.169) in four males and 0.16-0.21 (0.177) in 15 females. The tarsal fold is pale in specimens from Colima, but dark in those from Veracruz and Chiapas (Duellman, 1958b:7). Of the 63 specimens examined by us from Nayarit, Jalisco, Oaxaca, Veracruz, and Chiapas, only seven (four from Veracruz and three from Chiapas) have dark tarsal folds. Duellman (1960:56) recorded 15 specimens from a total of 200 that had a pale middorsal stripe. Two of the 25 specimens from Sinaloa have a pale middorsal stripe.

Eleutherodactylus vocalis frequently is found near streams or in rocky canyons. One individual (KU 73812) was found in a small crevice of a mine shaft in the pine-oak forest zone of northern Sinaloa; two other specimens were taken in mines.

Distribution in Sinaloa.—Known from the foothills below 1200 meters in southern Sinaloa and from near Choix in the north. See Fig. 15.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 73812); 2.4 mi. E Chupaderos (JFC 62:72-73); 1 mi. W Copala (CSCLB 1668-69); 1 mi. E Pánuco (CSCLB 1667); Plomosas, 760 mm. (* KU 73814-16); 0.4 mi. E Potrerillos (JFC 62:14-15); Santa Lucía, 1100 m. (* KU 75251; CSCLB 1671-72); 2.2 km. NE Santa Lucía, 1150 m. (* KU 78256); 2.4 km. E Santa Lucía (KU 44555); 2-3 km. E Santa Lucía (* KU 41530-41, 41558-60, 44556-59); 3 mi. E. Santa Lucía (CSCLB 1670); 5 km. SW Santa Lucía, 660 m. (* KU 80686); 4.0 mi. W Santa Lucía (JFC 62:1-3).

Literature record.—18 mi. NE Concordia (Webb, 1960:289).

Additional records.—10.7 mi. N Concordia (MCZ 32577-79); 1.3 mi. N Santa Lucía (MCZ 32580-81); 24.8 mi. E (by highway 40) Junction highway 15 and 40 (Villa Unión) (CAS 99302-09).

Leptodactylus occidentalis Taylor

Leptodactylus occidentalis Taylor, Trans. Kansas Acad. Sci., 39:349, 1937 (type locality, Tepic, Nayarit).

Remarks.—From *Leptodactylus melanonotus*, *L. occidentalis* usually differs as follows: head narrower at eye level; tympanum smaller; throat and chest lightly pigmented with black and dark brown (instead of heavily pigmented with dark gray); ventral glands dark brown or black, sharply defined, absent from the throat, and absent or reduced on the mid-ventral surface. A re-evaluation of the importance of these characters is considered necessary, especially with reference to the ventral glands.

Duellman (1961:32) suggested that size might be another valid character for separating these two species. The average snout-vent length in samples of adult males from Sinaloa (16), Veracruz (5), Campeche (9), Guatemala (8), Nicaragua (10), Costa Rica (21), and Panama (9) varied from 32 to 36 mm. No geographic trend in size was noticed.

Three specimens (LACM 6207, 6221, 6222) from the southern lowlands are intermediate between the two nominal species in the position and color of the ventral glands. Duellman (1961:33) mentioned *L. melanonotus* from Acaponeta, Nayarit. If he is correct in the allocation of the Acaponeta frogs, then it is possible that populations of *Leptodactylus* from southern Sinaloa are intermediate between the two recognized species. Because of the lack of material from the critical region, we refer all *Leptodactylus* from Sinaloa to *L. occidentalis*.

During the dry season individuals were found beneath rocks along streams, near wells, and in moist canyons. In the rainy

season specimens were collected wherever there was sufficient water. During the breeding season males were heard calling from flooded fields, roadside ponds, rocky streams in arroyos, and temporary rain ponds. Males usually call from deep grass around the pond, sometimes concealed beneath debris. Foam nests were found in mid-July near San Ignacio. The nests were concealed in deep grass in a field flooded by one to two inches of water.

Distribution in Sinaloa.—*Leptodactylus occidentalis* occurs throughout Sinaloa below about 700 meters. See Fig. 16.

Specimens examined.—1 mi. N Ahome, Río Fuerte (UAZ 10896); 8 km. N Carrizalejo, 460 m. (* KU 78033-34); 16 km. NNE Choix, 520 m. (* KU 73819); 1 km. S Concepción, 75 m. (* KU 63664-74); Coyotitán (JFC 62: 18-26); Culiacán (CSCLB 1572-77); 51 km. SSE Culiacán (* KU 37810-11); 6 km. NE El Fuerte, 150 m. (* KU 78029-31); 6 mi. N (by hwy. 15) Río Elota (CSCLB 6220); 10 mi. S Espinal (CSCLB 6771); 12.5 mi. N Guamúchil (CSCLB 1738-47); 19.2 mi. N Guasave (CSCLB 1748-50); 7 mi. SE Guasave (CSCLB 1584); Isla Palmito de la Virgen, 5 m. (* KU 73820); 10 mi. E La Cruz (CSCLB 6219); 1.3 mi. S (on hwy. 15) La Cruz turnoff (JFC 62:30-38); 3.1 mi. N Los Mochis (JFC 62:59-69); 5 km. N Los Mochis (* KU 73830-34); 0.5 mi. NE Los Mochis turnoff [on hwy. 15] (UAZ 8161-66); E Los Mochis (CSCLB 1579-83); 6 km. W Los Mochis, 2 m. (* KU 78032); 7.3 km. SW Matatán, 155m. (* KU 78259-61); Mazatlán (CSCLB 1590-93; SDSC 1773; UAZ 8153-60); 3.3 mi. N Mazatlán (UAZ 8169); 2.3 mi. E, 1 mi. N Mazatlán (UAZ 8170); 2.6 mi. NW Mazatlán (UAZ 8167-68); 14.2 mi. WNW (by rd.) Pericos turnoff (on hwy. 15), Rancho de los Pocitos (UAZ 8125-52); Rosario, 150 m. (* KU 73822); 4 mi. N San Blas, 400 ft. (JRM 1112-18); 3.6 mi. SW San Blas (CSCLB 1585); San Ignacio, 215 m. (* KU 73823-29; LACM 6208-14, 6216-18); 10.2 mi. W (by rd.) San Miguel (on rd. to Higuera) (UAZ 10902); Teacapán (LACM 6221, 6223-26); Highway 15 at Tecuala turnoff [Nayarit] (LACM 6222); Villa Unión, 15 m. (* KU 67957, 73821, 78263-66); 8 km. N Villa Unión, 135 m. (* KU 80687); 10 km. N Villa Unión (* KU 78262); 8.4 mi. NE Villa Unión (LACM 6205-07); 13 km. ENE Villa Unión, 60 m. (* KU 67956); 3 km. W Villa Unión (* KU 29901-07).

Literature records.—Chele (Duellman, 1961:33); Costa Rica (Smith and Van Gelder, 1955:145); Culiacán (Duellman, 1961:33); El Dorado (Fugler and Dixon, 1961:8); Mazatlán (Smith and Taylor, 1948:56); nr. Mazatlán (Kellogg, 1932:89; Taylor, 1938:514); 1-2 mi. E Mazatlán (Taylor, 1937:349); Presidio (Kellogg, 1932:89); 10 mi. S Presidio (Taylor, 1937:349); Rosario (Duellman, 1961:33).

Additional records.—N. Bank Río Baluarte, 3 mi. N bridge (CAS 99265-85); 11 mi. NE Concordia (SM 10095, 10287-88, 12113); 12 mi. NE Concordia (SM 10071, 10073-79, 10081-84); Culiacán (AMNH 58382-402, 64176-77 + 27 spec. untagged); 10 mi. N Culiacán (FAS 10073); 19 mi. NW Culiacán (AMNH 68050-51); 1 mi. NE El Fuerte (FMNH 71374-441); N Los Mochis, Río Fuerte and hwy. 15 (AMNH 64174-75); 3.3 mi. N. Los Mochis (UF 12863); 15 mi. N Los Mochis (SM 10667-72); 6 mi. S Los Mochis (SDSNH 19891); Mazatlán (MCZ 44301; USNM 147966-79); N Mazatlán (AMNH 12591-600, 13235-46); E Mazatlán (UIMNH 7801); 22 mi. N Mazatlán (AMNH 68052; CAS 99412; FAS 7808-11; SM 10094); 36 mi. N Mazatlán (FAS 9594; UIMNH 38159); 1-2 mi. E Mazatlán (UIMNH 29700); 1.3 mi. W, 2.5 mi. N. Mazatlán (FAS 9049); 10.2-10.8 mi. SE Navolato (CAS 99660-79); Piaxtla (AMNH 71417); 9 mi. NW Piaxtla (SM 10673-77); Rosario (UIMNH 7791-96, 7802-04, 62645-47); 11 mi. NE Rosario, Río Baluarte (UMMZ 113062 [2 spec.]); 3 mi. E San Pedro, 550 ft. (KU 93467); 3 mi. SE Villa Unión (SM 10678).

Syrhophus interorbitalis Langebartel and Shannon

Syrhophus interorbitalis Langebartel and Shannon, Herpetologica, 12:161, September 1, 1956 [type locality, 36 miles north of Mazatlán (center of city), Sinaloa].

Remarks.—This species has been collected along a rocky creek bed in tropical deciduous forest (Langebartel and Shannon, 1956: 161), and in a crack of a granite boulder “on a densely vegetated rocky road shoulder” (Campbell and Simmons, 1962:194). Campbell and Simmons reported hearing calls that could have been from this species from an area north of Culiacán (probably tropical semiarid forest) to south of Mazatlán. Duellman (1958c:10) suggested that this species occurs along the lowlands of Sinaloa, possibly into southern Sonora.

Distribution in Sinaloa.—Known only from the central lowlands. See Fig. 17.

Specimen examined.—7.1 mi. S (by rd.) Guamúchil (UAZ 8232).

Literature record.—65 mi. N Mazatlán (Campbell and Simmons, 1962:194).

Syrhophus modestus Taylor

Syrhophus modestus Taylor, Univ. Kansas Sci. Bull., 28:304, November 12, 1942 (type locality, Hacienda Paso del Río, Colima).

Remarks.—Duellman (1958c:6-7) described *Syrhophus modestus pallidus* in Nayarit as having, in life, a pale tan ground color (“light-gray ground color,” p. 5) and interconnecting dark brown spots dorsally, grayish white belly, white vocal sac, and a dark golden iris. In contrast, *S. m. modestus* in Colima has a red-rust ground color with scattered irregular black spots above, a pale gray belly, and a golden iris. Zweifel (1960:93-94) recorded *S. m. pallidus* from the Tres Mariás Islands as being golden brown above with spots darker and browner than ground color and some grayish patches, pale belly and brownish throat.

Specimens from Sinaloa (KU 75263-72, 78527-28) differ from the above descriptions in having an orange to pale grayish golden ground color above, and dark brown spots or reticulations that become darker anteriorly. In life, the thighs were orange with brown blotches dorsally and white ventrally; the belly was grayish white in the groin, fading to brownish black on chest and throat; the iris was silver-gold to gold color with a pinkish and a pale greenish tint. Three of 12 frogs from Sinaloa have dark throats, which, as seen under high magnification, result from expanded melanophores. These are present also, but contracted, in the white-throated frogs.

Examination of 42 specimens (in alcohol) of *Syrhophus* from

Sinaloa and Nayarit indicate a wide range of variation in color and pattern. The dorsal ground color varies from pale brown or tan to dark brown or gray-brown. Dorsal mottling is variable; some specimens lack distinct dorsal pattern but have a few dark brown flecks laterally; others show all degrees of pattern from fine brown or dark brown mottling to individuals with large distinct reticulations. No specimens have an interorbital bar. All show some brown mottling on arms and legs, tending to form distinct bands in many individuals. None of the differences in pattern and color in the preserved material could be attributed to geographic variation. It is suspected that much of this color variation can be attributed to the various methods of preservation. There is also considerable variation in the size of the metatarsal tubercles. Because of the lack of detailed color notes from living individuals over a wide geographic range of the species and the variation present in the preserved material, we refrain from assigning the Sinaloan population to a subspecific status.

Distribution in Sinaloa.—Known from several localities along the Concordia-Santa Lucía road. See Fig. 17.

Specimens examined.—3 mi. NE Copala (RGW 3056-57); 1 mi. NE Copala (RGW 3670); 3.4 mi. NE Concordia (CSCLB 620-23); Santa Lucía, 1100 m. (* KU 75263-72); 1 km. NE Santa Lucía, 1150 m. (* KU 78257); 1 km. NE Santa Lucía (CSCLB 1712-14); 2.2 km. NE Santa Lucía, 1150 m. (* KU 78258); 16.9 mi. W Santa Rita (LACM 6234-35); 19.6 mi. NE (by road) Villa Unión (LACM 6233); 47.2 mi. NE Villa Unión (CSCLB 624).

Additional records.—5 mi. E Copala (CAS 91939-55); Santa Lucía, 1100 m. (KU 80320).

***Tomodactylus nitidus petersi* Duellman**

Tomodactylus petersi Duellman, Occas. Papers Mus. Zool., Univ. Michigan, 560:5, October 22, 1954 (type locality, one fourth mile east of Coalcomán, Michoacán).

Tomodactylus nitidus petersi: Dixon, Texas Jour. Sci., 9:390, December 4, 1957.

Remarks.—Specimens of *Tomodactylus nitidus petersi* from the eastern Sinaloan highlands are melanistic and agree in all characteristics with those examined by Dixon (1957b:385). Webb and Baker (1962:330) recorded this subspecies from mixed boreal—tropical forest in Durango.

Distribution in Sinaloa.—Known only from the southern highlands. See Fig. 18.

Specimens examined.—0.5 km. S Santa Lucía (CSCLB 1719); 0.9 mi. W Santa Rita (LACM 6236); 1.2 mi. W Santa Rita (LACM 6238); 3.5 mi. W Santa Rita (LACM 6237); 47.2 mi. NE Villa Unión (CSCLB 1718).

Literature records.—49 mi. NE Concordia, 4800 ft. (Dixon, 1957a:64); "mountains of eastern Sinaloa," 5600 ft. (Dixon, 1957b:385).

Tomodactylus saxatilis Webb

Tomodactylus saxatilis Webb, Univ. Kansas Publ., Mus. Nat. Hist., 15:177, 1 fig., March 7, 1962 (type locality, eight miles west of El Palmito, Sinaloa, approx. 6100 feet).

Remarks.—This frog occurs in the lower montane dry forest of southeastern Sinaloa. It has been recorded also in mixed boreal—tropical forest near Pueblo Nuevo in Durango (Webb and Baker, 1962:330).

Distribution in Sinaloa.—Known only from the type locality. See Fig. 19.

Specimens examined.—8 mi. W El Palmito [Durango] (KU 63326 holotype, KU 63327-33 paratypes).

Family Bufonidae

Bufo alvarius Girard

Bufo alvarius Girard, in Baird, Report on the United States and Mexican Boundary Survey, 2:26, pl. 41, Figs. 1-6, 1859 (type locality, valley of the Gila and Colorado rivers).

Remarks.—Two adult specimens of *Bufo alvarius* are olive drab dorsally with yellowish cream venters. Glands are present on fore and hind limbs. A female with egg-filled ovaries has a snout-vent length of 150 and a male has snout-vent length of 144. The increase of favorable habitats created by cultivation probably has aided the dispersal of this species in Sinaloa.

Distribution in Sinaloa.—*Bufo alvarius* occurs in the lowland tropical thorn forest of northern Sinaloa. See Fig. 17.

Specimens examined.—10 km. ESE Guasave (° KU 43571-72); 5.4 mi. SW San Blas (CSCLB 1771).

Literature records.—7 mi. W Guamúchil (Riemer, 1955:17); 24 mi. N Los Mochis, 50 ft.; 35-45 mi. N Los Mochis, 100 ft. (Davis and Dixon, 1957b:145).

Additional record.—20 mi. N Culiacán (FAS 12611) [needs verification].

Bufo kelloggi Taylor

Bufo kelloggi Taylor, Univ. Kansas Sci. Bull., 24:510, February 16, 1938 (type locality, two miles east of Mazatlán, Sinaloa).

Remarks.—The snout-vent lengths for 12 females of *Bufo kelloggi* are 33.6-48.8 (38.8), and for 29 males are 28.4-40.1 (35.1).

Specimens were first encountered on July 12 near La Cruz during a light rain. Several large choruses were found in late August between Espinal and the Río Elota. Calling males were first heard in mid-August, suggesting that the species breeds later in the rainy season than most of the other species in the state. Males usually call out of water, often perched on small islands in a pond.

Distribution in Sinaloa.—*Bufo kelloggi* occurs throughout the coastal lowlands below 200 meters. See Fig. 19.

Specimens examined.—16 km. NW Acajoneta (Nayarit) (* KU 60472); 4.7 mi. NE Concordia (CSCLB 1734-35); 20 mi. N. Culiacán (LACM 6077-82); 32 km. N Culiacán (* KU 73777-87); 12 mi. N (on hwy. 15) Río Elota (LACM 6071-76); 15.4 mi. N (on hwy. 15) Río Elota (LACM 6052); 32.5 mi. SE Guamúchil (CSCLB 1737); Isla Palmito de la Virgen, 5 m. (* KU 73776); 1-3 mi. E La Cruz (LACM 6065-70); 5 mi. E La Cruz (LACM 6053-64); 39 km. N Los Mochis (* KU 60473-79); 18.4 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 11487); 20.7 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 11493-94); Mazatlán (CSCLB 1736); 3 mi. N Mazatlán (UAZ 11490); 5 mi. N Mazatlán (CSCLB 1733); 5.4 mi. SE Mazatlán (UAZ 11489); 2.5 mi. NW Mazatlán (UAZ 11488, 11491-92, 13796-80); Villa Unión (* KU 75205-24); 3.7 km. E Villa Unión, 30 m. (* KU 78267).

Literature records.—13-35 m. N Culiacán; 33 mi. SE Escuinapa (Bogert, 1962:34); 4-33 mi. SE Escuinapa, 50 ft. (Davis and Dixon, 1957b:145); 13 mi. N Los Mochis (Bogert, 1962:34); 24 mi. N Los Mochis (Davis and Dixon, 1957b:145); 13 mi. NE Los Mochis (Smith and Chrapliwy, 1958:267); Mazatlán (Kellogg, 1932:53; Taylor, 1938:510); 2 mi. N Mazatlán; 6 mi. S Mazatlán; 6 mi. SW San Blas (Bogert, 1962:34).

Additional records.—Copala (CAS 89758-59); 2.4 mi. N. Escuinapa (CAS 99600); 0.9 mi. E La Cruz (CAS 99646); Mazatlán (FMNH 100717-18; UIMNH 39729); 27.9 mi. N Mazatlán (UF 12859); 36 mi. N Mazatlán (UIMNH 39475); 2 mi. E Mazatlán (UIMNH 23450-59; USNM 134258); 15.6 mi. NNW Mazatlán, 200 ft. (UMMZ 115347 [2 spec.]).

Bufo marinus (Linnaeus)

Rana marina Linnaeus, *Sistema naturae*, ed. 10, 1:211, 1758 (based on a specimen from America).

Bufo marinus: Schneider, *Historias amphibiarum naturalis et literariae*, 1:219, 1799.

Remarks.—*Bufo marinus* is common throughout the lowlands of Sinaloa. Taylor (1938:508) found one specimen under a board on the sandy beach of the Río Mazatlán near Presidio. In the dry season individuals congregate along streams and irrigation ditches. Bogert and Oliver (1945:340) found hibernating toads under boulders along the river [Río Culiacán?] at Culiacán. Large numbers of juvenile toads (snout-vent length approximately 20) were observed on the rocky shore of the Río Fuerte in June, up to 150 meters from the water.

Small young are easily identified by the presence of a white spot on the upper jaw just below the eye, an enlarged triangular parotoid gland, the presence of a row of warts (sometimes connected) extending from the posterior tip of the parotoid gland along the side of the body, and the presence of a prominent tarsal fold. The white spot is absent in some toads measuring more than 100 mm. in snout-vent length, but the parotoid gland and lateral row of warts usually are more distinct in larger toads. These large ubiquitous toads were observed several times in towns and villages

sitting beneath street lights or in patios of cafes and houses, eating the myriad of insects attracted to the lights. Males were heard calling along the Río Piaxtla at La Cruz on July 1 after a heavy rain had flooded the river. On August 16, several hundred individuals were found dead on the road about 28 miles north Mazatlán. Evidently a large flooded field to the east of the road had served as a breeding pond.

Distribution in Sinaloa.—*Bufo marinus* occurs throughout the lowlands of Sinaloa up to elevations of about 500 meters. See Fig. 20.

Specimens examined.—Aguaje (UCLA 14833); nr. Concepción (LACM 6097); Concordia (* KU 78278; UNM 9981-97); 4.5 mi. NE Concordia (UAZ 11564, 14380); 8 km. E. Concordia (* KU 78279); 6 km. E. Cosalá, 460 m. (* KU 73789); N Culiacán (CSCLB 1767-68); 51 km. SSE Culiacán (* KU 37742); 79.6 mi. S Culiacán (UAZ 12331-32); 6 km. NE El Fuerte, 150 m. (* KU 78040-69); 8 km. NE El Fuerte, Río Fuerte, 160 m. (* KU 78070-78); Elota (* KU 78270); 18 km. NE Elota (* KU 62250); Escuinapa (LACM 8622-23); 2 mi. N Higuera (UAZ 11079, 11579); 5 mi. NE La Cruz (LACM 6085); 1-3 mi. E La Cruz (LACM 6092-96); 5 km. N Los Mochis (* KU 73795); 8 km. N Los Mochis (PR 530); 4 mi. NE Los Mochis (UAZ 9450); 7.3 km. SW Matatán, 155 m. (* KU 78269, 78280); Mazatlán (UAZ 11562); 7.2 mi. N Mazatlán (UAZ 11531-32); 12.5 mi. N Mazatlán (UAZ 11533); 55 mi. N Mazatlán, Río Piaxtla (CSCLB 1769-70); 5.3-11.7 mi. SE Mazatlán (UAZ 11556); 1 mi. W Pánuco (CSCLB 2459-60), 1 mi. W highway 15 along Río Piaxtla (CSCLB 2464); Rancho Huanacastle (LACM 6100-16); 7 km. N Rosario (* KU 29863); 10.3 mi. SW San Blas (CSCLB 1766); San Ignacio (LACM 6089-91); 1 mi. S. San Ignacio (LACM 6086-88); San Miguel, Río Fuerte, 115 m. (* KU 44532-35); Río Sinaloa (LACM 6117-28); 5 km. NE Trancas (* KU 78271-75); Villa Unión (* KU 62249, 78281); 1 km. NE Villa Unión (* KU 75225-30); 24.7 mi. NE Villa Unión (CSCLB 1764-65); 3.7 km. E Villa Unión, 30 m. (* KU 78276-77); 7.8 mi. E (by hwy 40) Villa Unión (LACM 6099); 12.4 mi. E (by hwy. 40) Villa Unión (LACM 6098).

Literature records.—Culiacán, Río Culiacán (Bogert and Oliver, 1945:340); Mazatlán (Smith and Taylor, 1948:42); Presidio (Taylor, 1938:508).

Additional records.—11 mi. NE Concordia (SM 10282-86); 18.0 mi. E Concordia (CAS 99626); 2 mi. ENE Copala, 1400 ft. (TCWC 12291); nr. Coyotitán (AMNH 67930-31); Culiacán (AMNH 43900-03); 18.5 mi. E Culiacán, arroyo de Soualoua (UMMZ 113091-94 [4 spec.]); El Dorado (LUS 7840); 1 mi. NE El Fuerte (UIMNH 40689-90); Elota (AMNH 43879, 43890-94); N Los Mochis, Río Fuerte at hwy. 15 (AMNH 64219); 15 mi. N Los Mochis (SM 10828-30); 49 mi. NNW Mazatlán, nr. Río Piaxtla (AMNH 67932); Palmar de Sepúlveda (UMMZ 123851); 9 mi. W Piaxtla (SM 10742); 9 mi. NW Piaxtla (SM 10825-27); Rosario (UIMNH 7516, 7519-36, 62526-31); 3 mi. SE Rosario (UIMNH 7544-45); 24.8 mi. E hwy. 15 [Villa Unión] on hwy 40 (CAS 99316-17).

Bufo marmoratus Wiegmann

Bufo marmoratus Wiegmann, Isis von Oken, 26:66, 1833 (based on a specimen from Veracruz, Veracruz).

Remarks.—Examples of *Bufo marmoratus* from Sinaloa have curved to slightly angled supraorbital and postorbital crests. The pale-colored, diagonal lateral stripe of females and the concentra-

tion of tubercles in a broad band on the back of males are present in the Sinaloan toads examined. The males may have a narrow middorsal line or none at all.

Nearly all specimens were found on the road at night during or just after a rain. Most females were taken in the first two weeks of July and contained eggs. No males were heard vocalizing nor were any amplexing pairs seen.

Distribution in Sinaloa.—Although much more common in the southern part of the state, *Bufo marmoratus* occurs throughout the lowlands up to 400 meters. See Fig. 21.

Specimens examined.—Chupaderos (CSCLB 1840); 2 mi. W Chupaderos (CSCLB 1841); 3 mi. W Chupaderos (CSCLB 1842); 4 mi. W Chupaderos (CSCLB 1843); 4.5 mi. NE Concordia (LACM 6129); 4.7 mi. NE Concordia (CSCLB 1783-84); 29.2 mi. NW Culiacán (LACM 6136); 54 mi. SE Culiacán (UAZ 11630-31, 11782); 51 km. SSE Culiacán (* KU 37644); 13.4 mi. N (hwy. 15) Río Elota (LACM 6137); 0.5 mi. S Espinal (CSCLB 1778-79); 3 mi. S Espinal (CSCLB 1780); Matatán, 170 m. (* KU 73796); 55 mi. N Mazatlán, Río Piaxtla (CSCLB 1785, 1844-45); 4 mi. N San Blas, 400 ft. (JRM 1125); San Ignacio, 210 m. (* KU 73797-98; LACM 6130, 6132-33); 6.8 mi. N (on hwy. 15) turnoff to San Ignacio (LACM 6131); 16 mi. N (on hwy. 15) turnoff to San Ignacio (LACM 6134-35); 2 km. ENE San Lorenzo (* KU 47925-44); 24.7 mi. NE Villa Unión (CSCLB 1772-77); 26 mi. NE Villa Unión (CSCLB 1781-82).

Literature records.—Mazatlán (Kellogg 1932:60; Martín del Campo, 1941:760; Smith and Taylor, 1948:45); Rosario (Kellogg, 1932:60; Smith and Taylor, 1948:45).

Additional records.—7.8 mi. S Río Baluarte (CAS 99627-28); 7-8 mi. N Culiacán (FAS 12531); 63-68 mi. S Culiacán (FAS 12793); 16-18 mi. NW Culiacán (AMNH 67944-45); 78 mi. N Mazatlán (CAS 99436); 49 mi. NNW Mazatlán, nr. Río Piaxtla (AMNH 67946-47); Rosario (UIMNH 62582-85); 3 mi. SE Rosario (UIMNH 7546-50); Villa Unión, Río Presidio (UMMZ 102620).

Bufo mazatlanensis Taylor

Bufo mazatlanensis Taylor, Univ. Kansas Sci. Bull., 26:492, November 27, 1940 (type locality, two miles east of Mazatlán, Sinaloa).

Remarks.—See Zweifel (1960:93) for a brief summary of the taxonomy of *Bufo mazatlanensis*. It is variable in dorsal coloration and tubercle size throughout its range, but no detailed study of geographic variation has been completed.

Specimens were taken in both the wet and dry seasons. Calling males were found on July 29, in roadside ponds north of Mazatlán. The males usually call from the bank of the pond at the water's edge. A few females were collected on the road that same night but none were noted near the water. The first amplexing pair was collected about 8 days later near Villa Unión. Choruses were heard throughout July and August and amplexing pairs were observed as

late as August 16. The breeding season probably continues through the remainder of the rainy season.

Distribution in Sinaloa.—Common throughout, below an elevation of about 1000 meters. See Fig. 22.

Specimens examined.—Aguapepe (CAS 89955-57); 1 mi. NE Ahome, S Río Fuerte (UAZ 10893); 1.5 km. SE Camino Real, Río Piaxtla (* KU 63658); 8 km. N Carrizalejo, 460 m. (* KU 78097); 0.2 mi. W Chupaderos (CSCLB 1826-27); 1 km. S Concepción, 75 m. (* KU 63657); Concordia (* KU 78289-92); 4.3 mi. NE Concordia (CSCLB 1838); 4.5 mi. NE Concordia (LACM 6156-57; UAZ 11758); 4.7 mi. NE Concordia (CSCLB 1815-16); 9.4 mi. NE Concordia (CSCLB 1837); 27.2 mi. NE Concordia (CSCLB 1821-22); 3.5 mi. E Coyotitán (LACM 6165) 2.1 mi. N. Culiacán (CSCLB 1834); 14 mi. N Culiacán (CSCLB 1874); 1.3 mi. NE Culiacán (CSCLB 1871-73); 39-40 mi. SE Culiacán (UAZ 14368-69); 54.4 mi. SE Culiacán (UAZ 11699, 11748-54, 11756, 11758, 11763-64); 54 km. SSE Culiacán (* KU 37638-43, 37741); 2 mi. S Culiacán (LACM 25415); 7.5 mi. S Culiacán (LACM 6175); 7.6 mi. S Culiacán (LACM 6176); 18.8 mi. S Culiacán (LACM 6177); 2 km. S El Dorado, 6 m. (* KU 73801); 8 km. N El Fuerte, Río Fuerte, 160 m. (* KU 78079-81); 12 mi. N El Fuerte (CSCLB 1823-24); 6 km. NE El Fuerte, 150 m. (* KU 78082-96, 78098-116, 78282-86); Elota (* KU 78287); 12.6 mi. SE Escuinapa (UAZ 11803); 59 km. S Escuinapa (* KU 73799-800); Guamúchil (UCLA 14808, 14828-30); 8 mi. NW Guamúchil (CSCLB 1832); 10 km. SSE Guasave (* KU 41365-69); Isla Palmito de la Virgen (* KU 73802); 1-3 mi. E La Cruz (LACM 6166-68); 5 mi. E La Cruz (LACM 6170-72); 1 mi. E Los Mochis (CSCLB 1814, 1833); 7.9 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 11688-92); 9.9 mi. NW Los Mochis turnoff (on hwy. 15) (UAZ 11667-87, 11701-17); 11.7 mi. N Los Mochis turnoff (on hwy. 15) (UAZ 9460-61, 9465); Matatán, 165 m. (* KU 73804); Mazatlán (* KU 33936; SDSC 1766-69); Mazatlán, beachroad (UAZ 14384); 1.1 mi. N Mazatlán (CSCLB 1835); 1.9-5.7 mi. N Mazatlán (UAZ 11785-86, 11797); 2.5 mi. N Mazatlán (UAZ 11628, 11798); 4.3 mi. N Mazatlán (LACM 6150-54); 5.5 mi. N Mazatlán (LACM 6141); 6.7 mi. N Mazatlán (UAZ 11787-88); 7 mi. N Mazatlán (CSCLB 1831; LACM 6142); 8 mi. N Mazatlán (UAZ 11790, 11792-94, 11799, 11800); 8.3 mi. N Mazatlán (LACM 6143-44); 9 mi. N Mazatlán (LACM 6145); 10.9 mi. N Mazatlán (CSCLB 1789-92); 11 mi. N Mazatlán (UAZ 11696-98, 11789, 11791); 12.5 mi. N Mazatlán (UAZ 11795-96); 13.8 mi. N Mazatlán (UAZ 11718-31); 14.9 mi. N Mazatlán (UAZ 11700); 16 mi. N Mazatlán (LACM 6138); 17.7 mi. N Mazatlán (LACM 6149); 18.1 mi. N Mazatlán (LACM 6146); 20.4 mi. N Mazatlán (LACM 6148); 27 mi. N Mazatlán (LACM 6180-82); 27.1 mi. N Mazatlán (LACM 6147); 30 mi. N Mazatlán (UAZ 11757); 55 mi. N Mazatlán (CSCLB 1817-20, 1828-30); 5.3-11.7 mi. SE Mazatlán (UAZ 11693-95); 5.4 mi. SE Mazatlán (UAZ 11759); 1 mi. NW Mazatlán (LACM 6174); 0.6 mi. N [on hwy. 15] Nayarit state line (CSCLB 1793-1813); 1 mi. N Palmillas (LACM 25414); 8 mi. S Palmillas (LACM 25412-13); 14.2 mi. WNW Pericos, Rancho de los Pocitos, ca. 50 ft. (UAZ 14386); Rosario, 150 m. (* KU 73803); 8 km. SSE Rosario (* KU 29809-10); 4 mi. N San Blas, 400 ft. (JRM 1126-28, 1135); San Ignacio (LACM 6169); 1.5 km. ENE San Lorenzo (* KU 47907-13); San Miguel, Río Fuerte (* KU 44538-43); 0.6 mi. W Santa Lucía (LACM 6179); Teacapán (LACM 6183-94); 15.2 mi. N Terreros (LACM 6173); 5 km. NE [Las] Trancas (* KU 78288); 9.5 mi. S [on hwy. 15] Tropic of Cancer (CSCLB 1836); nr. Tropic of Cancer [on hwy. 15] (CSCLB 1825); Villa Unión (* KU 29808, 29832); 4 mi. NE Villa Unión (LACM 6155); 7.4 mi. NE Villa Unión (LACM 6158); 9.4 mi. NE Villa Unión (LACM 6159); 12.8 mi. SE Villa Unión (LACM 6163-64); 13 mi. SE Villa Unión (LACM 6162); 16.3 mi. SE Villa Unión (LACM 6160-61); 1.5 km. NW Villa Unión, 15 m. (* KU 68712).

Literature records.—10 mi. W Concordia; Costa Rica (Porter, 1964:240); Costa Rica (Smith and Van Gelder, 1955:145); Coyotitán; 2 mi. N, 5 mi. N, 5 mi. S, 16-18 mi. NW Culiacán (Porter, 1964:240); El Dorado (Fugler and

Dixon, 1961:8; Porter, 1964:240); 1 mi. NE El Fuerte; 5 mi. N, 7 mi. N, 9 mi. N, 29 mi. N El Quelito; Escuinapa; 3 mi. SE, 18 mi. SE, 26 mi. SE Escuinapa (Porter, 1964:240); 7 mi. W Guamúchil (Riemer, 1955:20); Guasave; Los Mochis; 10, 11, 13 mi. N Los Mochis (Porter, 1964:240); Mazatlán (Smith and Taylor, 1948:44; Langebartel and Smith, 1954:126; Porter, 1964:240); 3, 10, 13, 15-20, 39 mi. N, 2 mi. E, 2 mi. NW, 3.5 mi. NNW Mazatlán (Porter, 1964:240); 5-11 mi. N Mazatlán (Riemer, 1955:20); Rosario (Langebartel and Smith, 1954:126); 3 mi. SE Rosario; 2 mi. SE San Lorenzo (Porter, 1964:240); 1 mi. SE Villa Unión; 2 mi. W. Villa Unión (Porter, 1964:241).

Additional records.—N bank Río Baluarte, 3 mi. N of bridge (CAS 99289-301); 11.1 mi. S Río Baluarte (CAS 99445); 4.5 mi. S Caitime (FAS 8587); 0.2 mi. S Río Cañas (CAS 99634-35); Concordia, 400 ft. (TCWC 12480-83); 10.1 mi. E Concordia (CAS 99612); 11 mi. NE Concordia (SM 10686-94); 16.3 mi. E Concordia (CAS 99609); 17.0 mi. E Concordia (CAS 99607); 17.1 mi. E Concordia (CAS 99606); 17.4 mi. E Concordia (CAS 99605); nr. Coyotitán (AMNH 67948-64); 2 mi. N Culiacán (AMNH 59245); 53.4 mi. N Culiacán (FAS 14195); 3 mi. S Culiacán (UF 17120); 5 mi. S Culiacán (AMNH 60442); 40-45 mi. S Culiacán (FAS 14576); 16-18 mi. NW Culiacán (AMNH 67965-66); 1.3 mi. N El Dorado (CAS 99657); 1.6 mi. N El Dorado (CAS 99658); 10 mi. N El Dorado (SM 10831); 1.3 mi. S Río Elota (CAS 99636-43); 2.4 mi. N Escuinapa (CAS 99600); 5.1 mi. N Escuinapa (CAS 99602); 7.8 mi. N Escuinapa (CAS 99603); 11.8 mi. N Escuinapa (CAS 99604); 7 mi. NW Escuinapa (SM 10889-95); 0.2 mi. S Escuinapa (CAS 99446-47); 3.1 mi. S Escuinapa (CAS 99448); 4.4 mi. S Escuinapa (CAS 99449); 9.9 mi. S Escuinapa (CAS 99450); 17.9 mi. S Escuinapa (CAS 99451); nr. Guasave, Río Sinaloa (AMNH 64225, 67967-69); E Guasave (FAS 11666); 1 mi. E Guasave (FAS 11658); west half La Cruz rd. (CAS 99647-52); Los Mochis (CAS 99439-40; FAS 14112); N Los Mochis, Río Fuerte at hwy. 15 (AMNH 64220-24); 15 mi. N Los Mochis (SM 10880-84); 11 mi. NE Los Mochis (UIMNH 40617); 13 mi. NE Los Mochis (UIMNH 40607-16); nr. Madero (UMMZ 102632-33); Mazatlán (CAS 99599; MCZ 44288-89, 45681); N Mazatlán (AMNH 13253); 1 mi. N Mazatlán (SM 10695); 3 mi. N Mazatlán (AMNH 59244; SDSNH 19894-903); 6.7 mi. N Mazatlán (CAS 99381); 8.2 mi. N Mazatlán (CAS 99382); 8.3 mi. N Mazatlán (CAS 99383); 8.4 mi. N Mazatlán (CAS 99384); 8.5 mi. N Mazatlán (CAS 99386); 8.6 mi. N Mazatlán (CAS 99387); 8.8 mi. N Mazatlán (CAS 99388-91); 9.0 mi. N Mazatlán (CAS 99392); 9.6 mi. N Mazatlán (CAS 99394); 10.3 mi. N Mazatlán (CAS 99397); 12.3-14.1 mi. N Mazatlán (CAS 99405); 20.6 mi. N Mazatlán (CAS 99407); 21.5 mi. N Mazatlán (CAS 99408); 21.8 mi. N Mazatlán (CAS 99409-10); 21.9 mi. N Mazatlán (CAS 99411); 22.4 mi. N Mazatlán (CAS 99418-20); 22.6 mi. N Mazatlán (CAS 99423); 61.0 mi. N Mazatlán (CAS 99430); 78.2 mi. N Mazatlán (CAS 99438); 4 mi. NE Mazatlán (SM 9752); 2 mi. E Mazatlán, 50 ft. (TCWC 12479); 2.3 mi. E Mazatlán (FAS 7905); 2.3 mi. N, 1.5 mi. W Mazatlán (FAS 8581); 49 mi. NNW Mazatlán, nr. Río Piaxtla (AMNH 67970-72); 10.2-10.8 mi. SE Navolato (CAS 99681-82); 9 mi. NW Piaxtla (SM 10832-37, 10885-86); 12.4 mi. S Río Presidio (CAS 99441); 33.8 mi. S Río Presidio (CAS 99442); Rosario (USNM 46942-46, 47446); 8 mi. NW Rosario (SM 10896-99); Villa Unión (AMNH 72639); 24.8 mi. E hwy 15, Villa Unión (CAS 99318).

Bufo occidentalis Camerano

Bufo occidentalis Camerano, Atti R. Acad. Sci. Torino, 14:887, December 31, 1878 (based on 3 syntypes from México).

Remarks.—Three females are 76, 80, 86 and seven males are 39-74 (57.7) in snout-vent length. Seven juvenile toads have snout-vent lengths of less than 39. The tympanum is large and distinct, but covered with thick skin, in all toads examined. The tympanum is

indiscernible externally, except in large adults, which seem to have fewer warts over the tympanum. Supraorbital crests are absent in the smallest toads, but become more evident with an increase in snout-vent length. The color pattern, shape of the parotoid glands, and the habitat were the primary bases for the identification of the juveniles.

Two specimens have been reported from the coastal lowlands near Mazatlán and Presidio. The specimen (AMNH 13253) reported by Kellogg (1932:67) is *Bufo mazatlanensis*. A second specimen was listed by Günther (1885-1902:254) and Kellogg (1932:64) as coming from Presidio, Sinaloa. No other specimens have been collected on the coastal plain. Duellman (1961:28) mentioned specimens from near 900 meters, the lowest altitudinal limit of the species in Michoacán. Other locality information indicates that the species inhabits pine and oak forests in México. It seems likely that Günther's specimen, if it is *Bufo occidentalis*, was collected to the east of Presidio in the foothills of the Sierra Madre Occidental rather than on the coastal plain, and that Presidio was the port or origin of shipment of the specimen rather than the collecting locality.

Distribution in Sinaloa.—Known from several localities in pine-oak forest between 1100 and 2000 meters near Santa Lucía. See Fig. 23.

Specimens examined.—4 mi. E [by hwy. 40] El Palmito [Durango] (CSCLB 1786); 2.6 km. SW El Palmito (Durango), 2015 m. (* KU 78302-03); 2.2 km. NE Santa Lucía, 1150 m (* KU 78296-98); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78299-301, 78304-12); Santa Rita (LACM 6198); 4.8 mi. E Santa Rita (LACM 6196); 0.9 mi. W Santa Rita (LACM 6197); 1.2 mi. W Santa Rita (LACM 6195); 47.2 mi. NE Villa Unión (CSCLB 1787).

Literature records.—El Batel, 5100 ft. (Riemer, 1955:21); Plomosas (Kellogg, 1932:67); Presidio [?] (Günther, 1885-1902:254; Kellogg, 1932:64).

Additional record.—9.6 mi. SW El Palmito (UMMZ 123027).

Bufo punctatus Baird and Girard

Bufo punctatus Baird and Girard, Proc. Acad. Nat. Sci. Philadelphia, 6:173, 1854 (based on a specimen from Río San Pedro [Devil's River], Val Verde Co., Texas).

Remarks.—*B. punctatus* has been taken at scattered localities: on the coastal plain near Guamúchil, Navolato, and Mazatlán, and in the mountains at El Batel and Plomosas. Taylor (1938:508) found a specimen beneath a rock near Mazatlán. In other parts of its range the toad usually is found in arid situations, and is active during or after rains.

Distribution in Sinaloa.—Probably occurs throughout the state. See Fig. 18.

Specimens examined.—None.

Literature records.—El Batel; Guamúchil (Riemer, 1955:22); about 3 mi. SE Mazatlán (Taylor, 1938:508); Plomosas; Presidio [?] (Riemer, 1955:22).

Additional records.—36 mi. N Mazatlán (UIMNH 39474); 2 mi. E. Mazatlán (FMNH 102426); 14.2 mi. E Navolato (CAS 99659).

Family Hylidae

Diaglena spatulata (Günther)

Triprion spatulatus Günther, Ann. Mag. Nat. Hist., ser. 5, 10:279, October, 1882 (type locality, Presidio, México).

Diaglena spatulata, Cope, U. S. Nat. Mus. Bull., 32:12, 1887.

Remarks.—Twenty-five males have snout-vent lengths of 66-87 (74.7), tibia lengths of 24.5-29.5 (27.8), foot lengths of 33.1-41.5 (38.5), head-casque lengths of 23.5-29.2 (25.9), head-casque widths (over the tympanum) of 15.3-19.6 (16.9), interorbital widths of 12.2-16.5 (14.0), third finger-pad widths of 2.6-3.6 (3.2), fourth toe-pad widths of 2.1-3.1 (2.8), and greatest tympanum widths of 3.0-4.1 (3.6). In two females (KU 75283, 75285) the above measurements are, respectively: 82, 84; 20.9, 31.2; 44.3, 43.1; 28.2, 29.4; 19.1, 19.9; 16.5, 16.8; 3.5, 3.7; 2.9, 3.1; 4.3, and 4.0. The testes are white in two males examined (KU 75273, 75281). All males have black nuptial pads on the thumbs, and vocal pouches distended with two vocal pouch openings located posterior and slightly lateral to the tongue attachment. Both females contain eggs.

One of the objectives of field work by the second author was to learn something concerning the breeding biology of the amphibian fauna of the state. One of the more difficult species to study was *D. spatulata*. Single males were collected in early July from temporary rain ponds near Concordia, southeast of Villa Unión, and near Coyotitán. Males collected near Concordia on July 1, and near Villa Unión on July 7, were found away from the water and apparently had just arrived at the vicinity of the ponds. Calling males were first heard on July 12 near Coyotitán. *Diaglena* called from the shallow edges of a large rain pond, together with a large chorus of *Bufo mazatlanensis* and *Smilisca baudinii*. No females were seen. For several nights thereafter the pond was revisited, as were several other potential breeding sites, but to no avail.

On August 20, a remarkable incident occurred. McDiarmid had been collecting in the La Cruz area continuously for three nights. There had been a steady rain of two or three hours duration on August 18, but no rain on the 19th. We arrived at the La Cruz road about 8 p. m. on August 20. The sky was cloudy and overcast and

the temperature slightly cooler than the previous night. There was no indication of rain that afternoon, although it may have rained that morning. We began collecting frogs of several species from choruses congregated at roadside ponds. The second pond visited contained several hundred *Diaglena*. Males were calling from about 35 centimeters above the edge of the water or on rocks in the water. No males were observed calling from the water. There appeared to be established calling sites around the pond. Most of the calling males were spaced about 50 centimeters apart on the bank. Several amplexing pairs were noted swimming in the water; amplexus is axillary. Some of the pairs were put in gallon jars and remained in amplexus for several days. We encountered many more *Diaglena* hopping toward the pond as we returned to the road. When the lights of the field vehicle were turned on, amphibians were seen everywhere on the road. The high density of frogs extended for nearly 5 miles. *Diaglena* were very abundant; an estimate of a thousand individuals is considered conservative. The road was dry at the time. Although no males were calling from the road, twelve pairs in amplexus were collected as they hopped along the pavement. The ditches on each side of the road were full of water 50 to 100 centimeters deep. Breeding in the same ditches with *Diaglena* were several other amphibians, including: *Scaphiopus couchii*, *Bufo kelloggi*, *Bufo mazatlanensis*, *Hypopachus oxyrrhinus*, *Gastrophryne olivacea*, *Phyllomedusa dacnicolor*, *Pternohyla fodiens*, and *Smilisca baudinii*. The following night we returned to the area only to find the breeding ponds deserted. Except for the eggs and tadpoles there was no sign of the previous night's activity.

On July 8, 1963, the first author collected 17 specimens (KU 75273-89) in rain pools in association with *Scaphiopus couchii*, *Pternohyla fodiens*, *Smilisca baudinii*, *Phyllomedusa dacnicolor*, and *Hyla smithi*. Some males were calling and one pair was found in amplexus. No specimens have been collected later than August 20.

Peters (1955:1) reviewed the current knowledge of frogs of the genus *Diaglena* and pointed out that breeding activity of *D. reticulata* in Michoacán apparently is correlated with the first heavy rain of the year. Duellman (1960:59) mentioned choruses of *D. reticulata* immediately following torrential rains. The enormous breeding population of this supposedly rare hylid that was encountered near La Cruz suggests that the paucity of specimens is due to poor timing on the part of collectors. While the exact ecologic stimulus for breeding remains unknown, we suspect that a

combination of sufficient rain, cool weather, and overcast sky initiates reproductive activity.

Distribution in Sinaloa.—Known only from the lowlands of Sinaloa from about 60 miles south of Culiacán to near Villa Unión. See Fig. 24.

Specimens examined.—2.1 mi. NE Concordia (CSCLB 1876, 1881-86); 4 km. SE Concordia (* KU 73835-36); 5 km. SW Concordia (* KU 75282-89, 73837-40); 3.5 mi. E Coyotitán (LACM 6242); 7.5 mi. E Coyotitán (LACM 6243-47); 89 km. S Culiacán (* KU 73841-44); La Cruz to 5 mi. E La Cruz (LACM 6248-98); Mazatlán (SDSC 1774); 4.2 mi. N Mazatlán (CSCLB 1878); 7 mi. N Mazatlán (CSCLB 1146); 8 mi. N Mazatlán (CSCLB 1877); 16.2 mi. N Mazatlán (CSCLB 1879); 16.7 mi. N Mazatlán (CSCLB 1880); 9 km. NE Villa Unión (* KU 75273-81); 9.4 mi. NE Villa Unión (LACM 6239); 13 mi. SE Villa Unión (LACM 6241); 16.3 SE Villa Unión (LACM 6240).

Literature records.—Nr. Mazatlán (Peters, 1955:1); Presidio (Günther, 1885-1902:293; Kellogg, 1932:138); nr. Presidio (Taylor, 1942b:58); Venodío [Venadillo], 4000 ft. [?] (Kellogg, 1932:138).

Additional records.—22.8 mi. S El Salado (FAS 17019; UIMNH 62383); Mazatlán (MCZ 44304); 9 mi. N Mazatlán, 100 ft. (AMNH 58694; MVZ 58803, 58807); 19 mi. N Mazatlán (AMNH 62154); 74.5 mi. N Mazatlán (FAS 14688); 18.6 mi. NNW Mazatlán (UMMZ S-1938-9, 115322).

Hyla arenicolor Cope

Hyla arenicolor Cope, Jour. Acad. Nat. Sci. Philadelphia, 6:84, July, 1866 (based on a specimen from northern Sonora).

Remarks.—Kellogg (1932:159) listed one specimen of *Hyla arenicolor* from Sinaloa. Bogert and Oliver (1945:314) implied that this species occurs in Sinaloa, but did not cite definite records. The occurrence of this species in the surrounding states of Sonora, Chihuahua, Durango, and Nayarit suggests that it is probably more widespread in Sinaloa than our records indicate.

Distribution in Sinaloa.—Higher elevations in southern part of state. See Fig. 25.

Specimens examined.—44 mi. NE Villa Unión (CSCLB 1751-56); 47.2 mi. NE Villa Unión (CSCLB 1648).

Literature record.—Plomosas (Kellogg, 1932:159).

Additional record.—Sinaloa [State?] (USNM 84410-11).

Hyla smaragdina Taylor

Hyla smaragdina Taylor, Copeia, no. 1:18, March 30, 1940 (type locality, six kilometers east of Cojumatlán, Michoacán).

Remarks.—Twenty-eight frogs collected on July 11 and two on July 25, 1963 (included in the series KU 75295-333, 78380-82) are yellowish green, pinkish tan, brown, or rusty brown with dark brown or black specks uniformly distributed from between the eyes to the anus. The lips are dark brown below a line connecting the nostril

and the anterior edge of the eye. The iris is rose-gold to pinkish gold with tiny black flecks; the pupil is horizontally elliptical. The belly is yellowish white. The hands are darker dorsally than the dorsum, and the toe pads are yellow. The unexposed parts of the thigh are golden brown with no flecks, and those parts of the tibia and foot are similar but paler in color.

One gravid female (KU 75304) obtained on July 11, 1963, has a snout-vent length of 28.4 and a tibia length of 13.7. Forty-two males (KU 68719, 75295-303, 75305-33, 78380-82) have snout-vent lengths of 22.7-25.6 (24.2) and tibia lengths of 10.8-12.2 (11.7). The testes are unpigmented.

Metamorphosing tadpoles (KU 78988-89), collected on August 7 and 9, 1963, agree with the description given by McDiarmid (1963: 7-8), except that the brown reticulations and blotches on the caudal musculature and lines are more distinct than indicated in his illustration (Fig. 3, p. 8).

Distribution in Sinaloa.—Known only from the vicinity of Santa Lucía in the pine-oak forest. See Fig. 25.

Specimens examined.—27.2 mi. E Concordia (CSCLB 582-611); Copala (* KU 95807-13); Potrerillos, 1550 m. (* KU 78988-89); Santa Lucía, 1100 m. (* KU 75295-333); 2.2 km. NE Santa Lucía, 1150 m. (* KU 78380-82); 1.5 km. E Santa Lucía, 1300 m. (* KU 68719).

Additional record.—Santa Lucía, 3600 ft. (KU 80321-23).

Hyla smithi Boulenger

Hyla smithi Boulenger, Zool. Rec. Reptilia and Batrachia, 38:33, 1902 (type locality, Cuernavaca, Morelos).

Remarks.—Forty-two specimens (excluding KU 73867, 78400, 78404-06) from Sinaloa were compared with 97 specimens from Oaxaca. Females in both samples are slightly larger than males, and the specimens of both sexes from Oaxaca are slightly larger than those from Sinaloa. The samples are similar in tibia length, eye diameter, tympanum diameter, and third finger pad diameter. In both samples some specimens have an unmarked dorsum, some have small dark flecks, and some have distinct brown spots on the pale yellow ground color. Two differences in coloration were observed between these samples. The pale, yellowish white dorsolateral stripe extends to the groin in frogs from Sinaloa, but in the frogs from Oaxaca the stripe terminates posteriorly near the middle of the body or slightly posterior to the middle; rarely does the stripe extend to the groin. The ventral surfaces of the frogs from Sinaloa were uniformly white or pale yellow, whereas in the Oaxacan frogs

the belly was pale yellow and the ventral surfaces of the legs and throat were deeper yellow.

On July 27, 1963, several *Hyla smithi* were collected near Villa Unión. An egg mass (KU 78987) was deposited in a plastic bag by a mated pair. The embryos of 29 preserved fertilized eggs (KU 78987) are 0.9-1.1 (1.0); the vitelline membranes are closely adherent to the eggs; the outer envelope is 1.3-2.0 (1.7) in diameter.

This common frog is usually found in rain pools in the southern lowlands of Sinaloa. The males usually call from vegetation in the water or around the edge. *Hyla smithi* was found in the same pool with *Phyllomedusa dacnicolor*, *Pternohyla fodiens*, *Rana pipiens*, *Bufo marinus*, *Bufo kelloggi*, and *Natrix valida* in July, 1963.

Distribution in Sinaloa.—Recorded from several localities in the lowlands, but not from the arid northwest, and from Polomasas at an elevation of 760 meters. See Fig. 26.

Specimens examined.—4 km. NE Concordia (* KU 73858); 3.7 mi. E Concordia (CSCLB 1715); 10 km. SW Concordia (* KU 73859-64); N Culiacán (CSCLB 647-49); 15.5 mi. N (by hwy. 15) Río Elota (LACM 6310-11); 34 km. SE Escuinapa (* KU 73870-74); La Cruz (LACM 6299-300); 7.3 km. SW Matatán, 155 m. (* KU 78383-84, 78407); Mazatlán (CSCLB 1717); 1.9-5.7 mi. N Mazatlán (UAZ 16063); 3.3 mi. N Mazatlán (UAZ 16064); 4.5 mi. N Mazatlán (UAZ 16024-33); 7.1 mi. N Mazatlán (CSCLB 1732); 9.2 mi. N Mazatlán (CSCLB 1716); 55 mi. N Mazatlán (CSCLB 1730-31); 2.4 mi. SE Mazatlán (UAZ 16061); 8.2 mi. SE Mazatlán (UAZ 16062); Plomosas, 760 m. (* KU 73875-77); San Ignacio, 210 m. (* KU 73865-69; LACM 6307-09); 0.5 km. S Santa Lucía (CSCLB 1643); Teacapán (* KU 73878; LACM 6313, 6523-25); Villa Unión, 15 m. (* KU 78400-06); 3 mi. NE Villa Unión (LACM 6301-02); 8.4 mi. NE Villa Unión (LACM 6303-06); 9.5 km. NE Villa Unión (* KU 75334); 26 mi. NE Villa Unión (CSCLB 1722-29); 2.3 mi. E Villa Unión (CSCLB 1644-47); 3.7 km. E Villa Unión, 30 m. (* KU 78385-99, 78987).

Literature records.—El Dorado (Fugler and Dixon, 1961:7); 2 mi. E Mazatlán (Taylor, 1937:357).

Additional records.—Chele, ca. 300 ft. (UMMZ 110915 [7 spec.]); 11 mi. NE (by road) Copala (UIMNH 40530-31); 3.2 km. SW Copala (KU 95814-44, 95850); 7.6 mi. N Culiacán, Hacienda Simon (UMMZ 120252); 8.5 mi. NW Culiacán (AMNH 59272); El Dorado (UIMNH 43079-89); El Venadillo (UMMZ 123028); Mazatlán (FAS 8569-77; USNM 147980-81); 9.2 mi. S Mazatlán (UIMNH 38444-90); 59 mi. S Mazatlán (FMNH 107023); 2.5 mi. N, 1.5 mi. W Mazatlán (FAS 9006-47); 3 mi. SE Rosario (UIMNH 7288); 12 mi. NE San Benito, 1000 ft. (KU 91409); 20.2 mi. NNW Sinaloa, 200 ft. (UMMZ 115257); 6 mi. NNW Teacapán (KU 91408).

Phrynohyas venulosa (Laurenti)

Rana venulosa Laurenti, Specimen medicum, exhibens synopsin reptilium . . ., (based on Seba, 1734, Locupletissimi rerum naturalium thesauri accurata descriptio, . . ., I:115, pl. 72, fig. 4) p. 31, 1768 (type locality, "habitat in Indies"); validated by fiat, International Commission of Zoological Nomenclature, Opinions and Decisions, 1958:169.

Phrynohyas latifasciata Duellman, Misc. Publ. Mus. Zool., Univ. Michigan, 96:24, February 21, 1956 (type locality, Presidio, Sinaloa).

Phrynohyas venulosa: validated by fiat, International Commission of Zoological Nomenclature, Opinions and Decisions, 1958:169.

Remarks.—Eight specimens, seven males and a female (one pair in amplexus), were collected south of Escuinapa on August 3. The males were located in the water by their calls. The pond was about 25 centimeters deep and surrounded by secondary vegetation.

On the afternoon of September 2, near Teacapán, another *Phrynohyas* was heard calling from a coconut palm during a light rain. The following day a second male called from a strangler fig tree in dense forest. Both eluded capture. Judging from the two diurnal encounters and field experience with this frog elsewhere, we assume the *P. venulosa* is arboreal most of the time and descends to the ground only to breed. The only other specimens known from Sinaloa were collected near Presidio by Forrer (Boulenger, 1882:327-28).

A study of the genus *Phrynohyas* in Mexico and Central America (McDiarmid, 1968) forms the basis for assigning the Sinaloan frogs to *P. venulosa*.

Distribution in Sinaloa.—Known from two localities in the southern lowlands. See Fig. 25.

Specimens examined.—9.4 mi. SE Escuinapa (LACM 6315-19, 7245).

Literature record.—Presidio (Boulenger, 1882:327-28).

Phyllomedusa dacnicolor Cope

Phyllomedusa dacnicolor Cope, Proc. Acad. Nat. Sci. Philadelphia, 16:181, September 30, 1864 (type locality, Colima, Colima).

Remarks.—Fifty-four males have snout-vent lengths of 60-77 (68) and tibia lengths of 23-29 (26). Thirty-three females have snout-vent lengths of 46-92 (67) and tibia lengths of 18-38 (28). Sexual dimorphism in snout shape, as described by Duellman (1957a:30), was evident in all specimens examined.

In the rainy season this large hylid is usually abundant near temporary rain pools throughout the lowlands of Sinaloa. Several were taken from trees along a small stream near Carrizalejo, on the night of June 18, in association with *Smilisca baudinii*, *Rana pipiens*, *Leptodactylus occidentalis*, *Bufo mazatlanensis* and *Lepidodeira splendida ephippiata*. *Phyllomedusa dacnicolor* was found with *Pterohyla fodiens*, *Bufo kelloggi*, *B. marinus*, *Hyla smithi*, *Rana pipiens*, and *Natrix valida valida* at a large roadside rain pool near Villa Unión. All males observed calling were doing so from trees or branches around or above the ponds. *Phyllomedusa* is one of the few amphibians active during the dry season. Thirteen speci-

mens were taken on the road north of Mazatlán during the first week of April and three specimens were found in December at Mazatlán. A specimen was removed from the stomach of a *Leptophis diplo-*
tropis near Terreros.

Distribution in Sinaloa.—Throughout the lowlands, below 500 meters. See Fig 27.

Specimens examined.—9 mi. NW Acaponeta [Nayarit] (LACM 6334); 8 km. N Carrizalejo, 460 m. (* KU 78117-31); 1 km. S Concepción, 75 m. (* KU 63875); Concordia (UNM 10017-18); 2.1 mi. E Concordia (CSCLB 1551); 3 mi. E Concordia (CAS 91921-24); 3.7 mi. E Concordia (CSCLB 1552); 4.3 mi. E Concordia (CSCLB 1560); 5 km. SW Concordia (* KU 75372-76); Culiacán (CSCLB 1561-62); 15.8 mi. N Culiacán (CSCLB 1559); 5.4 mi. N, 1.3 mi. NE Culiacán (CSCLB 1870); 51 km. SSE Culiacán (* KU 37772); 5.5 mi. S Culiacán (LACM 6333); Elota (* KU 78408); 15.5 mi. N Río Elota (LACM 6328); 9.4 mi. SE Escuinapa (LACM 6335); 8.6 mi. S Espinal (CSCLB 1538); Guamúchil (UAZ 12866); Isla Palmito del Verde, middle (* KU 73891); 6 mi. E La Cruz (LACM 6327); 5 km. NE Las Trancas (* KU 78413-16); 5 km. N Los Mochis (* KU 73888-89); 7.3 km. SW Matatán, 150 m. (* KU 78446-54); Mazatlán (CAS 89711-12; CSCLB 1543-45, 1547-50, 1563-71; LACM 6515; UAZ 12835); S Mazatlán (JFC 62:51-54); 1 mi. N Mazatlán (LACM 6337-39); 3.3 mi. N Mazatlán (UAZ 12857-64, 12867); 5 mi. N Mazatlán (CSCLB 1542, 1546); 5.9 mi. N Mazatlán (UAZ 13359); 7.1 mi. N Mazatlán (CSCLB 1540); 9.2 mi. N Mazatlán (LACM 6320); 2 mi. SE Mazatlán (UAZ 12832); 13.7 mi. SE Mazatlán (UAZ 12833); 2.5 mi. S Mazatlán (UAZ 12865); 2.6 mi. S Mazatlán, Urias (UAZ 12836); 4 km. SW Navolato, 6 m. (* KU 73880); 8 mi. S Palmillas (LACM 25621); 14.2 mi. WNW Pericos turnoff [on hwy. 15], Rancho de los Pocitos (UAZ 13363-65); 1.4 mi. N Río Piaxtla (CSCLB 1539); 0.2 mi. SE Rancho Huanacastle (LACM 6336); 3.5 mi. N Rosario (CSCLB 1553-57); 4 mi. N San Blas, 400 ft. (JRM 1108-10); 5 km. SW San Ignacio, 200 m. (* KU 78409-12); Teacapán (* KU 73890; LACM 6537-39); Villa Unión, 15 m. (* KU 73881-87, 75366-67, 78418-45; LACM 6329-32; SU 15571-74, 15585); 3 mi. NE Villa Unión (LACM 6326); 4 mi. NE Villa Unión (LACM 6321); 9 km. NE Villa Unión (* KU 75368-71); 8.8 mi. NE Villa Unión (LACM 6322); 9.4 mi. NE Villa Unión (LACM 6323); 2.3 mi. E Villa Unión (CSCLB 1541); 3.7 km. E Villa Unión, 60 m. (* KU 78417); 16.3 mi. SE Villa Unión (LACM 6324-25); 5.9 mi. S Villa Unión (CSCLB 1558).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); El Dorado (Fugler and Dixon, 1961:7); 14 mi. SE Escuinapa, 100 ft. (Davis and Dixon, 1957b:147); Mazatlán (Kellogg, 1932:144; Taylor, 1938:515; Martín del Campo, 1941:760; Smith and Taylor, 1948:72); N Mazatlán (Kellogg, 1932:144; Lewis and Johnson, 1956:277); 2 mi. E Mazatlán, 50 ft. (Davis and Dixon, 1947b:147); Presidio, Rosario (Kellogg, 1932:144; Smith and Taylor, 1948:72); San Blas (Smith and Taylor, 1948:72); San Francisquito (Kellogg, 1932:144).

Additional records.—N bank Río Baluarte, 3 mi. N bridge (CAS 99286-87); 9 mi. S Río Baluarte (CAS 99443); 9.3 mi. S Río Baluarte (CAS 99444); 0.8 mi. S Río Cañas (CAS 99633); Chele, ca 300 ft. (UMMZ 110916 [7 spec.]); Concordia (AMNH 73778); 1.1 mi. E Concordia (CAS 99615); 11 mi. NE Concordia (SM 9210-12); 12 mi. NE Concordia (SM 9989-90); 3.2 km. SW Copala (KU 95870); Costa Rica (UIMNH 34890-91); Culiacán, 270 ft. (UMMZ 118813; USNM 153770); 2 mi. N Culiacán (AMNH 59282); 7.6 mi. N Culiacán, Hacienda Simon (UMMZ 120260); 7.8 mi. N Culiacán (FAS 12497); 30-35 mi. S Culiacán (FAS 14599); El Dorado (AMNH 70825-26); 0.2 mi. N El Dorado (CAS 99656); 10 mi. N El Dorado (SM 12040-44); 1 mi. NE El Fuerte (FMNH 71442-63); 8 mi. NNE El Fuerte (FMNH 71464); El Venadillo (UMMZ 123031); Escuinapa (AMNH 860-62); 11.7 mi. N

Escuinapa (UF 16550); 15 mi. SE Escuinapa, Hacienda La Campana, 300 ft. (UMMZ 118814 [5 spec.]); 9.1-14.1 mi. S Escuinapa (FAS 13956-60); 3.6 mi. E Guasave (on Verdura road) (CAS 99033-42); W half La Cruz rd. (CAS 99653); Los Mochis (FAS 10639-43); 13 mi. NNE Los Mochis (UIMNH 40566-68); Mazatlán (USNM 153773-74); N Mazatlán (AMNH 13126); 1 mi. N Mazatlán (SM 9194-209); 1.8 mi. N Mazatlán (UF 12854); 3 mi. N Mazatlán (MCZ 32575-76; USNM 151798-801; 3.2 mi. N Mazatlán (CAS 99380); 4 mi. N Mazatlán (AMNH 6205-06); 5 mi. N Mazatlán (SM 12051-55); 10 mi. N Mazatlán (MCZ 32573); 10.3 mi. N Mazatlán (CAS 99398); 10.4 mi. N Mazatlán (CAS 99399); 12 mi. N Mazatlán (UF 12855); 18 mi. N Mazatlán (AMNH 59281); 21 mi. N Mazatlán (MCZ 32571-72); 24 mi. N Mazatlán (MCZ 32565-70); 78.1 mi. N Mazatlán (CAS 99437); 1 mi. E Mazatlán (UIMNH 32769); 2.5 mi. E Mazatlán (FAS 8579); 0.4 mi. SE Mazatlán (MCZ 32574); ca. 2 mi. SE Mazatlán (FMNH 105263; UIMNH 25394-403); 2 mi. SE Mazatlán (FMNH 112751, 112754, 112757, 117466-68, 117476, 117478, 117481-84); 2.3 mi. N, 1.5 mi. W Mazatlán (FAS 7734-43); 25 mi. NW Mazatlán (MCZ 32950); 5-8 mi. NNW Mazatlán, 50-100 ft. (UMMZ 115302 [3 spec.]); 23.3 mi. NNW Mazatlán, 150 ft. (UMMZ 115303); 9 mi. NW Piaxtla (SM 11665-66, 12045-50); Rosario (UIMNH 7073, 62656-64); 8 mi. WNW Rosario (UMMZ 112850-51); Villa Unión, Río Presidio (UMMZ 102615); 3 mi. SE Villa Unión (SM 12056-61).

Pternohyla fodiens Boulenger

Pternohyla fodiens Boulenger, Ann. Mag. Nat. Hist., ser. 5, 10:326, figs., juveniles) of *Pternohyla fodiens* from Sinaloa were compared with three males of *Pternohyla dentata* Smith from Aguascalientes. In addition to the characters that Smith (1957:1) listed as differentiat-

Remarks.—Thirty-nine specimens (32 males, two females, and five October, 1882 (type locality, Presidio, W. México).

ing the two species, males of *Pternohyla fodiens* have black throats speckled with white (white tips of the ventral granules), and the paired vocal pouches are joined medially. The three males of *P. dentata* have the vocal pouches darker in color than the belly but paler than the light interspaces of the dorsum, and the pouches are separated by the white throat skin, which is as granular as the belly.

The males, females and juveniles of *P. fodiens* have snout-vent lengths of 38-62 (47.5), 60, 61, and 35-41 (38.8), and tibia lengths of 15.0-23.6 (19.1), 24.0, 28.7, 14.8-16.4 (15.5), respectively. The three males of *P. dentata* have snout-vent lengths of 52, 52 and 56 and tibia lengths of 18.7, 18.8, and 20.0.

Males usually call from the base of bushes or in grass, well back from the edge of the ponds. Amplexing pairs were collected on August 20 near La Cruz. Tadpoles were collected the following day from a pond eight to ten centimeters in depth. Thousands of tadpoles, all of which appeared to be newly hatched and about 10 mm. in length, were all that remained from the previous night's breeding activities. Most of the larvae were floating in clusters with their tails directed downward at the surface of the pond.

When a cluster was disturbed, the larvae would disperse, some swimming away and others sinking to the bottom. Jelly envelopes, some containing undeveloped eggs, were scattered over the bottom of the pond. The tadpoles clustered at the surface may have been feeding on surface scum. Three large series were collected and allowed to develop. Three days later the larvae lost their external gills.

Distribution in Sinaloa.—Throughout the lowlands, below 250 meters. See Fig. 28.

Specimens examined.—8.9 mi. N Acajoneta [Nayarit] (LACM 6408); 2.1 mi. NE Concordia (CSCLB 1608); 4 km. NE Concordia (* KU 73901); 3.7 mi. NE Concordia (CSCLB 1611-18); 4.7 mi. NE Concordia (CSCLB 1617-22); Culiacán (CSCLB 1601-05); 19.7 mi. S Culiacán (LACM 6405); 19.8 mi. S Culiacán (LACM 6406); 20.2 mi. S Culiacán (LACM 6404); 12 mi. NE El Fuerte (CSCLB 1606); 2.9 mi. N Elota (CSCLB 1623); 12 mi. N (by hwy. 15) Río Elota (LACM 6400); 15.5 mi. N (by hwy. 15) Río Elota (LACM 6401-02); 3.4 km. SE Escuinapa (* KU 73902-08); 1-3 mi. E La Cruz (LACM 6394-95); 5 mi. E La Cruz (LACM 6397-99); 10 mi. E La Cruz (LACM 6396); Matatán, 170 m. (* KU 73897-900); Mazatlán (CSCLB 1607; SDSC 1758-65); 5 mi. N Mazatlán (CSCLB 1625-38); 7.1 mi. N Mazatlán (CSCLB 1639-41); 8 mi. N Mazatlán (CSCLB 1610); 15.9 mi. N Mazatlán (CSCLB 1609); 55 mi. N Mazatlán, Río Piaxtla (CSCLB 1642); 7.3 km. SW Matatán, 155 m. (* KU 78455-56); Rosario, 150 m. (* KU 73896); 4 mi. N San Blas, 400 ft. (JRM 1105-07); San Ignacio (LACM 6391-93); 5 km. SW San Ignacio, 200 m. (* KU 78457); 1.5 km. ENE San Lorenzo (* KU 47904-05); Teacapán (LACM 6516-22); 0.8 mi. S Terreros (LACM 6409); Villa Unión (* KU 75383-96; LACM 6373-75); 3 mi. NE Villa Unión (LACM 6390); 9.5 km. NE Villa Unión (* KU 75397); 7.4 mi. NE Villa Unión (LACM 6376-82); 9.4 mi. NE Villa Unión (LACM 6383); 3.7 km. E Villa Unión, 60 m. (* KU 78458-63); 2.3 mi. E Villa Unión (CSCLB 1624); 10 mi. SE Villa Unión (LACM 6385-86); 16.3 mi. SE Villa Unión (LACM 6387-89); 18 mi. SE Villa Unión (LACM 6384).

Literature records.—Concordia, 400 ft. (Davis and Dixon, 1957b:147); Costa Rica (Smith and Van Gelder, 1955:145); El Dorado (Fugler and Dixon, 1961:7); 2 mi. E. Mazatlán (Taylor, 1938:514); Presidio; Rosario, 250 ft. (Kellogg, 1932:137).

Additional records.—23.3 mi. S Caitime (FAS 8590-91); 0.8 mi. S Río Cañas (CAS 99632); 1.0 mi. E Concordia (CAS 99620); 1.1 mi. E Concordia (CAS 99616); 4.4 mi. E Concordia (CAS 99614); 26.4 mi. N Culiacán (FAS 12632-33); 25 mi. S Culiacán (AMNH 60441); 58-63 mi. S Culiacán (FAS 12646-58); 7-8 mi. W Culiacán (FAS 12626); El Dorado (AMNH 70827); 1 mi. NE El Fuerte (UIMNH 40558-61); W part La Cruz rd. (CAS 99654); 13 mi. NE Los Mochis (UIMNH 40553-57; Mazatlán (FAS 7804-07; MCZ 44311-16; UIMNH 30676-81); 9 mi. N Mazatlán (UIMNH 40552); 35-40 mi. S Mazatlán (FAS 15354-57); 3.5 mi. NNW Mazatlán (UMMZ 115299); 19.6 mi. NNW Mazatlán (UMMZ 115298); 10.2-10.8 mi. SE Navolato (CAS 99680); Rosario (UIMNH 62707-710).

Smilisca baudinii (Duméril and Bibron)

Hyla baudinii Duméril and Bibron, *Erpétologie générale*, 8:564, 1841 (based on a specimen from México).

Smilisca baudinii, Cope, *Bull. U. S. Nat. Mus.*, 34:379, 1889.

Remarks.—Twenty-seven males have snout-vent lengths of 51-72

(62.5) and tibia lengths of 25.8-33.0 (29.8). The corresponding measurements for eight females are 45-78 (58.0) and 23.8-37.0 (29.2). One juvenile has a snout-vent length of 34 and a tibia length of 16.6. See Duellman and Trueb (1966:293) for additional notes on the Sinaloan population of this species.

Smilisca baudinii is one of the first frogs to begin breeding at the onset of the rainy season. Large choruses were heard as early as June 29 near Concordia. Males call from the shore or from low bushes around temporary ponds. Gravid females were collected at breeding ponds as early as July 7. Amplexing pairs were seen in the water and perched on limbs a few feet above the water.

On July 1, observations were made (at a breeding pond located about 10 miles NE of Villa Unión) which emphasized the spatial isolation existing between calling males of different species breeding at the same pond. The pond was about ten meters in diameter and was nearly circular. The shore was grassy except for a large tree at one side and some shrubs in another place. Small scattered bushes grew about 6 meters from the water's edge. Individual males of four species were calling from specific sites around the pond. *Bufo mazatlanensis* called from the open grassy shore near the water. About 30 males of *Phyllomedusa dacnicolor* were calling from limbs and leaves high in the tree above the water. Several jumped eight to ten meters into the pond when disturbed. Another frog, *Pternohyla fodiens*, was calling well away from the water, usually from the ground at the base of a bush or from a depression. Several *Smilisca* were calling from shore near the shrubs or from the lower branches of the shrubs. At no place around the pond were any two species calling from the same site, thus enhancing the separation of contemporary breeding populations.

Distribution in Sinaloa.—Throughout the state below 800 meters, most commonly in the southern lowlands. See Fig. 29.

Specimens examined.—8 km. N Carrizalejo, 460 m. (* KU 78133); 4 km. NE Concordia (* KU 73914); 3.7 mi. NE Concordia (CSCLB 1657-63); 4.5 mi. NE Concordia (LACM 6345-49); 5 km. SW Concordia (* KU 75438-39); 6 km. E Cosalá, 460 m. (* KU 73910); 3.5 mi. E Coyotitán (LACM 6361); N Culiacán (CSCLB 1664-66); 51 km. SSE Culiacán (* KU 37792); El Dorado (* KU 60392); 15.5 mi. N Río Elota (LACM 6366); 9.4 mi. SE Escuinapa (LACM 6367-70); Isla Palmito del Verde, middle (* KU 73916-17); 5 mi. E La Cruz (LACM 6363-65); 11.1 mi. NW (by hwy. 15) Los Mochis turnoff [on hwy. 15] (UAZ 13331); Matatán, 170 m. (* KU 73913); 7.3 km. SW Matatán, 155 m. (* KU 78464, 78466-70); Mazatlán (CAS 89707; SDSC 1756-57, 1771-72); 1.9-5.7 mi. N Mazatlán (UAZ 13338, 13414-15); 4.3 mi. N Mazatlán (LACM 6342-44); 5 mi. N Mazatlán (CSCLB 1649); 5.5 mi. N Mazatlán (LACM 6340); 7.1 mi. N Mazatlán (CSCLB 1652-54); 8.8 mi. N (by hwy. 15) Mazatlán (UAZ 13411); ca. 11 mi. N (by hwy. 15) Mazatlán

(UAZ 13412-13); 11.1 mi. N (by hwy. 15) Mazatlán (UAZ 13332); 15.9 mi. N Mazatlán (LACM 6341); 16 mi. N Mazatlán (CSCLB 1655); 17.5 mi. N Mazatlán (LACM 6371); 27.9 mi. N Mazatlán (LACM 6372); 8 mi. S Palmillas (LACM 25613); Rosario, 150 m. (* KU 73911-12; CSCLB 1651); 8 km. SSE Rosario (* KU 37625); 4 mi. N San Blas, 400 ft. (JRM 1111); San Ignacio (LACM 6362); 5 km. SW San Ignacio, 200 m. (* KU 78465); 1.5 km. ENE San Lorenzo (* KU 47917-24); Teacapán (* KU 73915; LACM 6526-36); Villa Unión (* KU 78471; LACM 6350-51); 8 km. N Villa Unión, 140 m. (* KU 80689-90); 5.7 km. NE Villa Unión (* KU 75434-37); 9.4 mi. NE Villa Unión (LACM 6352); 25 mi. NE Villa Unión (CSCLB 1656); 12.8 mi. SE Villa Unión (LACM 6360); 13 mi. SE Villa Unión (LACM 6359); 16.3 mi. SE Villa Unión (LACM 6354-58); 18 mi. SE Villa Unión (LACM 6353).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); El Dorado (Fugler and Dixon, 1961:7); N Mazatlán; Plomosas (Kellogg, 1932:162); 2 mi. N Presidio (Taylor, 1938:515).

Additional records.—2.6 mi. S Río Cañas (CAS 99631); 15.5 mi. E Concordia (CAS 99611); 16.5 mi. E Concordia (CAS 99608); Costa Rica (UIMNH 34887-89); N Culiacán (UF 12858); Río Culiacán (AMNH 64205); 25 mi. S Culiacán (AMNH 60440); El Dorado (AMNH 70828-29); 1 mi. NE El Fuerte (FMNH 71468); 5.0 mi. N Escuinapa (CAS 99601); 13 mi. NNE los Mochis (UIMNH 40536-37); Mazatlán (MCZ 44308-09); 3 mi. N Mazatlán (MCZ 32564); ca. 4 mi. N Mazatlán (AMNH 12562); 36 mi. N Mazatlán (UIMNH 38364); 4 mi. NE Mazatlán (SM 10237); 2.3 mi. N, 1.5 mi. W Mazatlán (FAS 7725-33); 3.5 mi. NNW Mazatlán (UMMZ 115197); Rosario (UIMNH 62706); 3 mi. E Rosario (UIMNH 7360-76); 6 mi. NNW Teacapán (KU 91410); 5.7 mi. W Villa Unión (AMNH 59284).

Family Microhylidae

Gastrophryne olivacea mazatlanensis (Taylor)

Microhyla mazatlanensis Taylor, Univ. Kansas Sci. Bull., 29:355, October 15, 1943 (type locality, two miles east of Mazatlán, Sinaloa).

Microhyla carolinensis mazatlanensis: Hecht and Matalas, Amer. Mus., Novitates, 1315:5, April 1, 1946.

Microhyla olivacea mazatlanensis: Langebartel and Smith, Herpetologica, 10:126, May 5, 1954.

Gastrophryne olivacea mazatlanensis: Fugler and Dixon, Michigan St. Univ., Mus. Publ., 2(1):8, July 20, 1961.

Remarks.—Hecht and Matalas (1946:4) reported intergradation between *Microhyla carolinensis* and *M. mazatlanensis* in Sonora, México, and as a result considered *mazatlanensis* to be a subspecies of *carolinensis*. Twenty-two *Gastrophryne olivacea* from Sinaloa agree with the original description for *Microhyla mazatlanensis* Taylor (1943:355-357) with the following exceptions: the lateral black line is absent or is reduced to a single spot on the shoulder in some; the sides are dark brown below the lateral black line, becoming paler ventrally; the inguinal spot and the limb bars, which form a continuous line when the leg is folded, have faint pale centers in individuals from northern Sinaloa; the scattered black dorsal spots tend to form a pattern of lines diverging posteriorly in specimens

from southern Sinaloa and are scattered, forming an indistinct pattern, in frogs from northern Sinaloa; the flanks are pale ventrally with a slight peppering of pigment or are faintly mottled with pale brown.

The specimens from Sinaloa were compared with 20 specimens from Sonora (20 to 50 kilometers east of Kino), and with 161 frogs from Texas. The Sonoran specimens have brownish flanks; an indistinct row of black spots borders the flanks dorsally and posterior to the eye in some individuals, but spots are absent in others. The brown inguinal spots seem slightly smaller, but darker and more conspicuous, than those of the Sinaloan frogs. The limb bars are either solid, composed of many fused dark brown spots, or reduced to two to four dark brown spots. Dorsal brown spots are present anteriorly, or they are absent. The belly is creamy white with the edges, the chest, and lower jaw mottled with brown, or with a faint peppering of dark pigment. The flanks are distinctly mottled with brown.

The Texan frogs have small inguinal spots or lack them entirely. The limb spots, if present, are small, brown to brownish black, separated or fused, and enclose a pale tan area. The dark brown lateral area that is present in frogs from Sinaloa may be absent or indistinct. The dorsal spots are smaller and fewer than in Sonoran frogs, or are absent. The belly is clear with only a trace of mottling laterally. The flanks are unmarked or only faintly mottled.

From the characters of the pattern and coloration examined, it is evident that the population in western Sonora differs from the populations in Sinaloa and Texas in having distinctly mottled sides, mottling on the lower jaw, chest, and edges of the belly, and distinct dark brown inguinal and leg spots. Other characters are intermediate between the Sinaloan and Texan populations.

Wake (1961:88-89), on the basis of specimens secured in southern Arizona, elevated *mazatlanensis* to specific status on the assumption that the single specimen reported by Hecht and Matalas (1946:4) is a hybrid and does not represent an intergrading population. If the specimen reported by Hecht and Matalas (1946:4) is a hybrid, then the Sinaloan population would be *G. mazatlanensis*. Until more material from eastern Sonora and western Chihuahua is available, we refer the Sinaloan specimens to *Gastrophryne olivacea mazatlanensis*. Regardless of the specific status of the frogs west of the continental divide, those from northwestern coastal Sonora possibly represent a taxon distinct from that in Sinaloa.

Single males were encountered at night in early July, immediately following heavy rains. On August 18, several calling males were collected in a pond near La Cruz. A few nights later a large series of both sexes was collected in the same area. The breeding ponds were all temporary rain-filled pools, usually on the forest floor. The water was dirty brown and contained much floating debris. The majority of males were calling from the water. The tiny frogs would hang on floating debris, arch their backs and call; sometimes the black and white mottled vocal pouch was all that was visible of the songster. The call begins with a peep and continues as a high-pitched buzz of about two seconds duration. Males calling from the shore usually were concealed in deep grass or in a depression. All amplexing pairs were taken in shallow water near shore.

Distribution in Sinaloa.—Throughout the lowlands, below 250 meters north of Villa Unión. See Fig. 30.

Specimens examined.—5 km. SW Concordia (* KU 75461); 16 mi. N Coyotitán (LACM 6429); 32 km. N Culiacán (* KU 73928-32); 12 mi. N (by hwy. 15) Río Elota (LACM 6457); 15.5 mi. N (by hwy. 15) Río Elota (LACM 6458-63); 5 mi. E La Cruz (LACM 6436-56); 10 mi. E La Cruz (LACM 6430-35); 10.9 mi. N La Cruz turnoff [Las Teposanas] on hwy. 15 (LACM 6428); 5 km. N Los Mochis (* KU 73922-27); 2.3 mi. NE (by hwy. 15) Villa Unión (CSCLB 1875); 9 km. NE Villa Unión (* KU 75451-60); 0.8 mi. S Villa Unión (CSCLB 1721).

Literature records.—El Dorado (Fugler and Dixon, 1961:8); 13 mi. NE Los Mochis (Chrapiwy, *et al.*, 1961:89); Mazatlán (Hecht and Matalas, 1946:6); 2 mi. E Mazatlán (Taylor, 1938:516); 18.6 mi. NNW Mazatlán (Wake, 1961:90).

Additional records.—1 mi. NE El Fuerte (FMNH 71465-67); 6 mi. S Los Mochis (SDSNH 19892-93); Mazatlán (USNM 147964-65).

Gastrophryne usta usta (Cope)

Engystoma ustum Cope, Proc. Acad. Nat. Sci. Philadelphia, 18:131, 1866 (type locality, Guadalajara, Jalisco).

Gastrophryne usta: Stejneger, Proc. Biol. Soc. Washington, 23:166, December 29, 1910.

Gastrophryne usta usta: Lynch, Trans. Kansas Acad. Sci., 68:397, November 10, 1965.

Remarks.—Two males and three females have snout-vent lengths of 25.0, 25.7, 26.9, 27.0, and 25.3 (USNM 73267), respectively. All females contain eggs. The five frogs examined have a narrow, mid-dorsal line that is faintly cream-colored and that resembles the mid-dorsal line in frogs illustrated by Taylor and Smith (1945; plate 32, figs. 2 and 4); however, there is no trace of a fine line on the posterior surface of the femur, tibia or foot. All five frogs have two well-developed metatarsal tubercles.

On June 30, a single male was located as it called from beneath

a rock in an arroyo northeast of Concordia. The call was about two seconds in duration and was issued every three or four minutes. The following night a male and female were taken from a pool in the arroyo. Two other males were collected as they called from beneath a small log at the edge of a pond on July 7. A female taken at the same time was gravid. Another series of males in chorus was secured in August at Teacapán.

The call is a soft, high-pitched baaaaa. After some time it was possible to distinguish between the call of *G. usta* and that of *G. olivacea*, which is lower in pitch and slightly louder. The characteristic peep preceding the *mazatlanensis* call was not perceived from *usta* and may be lacking.

The ranges of the two species of *Gastrophryne* overlap near Mazatlán. The two species have not been taken sympatrically and probably are ecologic replacements of each other in southern Sinaloa. *Gastrophryne usta* has been collected in the same pond with *Smilisca baudinii*, *Phyllomedusa dacnicolor*, *Pterohyla fodiens*, *Hyla smithi*, *Diaglena spatulata*, *Bufo mazatlanensis*, and *Hypopachus oxyrrhinus*.

Distribution in Sinaloa.—Recorded from the coastal lowlands from near Mazatlán southward. See Fig. 30.

Specimens examined.—4 km. NE Concordia (° KU 73918-19); 4.5 mi. NE Concordia (LACM 6464-65); 34 km. SE Escuinapa (° KU 73920-21); Teacapán (LACM 6468-74); Venodio [Venadillo] (° USNM 73267); 16.3 mi. SE Villa Unión (LACM 6467); 18 mi. SE Villa Unión (LACM 6466).

Literature records.—Presidio (Parker, 1934:149); Venodio [Venadillo] (Kellogg, 1932:188; Smith and Taylor, 1948:94).

Hypopachus oxyrrhinus oxyrrhinus Boulenger

Hypopachus oxyrrhinus Boulenger, Ann. Mag. Nat. Hist., ser. 5, 11:344, May, 1883 (type locality, Presidio de Mazatlán, Sinaloa).

Hypopachus oxyrrhinus oxyrrhinus: Shannon and Humphrey, Herpetologica, 14:89, July 23, 1958.

Remarks.—Sixteen specimens examined have dark brown pigment on the side of the head from above the nostril and outer edge of the eyelid, ventrally and posteriorly to the groin. The dark pigment forms a sharp but irregular border dorsally, then fades gradually into the pale ventral coloration. The dark pigment contains color flecks that increase in size ventrally, becoming large round white spots on the belly. These frogs resemble *H. oxyrrhinus ovis* in this aspect of their coloration, but none has an irregular dark line from between the eyes to the groin (Taylor, 1940c:521, plate 62, figs. C and D). Also, the Sinaloan frogs, which have snout-vent lengths of 36-49 (41) and foot lengths of 21-28 (24), are larger than *H. o. ovis* as defined by Smith and Taylor (1948:95).

The first specimen of *Hypopachus* was collected in late June as it called from a hole in the bank of a slow, rain-fed stream. Heavy rain that afternoon initiated the breeding season for several species of frogs which were then collected for the first time. Three gravid females were taken from a pond southeast of Villa Unión where several males were found calling from hoof depressions around the edge of the pond. No amplexing pairs were seen that night. Other males were calling from concealed sites in grass near the Río Elota. The call is a loud Waaaaa, lower in pitch than *Gastrophryne*, and lasting two or three seconds. Amplexing pairs were noted swimming in the water on two occasions in mid-August.

Distribution in Sinaloa.—Known from the coastal lowlands south of Espinal. See Fig. 31.

Specimens examined.—2.1 mi. NE Concordia (CSCLB 1709-11); 4 km. NE Concordia (* KU 73935-38); 3.7 mi. NE Concordia (CSCLB 1673-1707); 4.5 mi. NE Concordia (LACM 6475); 10 km. SW Concordia (* KU 73939); 16 mi. N Coyotitán (LACM 6487); 6 mi. N (by hwy. 15) Río Elota (LACM 6493-95); 15.5 mi. N (by hwy. 15) Río Elota (LACM 6496-99); 9.4 mi. SE Escuinapa (LACM 6545-47); 34 km. SE Escuinapa (* KU 73940-43); 1-3 mi. E La Cruz (LACM 6488); 5 mi. E La Cruz (LACM 6489-92); 7.3 km. SW Matatán, 155 m. (* KU 78497-99); 7.1 mi. N Mazatlán (CSCLB 1708); 3 mi. S Rosario (LACM 6503); 9 km. NE Villa Unión (KU 75465-68); 16.3 mi. SE Villa Unión (LACM 6476-86).

Literature records.—8.1 and 8.8 mi. N Mazatlán (Shannon and Humphrey, 1958:88); Presidio (Boulenger, 1883:344; Kellogg, 1932:185).

Additional records.—8.0 mi. S Río Balurate (CAS 99629-30); 9 km. NE Concordia (KU 95939-44); 1.0 mi. E Concordia (CAS 99621); 1.1 mi. E Concordia (CAS 99619); 12.4 km. SW Concordia (KU 95945).

Family Ranidae

Rana catesbeiana Shaw

Rana catesbeiana Shaw, General Zoology, 3:106, pl. 33, 1802 (based on a specimen from North America; type locality restricted to South Carolina by Kellogg, Bull. U. S. Nat. Mus., 160:197, March 31, 1932).

Remarks.—Two recently metamorphosed frogs have snout-vent lengths of 35.7 and 43.4. The tips of the toes are pointed; the sub-articular tubercles of the hind feet are small and rounded; dorsolateral folds are absent; the tympanum is distinct and approximately the same size as the eye in both specimens.

One of the frogs was taken on August 4, 1962, from a roadside pond in association with *Phyllomedusa dacnicolor*, *Leptodactylus occidentalis*, *Gastrophryne olivacea mazatlanensis*, and *Bufo marinus*.

In 1956, *Rana catesbeiana* was introduced near Los Mochis in anticipation of its use as a harvestable food item (Ibarra, 1963:19).

Since its introduction, the bullfrog has spread throughout the irrigation ponds and ditches of the agricultural region around Los Mochis. Males were heard calling on several nights along the highway south of Los Mochis. The frog is well established and probably will continue to spread whenever and wherever suitable habitat becomes available.

Distribution in Sinaloa.—Known only from the vicinity of Los Mochis and Guasave. See Fig. 23.

Specimens examined.—Los Mochis (CSCLB 1600); 5 km. N Los Mochis (* KU 73944); 6.5 km. E Los Mochis (* KU 62363); 24.3 mi. S (by hwy. 15) Los Mochis (LACM 6416).

Additional records.—3.6 mi. E Guasave (CAS 99050); Los Mochis turnoff (on hwy. 15) (FAS 14105-09); 15 mi. N Los Mochis (SM 10625).

Rana pipiens Schreber

Rana pipiens Schreber, Der Naturforscher, Halle, 18:185, pl. 4, 1782 (based on a specimen from Raccoon, Gloucester county, New Jersey).

Rana forreri Boulenger, Ann. Mag. Nat. Hist., ser. 5, 11:343, May, 1883 (type locality, Presidio de Mazatlán, Sinaloa).

Remarks.—*Rana pipiens* has been collected from near sea level in tropical thorn woodland to about 1700 meters in tropical deciduous forest. This species is frequently found near irrigated fields, roadside pools in the lowlands, and creeks, rivers, or ponds at the higher elevations. The leopard frog is another species which has benefitted from agricultural development in Sinaloa, having become abundant in the irrigation ditches near Los Mochis.

Distribution in Sinaloa.—Throughout the state, below 1700 meters. See Fig. 32.

Specimens examined.—8 km. N Carrizalejo, 460 m. (KU 78158-77); 1 km. S Concepción, 75 m. (KU 63676); Concordia (UNM 10014-16); 7.2 mi. NE Concordia (CSCLB 1599); 6 km. E Cosalá, 460 m. (KU 73949); Coyotitán (JFC 62:16-17); 4 mi. N Culiacán (JMS osteo. coll.); 80 mi. N Culiacán (LACM 6420); 21.4 mi. S Culiacán (LACM 6426); El Burrion (JFC 62:39-44); 6 km. NE El Fuerte, 150 m. (KU 78154-55); 15.4 mi. N Río Elota (JMS osteo. coll.); 9 mi. S Escuinapa (LACM 25688); 6 km. ESE Guasave (KU 48981-82); 3.3 mi. S Guasave (UAZ 16268); 17.4 mi. NW (by rd.) Guasave (on rd. to Plaza Visnaga) (UAZ 9451-52); Isla Palmito de la Virgen, 15 m. (KU 73950); 1.3 mi. S La Cruz turnoff (on hwy. 15) (JFC 62:27-29, 70); Los Mochis (CSCLB 1598); 14.1 mi. S Los Mochis (UAZ 16271-75); 6 km. W Los Mochis, 3 m. (KU 78156-57); 11.1 mi. NW Los Mochis turnoff [on hwy. 15] (UAZ 16270); 34.1 mi. NW Los Mochis turnoff [on hwy. 15] (UAZ 16269, 16276-79); Mazatlán (CSCLB 1597); 1 mi. W Pánuco (CSCLB 1596); 14.2 mi. WNW Pericos turnoff [on hwy. 15], Rancho de los Pocitos (UAZ 16262-67); Plomosas, 760 m. (KU 73951-58); 4 mi. N San Blas, 400 ft. (JRM 1119-24); San Miguel (KU 44613, 44616); Santa Lucía, 1100 m. (KU 75444); 1.2 mi. NE Santa Lucía (CSCLB 1758-59); E Santa Lucía (KU 44627-29); 2 km. E Santa Lucía (KU 44624-26); 2.8 mi. W Santa Lucía (CSCLB 1595); Teacapán (LACM 6540-44); 79.2 mi. N Terreros (LACM 6425); 17.6 mi. S Terreros (JMS osteo. coll.); 18.1 mi. S Terreros (JMS osteo. coll.); Villa Unión (CSCLB 1594; LACM 6423-24).

Literature records.—50 mi. NE Choix (Kellogg, 1932:212); El Carrizo (Lewis and Johnson, 1956:277); El Dorado (Fugler and Dixon, 1961:8); Mazatlán (Martin del Campo, 1941:760); nr. Mazatlán (Kellogg, 1932:212; Taylor, 1938:516); 3 mi. E Mazatlán (Taylor, 1938:516); Presidio (Boulenger, 1883:343; Kellogg, 1932:212); nr. Presidio (Taylor, 1938:516); Rincón de Uñas (Kellogg, 1932:212).

Additional records.—Chele, ca. 300 ft. (UMMZ 110913); Concordia (UMMZ 102621, 102639 [3 spec.]); 1.1 mi. E Concordia (CAS 99623); Culiacán (AMNH 58378-81); ca. 10 mi. N Culiacán (UIMNH 38149-51); 18-23 mi. S Culiacán (FAS 12495); 24.2 mi. S Culiacán (UF 17119); 14 mi. SW El Batel (AMNH 59224); 1 mi. NE El Fuerte (FMNH 71476-78); Río Fuerte at hwy. 15 (AMNH 64152-53); 37.6 mi. N Guamúchil (AMNH 67558-59); Guasave, Río Sinaloa (AMNH 64154); 3.6 mi. E Guasave (CAS 99043-49); 6 mi. S Los Mochis (SDSNH 19886-90); Mazatlán (MCZ 8630); nr. Mazatlán (FMNH 107802; USNM 47445); N Mazatlán (AMNH 12568, 13127-28); 9 mi. NW Piaxtla (SM 10426, 10430, 10439); 10 mi. S Presidio (UIMNH 32181-82); Rosario (UIMNH 62511); 1.3 mi. N Santa Lucía (MCZ 32590); 24.8 mi. E hwy. 15 [Villa Unión] on hwy. 40 (CAS 99310-12).

Rana pustulosa Boulenger

Rana pustulosa Boulenger, Ann. Mag. Nat. Hist., ser. 5, 11:343, May, 1883
(type locality, Ventanas, Durango).

Remarks.—We have examined six frogs and four tadpoles. The frogs have the following measurements: snout-vent length 49.9-75.4 (56.1); tibia length 28.3-43.9 (31.3); head length 19.7-30.0 (22.2); head width 17.3-26.8 (19.5). The tibia length/snout-vent length is 0.54-0.58 (0.557); head length/snout-vent length is 0.39-0.41 (0.396); head width/snout-vent length is 0.33-0.35 (0.347); head width/head length is 0.84-0.89 (0.875). The tadpoles, two of which were metamorphosing when preserved on June 23, 1955, agree closely with the descriptions and illustrations given by Taylor (1942a:44-45, pl. I, fig. 1, pl. III, fig. 4) and Zweifel (1955:251, fig. 22). The tadpoles were found in the rapids of a canyon stream.

The proximity of the type locality to Sinaloa, and the range of the species to the south, suggest that *Rana pustulosa* probably occurs in the mountains of southeastern Sinaloa. Two specimens (USNM 84404-05) were sent to the U. S. National Museum in November, 1921, by the Departamento de Exploracion Biologia Republica Mexicana. One of these (USNM 84405) was sent to the Museum of Comparative Zoology on February 21, 1944, and identified as *Rana sinaloae* (MCZ 25756). Zweifel (1954a:135-36) discussed the National Museum specimen (84404, not 34404 as published by Zweifel) and pointed out that it is either *Rana pustulosa* or *sinaloae* but definitely not *R. pipiens* (the only other logical possibility for the area). Examination of both specimens indicates that the frogs probably are *R. pustulosa*. Although the specimens are listed as coming from

Mazatlán we suspect they were collected at higher elevation in the Sierra Madre Occidental and subsequently shipped to México City from Mazatlán. An examination of the original tags indicates that the Mazatlán referred to is the one in Sinaloa.

Dunn (1922:222) recorded a single specimen of *R. pustulosa* from Mazatlán that, upon later examination, was referred to *Rana montezumae* by Oliver (1937:7-8). Since *R. montezumae* otherwise is known only from the southern part of the Mexican plateau, since the specimen examined by Oliver was "badly rubbed," since Mazatlán represents a locality and habitat separate and distinct from those previously known for the species (Duellman, 1961:54-55), *R. montezumae* is not here included in the fauna of the state.

Distribution in Sinaloa.—Known only from the vicinity of Santa Lucía in the southern highlands. See Fig. 33.

Specimens examined.—Mazatlán [probably incorrect] (MCZ 25756; USNM 84404); 3 mi. N Santa Lucía (* MCZ 32591-94); 1.2 mi. NE Santa Lucía (* CSCLB 1760); 1.5 km. E Santa Lucía (* KU 69159; N = 4); 5.1 mi. SW Santa Lucía (* CSCLB 652).

Rana sinaloae Zweifel

Rana sinaloae Zweifel, Bull. So. California Acad. Science., 53:131, December 31, 1954 (type locality, fourteen miles, by road, southwest of El Batel, Sinaloa, 4200 feet).

Remarks.—A series of 24 specimens agrees with the original description. The measurements are as follows: snout-vent length, 25.8-76.8 (46.8); head width 10.2-28.9 (17.2); head length 9.7-26.5 (16.2); tibia length 13.5-46.8 (25.6); tympanum diameter 1.6-5.9 (3.2). The tibia length/snout-vent length is 0.48-0.62 (0.536); the tympanum diameter/head width is 0.16-0.21 (0.189), which agrees with data given by Zweifel (1954a:133), but is lower than those reported by Duellman (1958b:10) and by McDiarmid (1963:9).

Rana sinaloae occurs in tropical deciduous forest, usually along mountain streams.

Distribution in Sinaloa.—Known only from the vicinities of Plomosas and Santa Lucía, from about 750 to 1950 meters elevation. See Fig. 34.

Specimens examined.—Plomosas, 760 m. (* KU 73960-65); Santa Lucía, 1100 m. (* KU 75445-50; CSCLB 646); 0.6 mi. NE Santa Lucía (CSCLB 653-54); 2.2 km. NE Santa Lucía, 1150 m. (* KU 78492-96; 1.5 km. E. Santa Lucía (* KU 44632-37); 21 km. E Santa Lucía (* KU 44631); 7.2 mi. W Santa Rita (LACM 6427).

Literature record.—10 mi. NE (by rd.) El Batel, 6400 ft. (Zweifel, 1954a:132).

Additional record.—3.2 km. SW Santa Lucía, 4000 ft. (KU 95948-49).

Class REPTILIA

Order TESTUDINES

Family Kinosternidae

Kinosternon integrum Le Conte

Kinosternon integrum Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 7:183, 1854 (type locality, México).

Remarks.—Three specimens identified as *K. hirtipes* by Taylor (1938:529) were later reidentified by Norman Hartweg (personal communication) as *K. integrum*. Examination of 55 specimens of *K. integrum* from Sinaloa and nine specimens of *K. hirtipes* from Chihuahua and Durango has revealed at least three characters which serve to separate these two confusing species. In *K. hirtipes* the plastron is narrower relative to the carapace, the gular is shorter relative to the suture separating the humerals and pectorals, and the thighs of males bear patches of cornified scales posteriorly. In *K. integrum* the plastron is wider, the gular is longer, and there are no cornified scales on the thighs of males. To our knowledge, *K. integrum* is the only species of *Kinosternon* known definitely from Sinaloa.

The measurements for 55 specimens are as follows: carapace length 36-180 (132), carapace width 33-113 (88), carapace width/carapace length 0.62-0.92 (0.68). Excluding seven individuals with carapace lengths of less than 100 mm. the ratio is 0.62-0.75 (0.67) for the remaining 48 specimens.

Kinosternon integrum was the turtle most commonly encountered during the field work. Mud turtles are found in all river drainages in the state and are taken often in roadside ponds, ditches, and on the road at night. Hatching turtles were found in late July, August, and September.

Distribution in Sinaloa.—Found in association with permanent water throughout the state, up to an elevation of about 1100 meters. See Fig. 35.

Specimens examined.—2.5 km. N Badiraguato, 230 m. (* KU 83423); 1.5 km. SE Camino Real (* KU 63633-36); 1 km. S Concepción (* KU 63612-32); 1 mi. W Copala (CSCLB 1992); Concordia (UNM 9998-10009); Culiacán (CSCLB 1993-96); 5.5 mi. N Culiacán (CSCLB 1998); 12 km. W Cuspaderos [Chupaderos?] (* KU 78978); El Dorado (* KU 45398); 5.8 mi. S Escuinapa (CSCLB 1999); 7.3 km. SW Matatán, 155 m. (* KU 78974-76); North Mazatlán (JFC 63:140); Río Presidio Bridge (SU 18263); Rosario (LACM 6550); 4.8 km. NE San Miguel (* KU 63637-46); Santa Lucía, 1100 m. (* KU 75648-53, 78977; CSCLB 1997); 5 km. SW Santa Lucía, 660 m. (* KU 80771); Teacapán (LACM 6553-57); 13 km. NNE Vaca, 400 m. (* KU 80772-73); Villa Unión (SU 22292); 9.5 km. NE Villa Unión (* KU

48557-60); 8.4 mi. NE Villa Unión (LACM 6548); 10.2 mi. NE Villa Unión (LACM 6549).

Literature records.—Mazatlán (Boulenger, 1889:42; Günther, 1885-1902: 15); Presidio (Boulenger, 1889:42; Taylor, 1938:529).

Additional records.—Concordia (UMMZ 102627-31); Culiacán (AMNH 82143); 7.6 mi. N Culiacán (UMMZ 121922); El Dorado (AMNH 90765); 20 mi. S, 14 mi. E Escuinapa (MVZ 68971); Guasave (AMNH 82142); Mazatlán (USNM 12607-08, 13388-89); 5 mi. N Mazatlán (SM 11425, 11427-32, 11456); 20 mi. S Mazatlán (AMNH 17867); ca. 13 mi. NE Palmar [de Sepúlveda], tributary of Río Bacubirito (UMMZ 122242); Presidio (FMNH 123640); Rosario (UIMNH 7052-58); 0.9 mi. N San Benito, tributary of Río Mocerito (UMMZ 122235-39); Villa Unión (UMMZ 102625-26); 4 mi. S. Villa Unión (UMMZ 118040-41); 1 mi. NW Villa Unión (AMNH 94721-22).

Family Emydidae

Chrysemys scripta hiltoni (Carr)

Pseudemys scripta hiltoni Carr, Amer. Mus. Novitates, 1181:1, Figs. 1-3, July 30, 1942 (type locality, Guirocoba, 28 miles southeast of Alamos, 1485 feet, Sonora).

Chrysemys scripta [hiltoni]: McDowell, Proc. Zool. Soc. London, 143:274, September 1964.

Remarks.—Ten specimens obtained from the Río Fuerte and nearby lagoons in northern Sinaloa, 5-7 March, 1961, are typical *hiltoni*. Their measurements are: carapace length 125-295 (180), carapace width 100-215 (130), and shell depth 45-150 (70). The series includes two males. Marginal black spots are distinct on all specimens.

Distribution in Sinaloa.—Probably occurs throughout the Río Fuerte drainage system. See Fig. 36.

Specimens examined.—4.8 km. NE San Miguel, Río del Fuerte, 90 m. (* KU 63600-09).

Additional record.—7 mi. N Los Mochis (SM 10585).

Chrysemys scripta ornata (Gray)

Emys ornata Gray, Synopsis reptilium, p. 30, 1831 (type locality, Mazatlán, Sinaloa).

Pseudemys scripta ornata: Carr, Herpetologica, 1:135, December 30, 1938.

Chrysemys scripta [ornata]: McDowell, Proc. Zool. Soc. London, 143:274, September 1964.

Remarks.—Three specimens from southern Sinaloa are typical *ornata*, with no indication of black smudge-like marks on the marginals that are characteristic of *hiltoni*. Measurements of an adult male, female, and juvenile are respectively: carapace length 151, 300, 34; carapace width 120, 235, 31; shell depth 54, 120, 18. Intergradation between *ornata* and *hiltoni* may occur in north-central Sinaloa.

This turtle inhabits roadside ponds, tanks, and wells in the lowlands of southern Sinaloa. They were seen sunning on the banks or on floating debris in both the wet and dry seasons. Field observations indicate that *ornata* is more terrestrial than *hiltoni*. Specimens have been collected on the road at night near Escuinapa, and encountered wandering overland in early spring near Teacapán. Two females contained well developed ova on April 26; nesting activities were observed on May 18 near Teacapán (Scott, 1962:19).

Distribution in Sinaloa.—Coastal drainage systems of southern Sinaloa below 200 meters. See Fig. 36.

Specimens examined.—1.5 km. SE Camino Real (* KU 63610); 1 km. S Concepción (* KU 63611); 7.3 km. SW Matatán, 155 m. (* KU 78979); Rancho Huanacastle (LACM 6551); 1 mi. N Teacapán (LACM 6552).

Literature records.—Mazatlán; Presidio (Boulenger, 1889:81).

Additional records.—2 mi. N Escuinapa (FAS 15911); 5 mi. N Mazatlán (SM 10578-82); ca. 5.5 mi. SW Villa Unión (UMMZ 113090).

Rhinoclemys pulcherrima pulcherrima (Gray)

Emys pulcherrima Gray, Cat. Shield Reptiles Brit. Mus., Pt. I Testudinata, p. 25, Table 25, Fig. 1, December 1, 1855 (based on a specimen from México).

Geoemyda pulcherrima pulcherrima: Wettstein, Sitzb. Akad. Wiss. Wien, math-nat. Kl., Abth. 1, 143:18, 1934.

Rhinoclemys pulcherrima [*pulcherrima*]: McDowell, Proc. Zool. Soc. London, 143:267, September 1964.

Remarks.—Two individuals (KU 75656, 43617) have the following measurements: carapace 101.9×85.0 , 94.5×83.3 ; plastron 92.3×56.6 , 87.3×51.2 (hind lobe); depth 42.8, 41.9; length anterior lobe of plastron 20.0, 18.9; length posterior lobe 26.6, 26.9; length bridge 45.1, 40.7. In both specimens the lateral borders of the carapace are strongly bowed, a distinct median keel is present dorsally, the posterior edge of the plastron is deeply notched, the gular is triangular with its anterior corners protruding beyond the plastron edge, there are three light lines anterior to the eye, and the plastron is yellow laterally with a brown stripe occupying the median half. Other characters agree with Gray (1855:25) and Günther (1885-1902:6-7).

Although *Rhinoclemys pulcherrima* apparently is abundant to the north and south of Sinaloa (Bogert and Oliver, 1945:396) only a few specimens have been collected in the state. Nothing is known concerning the specific habitat of this species. Two turtles (KU 43617; CSCLB 2000) were found crossing a road in July; a third (KU 75656) was obtained from natives in the same month.

Distribution in Sinaloa.—Inhabits canyons and arroyos at intermediate elevations on the Pacific versant of the Sierra Madre Occidental. See Fig. 37.

Specimens examined.—7.5 mi. E Concordia (CSCLB 2000); 1.5 km. W Coyotitán (* KU 43617); Santa Lucía, 1100 m. (* KU 75656).

Literature record.—Presidio de Mazatlán (Günther, 1885-1902:6).

Additional record.—"Vicinity of Los Mochis" (UMMZ 120422).

***Terrapene nelsoni klauberi* Bogert**

Terrapene klauberi Bobert, Amer. Mus. Novitates, 1226:2, 1943 (type locality, Rancho Guirocoba, about 18 miles southeast of Alamos, Sonora).

Terrapene nelsoni klauberi: Milstead and Tinkle, Copeia, No. 1:184, March 20, 1967.

Remarks.—Inquiry among the inhabitants at Terreros led to the discovery of this turtle, heretofore unknown from the state. A single plastron and carapace was found on a steep hillside near Terreros. William W. Milstead kindly examined this specimen and provided the identification. The specimen is a male with the following characteristics: total length, 135; posterior lobe of plastron length, 81; interabdominal suture, 28; interfemoral, 14; interanal, 39; posterior lobe ratios—interabdominal, 0.34; interfemoral, 0.17; interanal, 0.48 (all measurements by Milstead).

The specimen was found on an isolated rocky peak that reaches a height of about 600 meters; the hillside is covered by a low-canopy forest. Numerous burrows were found on the southeastern slope of the peak, some of which were attributed to *Terrapene*. Additional collecting in the foothills along the eastern border of the state and on other isolated peaks on the coastal plain should turn up additional specimens.

Distribution in Sinaloa.—Known only from an isolated peak in the central lowlands. See Fig. 37.

Specimen examined.—About 4 mi. W Terreros (JMS osteo. coll. 911).

Family Testudinidae

***Gopherus agassizii* (Cooper)**

Xerobates agassizii Cooper, Proc. California Acad. Sci., 2:120, 1863 (type locality, Mountains of California near Fort Mojave, Kern County, California).

Gopherus agassizii: Stejneger, N. Amer. Fauna, 7:161, 1893.

Remarks.—Bogert and Oliver (1945:398-9), on the basis of four specimens of *Gopherus agassizii* from Alamos, Sonora, reported that the population inhabiting the Río Fuerte drainage has become partly

differentiated from *G. agassizii* in Arizona and California. The Alamos specimens differed from other specimens of *Gopherus* in the ratios of plastron width and length, shell depth and plastron length, and hind foot diameter and head width. One specimen was reported from Sinaloa (Loomis and Geest, 1964:203).

Distribution in Sinaloa.—Known only from the northern foothills. See Fig. 37.

Specimens examined.—None.

Literature record.—3.8 mi. NE El Fuerte (Loomis and Geest, 1964:203).

Family Cheloniidae

Caretta caretta gigas Deraniyagala

Caretta gigas Deraniyagala, Ceylon Journ. Sci. sect. B, 28:61, 1933 (type locality, Ceylon).

Caretta caretta gigas: Deraniyagala, Tetrapod reptiles of Ceylon, 1:164, 1939.

Remarks.—This widely distributed species has been reported only from the southern coast and from adjacent Baja California.

Distribution in Sinaloa.—Known only from the coast at Mazatlán. See Fig. 38.

Specimens examined.—None.

Literature records.—Mazatlán (Boulenger, 1889:186); Sinaloa [state only] (Anonymous, 1966:25).

Chelonia mydas carrinegra Caldwell

Chelonia mydas carrinegra Caldwell, Contrib. in Sci., Los Angeles County Mus., 61:4, December 7, 1962 (type locality, waters adjacent to Isla Angel de la Guarda, Gulf of California, Baja California).

Remarks.—Green sea turtles have been taken in the Gulf of California and Pacific Oceans from Sonora southward to Michoacán, México. This species apparently is abundant (Carr, 1961:68) and a valuable food source in some portions of the state.

Distribution in Sinaloa.—In waters off the coast. See Fig. 38.

Specimens examined.—None.

Literature records.—Sinaloa [state only] (Anonymous, 1966:19); Bahía de Obura; Topolobampo (Carr, 1961:68).

Eretmochelys imbricata (Linnaeus)

Testudo imbricata Linnaeus, Systema naturae, ed. 12, p. 350, 1766, (type locality, American seas).

Eretmochelys imbricata: Fitzinger, Systema reptilium, fasc. 1:30, 1843.

Remarks.—This species has been reported as common in estuaries

along the southern coast (Scott, 1962:17). The name used herein follows Smith and Taylor (1950b:16, footnote).

Distribution in Sinaloa.—Known only from the southern coast. See Fig. 38.

Specimens examined.—None.

Literature records.—Teacapán (Scott, 1962:17).

Lepidochelys olivacea (Eschscholtz)

Chelonia olivacea Eschscholtz, Zool. Atlas, pt. 1, p. 2, 1829 (based on a specimen from Manila Bay, Philippine Islands).

Lepidochelys olivacea: Girard, United States Exploring Expedition . . . , 20 (Herpetology):435, 1858.

Remarks.—This species has been reported from several localities on the Pacific coast, and ranges as far northward as Tiburon Island, Sonora (Bogert and Oliver, 1945:417).

Distribution in Sinaloa.—Entire Pacific coast. See Fig. 38.

Specimen examined.—Mazatlán (JMS osteo. coll. 1310).

Literature records.—Sinaloa [state only] (Anonymous, 1966:35); Mazatlán; Tamboritos; Teacapán (Carr, 1961:69); Teacapán (Scott, 1962:17).

Additional record.—Mazatlán (USNM 12609).

Family Dermochelyidae

Dermochelys coriacea (Linnaeus)

Testudo coriacea Linnaeus, Systema naturae, ed. 12, vol. 1, p. 350, 1766 (type locality, unknown).

Dermochelys coriacea: Blainville, Bull. Sci., Soc. Philom., Paris, p. 119, 1816.

Remarks.—The leather back turtle has been taken occasionally in the Gulf of California (Caldwell, 1962:25). Although there are no known records from the coast of Sinaloa, a record from Guaymas, Sonora (Smith and Taylor, 1950b:13) suggests its presence in the state. *Dermochelys* is included here in the herpetofauna of Sinaloa, pending evidence to the contrary.

Distribution in Sinaloa.—In waters off the coast.

Specimens examined.—None.

Literature record.—Sinaloa [state only] (Anonymous, 1966:13).

Order SQUAMATA

Suborder SAURIA

Family Gekkonidae

Coleonyx variegatus fasciatus (Boulenger)

Eublepharis fasciatus Boulenger, Cat. Liz. Brit. Mus., 1:234, 1885 (type locality, Ventanas, Durango).

Coleonyx variegatus fasciatus: Conant, Amer. Mus. Novitates, 2205:6, January 29, 1965.

Remarks.—Only five specimens of *Coleonyx* have been collected in Sinaloa. Edward H. Taylor found a specimen beneath a pile of logs south of Presidio and referred it to *Coleonyx fasciatus* (Taylor, 1935b:203-05, 1938:517; Klauber, 1945:182-84, 205). A second specimen (UIMNH 57847), collected at night on the highway in the same area, exhibits the coloration typical of *C. fasciatus*. Three other specimens are known from north of Culiacán; two were taken at night on the road and a third (SU uncataloged) was found beneath a rock. Conant (1965:4-6) considered his specimen (AMNH 87617) to be intermediate between *C. variegatus sonoriensis* and *C. fasciatus* and accordingly reduced *fasciatus* to subspecific status. The other two lizards from the same area confirm his findings.

Distribution in Sinaloa.—Probably throughout the lowlands of the state. See Fig. 39.

Specimen examined.—11 mi. S Guamúchil (CSCLB 2002).

Literature records.—18 mi. NW Culiacán (Conant, 1965:4); 10 mi. S Presidio (Klauber, 1945:182; Smith and Taylor, 1950b:43; Taylor, 1935b:203).

Additional records.—7.4 mi. S junc. hwy. 15 and 40 (UIMNH 57847); 21 mi. N Río Culiacán [hwy. 15] (SU uncataloged, field number FWB 2140).

Gehyra mutilata (Wiegmann)

Peropus mutilatus Wiegmann, Nova Acta Acad. Leop.-Carol., 17:238, 1835 (type locality, Manila, Philippine Islands).

Gehyra mutilata: Boulenger, Catalogue Lizards Brit. Mus., 1:148, 1885.

Remarks.—Two females agree with the redescription by Smith and Necker (1943:197-99) based on one adult and one juvenile of undetermined sex. The snout-vent lengths are 48, 56; tail 50, 33 (partially regenerated); supralabials 7/7, 8/8 to center of eye; infra-labials 7/7 to center of eye. Both specimens were captured from the side of a building on June 4, 1962. The name *Gehyra mutilata* is used following Boulenger (1885a:148) and Bustard (1965:260).

Gehyra mutilata has been introduced into western México at several seaport towns. The climbing ability and secretive habits of these lizards make them likely candidates for stowaway transport with ship cargos. The original colonists probably came from the Philippine Islands (Taylor, 1922:64). These lizards are seen in abundance at night throughout the older parts of Mazatlán. Specimens were found by careful searching of walls and buildings along the beach front. Individuals are especially plentiful around lights where they feed on insects attracted to the light.

Distribution in Sinaloa.—Known only from Presidio and Mazatlán, but probably present elsewhere on the seacoast in association with human habitation. See Fig. 39.

Specimens examined.—Mazatlán (* KU 73653-54; JFC 62:34-35; LACM 3244-49, 6564-66; UAZ 4569-79, 10242, 10244, 10246, 10254, 10283); N Mazatlán (CSCLB 1976).

Literature records.—Mazatlán (Martín del Campo, 1941:761; Smith and Taylor, 1950b:52); Presidio (Boulenger, 1885a:150; Smith and Taylor, 1950b:52).

Additional records.—Mazatlán (SM 11295-310; UIMNH 46846; USNM 153771-72).

Hemidactylus frenatus Schlegel

Hemidactylus frenatus Schlegel, in Duméril and Bibron, *Erpétologie Générale* . . . 3:366, 1836 (based on two specimens from Timor and Java; type locality restricted to Java by Loveridge, *Bull. Mus. Comp. Zool., Harvard College*, 98 (1):127, January, 1947; type locality further restricted to Batavia, Java by Taylor, *Univ. Kansas Sci. Bull.*, 35:1549, September 10, 1953).

Remarks.—Two females were collected in Los Mochis on September 8, 1963, by C. H. Lowe, Jr. They have the following characters: snout-vent length 20, 39; lamellae beneath fourth toe 10, 10; granules between eyes 37, 40; internasal scale 1, 1; scales in row between nasals posterior to internasals 5,4; supralabials 9-8, 9-9; infralabials 12-12, 12-12; postmentals in mutual contact medially and also contact infralabials 2-2, 2-1. Both specimens have 8 rows of enlarged dorsal tubercles at midbody; 2 paravertebral rows with 19-16, 18-20 tubercles; 6 lateral rows with 21, 21-22 tubercles that converge anteriorly and posteriorly. Tails are incomplete with 6, 6 scales in anterior caudal rows. Both specimens agree with *Hemidactylus frenatus* from Zihuatanejo and Acapulco, Guerrero, in all characters examined. It is likely that *Hemidactylus* was introduced into Los Mochis within the last 25 years, probably from an active Mexican port such as Acapulco.

Distribution in Sinaloa.—Known only from Los Mochis. See Fig. 39.

Specimens examined.—Los Mochis (UAZ 11939-40).

Phyllodactylus homolepidurus homolepidurus Smith

Phyllodactylus homolepidurus Smith, *Univ. Kansas Sci. Bull.*, 22:121, November 15, 1935 (type locality, five miles southwest of Hermosillo, Sonora).

Phyllodactylus homolepidurus homolepidurus: Dixon, *Sci. Bull., Research Center, New Mexico State Univ.*, 64(1):40, March 1964.

Remarks.—Dixon (1964:42) stated that he knew of no records of

Phyllodactylus homolepidurus outside of the "rock outcroppings of sandstone, schist, and granite within a 130 mile radius of Hermosillo, Sonora." Three specimens examined by us are from northern Sinaloa, thus representing a considerable extension of the known range southward.

These specimens have, respectively: 14, 12, 14 rows of dorsal tubercles; 5, 6, 6 tubercles at base of tail; 20, 19, 19 tubercles between axilla and groin; 32, 32, 33 paravertebral tubercles; 13, 13, 13 lamellae beneath fourth toe; 23, 25, 20 interorbital scales; 26, 28, 28 scales across snout between third labials; 7, 7, 7 scales bordering postmentals; 8, 7, 7 scales bordering internasals; 64, 62, 61 scales from posterior gular region to anus; and 14, 15, 14 scales between nostril and eye.

These data confirm a decrease from north to south in number of lamellae beneath fourth toe and of scales bordering postmentals, and an increase from north to south in number of scales across snout at third labials and of scales between nostril and eye—as demonstrated by Dixon (1964:39) for specimens in central and northern Sonora. However, our specimens have more scales bordering the internasals, and fewer interorbital scales, than expected from north-south trends in these characters as reported by Dixon.

Phyllodactylus tuberculosus is known from northern Sinaloa, near Los Mochis (KU 67538-40). Although the ranges of *P. homolepidurus* and *P. tuberculosus* apparently overlap, these species may be ecologically separated in this area.

Distribution in Sinaloa.—Northern coastal lowlands. See Fig. 39.

Specimens examined.—Topolobampo (CSCLB 1518-1520).

Phyllodactylus tuberculosus saxatilis Dixon

Phyllodactylus tuberculosus saxatilis Dixon, Sci. Bull., Research Center, New Mexico State Univ., 64(1):31, March 1964 (type locality, eight miles northeast of Villa Unión, 200 ft., Sinaloa).

Remarks.—Fifty-four specimens of *Phyllodactylus* are referred to *P. tuberculosus saxatilis* following Dixon (1964:31-36). Dixon recorded three species of *Phyllodactylus* in northwestern México: *P. homolepidurus homolepidurus* in central Sonora; *P. tuberculosus saxatilis* in southern Sonora, Sinaloa, central Nayarit, and northern Jalisco; and *P. lanei rupinus* in southern Nayarit and northern Jalisco. Difficulty was experienced in allocating specimens from Sinaloa to one of the above species because of the extensive overlap in the ranges of variation of certain meristic characters. With respect

to eleven meristic characters, all but nine of the specimens have six or more characters that are within the range of variation for all three species.

The specimens that we examined have the following characters: rows of dorsal tubercles, 12-16 ($13.6 \pm .11$); rows of tubercles at base of tail, 4-7 ($5.6 \pm .10$) (excluding KU 67515, 75480); tubercles between axilla and groin, 17-22 ($18.9 \pm .17$) (excluding KU 67537); paravertebral tubercles, 26-38 ($31.4 \pm .37$) (excluding KU 29531, 67537); lamellae beneath fourth toe, 11-15 ($13.1 \pm .11$); interorbital scales, 16-29 ($22.0 \pm .38$); scales across snout between third labials, 22-29 ($25.7 \pm .38$) (excluding KU 67516); scales bordering postmentals, 5-10 ($7.0 \pm .15$); scales bordering internasals, 6-9 ($6.9 \pm .08$); scales from posterior gular region to anus, 59-78 ($66.5 \pm .52$); scales between nostril and eye, 11-16 ($13.4 \pm .15$). These characters are equivalent to those used by Dixon (1964).

Sinaloan specimens examined closely resemble specimens of *P. t. saxatilis* (Dixon, 1964:31-36) in the number of tubercles between axilla and groin, rows of tubercles at base of tail, lamellae beneath fourth toe, interorbital scales, scales across snout between third labials, scales bordering internasals, scales between nostril and eye, and scales from posterior gular region to anus. The specimens closely resemble *P. h. homolepidurus* (Dixon, 1964:40-42) in the rows of dorsal tubercles, and the number of scales bordering postmentals. The specimens closely resemble *P. lanei rupinus* (Dixon, 1964:67-71) in the number of paravertebral tubercles.

The Sinaloan specimens were compared with 26 specimens of *P. h. homolepidurus* (KU 67464-89 from Sonora) and with four specimens of *P. lanei rupinus* (three, KU 63371-73, from Jalisco; one, KU 63370, from Nayarit). Characteristically, specimens of *P. h. homolepidurus* are paler and more uniform in dorsal coloration than are specimens of *P. t. saxatilis* from Sinaloa. The four specimens of *P. l. rupinus* are more like *P. t. saxatilis*. Otherwise, no consistent differences can be determined in the dorsal pattern. Specimens of *P. h. homolepidurus* usually have a creamy white belly with pale yellow lateral patches. The yellow patches are almost indistinguishable in some *homolepidurus*, faintly present in only two *saxatilis* (both from southern Sinaloa), and absent in all of the *rupinus*. Specimens of *P. t. saxatilis* can be readily separated from *P. h. homolepidurus* when the dorsal tubercles at mid-body are compared in lizards of similar snout-vent length. The tubercles of *saxatilis* are larger, more distinctly keeled, and the base is oval in shape, while in

homolepidurus the tubercles are smaller and lower (due to the less distinct keel) and the base is usually circular in shape. Accordingly, the allocation of these specimens to *P. t. saxatilis* seems reasonable.

Phyllodactylus tuberculosus is nocturnal in habit and is frequently encountered on rocky hillsides, near caves, beneath stone bridges, and in road culverts. One specimen (LACM 6570) was found at night on the highway where the road passed through a rocky ridge.

Distribution in Sinaloa.—Probably occurs throughout the state, although specimens are lacking from some areas in the northern highlands. See Fig. 40.

Specimens examined.—24 km. NW Acaponeta [Nayarit], 75 m. (* KU 67515); 20 km. N, 5 km. E Badiraguato, 240 m. (* KU 83398); E base Cerro Pocitos, 17.5 mi. W Pericos junc. (UAZ 4375, 4377); 16 km. NNE Choix, 520 m. (* KU 73655); 4 km. NE Concordia (* KU 73662); 15 km. NE Concordia, 240 m. (* KU 75477-82); 21 km. NE Concordia (* KU 75483-84); 5 mi. N Culiacán (CSCLB 1989); 13.9 mi. N Culiacán (CSCLB 1988); 15.8 mi. N Culiacán (CSCLB 1987); 32 km. SE Elota 120 m. (* KU 67525-37); 37 km. S Escuinapa (* KU 73663); 13 km. SW Escuinapa, 15 m. (* KU 67516); Labrados (CAS 64979); 22 km. N Los Mochis (* KU 67538-39); 26 km. N Los Mochis (* KU 67540); Matatán, 170 m. (* KU 73657-61); 7 km. SW Matatán, 155 m. (* KU 78508); Mazatlán (CSCLB 1985-86); 33.2 mi. N Mazatlán (LACM 6570); 3 mi. S Palmillas (LACM 25689-90); 2 km. S Pericos (* KU 37754); Río Piaxtla, 1 mi. W. hwy. 15 (CSCLB 1990-91); 8 km. SSE Rosario, 35 m. (* KU 29531); 1 km. W Rosario, 35 m. (* KU 29532); Santa Lucía, 1100 m. (* KU 75485-86); 2 km. E Santa Lucía, 1700 m. (* KU 40428-29); 3 km. E Santa Lucía, 1700 m. (* KU 40430); 44 km. ENE Sinaloa, 180 m. (* KU 69922); 19.6 mi. NE hwy. 15 [Villa Unión] on hwy. 40 (LACM 6567-69); 13 km. ENE Villa Unión, 60 m. (* KU 67514, 67518-25); 16 km. ENE Villa Unión, 140 m. (* KU 67517).

Literature records.—5 mi. SW Copala; 8 mi. NW Culiacán; 10 mi. SE Elota; 4 mi. NW Elota; 28 mi. NW Elota (Dixon, 1964:35); Mármol (Lewis and Johnson, 1956:277); Mazatlán (Smith, 1935a:126; Van Denburgh, 1898:460); 18.5 mi. N Mazatlán; 1 mi. E. Mazatlán (Dixon, 1964:35-36); 2 mi. E Mazatlán (Smith, 1935a:126; Taylor, 1938:517); Presidio (Boulenger, 1885a:80; Dixon, 1964:36).

Additional records.—19.5 mi. N Culiacán (FAS 15863); 8 mi. NW Culiacán (UMMZ 117366); El Dorado (AMNH 90766-67); 23 mi. S Guamúchil (FAS 15864).

Family Iguanidae

Anolis nebulosus (Wiegmann)

Dactyloa nebulosa Wiegmann, *Herpetologia Mexicana*, p. 47, 1834 (type locality, México).

Anolis nebulosa: Bocourt, *Mission Scientifique au Mexique et dans L'Amérique Centrale*. Reptiles, Livr. 2:68-69, 1873.

Remarks.—The characters used to distinguish *Anolis nebulosus* (Wiegmann) from *A. nebuloides* Bocourt often are applicable to some populations but not to others. Duellman (1961:61-63) synthesized the available information for both species and presented characters which distinguish the two species in Michoacán. A

general application of these characters to anoles from Sinaloa resulted in allocation of these lizards to *A. nebulosus*. The characters used were: dorsal scales slightly smaller than ventral scales; throat fan bright orange in adult males. The smoothness and low keeling of snout scales is variable in the Sinaloan lizards.

The color of the dewlap is probably the most significant character in *Anolis* systematics, especially for distinguishing between *A. nebulosus* and *A. nebuloides*. Fifty-seven specimens of *Anolis* from Sinaloa were examined; the dewlap color for 14 males was orange in life. Lewis and Johnson (1956:278) reported seven *Anolis* from Mármol, Sinaloa with "large, red" dewlaps. Taylor (1938:518) described three specimens from southern Sinaloa as having dewlaps "grayish or with a pinkish tinge." Zweifel and Norris (1955:233) listed *Anolis* with pale pink gular pouch areas from southern Sonora. In Sinaloa it has been noted that the orange dewlap of living *Anolis nebulosus* turns reddish or pinkish after the animals have been preserved. This color change may account for some of the reports of lizards with red or pink dewlaps from the state. If, however, there is an anole with a red dewlap in Sinaloa, it seems probable to us that this lizard would represent a species distinct from *Anolis nebulosus*. All specimens examined during this study had, in life, an orange dewlap and are here referred to *Anolis nebulosus*.

Variation in dorsal color pattern is most evident in the females, which usually have a light middorsal stripe with straight, irregular or serrate edges. Some females have a brown middorsal stripe, heavily serrate, bordered with tan.

This lizard is much more obvious in the forest during the dry season than during the rainy season. Most specimens were collected in the lower levels of the forest, usually on limbs of low trees and shrubs. Several individuals were found at night asleep at the tip of branches or on tall grass.

Distribution in Sinaloa.—Known from most of the state except the dry northern lowlands. See Fig. 41.

Specimens examined.—E base Cerro Pocitos, 17.5 mi. W Pericos junc. (UAZ 4378-81); 16 km. NNE Choix, 520 m. (* KU 73670-71); 1 km. S Concepción, 76 m. (* KU 63677); 5.5 mi. NE Concordia (LACM 6573); 6 km. E Cosalá, 460 m. (* KU 73672-73); N Culiacán (CSCLB 2035); 19 km. N Culiacán (* KU 40437); 14 mi. N Culiacán (CSCLB 2038); 36.8 mi. N Culiacán (CSCLB 2031-32); 46 mi. S. Culiacán (CSCLB 2040); Escuinapa (UCLA 14843); La Cruz (LACM 6572); Mazatlán (LACM 6579); 5 km. NNW Mazatlán (* KU 29537); 8 km. NNW Mazatlán (* KU 63375-76); 3 mi. S Palmillas (LACM 25691); 5 km. SW El Palmito (Durango), 1850 m. (* KU

75500-02); 1.5 km. S Pericos (* KU 37731); 1 km. E San Blas (* KU 38066); San Ignacio, 210 m. (* KU 73674-75; LACM 6574-78); 5.5 km. NE San Lorenzo, 150 m. (* KU 83399); Santa Lucía, 1100 m. (* KU 75499; CSCLB 2039); near Santa Lucía (* KU 40438-46); 1 km. NE Santa Lucía, 1150 m. (* KU 78509); 2.2 km. NE Santa Lucía (via hwy. 40), 1930 m. (* KU 78516-18, 78520); 2 km. E Santa Lucía (* KU 40431-35, 44640); 1-2 mi. W Santa Rita (LACM 6580); Teacapán (LACM 6581); 54 mi. N Tropic of Cancer (LACM 6571); 13 km. NNE Vaca, 400 m. (* KU 80702); 8 km. N Villa Unión, 140 m. (* KU 80691-94); 12 km. N Villa Unión, 120 m. (* KU 80695-701); 1 mi. S, 26 mi. E Villa Unión (CSCLB 2036-37); 3 km. W Villa Unión (* KU 29534).

Literature records.—El Dorado (Fugler and Dixon, 1961:9); Mármol (Lewis and Johnson, 1956:278); Mazatlán (Martín del Campo, 1941:761; Taylor, 1938:518); 17 mi. N Mazatlán (Tanner and Robison, 1959:76); Presidio (Boulenger, 1885b:77); near Presidio (Taylor, 1938:518).

Additional records.—Chele, ca. 300 ft. (UMMZ 110909); 11 mi. NE Concordia (SM 11693-98); 2 mi. WSW Copala, 500 ft. (TCWC 12787); 4 mi. E Coyotitán (AMNH 69703); 14 mi. SW El Batel (AMNH 75868); El Dorado (AMNH 90768-71); Elota (AMNH 96592); 4 mi. W Elota (AMNH 62334); Escuinapa (AMNH 1550); 1.3 mi. S La Cruz rd. (JFC 62:2); Mazatlán (USNM 25152, 40041); near Mazatlán (USNM 47253); 10 mi. N Mazatlán (MCZ 61461-67); 17 mi. N Mazatlán (MCZ 61453-60); 30 mi. N Mazatlán (MVZ 66197); 32 mi. N Mazatlán, 350 ft. (TCWC 12788-89); 36 mi. N Mazatlán (FAS 11584-86); 2 mi. E Mazatlán, 50 ft. (TCWC 12786); about 5 mi. [E] Mazatlán (UMMZ 102593-94); 7.1 mi. SE Mazatlán (UIMNH 6655); 9.2 mi. S Mazatlán (UIMNH 40698); 12.1 mi. N Pericos (UIMNH 40697); 9 mi. NW Piaxtla (SM 11665-66); Plomosos (USNM 47693-96); 15 mi. S Presidio (UIMNH 20194); Rincón de Urías (AMNH 20733-36); Rosario (USNM 47697-98); Venodio (USNM 73268); 5 mi. E Villa Unión (UMMZ 113060); 3 mi. SE Villa Unión (SM 11684-92); 10 mi. S Villa Unión (MCZ 61468-70).

Anolis utowanae Barbour

Anolis utowanae Barbour, Copeia, no. 1:12, April 12, 1932 (type locality, about 10 miles north of Mazatlán, Sinaloa).

Remarks.—Repeated efforts to collect additional specimens of this lizard have failed. On three different occasions trips were made to the area of the type locality without results. Comparison of the holotype with other anoles from Sinaloa reaffirms the distinctiveness of *A. utowanae*. The dewlap color is unknown.

Distribution in Sinaloa.—Known only from the type locality. See Fig. 42.

Specimen examined.—About 10 mi. N Mazatlán (MCZ 31035).

Callisaurus draconoides bogerti Martín del Campo

Callisaurus draconoides bogerti Martín del Campo, Anales del Instituto Biología, México, Tome XIV:619, 1943 (type locality, Isla de los Chivos, en el Puerto de Mazatlán, Sinaloa).

Remarks.—Fugler and Dixon (1961:9) summarized the nomenclatural history of this species in Sonora and Sinaloa, and referred the lowland populations from southern Sinaloa through Sonora to *Callisaurus draconoides bogerti* and the montane *Guirocoba*—

Alamos populations (Sonora) to *C. d. brevipes*. Our data support this arrangement for Sinaloan specimens (Table 3). The ratio of hind leg length into snout-vent length was about the same in the Sinaloan material examined as was the ratio of fourth toe length into snout-vent length. The one specimen from Isla San Ignacio had a lower fourth toe to snout-vent ratio than the other two populations. If the one Isla San Ignacio specimen is considered, a decrease in ventral scales and an increase in femoral pores is indicated from south to north in the lowlands. Although this insular specimen supports this trend in variation for the above two characters, disagreement is found in fourth toe lamellae and the ratio noted above. Several possibilities exist to explain these differences: the insular population may be expected to differ in certain (or all) characters from the mainland population depending on the duration of its isolation; and differences in the methods of securing data may have resulted in a higher lamellar count and lower ratio. Another and perhaps more plausible explanation for this disagreement is that the number of toe lamellae is correlated with the substrate of the habitat and hence variable from deme to deme and of no systematic value.

Five specimens from the vicinity of El Fuerte are referred to *C. d. brevipes* on the basis of the data in Table 3. Note that in ventral scales and femoral pores the greatest difference in the two subspecies is between adjacent populations.

There has been some confusion as to the systematic relationships between *bogerti* in Sinaloa and the coastal race in Sonora referred to *bogerti* (Fugler and Dixon, 1961:9) and *brevipes* (Langebartel and Smith, 1954:128). Males from near Guaymas and Hermosillo, Sonora, have the same breeding colors found in the Sinaloan populations of *bogerti*. A male from Teacapán (LACM 6584) has two lateral dark bars covered with a bright green wash. The green extends posteriorly and laterally to the insertion of the hind legs. There is an orange-brown wash anterior to the green that extends onto chest and forelegs; it is darkest anterior to the bars. The chin and throat are dusky orange, darkest in the gular area. An adult female (LACM 6585) has a bright orange spot in front of the body bars, a yellow wash through the bars and onto the hind legs and base of the tail. The chin is white with lateral gray streaks and bright orange gular spot. We have not examined live material referred to *brevipes*. It appears that the coastal race in Sinaloa

TABLE 3.—A Comparison of Data for *Callisaurus draconoides bogerti* and *C. d. brevipes* in Sonora and Sinaloa.

SPECIES	Locality	Number of specimens	Ventral scales	Fourth toe lamellae	Total femoral pores
<i>C. d. bogerti</i>	Vicinity of Mazatlán	28	82-95 (85.5)	27-35 (31.5)	17-30 (24.8)
<i>C. d. bogerti</i>	* El Dorado	21	76-92 (84.6)	26-34 (29.0)	13-19 (15.2) [=30.4]
<i>C. d. bogerti</i>	Isla San Ignacio	1	83	35	32
<i>C. d. brevipes</i>	Vicinity of El Fuerte	5	76-82 (78.6)	30-35 (33.0)	23-26 (24.4)
<i>C. d. brevipes</i>	**	9	75-82 (78.2)	30-33 (31.7)	11-15 (12.8) [=25.6]

* Data from Fugler and Dixon, 1961:10.

** Data from Bogert and Dorson, 1942:175.

is the same as the coastal Sonoran population. This tentative conclusion may be revised by Benjamin H. Banta, who is presently working on lizards of the genus *Callisaurus*.

Distribution in Sinaloa.—Occurs in beach habitat along the coast to Teacapán. See Fig. 43.

Specimens examined.—N. Mazatlán (CSCLB 2018-30; JFC 62:30-32; LACM 6582-83); 1.5 km. N Mazatlán (* KU 40366-84, 68722-25); 5 km. NNW Mazatlán (* KU 29652-56); Playa Visnaga (UAZ 9505-19); Isla San Ignacio, 3 m. (* KU 69923); 1 mi. N Teacapán (LACM 6584-86).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); La Boca (Fugler and Dixon, 1961:9); Mazatlán (Martín del Campo, 1941:761; Van Denburgh, 1898:461); Mazatlán, Isla de los Chivos (Martín del Campo, 1941:761).

Additional records.—Altata (UMMZ 118967); 6 mi. W Baca del Rico [= La Boca?] (SM 11410-15); El Dorado (AMNH 90779-85; LSU 6441-42); 9 mi. SW El Dorado (SM 11416-24); Mazatlán (SM 10213-23; UF 20621; UMMZ 102569); Mazatlán, Isla de los Chivos (AMNH 64715-17); 4 mi. W Mazatlán (MVZ 59011).

Callisaurus draconoides brevipes Bogert and Dorson

Callisaurus draconoides brevipes Bogert and Dorson, Copeia, no. 3:173-75, October 8, 1942 (type locality, Guirocoba, 18 miles southeast Alamos, Sonora).

Remarks.—Lizards of this subspecies, discussed in the account of *Callisaurus draconoides bogerti*, are frequently encountered along the sandy washes and arroyos of northeastern Sinaloa. On June 16, 1963, five specimens were obtained along the Río Fuerte in deciduous thorn woodland dominated by *Acacia* and *Prosopis*. *Holbrookia* was common in the same area.

Distribution in Sinaloa.—Known only from the area drained by the Río de Choix and Río Fuerte above El Fuerte. See Fig. 43.

Specimens examined.—8 km. N El Fuerte, Río Fuerte, 160 m. (* KU 78521); 6 km. NE El Fuerte, Río Fuerte, 155 m. (* KU 78522-25).

Literature record.—Río de Choix, Río Fuerte (Bogert and Dorson, 1942:173).

Additional records.—2 mi. N Choix (FMNH 71479-80); 4 mi. NNE El Fuerte (FMNH 71481); 8 mi. NNE El Fuerte (FMNH 71482-84).

Ctenosaura hemilopha (Cope)

Cyclura (*Ctenosaura*) *hemilopha* Cope, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 105 (type locality, Cape San Lucas, Baja California).

Remarks.—In a revision of the genus *Ctenosaura*, Bailey (1928: 8-9) listed six species as occurring in western México: *C. acanthura*, *C. hemilopha*, *C. brachylopha*, *C. pectinata*, *C. brevirostris*, and *C. parkeri*. Bailey distinguished these species utilizing characters of the median dorsal scales, head length, and numbers of scale rows between the whorls of spinous caudal scales. Smith (1935a:134-142)

and Smith and Taylor (1950b:73-76) allocated *C. brachylopha*, *C. breviostris* and *C. parkeri* to the synonymy of *C. pectinata*. Specimens of *C. acanthura* reported from western México were designated as *C. pectinata* (Smith and Taylor, 1950b:74, footnote). Smith and Taylor (1950b:73, 75) characterized *C. hemilopha* as possessing a single row of small scales between the fourth and fifth rows of enlarged caudal spines, and having a range including southern Baja California and central Sonora to northern Sinaloa. They characterized *C. pectinata* as possessing three rows of small scales between the fourth and fifth proximal rows of enlarged caudal spines, and having a range from southern Sinaloa southward to the Isthmus of Tehuantepec, Oaxaca. Other authors have followed Smith and Taylor in distinguishing between *C. hemilopha* and *C. pectinata* in Sinaloa (Smith and Van Gelder, 1955:145; Fugler and Dixon, 1961:11). Bailey (1928:8-9) stated that the median enlarged dorsal scales are interrupted at the sacrum in *hemilopha* and complete to the end of the tail in *C. pectinata*.

In an effort to clarify the relationships between these two species in Sinaloa, we examined more than 150 specimens of *Ctenosaura* from western México. All specimens of *C. hemilopha* examined from throughout its range have the dorsals interrupted over the sacrum. Of 99 specimens of *pectinata* examined, 46 per cent possessed a complete row of enlarged dorsal scales, whereas 54 per cent had enlarged dorsal scales interrupted over the sacrum. This condition might suggest a clinal trend in dorsal scales from interrupted series in the north to a complete series in the south. However, there was no geographic trend in the dorsal scale row character in *C. pectinata* from Sinaloa to Colima, both conditions occurring throughout this region. In Sinaloa, 36 of 50 specimens of *C. pectinata* examined for this character have the enlarged dorsal scales interrupted over the sacrum. Individuals in a large series of *C. similis* from Costa Rica have a complete row of dorsal scales. If *similis* were included in the above analysis, a clinal gradient is indicated for this character from Sonora, México, to Panamá.

The number of small scale rows between the fourth and fifth caudal whorls varies in the specimens examined. Damaged specimens were not included in the following counts. Twenty-six of 54 specimens (48%) of *C. hemilopha* have a single row of small scales preceding the fifth caudal whorl; 28 specimens (52%) have two rows of scales preceding the fifth caudal whorl. In Sinaloa, 14 specimens (56%) of *hemilopha* have one row of small scales and

11 specimens (44%) have two rows of small scales preceding the fifth caudal whorl. A total of 92 *C. pectinata* examined includes 34 specimens (37%) with two rows of small scales, 53 specimens (58%) with three rows of small scales, and 5 specimens (5%) with four rows of small scales preceding the fifth enlarged caudal whorl. In Sinaloa, 30 specimens (50%) of *pectinata* have two rows of scales, 29 specimens (48%) have three rows, and 1 specimen (2%) has four rows. Thus, the number of rows of small scales preceding the fifth caudal whorl seemingly increases from north to south. As with the other character discussed, there is considerable overlap in counts for *hemilopha* and *pectinata* in Sinaloa.

Little is known concerning the amount of sexual dimorphism or the degree of ontogenetic change in either of these scale characters. Neither character serves to separate the two species in Sinaloa. A re-evaluation of these characters as diagnostic criteria for distinguishing species of *Ctenosaura* is warranted in view of our findings. Because of the lack of knowledge of variation in other characters in the genus *Ctenosaura* (a necessary precursor to an understanding of specific relationships), and because of the scope of this paper we continue to recognize two species of *Ctenosaura* in Sinaloa based primarily on differences in color patterns. We suspect a detailed study of *Ctenosaura* would indicate that a single species ranges from southern Sinaloa, México, along the Pacific coast to Tehuantepec and perhaps southward to Panamá. A second species is found in Baja California, Sonora, and northern Sinaloa. The eastern Mexican population may be distinct or represent a race of the Pacific coastal population.

A large series of *C. hemilopha* was examined from southern Sonora. The coloration and pattern of this population are evident continuously through Sonora into northern Sinaloa; specimens from the vicinity of El Fuerte, Topolobampo, Guamúchil, Terreros, and Pericos have the same coloration as the Sonoran sample. Specimens from about 20 miles north of Culiacán southward throughout the rest of the state are characteristic of specimens referred to *C. pectinata*. An apparent gap of about 12 miles between ranges of the two forms is not real, because the highway from which much of the collecting is done, passes through a flat area with extensive agricultural activity; the lack of habitat close to the road rather than an actual gap in range accounts for the hiatus. The taxonomic status of the two remains uncertain, pending efforts to obtain specimens from this area of potential contact; meanwhile, we retain them

as distinct species. There are suggestions of morphological character differences that correlate with color pattern, but evaluation of these characters requires further study.

Adult males of *C. hemilopha* exhibit the following coloration: top of head light tan, sides and neck darker gray; white stripe from angle of lower jaw to tympanum; a black spot and two black bars on shoulders and back, increasing in width posteriorly, separated by light gray to white bands; first bar with lateral arms extending anteriorly to near tympanum, below first spot; posterior two-thirds of body gray, speckled with dark brown or black; chin, gular area, forelegs, and pectoral region black ventrally; belly and hind legs tan or dirty white with scattered black spots; hind legs dorsally speckled black, with three irregular narrow white bars on thigh; dorsal crest scales lower than *pectinata*.

Lowe and Norris (1955:90) suggested that "either one should recognize one widespread and variable monotypic form, *Ctenosaura hemilopha*, or recognize a polytypic species with four subspecies of varying degrees of differentiation." It is their opinion that four subspecies should be recognized, primarily on the basis of "highly significant differences in color pattern." They recognized two insular subspecies (*insulana* and *conspicua*); *C. h. hemilopha* from Sonora, northern Sinaloa, and southwestern Chihuahua, México; and *C. h. interrupta* from southern Baja California.

The name *hemilopha* was first used in reference to a population of *Ctenosaura* from Cape San Lucas, Baja California, by Cope in 1863. The name *interrupta* was originally used by Bocourt in 1882 for a population in Baja California (later restricted to Cape San Lucas by Smith and Taylor, 1950a:322). Therefore, if subspecies are recognized, *hemilopha* (the oldest available name) would apply to the Baja California (peninsula) population. This would leave the population in Sonora, northern Sinaloa, and southwestern Chihuahua without a trivial name.

We follow the first alternative of Lowe and Norris (1955:90) in recognizing one widespread variable monotypic form, *Ctenosaura hemilopha*, until more evidence becomes available to warrant subspecific designations, and until the relationships between *hemilopha* and *pectinata* are clarified.

Ctenosaura hemilopha is found in rocky areas throughout its range. The lizards are often seen in trees in areas where no rocky retreats are available.

Distribution in Sinaloa.—Known from the northern third of the state. See Fig. 44.

Specimens examined.—Ahome (* LACM 8645); E base Cerro Prieto, 17.5 mi. W Pericos junction (* UAZ 4206); 16 km. NNE Choix, 520 m. (* KU 73676); 26 km. NNE Choix, 510 m. (* KU 68751); 52 km. N Culiacán (* LACM 28705); 52.5 km. N Culiacán (* LACM 28706-07); 36.8 mi. N Culiacán (* CSCLB 1981); 43.4 mi. N Culiacán (CSCLB 2125-26); 53.2 mi. N Culiacán (* UAZ 1521, 1524); 92 km. N Culiacán (* LACM 28708); 42.8 mi. NW Culiacán (* UAZ 1523); 6 km. NE El Fuerte, 150 m. (* KU 77797-808, 78982); 40 mi. SE Guamúchil (* CSCLB 2148); 9 mi. S Guamúchil (* LACM 25703); Rancho Rosalito (* KU 45397); 1.1 mi. NE Topolobampo (* UAZ 1522); 0.5 mi. E Topolobampo (* CSCLB 2136); 13 km. NNE Vaca, 400 m. (* KU 80703-05).

Additional records.—5 mi. NNE El Fuerte (ASDM 793); Higuera de Zaragoza (SDSNH 18192-93); Hiqueres (UCLA 12945); Mocorito (USNM 33571-72); 3.5 mi. N Palmar de Sepulveda (UMMZ 123850).

Ctenosaura pectinata (Wiegmann)

Cyclura pectinata Wiegmann, *Herpetologia Mexicana*, p. 42, pl. 2, 1834 (type locality, México, by inference; type locality restricted to Colima, Colima, by Bailey, *Proc. U. S. Nat. Mus.*, 73:25, 1928).

Ctenosaura pectinata: Gray, *Catalogue of Lizards* . . . *Brit. Mus.*, p. 191, 1845.

Remarks.—Adult males of *C. pectinata* exhibit the following coloration: head mostly black, sometimes with scattered light scales; dorsum dark grayish brown with five to seven middorsal blotches; pale blotches middorsally on neck and shoulders between dark blotches; hind legs and base of tail black dorsally; ventral surface of forelegs, chest and belly straw to gray in color; hind legs uniform gray ventrally; chin mottled gray on greenish white background, with a black gular stripe; two to five narrow lateral-ventral black bars, interrupted on the midline. See the account of *C. hemilopha* for additional remarks.

Ctenosaura pectinata is common in varied habitat from sea level to about 300 meters wherever the topography or vegetation provides adequate cover or retreats. Individuals are common in rock piles and on stone walls in Mazatlán. Several specimens were dug from burrows along ravines near Rosario. Apparently these lizards take to the trees only where adequate ground cover is not available. The bright green hatchlings were first observed in July and are abundant in August. The young are unmarked except for black tail bands, present also on the adults. A female, measuring 135 mm. in snout-vent length, had lost almost completely the juvenile green coloration and had attained the typical adult pattern (Scott, 1962:21).

Distribution in Sinaloa.—Throughout the southern lowlands to north of Culiacán. See Fig. 44.

Specimens examined.—Camino Real (* AMNH 69681, 69685-86); 1 km. S Concepción, 75 m. (* KU 63743-48, 63750); 5 km. NE Concordia (* KU 33908); 9.9 mi. N Culiacán (* AMNH 86815); 19 km. N Culiacán (* LACM 28709); 15.8 mi. N Culiacán (* CSCLB 2120-22); 30 km. N Culiacán (* LACM 28710); 32 km. N Culiacán (* LACM 28711); 27 km. N, 1 km. NE Culiacán (* LACM 28712); 27 km. N, 2 km. NE Culiacán (* LACM 28713); 10.5 mi. NW Culiacán (* AMNH 75870); 19.2 mi. NW Culiacán (* UAZ 1535); El Dorado (* AMNH 90773; * KU 61454-60); 6 mi. N Elota (* UAZ 15048); 10 mi. S Elota (* UAZ 11495); 38.4 mi. NW Elota (* UAZ 1536); Escuinapa (* UCLA 12944); 1.5 km. NW Escuinapa (* KU 33909); 6 mi. N Espinal (* CSCLB 2123-24); Isla Palmito del Verde, middle (* KU 73677); Isla Palmito de la Virgen, 5 m. (* KU 73693); Mazatlán (* KU 63382-85, 63387; * CSCLB 2118-19); between Mazatlán and Elota (* LACM 4979-81); N Mazatlán (JFC 62:22-23); 4 mi. N Mazatlán (* AMNH 15356, 15359-60); 5 mi. N Mazatlán (* CSCLB 2128); 6 mi. N Mazatlán (* UAZ 1534); 25 mi. E Mazatlán (* AMNH 84576); 1.5 km. SE Mazatlán (* KU 29514, 29517); 5.4 mi. SE Mazatlán (* UAZ 1537); 1.5 km. S Pericos (* KU 37762); Rosario (* LACM 6593); 10 km. SE Rosario (* KU 33907); San Francisquito (* AMNH 15379); San Ignacio (* LACM 6592); 25 km. SW San Ignacio (* LACM 25200); 21.2 mi. S San Lorenzo (* UAZ 15047); Teacapán (* LACM 6589-91, 7247); Villa Unión (* UAZ 12315); 11 mi. S Villa Unión (* UCLA 14481); 1 mi. S, 26 mi. E Villa Unión (* CSCLB 1982).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); Culiacán (Bailey, 1928:24; Smith, 1949:36); El Dorado (Fugler and Dixon, 1961:11); Escuinapa (Bailey, 1928:16); Mazatlán (Bailey, 1928:24; Burt, 1935:169; Lewis and Johnson, 1956:278; Martín del Campo, 1941:761; Smith, 1939a:23; Smith, 1949:36; Van Denburgh, 1898:461); near Mazatlán; near Presidio; 10 mi. S Presidio (Smith, 1935a:134; Taylor, 1938:517); Sinaloa [state only] (Bailey, 1928:24).

Additional records.—10 mi. NW Acaponeta (Nayarit), 50 ft. (TCWC 12532); Concordia (UIMNH 56580); 11 mi. NE Concordia (SM 10168); 11 mi. N Culiacán, 150 ft. (TCWC 12535); 3 mi. W El Dorado (SM 11753-55, 11762, 11767-69); Elota, 200 ft. (UMMZ 114691-92); 3.7 mi. SSE Elota, 200 ft. (UMMZ 114690); Escuinapa (AMNH 1585-95); 44.5 mi. N Escuinapa (FAS 15531); 9 mi. SE Escuinapa (UIMNH 6667); 5 mi. NW Escuinapa (UIMNH 6668); 12 mi. NW Escuinapa (UIMNH 6670); Mazatlán (AMNH 15369; CAS 95811; MCZ 31589; SDSNH 7225; SM 10169-70); N Mazatlán (AMNH 20663-68); 4 mi. N Mazatlán (AMNH 15353-55, 15357-58, 15361-62; FMNH 75694); 5 mi. N Mazatlán (USNM 146622-24); 10.7 mi. N Mazatlán (FAS 11412); 14 mi. N Mazatlán (UMMZ 118974); 20 mi. N Mazatlán (AMNH 75869); 34 mi. N Mazatlán (UIMNH 41576); 37.5 mi. N Mazatlán (FAS 13570); 11 mi. N, 1.2 mi. E Mazatlán (UMMZ 112732-33); 37.4 mi. S Mazatlán (FAS 7744); 25.4 mi. NW Mazatlán (UF 12842); 5 mi. SE Piaxtla (SM 11771); 9 mi. NW Piaxtla (SM 11770); 10 mi. S Presidio (UIMNH 20228-29); 3 mi. SE Rosario (UIMNH 6669); San Francisquito (AMNH 15378); Santa Rosa UMMZ 118975); Isla Venados, N [NW] Mazatlán (SDSNH 41224); Villa Unión (SU 22297).

Dipsosaurus dorsalis sonoriensis Allen

Dipso-saurus dorsalis sonoriensis Allen, Occ. Papers Mus. Zool., Univ. Michigan, 259:4, April 3, 1933 (type locality, Hermosillo, Sonora).

Remarks.—Only a single specimen of *Dipsosaurus* has been reported from Sinaloa since the original description (Bogert and Oliver, 1945:401). Several additional specimens have been taken

on the floodplain of the Río Fuerte north of Los Mochis. Nine females have the following characters: supralabials 7-10 (mode 8); infralabials 8-9 (mode 9); total femoral pores 36-45 (40.5); snout-vent length 85-118 (104). Five males have the following characters: supralabials 8-10 (mode 8); infralabials 8-10 (mode 9); total femoral pores 40-41 (40.6); snout-vent length 88-135 (113). Most specimens have one row of small scales separating the nasal and rostral. The two largest males (snout-vent length 130, 135 mm.) have two rows of small scales between the nasal and rostral. The specimens agree closely in color pattern with the original description and with specimens at hand from the vicinity of the type locality.

Distribution in Sinaloa.—Known only from the floodplain of the Río Fuerte in the northern lowlands. See Fig. 42.

Specimens examined.—Ahome (* LACM 8646); 4 mi. N Los Mochis turn-off (* LACM 25716-26); San Miguel, Río del Fuerte, 110 m. (* KU 40448); 2.5 km. N Topolobampo (* CSCLB 1521).

Literature record.—Ahome (Bogert and Oliver, 1945:401).

Additional records.—1 mi. NE Ahome, S bank Río Fuerte (UAZ 9525); 22 mi. NNE Los Mochis (UIMNH 40427); 2.6 mi. SE Playa Visnaga (UAZ 9523).

Holbrookia maculata elegans Bocourt

Holbrookia elegans Bocourt, Mission scientifique au Mexique . . . , Etudes sur les reptiles, livr. 3:164, pl. 17 bis, figs. 8, 8a, 1874 (type locality, Mazatlán, Sinaloa).

Holbrookia maculata elegans: Smith and Taylor, Bull. U. S. Nat. Mus., 199:84, October 26, 1950.

Remarks.—Smith (1935b:192) characterized specimens of *Holbrookia maculata elegans* from southern Sinaloa as having tails shorter than the body (longer in specimens from Sonora), larger femoral pores, pink gular spots and more strongly angular and conspicuous dorsal spots in females, and very little blue surrounding the lateral black spots of males. Lewis and Johnson (1956:278) reported females from between Culiacán and Mazatlán as having relatively smaller femoral pores, pink chin coloration in only one, and bright blue-green bordering the lateral black bars of males.

Twenty-seven males from Sinaloa have the following measurements: dorsal scales from parietal to posterior edge of femur 138-158 (146.2); total femoral pores 22-31 (27.4); lamellae beneath fourth toe 21-30 (25.1); ventrals from gular fold to anus 58-76 (65.2); snout-vent length 27-66 (48.2); tail length 25-88 (53.0); snout-vent/tail 0.78-1.08 (0.92). Comparable measurements for 18 females are respectively: 139-157 (146.9); 17-33 (25.7); 22-28 (24.7); 57-71 (65.9); 29-61 (50.4); 29-60 (49.2); 0.91-1.03 (0.98). Specimens

from four localities north of Guasave, Sinaloa, have fewer dorsal scales and femoral pores, about the same number of lamellae beneath the fourth toe, a similar number of ventrals, and a relatively shorter tail in males than specimens from the rest of the state.

Ventral color pattern of live males is as follows: two dark blue or black bars bordered with light blue; light orange anterior to bars continuous to insertion of forelimbs; bright yellow posterior to bars, continuous to hind limbs and anterior part of thighs; chin gray or white, with orange (pink in preservative) gular spot covering about 15 scales; tail white. Ventral color of females is as follows: bars much fainter than males, without blue borders; light orange anterior to bars and bright yellow posterior to bars, extending onto femur; chin gray and white or white with orange gular spot; tail light orange. The orange gular coloration may be correlated with breeding activity and exhibit seasonal variation.

Axtell (personal communication) distinguishes female *H. m. elegans* from females of *H. m. thermophila* by differences in ground color, distinctness of the dorsal blotches, relative proportions of the dorsal blotches, and the relative size of the femoral pores. In material from Sonora and Sinaloa available to us, the paravertebral blotches are more sharply defined and are relatively wider in *elegans* than in *thermophila*. There are no constant differences in other characters examined. Axtell considers specimens from Guirocoba, Alamos, and Camoa (Sonora) to be intergrades between the two subspecies. Until more evidence regarding the intergradation zone becomes available, all specimens from Sinaloa are referred to *Holbrookia maculata elegans*.

Most specimens were found in open areas along trails, in river beds, and on the beach. Females collected between July 3 and July 19 contained eggs. Two recently hatched individuals (LACM 6606-07) were collected on August 15, 1962.

Distribution in Sinaloa.—Lowlands throughout the state, to elevation of 520 meters. See Fig. 45.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 73682-83); Colonia de la Reforma, 19.7 mi. W Techa junc. (UAZ 4361); 19 km. N Culiacán (* KU 40450-55); 23 mi. E Culiacán (CSCLB 1977); 48 mi. S Culiacán (SU 19356); 6 km. NE El Fuerte, 155 m. (* KU 78619-20); 18 mi. S El Fuerte (JRM 1129); 40 km. N El Limón (* KU 40449); Guamúchil (UAZ 14366); 11 mi. S Guamúchil (CSCLB 2104); La Cruz, 9 m. (* KU 73678; LACM 6601); 4 mi. N Los Mochis turnoff (LACM 25712-14); 7.3 km. SW Matatán, 155 m. (* KU 78616); near Mazatlán (LACM 6602); 7 mi. N Mazatlán (LACM 25711); 10 mi. N Mazatlán (LACM 8624); 7 mi. E Mazatlán (UNM 10049); 1.5 km. SE Mazatlán, 3 m. (* KU 29657-61); 2 mi. S Obispo (LACM 6600); Playa Visnaga (UAZ 10492); 1 mi. W highway 15 along Río Piaxtla (CSCLB 1978); Rancho de los Pocitos, 14.2 mi. WNW Pericos junc. (UAZ

4358-60, 14364-65); San Ignacio, 210 m. (* KU 73679-81; LACM 6603-05); 1.5 km. WNW San Lorenzo (* KU 48743-45); 1 mi. W Terreros (LACM 6608); 1.5 mi. N Topolobampo (CSCLB 1979); 3.9 mi. NE Topolobampo (UAZ 1729-30, 1807); 16 km. SE Topolobampo, 6 m. (* KU 69924); 13 km. NNE Vaca, 400 m. (* KU 80712-15); 12 km. N Villa Unión, 120 m. (* KU 80706-11); 10 km. NE Villa Unión (* KU 48739-40); 9.4 mi. NE Villa Unión (LACM 6606-07).

Literature records.—Bacubirito (Schmidt, 1922:715); 30 mi. S Culiacán (Lewis and Johnson, 1956:278); Escuinapa (Schmidt, 1922:715; Smith and Taylor, 1950b:84); near Mármol (Lewis and Johnson, 1956:278); Mazatlán (Bocourt, 1874; Cope, 1868:310; Schmidt, 1922:715; Smith and Taylor, 1950b:84; Van Denburgh, 1898:461); N Mazatlán (Lewis and Johnson, 1956:278); Presidio (Smith and Taylor, 1950b:84); near Presidio (Smith, 1935b:191; Taylor, 1938:517); Rosario (Schmidt, 1922:716; Smith and Taylor, 1950b:84).

Additional records.—4 mi. NNE El Fuerte (FMNH 71489); 8 mi. NNE El Fuerte (FMNH 71487-88); 25 mi. NW Elota (MVZ 58983); 5 mi. NW Escuinapa (UIMNH 6684-88); 12.3 mi. S Guamúchil (FAS 14481); 23 mi. S Guamúchil (UIMNH 41606-07); 43 mi. SE Cuasave (SM 11569-72); 20.2 mi. S Los Mochis (FAS 10474); near Mazatlán (USNM 47260-61); N Mazatlán (AMNH 20650); 1.3 mi. N Mazatlán (FAS 14480); 12 mi. N Mazatlán (MVZ 58981-82); 11 mi. N, 1.5 mi. E Mazatlán (UMMZ 112629); 37.4 mi. S Mazatlán (FAS 7745); 2.3 mi. N, 1.5 mi. W Mazatlán (FAS 7722); 12.1 mi. N Pericos (UIMNH 40153); Presidio (UIMNH 20361-62); Rosario (USNM 47682-86); 6 mi. W Topolobampo (SM 11568); 3 mi. SE Villa Unión (SM 11223); 10 mi. S Villa Unión (MCZ 61471).

Iguana iguana rhinolopha Wiegmann

[*Iguana*] *H[ypsilophus] rhinolophus* Wiegmann, *Herpetologia Mexicana*, 1:44, 1834 (type locality, México).

Iguana iguana [sic] *rhinolopha*: Van Denburgh, *Proc. Acad. Nat. Sci. Philadelphia*, p. 461, 1897.

Remarks.—Adult iguanas were observed on several occasions sunning in the tops of trees along the rivers in southern Sinaloa. Large males (more than 1500 mm. in total length) have extensive areas of orange color on their head and dewlap. Females contain well developed ova in February and March. Two females are 120 and 205 mm. and four males are 88, 117, 210, and 220 mm. in snout-vent length. Iguanas are very abundant in some parts of Sinaloa. More than 500 specimens, mostly juveniles, were brought to us by local people at Teacapán between August 29 and September 5, 1962.

Distribution in Sinaloa.—Known only from the lowlands north to Costa Rica. See Fig. 42.

Specimens examined.—1 km. S Concepción, 75 m. (* KU 63751-55); 13.8 mi. S Escuinapa (UAZ 12314); 7.3 km. SW Matatán, 155 m. (* KU 78621); Río Presidio (UAZ 14860); Rancho Huanacastle (LACM 6611); 8.4 mi. S Rosario (UAZ 1953); Teacapán (LACM 6612-13); Villa Unión (SU 22737).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); Mazatlán (Boulenger, 1885b:191; Smith and Taylor, 1950b:72; Van Denburgh, 1898:461); Presidio (Boulenger, 1885b:191; Smith, 1935a:133; Smith and Taylor, 1950b:72).

Additional records.—Barrón, Río Presidio (SDSNH 41225-26); El Dorado (AMNH 90772); Escuinapa (AMNH 1544); Mazatlán (USNM 7179); N

Mazatlán (AMNH 20669-79); 5 mi. N Mazatlán (SDSNH 41227); 73 mi. S Mazatlán (FAS 8716); near Presidio (FMNH 117780-81); 10 mi. S Presidio (UIMNH 20403-04); Rincón de Urías, E Mazatlán (AMNH 15363-64).

Phrynosoma solare Gray

Phrynosoma solaris Gray, Catalogue Lizards Brit. Mus. Nat. Hist., p. 229, 1845 (type locality, California).

Remarks.—Five specimens agree with the diagnosis given by Reeve (1952:907) with the exception that the ventral scales are not distinctly keeled. Measurements are as follows: (two males) snout-vent length 72, 40; tail 40, 14; tail/snout-vent length 0.56, 0.35; (three females) snout-vent 78, 61, 34; tail 31, 28, 11; tail/snout-vent length 0.40, 0.46, and 0.32. Horned lizards, known from areas of thorn woodland, reach their southern limit of distribution in central Sinaloa.

Distribution in Sinaloa.—Northern part of the state (north of Terreros). See Fig. 46.

Specimens examined.—Ahome (UCLA 13907, 13910-12); 6 km. NE El Fuerte, 150 m. (° KU 77809); 11 mi. S Guamúchil (CSCLB 1980); 10 km. S, 38 km. E Sinaloa, 240 m. (° KU 69925); Terreros (LACM 6614); 1 mi. W Terreros (LACM 6615); 4 mi. W Terreros (LACM 6616); 13 km. NNE Vaca, 400 m. (° KU 80716-18).

Literature records.—Ahome (Bogert and Oliver, 1945:401; Smith and Taylor, 1950b:104); Sierra de Choix (Reeve, 1952:910; Smith and Taylor, 1950b:104).

Additional records.—8 mi. NNE El Fuerte (FMNH 71485-86); 5 mi. N Guasave, 100 ft. (TCWC 12455); near Mocerito (UMMZ 125221); Río Sinaloa (MVZ 21012); 2 mi. S Sinaloa (UMMZ 125220).

Sceloporus bulleri Boulenger

Sceloporus bulleri Boulenger, Proc. Zool. Soc. London, p. 729, pl. 48, fig. 3, December 4, 1894 (type locality, La Cumbre de los Arrastrados, Jalisco).

Remarks.—Twenty-eight males have the following characteristics: dorsal scales 38-45 (40.5); middorsal scales in black collar 3-5.5 (4); total femoral pores (excluding KU 44746) 31-40 (35.7); snout-vent length 42-102 (63.6); tail length 81-130 (93.7) (N = 7; KU 44756, 75542, 78627, 78633, 78638-40); snout-vent/tail 0.62-0.68 (0.66). Ten males have the white anterior edge of the black collar broken middorsally; in 18 the white edge is complete. The corresponding characteristics of 12 females are, respectively: 36-42 (39.6); 3-6 (4); 30-37 (33.3); 48-91 (64.8) (excluding KU 78634); 85-135 (103.3) (N = 3; KU 75540, 78628, 78643); 0.61-0.67 (0.65). The white anterior edge is broken medially in 5, unbroken in 7.

The color of an adult male (LACM 6672) is as follows: top of head brownish olive with spots of pale green; collar velvet black,

with pale green anterior edge, broken middorsally; middorsal scales pale brownish green, grading into pale green laterally and into blue of belly; dorsal and lateral scales of tail pale blue with brown edges; legs brown dorsally; mental and anterior gulars pale blue; throat royal blue with invasions of black from sides of lower jaw; chest black; two royal blue lateral patches, joined by black anteriorly, separated posteriorly by dirty white; ventral surface of legs dirty white, yellowish white along femoral pores and outer edges of vent.

Specimens have been found on the sides of wooden buildings and on logs during June, July, and August in pine-oak forest above 1000 meters elevation.

Distribution in Sinaloa.—Known only from the mountains (above 1000 meters) in the vicinity of Santa Lucía and El Palmito [Durango]. See Fig. 47.

Specimens examined.—5 km. SW El Palmito, 1850 m. (* KU 75534-43); 1 km. NE Santa Lucía, 1155 m. (* KU 78626-27); 2.2 km. NE Santa Lucía, 1555 m. (* KU 78628-31); 10 km. NE Santa Lucía, 1950 m. (* KU 75533); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78632-43); 1.5 km. E Santa Lucía, 1750 m. (* KU 44746-52, 44754); 2 km. E Santa Lucía, 1720 m. (* KU 44753, 44755-56); Santa Rita (LACM 6668-71); 4.8 m. E Santa Rita (* LACM 6672).

Literature record.—El Batel, 5100 ft. (Zweifel, 1954b:145).

Additional records.—37 mi. E Concordia (UIMNH 41621-22); 8 mi. W El Palmito (AMNH 94810-17); 10.3 mi. W El Palmito (UAZ 11984).

Sceloporus clarkii boulengeri Stejneger

Sceloporus boulengeri Stejneger, N. Amer. Fauna, 7:180, pl. 1, figs. 5a-c, 1893 (type locality, Presidio, about 50 miles [south] from Mazatlán, Sinaloa).

Sceloporus clarkii boulengeri: Burt, Trans. Amer. Micr. Soc., 54:171-72, April, 1935 (part).

Remarks.—*Sceloporus clarkii boulengeri* has been recognized by most authors despite some confusion with other lizards (Burt, 1935:172; Taylor, 1938:520) and some disagreement about the taxonomic value of certain characters (Bogert and Oliver, 1945:347). Intergradation between *boulengeri* and *clarkii* occurs near Alamos (Bogert and Oliver, 1945:348) and Navojoa (Langebartel and Smith, 1954:130), Sonora.

Little sexual dimorphism is evident in the following characters of 140 specimens: snout-vent length, 33-126 (83.2); dorsal scales 28-37 (32.7) (excluding KU 29586, 37631, 63683); femoral pores (total), 13-27 (18.6) (excluding KU 29586, 77823, 80728). There are two rows of lorilabials below the suboculars in 126, one row in six, one right and two left in three, and two right and one left in

three (excluding KU 29575, 37631). The frontoparietals are in contact medially in 23; separated in 115 (excluding KU 29586, 63694).

As a measure of variation in *Sceloporus clarkii* in Sinaloa, the total femoral pores and number of dorsal scales were analyzed statistically for samples from Vaca, El Fuerte, Culiacán, Mazatlán, and Concepción. The total femoral pores of the Culiacán and Mazatlán samples are significantly different from each other and the other three populations (Fig. 8). The result suggests a possible

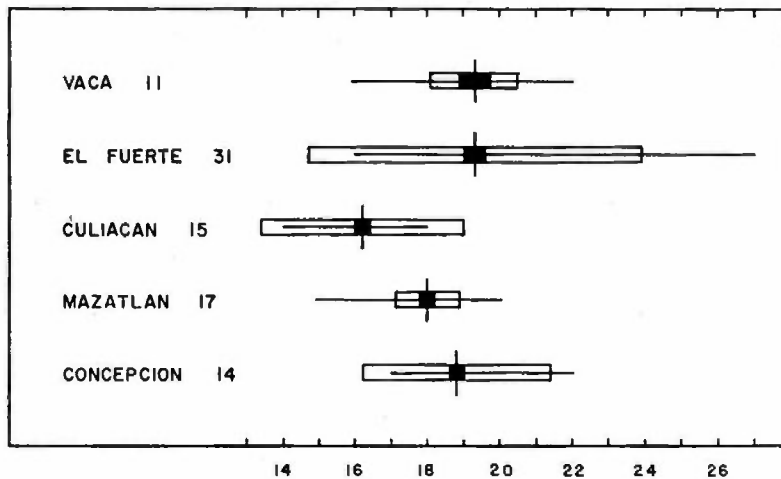


FIG. 8. Variation in the number of femoral pores in five samples of *Sceloporus clarkii boulengeri* in Sinaloa. The horizontal line represents the range of variation; the vertical line, the mean; the solid rectangle, two standard errors on either side of the mean; open rectangle, two standard deviations on either side of the mean. The samples include both sexes.

cline in southern Sinaloa in this character, with a sharp break between Culiacán and El Fuerte. Some workers might separate Sinaloan *Sceloporus clarkii* into two subspecies based on this character. No significant differences in the number of dorsal scales are indicated (Fig. 9). Analysis of variation in other characters demonstrates that there is little or no geographic correlation with variation of these characters. Our data support Smith's contention (1939c:132) that *Sceloporus clarkii boulengeri* exhibits a wide latitude of variation.

Tanner and Robison (1959:77), on the basis of three specimens, described *Sceloporus clarkii uriquensis* from Urique, Chihuahua. They diagnosed this subspecies as having the nasal separated from

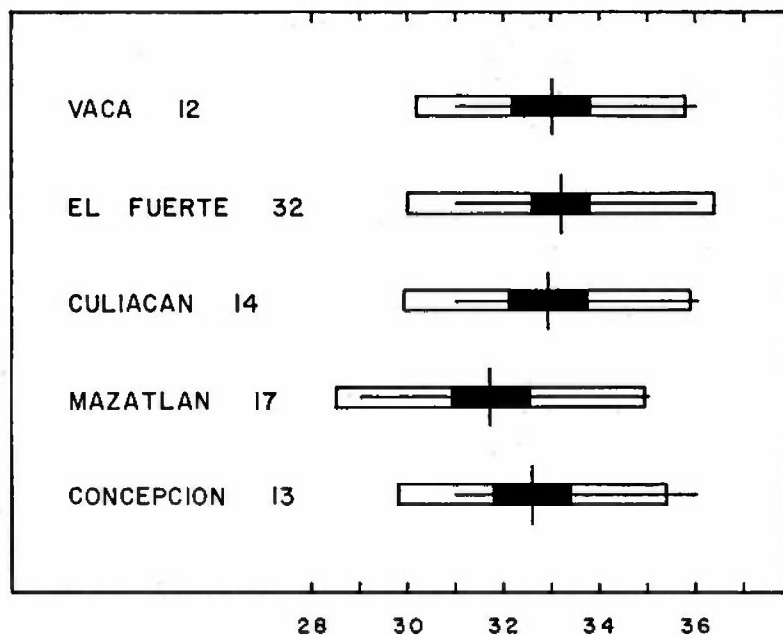


FIG. 9. Variation in the number of dorsal scales in five samples of *Sceloporus clarkii boulengeri* in Sinaloa. The horizontal line represents the range of variation; the vertical line, the mean; the solid rectangle, two standard errors on either side of the mean; open rectangle, two standard deviations on either side of the mean. The samples include both sexes.

the lorilabials, only one scale between the subocular and labials, only four supraoculars, and postmentals reduced to four. Tanner and Robison also stated that the Urique specimens do not have the dorsolateral stripes characteristic of *boulengeri*.

Three male topotypes (KU 56215-17), examined by us, have the nasal in contact with the lorilabials in one and not in two; they have 2, 3, and 2/1 rows of lorilabials between subocular and labials; two specimens have 5 supraoculars, one has six (or at least five, depending on whether small anterior plates are counted). The postmentals were counted in the manner indicated by Smith (1946:180) and Peters (1964:274). The three topotypes and 135 (of 139) Sinaloan specimens have two postmentals. Four specimens representing four different localities from El Fuerte to Rosario have three postmentals. Tanner and Robison evidently counted postmentals in the manner indicated by Smith (1939c:23). In any case, our data show no decrease in northern Sinaloa or at Urique; of 140 specimens examined only nine have a reduction of supraoculars

(one or both sides) and four of those reductions were from the vicinity of El Fuerte. Several specimens from Sinaloa do not exhibit the dorsolateral striping assumed to be characteristic of *boulengeri* (Tanner and Robison, 1959:77). Smith (1939c:130-31) indicated that females of *S. clarkii boulengeri* have dorsolateral stripes but males "become more or less uniform light straw color above" (p. 131). The type specimen of *uriquensis* is an adult male.

On the basis of a more complete understanding of the variation in *Sceloporus clarkii boulengeri* in Sinaloa, the intermediate condition in some characters of specimens from the Río Fuerte drainage, the probable continuum of distribution of *S. clarkii* throughout the Río Fuerte drainage (including Urique), and the latitude of variation of *Sceloporus clarkii uriquensis* (as shown by the three topotypes discussed), we find extensive overlap in the characters utilized by Tanner and Robison to diagnose the Urique specimens. Therefore, we place *Sceloporus clarkii uriquensis* Tanner and Robison in the synonymy of *Sceloporus clarkii boulengeri* Stejneger.

Sceloporus clarkii boulengeri is arboreal and commonly found on trunks of coconut palms along the coast. The lizards are wary and often retreat to the upper branches when disturbed. Taylor (1938:520) found *S. c. boulengeri* in "large trees that stood isolated in pasture fields" near Presidio and Mazatlán. Langebartel and Smith (1954:130) recorded *boulengeri* in "dense cactus and thorny scrub thickets of the west coast." Lewis and Johnson (1956:278-79) found *boulengeri* 10-15 feet above the ground in mesquite trees near El Carrizo (northern Sinaloa), and in thorny broadleaf trees and acacias and along fence rows north of Mazatlán. Newly hatched young were found at Teacapán in early September.

Distribution in Sinaloa.—Relatively abundant throughout the state. See Fig. 48.

Specimens examined.—Ahome (UCLA 13909, 13920-22, 13928-32); 1 mi. NE Ahome (UAZ 9389); 1.5 km. SE Camino Real, Río Piaxtla, 120 m. (* KU 63692); E base Cerro Pocitos, 17.5 mi. W Pericos junc. (UAZ 4373); 16 km. NNE Choix, 520 m. (* KU 73696-98); Colonia de la Reforma, 19.7 mi. W Techa junc. (UAZ 14363); 1 km. S Concepción, 77 m. (* KU 63678-91); 8.3 mi. ENE Concordia (UAZ 14255-57); 6 km. E Cosalá, 460 m. (* KU 73699-701); Culiacán (LACM 8637-39); N Culiacán (CSCLB 2078-81); 7.8 mi. N Culiacán (CSCLB 2100-01); 19 km. N Culiacán, 120 m. (* KU 40401-02, 40405-06); 55 km. N Culiacán (* KU 40400); 46 mi. S Culiacán (CSCLB 2073); 18 km. NW Culiacán, 30 m. (* KU 67541-46); 53 mi. NW, 1 mi. E Culiacán (UAZ 2335-37); 53 mi. NW, 2.7 mi. E Culiacán (UAZ 2339); 32 km. SSE Culiacán (* KU 37632); 6 km. NE El Fuerte, 150 m. (* KU 77811-36, 77842); 8 km. NE El Fuerte, 160 m. (* KU 77837-41); 36 mi. NW Elota (UAZ 2338, 2340, 2465); 5 km. SW El Palmito, 1850 m. (* KU 75568); Escuinapa (LACM 8640-44); 5 km. NW Escuinapa, 150 m. (* KU 73707);

2.7 mi. N Guamúchil (CSCLB 2072); 3 mi. NW Guamúchil (UAZ 14346-54); 8 mi. N Guamúchil (SU 18258); 14 mi. N Guamúchil (CSCLB 2074); 6 km. W Guasave, 15 m. (* KU 67547-51); Isla Palmito de la Virgen, 5 m. (* KU 73702-06); Isla Palmito del Verde, middle (* KU 73708-16); La Cruz (LACM 6625); Los Mochis (CSCLB 2088-90); 12 mi. NW Los Mochis (UAZ 14344-45); 7.3 km. SW Matatán, 155 m. (* KU 78646); Mazatlán (* KU 63391-99; JMS osteo. coll.; JRM 1096); N Mazatlán (CSCLB 2082-87, 2092; LMK 7337-41; UAZ 11277); about 2 mi. N Mazatlán (LACM 6620-24); about 4 mi. N Mazatlán (LACM 6626-27); 5 mi. N Mazatlán (CSCLB 2074-76); 10 mi. N Mazatlán (LACM 8636); 11.4 mi. N Mazatlán (CSCLB 2075); 8.4 mi. NE Mazatlán (UAZ 14357-62); 1.5 km. SE Mazatlán, 3 m. (* KU 29530-81, 29585); 5.4 mi. SE Mazatlán (UAZ 2373); NW Mazatlán (LACM 6644); 1 mi. NW Mazatlán (LACM 6642-43; 8625-35); 5 km. NNW Mazatlán, 8 m. (* KU 29574-75, 29582-84, 29586); 4 km. SW Navolato, 6 m. (* KU 73694-95); 1 mi. E Pánuco (CSCLB 2077); 1.5 km. S Pericos (* KU 37627-31); Rancho de los Pocitos, 14.2 mi. WNW Pericos junc. (UAZ 4374); Rancho Huanacastle (LACM 6631-36; JMS osteo. coll.); Rosario (UCLA 14820); 8 km. SSE Rosario, 30 m. (* KU 29573, 29577); San Ignacio (LACM 6628-30, 6641); E of San Blas (UAZ 9388, 9392); 5 km. SW San Ignacio, 200 m. (* KU 78644-45); 1.5 km. ENE San Lorenzo (* KU 48705); San Miguel (* KU 40399, 40403-04); 5 km. NE San Miguel, 92 m. (* KU 63693-96); Santa Lucía, 1100 m. (* KU 75566-67); near Santa Lucía (CSCLB 2093); 1.5 km. E Santa Lucía, 1700 m. (* KU 44757); 44 km. ENE Sinaloa, 180 m. (* KU 69928); Teacapán (LACM 6645-54); 11 mi. NE Teacapán (LACM 6655); 2 mi. E Teacapán (LACM 6656-57); Terreros (LACM 6637-40); Urique [Chihuahua] (* KU 56215-17); 13 km. NNE Vaca, 400 m. (* KU 80724-30); 1 km. SE Vaca, 200 m. (* KU 80719-23); Yecorato (UCLA 13924).

Literature records.—Ahome (Bogert and Oliver, 1945:348, 402); Bacubirito (Smith, 1939c:132); Costa Rica (Smith and Van Gelder, 1955:145); El Carrizo (Lewis and Johnson, 1956:278); El Dorado (Fugler and Dixon, 1961:11); Escuinapa; Los Mochis (Smith, 1939c:132); Mazatlán (Burt, 1935:171; Lewis and Johnson, 1956:278; Smith, 1939c:132; Van Denburgh, 1898:463); 1 mi. E Mazatlán (Smith, 1939c:132); 2 mi. E Mazatlán (Taylor, 1938:520); 9 mi. S Mazatlán; Mocorito; Presidio (Smith, 1939c:132); 10 mi. S Presidio (Taylor, 1938:520); Rincón de Urias; Rosario; San Francisquito; Sierra de Choix (Smith, 1939c:132); Yecorato (Bogert and Oliver, 1945:402).

Additional records.—Carrizo, 100 ft. (UMMZ 114882); Chele, about 300 ft. (UMMZ 110912); 2 mi. N Choix (FMNH 71496); 25 mi. NE Choix (UIMNH 20548); Costa Rica (UIMNH 34947-48); 7.6 mi. N Culiacán (UMMZ 120239); 9.9 mi. N Culiacán (AMNH 86819); 11 mi. N Culiacán, 150 ft. (TCWC 12554-57); 14.5 mi. N Culiacán (UIMNH 41647); 15.6 mi. N Culiacán (FAS 8500); 19.5 mi. N Culiacán (FAS 15757; UIMNH 41648-50); 21 mi. N Culiacán (UIMNH 41651); 22 mi. N Culiacán (UIMNH 41652-53); 10.5 mi. NW Culiacán (AMNH 75860); El Dorado (AMNH 90774-78; SM 12210-16); 10 mi. N El Dorado (SM 12218-20); 9 mi. SW El Dorado (SM 12221); 1 mi. NNE El Fuerte (FMNH 71495); 4 mi. NNE El Fuerte (FMNH 71493); 8 mi. NNE El Fuerte (FMNH 71494); Escuinapa, ca. 15 ft. (AMNH 1366-71, 1553-54); 31 mi. S Escuinapa (UF 12839); 5 mi. NW Escuinapa (UIMNH 6411-12); 12.3 mi. S Guamúchil (FAS 15905); 23 mi. S Guamúchil (UIMNH 41654-55); 1.5 mi. N Guasave turnoff, on hwy. 15 (FAS 16888-89); 30 mi. N Los Mochis (UIMNH 40468); 22.5 mi. NNE Los Mochis (UIMNH 40465-67); 13 mi. NE Los Mochis (UIMNH 40464); 1 mi. WNW Los Mochis (FAS 12909); Mazatlán, 25 ft. (AMNH 86817; SM 12199-200, 12207-09; UMMZ 114880); near Mazatlán (USNM 47269-70); N Mazatlán (AMNH 15499-509, 20680-90, 20714-15; USNM 51382-83); 1 mi. N Mazatlán (SM 12204-06, 12217); 3 mi. N Mazatlán (UNSM 151802); 22 mi. N Mazatlán (SM 12203); 36 mi. N Mazatlán (UIMNH 40173-74); 11 mi. N, 1.5 mi. E Mazatlán (UMMZ 112595); 1.5 mi. NW, 2.3 mi. E Mazatlán (FAS

7719-20, 7723); 1 mi. E Mazatlán (UIMNH 20552); 9 mi. S Mazatlán (FMNH 33332-35); 37.4 mi. S Mazatlán (FAS 7748); 73 mi. S Mazatlán (FAS 8707-08); 1 mi. NW Mazatlán (SM 12201-02); 6 mi. NNW Mazatlán, 50 ft. (UMMZ 114881); 40 mi. NNW Mazatlán (UMMZ 118810); Mocoquito (USNM 33573); 12.1 mi. N Pericos (UIMNH 40172); 9 mi. NW Piaxtla (SM 12222-29); Presidio (FMNH 33328-31, 33336-37, 105380-81, 105576-77; UIMNH 20549-50); 2 mi. N Presidio (EHT-HMS 667-83); 8-10 km. S Presidio (UIMNH 20551); Rincón de Urías (AMNH 20716-17); S Rincón de Urías (AMNH 20691-92); Rosario (UIMNH 62757-63); 8 mi. NNW Rosario (UMMZ 112596); Villa Unión (AMNH 94756).

Sceloporus horridus albiventris Smith

Sceloporus horridus albiventris Smith, Field Mus. Nat. Hist., Zool. ser., 26:108, July 27, 1939 (type locality, Tepic, Nayarit).

Remarks.—Eight specimens of *Sceloporus horridus albiventris* have the following measurements: total femoral pores, 4-6 (5.8); dorsal scales, 30-35 (32.5); snout-vent length 64-91 (77.8). The venter is white in four and exhibits a pale blue tint laterally in four. The chin is white in five, has a pale blue tint in two, and is barred laterally with gray in one. These characters are in agreement with those presented by Smith (1939c:108). Specimens from near Culiacán represent the northernmost locality for the species in Sinaloa. The lizard is to be expected in the foothills to the northeast of Culiacán as suggested by its occurrence in Chihuahua (Tanner and Robison, 1959:79). Individuals were collected from fence posts, logs, and on rock piles. This species apparently is more terrestrial than *Sceloporus clarkii boulengeri*.

Distribution in Sinaloa.—In the foothills and on the coastal plain of Sinaloa south of Culiacán. See Fig. 49.

Specimens examined.—1.5 km. SE Camino Real, 120 m. (* KU 63703); 1 km. S Concepción, 76 m. (* KU 63701-02); 6 km. E Cosalá, 460 m. (* KU 73725); 14 mi. N Culiacán (CSCLB 2067-68); 5 km. NW Escuinapa, 155 m. (* KU 73727); 5.4 mi. NW Escuinapa (LACM 6663); La Cruz (LACM 6659-62); 7.3 km. SW Matatán, 155 m. (* KU 78647-48); San Ignacio, 210 m. (* KU 73726).

Literature records.—Mármol (Lewis and Johnson, 1956:279); Rosario (Smith, 1939c:110).

Additional records.—12 mi. N Escuinapa (FAS 16891); 41.3 mi. S Escuinapa (FAS 11420); near Mazatlán (FMNH 62416); Rosario (MCZ 46925; UIMNH 62757-63).

Sceloporus jarrovii jarrovii Cope

Sceloporus jarrovii Cope, U. S. Geog. Geol. Surv. W. 100th Mr., 5:569, 1875 (type locality, Southern Arizona).

Sceloporus jarrovii jarrovii: Smith, Univ. Kansas Sci. Bull., 24:624, February 16, 1938.

Remarks.—One specimen of *Sceloporus jarrovii jarrovii* agrees with the descriptions given by Smith (1938:624-28, 1939c:226-27).

The specimen, a male, has the following characters: snout-vent 90; tail incomplete; dorsal scales 43; supraoculars complete; 30 femoral pores separated medially by eight scales; lateral scales as large as dorsals; two white lines on head, upper one continuous on neck to shoulder; nuchal collar three scales wide with light border broken posteriorly, anterior light border indistinct; dorsal scales not with conspicuous white centers; lateral belly patches blue; groin black.

Smith (1938:628) commented that specimens from western Chihuahua have a peculiar variation in collar pattern. The black nuchal collar is continuous with black of the back and neck, obscuring the light borders of the collar. Also, the dorsal scales of Mexican specimens lack white spots characteristic of specimens in Arizona. Both of these color variations are present in the specimen at hand.

Distribution in Sinaloa.—Known only from the eastern mountains. See Fig. 50.

Specimens examined.—1 km. NE Santa Lucía (CSCLB 2065-66); 15 km. N, 65 km. E Sinaloa, 1400 m. (* KU 69931).

Literature record.—10 mi. and 17 mi. (by road) NE El Batel, 6400 ft. (Zweifel, 1954b:145).

Sceloporus magister magister Hallowell

Sceloporus magister Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 7:93, 1854 (type locality, Fort Yuma, Yuma county, Arizona).

Sceloporus magister magister: Linsdale, Univ. California Publ. Zool., 38:365, 1932.

Remarks.—Two males of this species are 60 and 111 in snout-vent length, with 30, 32 dorsal scales; 29, 27 femoral pores; and 2-1, 2 rows of lorilabials beneath suboculars. Four females are 119, 106, 90, 74 in snout-vent length with 29, 29, 31, 32 dorsal scales; 29, 25, 28, 26 femoral pores; and 2 rows of lorilabials beneath suboculars; a fifth female has 25 femoral pores (CSCLB 2071). The frontoparietals are separated medially in all specimens (excluding CSCLB 2071).

These records are the first reports of *Sceloporus magister* from Sinaloa. Specimens were collected in dense portions of the arid thorn woodland from Guamúchil northward.

Distribution in Sinaloa.—Known only from the northern coastal lowlands and Isla Tachetizte. See Fig. 47.

Specimens examined.—22 km. N Guamúchil (* CSCLB 2071); 19 km. NE Guasave (* JLC 1128); Isla Tachetizte, 6 km. E Isla Altamura (* KU 69929-30); 4 mi. N Los Mochis turnoff (* LACM 25797); 16 km. SE Topolobampo, 7 m. (* KU 69926-27).

Sceloporus nelsoni Cochran

Sceloporus nelsoni Cochran, Jour. Washington Acad. Sci., 13:185, 1923 (type locality, Plomosas, Sinaloa).

Remarks.—Specimens of *Sceloporus nelsoni* from the region near Mazatlán are lighter in color than those elsewhere (Cochran, 1923:186). Smith (1939c:367) commented that females from this area "have much less ventral maculation on the throat, breast, and sides of abdomen, than females from elsewhere, and males have less maculation on the chest." However, Smith did not consider these differences sufficient to warrant subspecific recognition.

Tanner and Robison (1959:79) using ten specimens from Urique, Chihuahua, described the subspecies *Sceloporus nelsoni coeruleus* (= *S. n. barrancorum*, Tanner and Robison, 1960:114). They diagnosed *barrancorum*, in part, as being smaller than *nelsoni*, as having more dorsals and fewer postrostrals (three), and the males as having extensive deep blue from throat to hind legs.

Analysis of five characters for 16 specimens from Chihuahua and 56 specimens from Sinaloa (Table 4) fails to support the conclusions reached by Tanner and Robison, except that the maximum snout-vent length is slightly smaller in Chihuahua and northern Sinaloa than in southern Sinaloa. Additional material and localities may reveal clinal variation with respect to certain of these characters. The color pattern of the chest and belly of males is the most conspicuous variable. In specimens from Chihuahua and Choix, Sinaloa, (KU 73728) the chest and belly are solid black or very deep blue. The chest and belly are deep blue in male lizards from El Fuerte (KU 78669-75). A male (LACM 6682) from Terreros has the belly nearly all blue, darker midventrally; the chest is spotted with blue scales on white. A male from near Badiraguato (KU 83400) has black-edged, blue belly patches separated by a white median line that is continuous with a white chest. In the two specimens from south of Culiacán (KU 37773, 44850) the belly is blue laterally, darker blue medially, and the chest is white with large irregular blue blotches, similar to the Terreros specimen. Lizards from San Ignacio and vicinity (KU 73730-31, 78678-79; LACM 6675-77, 6679, 6681) have blue belly patches edged with black medially and posteriorly. The belly patches are in contact medially about two-thirds of their length, with white indentations anterior and posterior. The chests of these males are either all white, speckled blue and white, or blue-black with three or four white blotches. Males from vicinity of Mazatlán

TABLE 4.—Analysis of Five Characters for *Sceloporus nelsoni* from Various Localities in Chihuahua and Sinaloa.

LOCALITIES	Number of specimens	Dorsal scales from post. edge hind legs to parietal	Total femoral pores	Snout-vent length	Postrostrals between labials	Lamellae beneath fourth toe
Chihuahua						
Urique-type series ¹	10	38-43 (40.2)	17-19 ² (18.3)	51.5-57.5	3-4	
1.5 mi. SW Tocuina (14) 23 mi. S, 1.5 mi. E Creel (1) 3 mi. NE Temores (1)	16	38-45 (41.0)	29-37 (32.8)	51-59 (54.9)	3-5 (3.4)	16-21 (18.4)
Sinaloa						
El Fuerte Choix	8	40-46 (43.9)	31-38 (33.8)	41-59 (50.1)	(4.0)	17-19 (18.3)
Carrizalejo Sinaloa	3	37-42 (40.0)	33-35 (33.7)	47-53 (49.0)	3-4 (3.7)	(17.0)
Badiraguato Terrerros Culliacán (12 mi. N)	7	38-42 (40.1)	35-39 (36.7)	51-61 (54.5)	3-4 (3.6)	16-18 (17.1)
Cosalá Culliacán (32 mi. SSE)	2	36, 43 (39.5)	36, 38 (37.0)	54, 61 (57.5)	3, 4 (3.5)	17, 18 (17.5)
Camino Real, San Ignacio	17	37-42 (39.6)	31-40 (34.6)	48-64 (56.1)	2-4 (3.4)	16-21 (18.5)
Villa Unión, El Palmito, Santa Lucía	19	37-44 (40.1)	27-38 (33.0)	42-65 (58.0)	2-4 (3.2)	16-19 (17.7)

1. Tanner and Robison, 1959:81.

2. One side only.

have less maculation on the chest than those previously discussed. These color patterns indicate a clinal loss of black or blue ventral pigmentation in *S. nelsoni* from north to south.

Based on the evidence that the geographic variation involving ventral coloration is continuous, and that there are no consistent differences in numbers of dorsal scales and postrostrals, we conclude that *S. nelsoni barrancorum* should be allocated to the synonymy of *S. nelsoni*.

Sceloporus nelsoni is found at moderate to high elevations in the foothills and on the western slope of the Sierra Madre Occidental in western México. Lizards also have been taken in suitable habitat at a few isolated localities on the coastal plain. Specimens were collected on rocky outcroppings, along arroyos and rocky streams, usually in heavily shaded areas. All adult females collected in July and August were gravid.

Distribution in Sinaloa.—Most of the state except in the north-western lowlands. See Fig. 51.

Specimens examined.—21 km. ESE Badiraguato, 210 m. (* KU 83400); 1.5 km. SE Camino Real, Río Piaxtla, 120 m. (* KU 63706-08); 8 km. N Carrizalejo, 460 m. (* KU 78676-77); 16 km. NNE Choix, 520 m. (* KU 73728); 8.3 mi. ENE Concordia (UAZ 14252-54); 6 km. E Cosalá, 460 m. (* KU 73729); 23 mi. S, 1.5 mi. E Creel (Chihuahua) (* KU 44293); 19 km. N Culiacán (* KU 44850); 58 mi. N Culiacán (CSCLB 2099); 51 km. SSE Culiacán (* KU 37773); 74 km. S Culiacán (CSCLB 2070); 6 km. NE El Fuerte, 150 m. (* KU 78669-75); 5 km. SW El Palmito, 1859 m. (* KU 75582); 8.4 mi. NE Mazatlán (UAZ 14395); 1 mi. E Pánuco (CSCLB 2069); San Ignacio, 210 m. (* KU 73730-32; * LACM 6673-81; JMS osteo. coll.); 5 km. SW San Ignacio, 200 m. (* KU 78678-79); 1.5 km. E Santa Lucía (* KU 44840-49); 2.5 km. E Santa Lucía (* KU 44833-39); 44 km. ENE Sinaloa, 185 m. (* KU 69932); 3 mi. NE Temores (Chihuahua) (* KU 51795); 3-4 mi. W Terreros (* LACM 6682-86); 1.5 mi. SW Tocuina, 1500 ft. (Chihuahua) (* KU 47426-28, 51060-70); 8 km. N Villa Unión, 135 m. (* KU 80731); 1 mi. S, 26 mi. E Villa Unión, hwy. 40 (CSCLB 2097-98).

Literature records.—Culiacán (Cochran, 1923:186; Smith, 1939c:367); Mármol (Lewis and Johnson, 1956:278); near Mazatlán (Cochran, 1923:186; Smith, 1939c:367); 2 mi. E Mazatlán; 4 mi. SE Mazatlán (Taylor, 1938:518); S Rincón de Urías (Smith, 1939c:367); Rosario (Cochran, 1923:186; Smith, 1939c:367).

Additional records.—Culiacán (USNM 46629); 11 mi. N Culiacán, 150 ft. (TCWC 12448-54); 4 mi. NNE El Fuerte (FMNH 71490-92); Mazatlán (UMMZ 81958); near Mazatlán (FMNH 33480-82; USNM 47271, 47273-75); 9 mi. N Mazatlán (MVZ 59129-30); 36 mi. N Mazatlán (UIMNH 40155); 11 mi. N, 1.5 mi. E Mazatlán (UMMZ 115166); 3 mi. SE Mazatlán (UIMNH 21399); Rosario (USNM 47690-91); Santa Lucía (UMMZ 102585).

Sceloporus shannonorum Langebartel

Sceloporus shannonorum Langebartel, Herpetologica, 15:25, February 25, 1959 (type locality, 37 miles by road from Concordia, Sinaloa, near the Durango-Sinaloa border, state not determined).

Remarks.—Two females have 34, 32 femoral pores; 47, 50 dorsal

scales; 52, 52 scales around midbody, and snout-vent lengths of 59 and 70, respectively. Two males have 33, 32 femoral pores; 48, 47 dorsal scales; 52, 53 scales around midbody, and snout-vent lengths of 74 and 36, respectively. One female has a grayish white belly and the other has a faint bluish white belly without lateral patches of color. The smaller of the two males has pale blue lateral belly patches that are edged with gray medially and slightly separated by a creamy white area about one and one half to two scales wide. The larger male has pale blue belly patches edged with black and in contact medially. Three of the lizards have brown or tan sides but the larger male has pale blue mottling on the otherwise brown sides. The scales on the posterior surface of the thighs of the large male are definitely keeled, but those of the females are less strongly keeled. The other male (smallest specimen) lacks keels on the posterior surface of the thigh.

Two of these specimens were collected in pine-oak forest in August.

Distribution in Sinaloa.—Southern pine-oak forest between 1800 and 2000 m. See Fig. 49.

Specimens examined.—5 km. SW El Palmito, 1850 m. (* KU 75583); 13 km. W El Palmito, 1850 m. (* KU 63705); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78692-93).

Sceloporus utiformis Cope

Sceloporus utiformis Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 177, 1864 (type locality, Colima, Colima).

Remarks.—Three females and one male have the following characteristics, respectively: rows of lorilabials below center of eye 1-1, 2-2, 1-2, —; dorsals 43, 45, 50, 47; snout-vent 49, 33, 63, 41; tail length 116 (KU 44866 only); femoral pores 31, 32, 30 (excluding KU 44866). In all specimens the frontoparietals are separated by an azygous scale, which also separates the frontal and interparietal. Another azygous scale separates the prefrontals; the posterior frontal is divided longitudinally on all specimens. One female (KU 44868) has the frontal and interparietal in contact on the right but separated on the left by an azygous scale. The preanal scales of the two larger females are keeled, but those of the smallest female and the male are smooth. Other characters are in general agreement with those given by Smith (1939c:325-29). One female has a tail length of 116 and snout-vent/tail ratio of 0.42.

One female (KU 80732) taken on October 25, 1963, contains six eggs which measure 7×10 to 8×12 mm. Another specimen (KU

44866), taken June 23, 1955, contains 19 or more ovarian eggs 0.5-1.0 mm. in diameter. The testes of the male, taken on June 23, 1955, are 3 mm. long. These data do not support the contention of Smith (1939c:329) that the species is ovoviviparous.

Scattered records from southern Sinaloa suggest that this lizard has a wide range from sea level to near 1750 meters. Specimens have been reported to be abundant near the oyster shell middens near Teacapán (Scott, 1962:23).

Distribution in Sinaloa.—Probably inhabits most of Sinaloa south of Mazatlán. See Fig. 51.

Specimens examined.—1.5 km. E Santa Lucía, 1750 m. (* KU 44867-68); 2.5 km. E Santa Lucía, 1700 m. (* KU 44866); 2 mi. SE Teacapán (LACM 6687); 8 km. N Villa Unión, 135 m. (* KU 80732).

Literature records.—12 mi. S Presidio (Taylor, 1938:519); 15 mi. S Presidio; Rosario (Smith, 1939c:330).

Additional records.—Chele, about 300 ft. (UMMZ 110911); 59 mi. S Mazatlán (FMNH 116621, 116646); near Presidio (UIMNH 21932-34); Rosario (USNM 47687-88, 47692).

Urosaurus bicarinatus tuberculatus (Schmidt)

Uta tuberculata Schmidt, Amer. Mus. Novitates, 22:4, December 1, 1921 (type locality, Colima, Colima).

Uta bicarinata tuberculata: Mittleman, Jour. Washington Acad. Sci., 31:73-74, 1941.

Urosaurus bicarinatus tuberculatus: Mittleman, Bull. Mus. Comp. Zool., 91:169-70, September 1942.

Remarks.—Seven females and six males have ten rows of dorsal tubercles (KU 40467 excluded). The series of enlarged dorsal scales begins just posterior to the anterior edge of the insertion of the forelimbs; the postfemoral dermal pocket is absent, and the imbricate ventral scales are either rounded, rounded and mucronate, or all mucronate. The frontal is divided in two males (KU 40466-67) and one female (KU 44099). The total femoral pores in seven males are 20-27 (22.4), and in the females are 21-23 (22.0). Mittleman (1942:169) reported the frontal as "variable, usually divided" and the postfemoral dermal pocket as "variable, occasionally present."

We have examined specimens identified as *Urosaurus unicus* from near El Fuerte and are unable to distinguish between "*unicus*" and *bicarinatus*. We agree with Oliver (1943:106) and Tanner and Robison (1959:82) that *Urosaurus unicus* is synonymous with *Urosaurus bicarinatus tuberculatus*.

Most specimens were collected on tree trunks or branches. The

decrease in number and size of trees in northwest Sinaloa may account for the apparent absence of this species in that region.

Distribution in Sinaloa.—Generally known throughout the state below 1200 meters. See Fig. 52.

Specimens examined.—Cerro Pocitos, 17.5 mi. W Pericos junc. (UAZ 4348); 16 km. NNE Choix, 520 m. (* KU 73738-39); 53.2 mi. NW, 3.1 mi. E Culiacán (UAZ 3405); 19 km. N Culiacán (* KU 40468-67); 17.5 km. NW Culiacán, 30 m. (* KU 67622); 29 km. SSE Guamúchil (* KU 44097-99); Palmillas (LACM 6692-93); Plomosas, 760 m. (* KU 73740); San Ignacio (LACM 6688-90); Santa Lucía, 1100 m. (* KU 75584); Terreros (LACM 6691); 13 km. NNE Vaca, 400 m. (* KU 80733-36); 1 mi. S, 26 mi. NE Villa Union (CSCLB 2017).

Literature records.—35 mi. S Culiacán; Mármol (Lewis and Johnson, 1956; 280); Presidio (Boulenger, 1885b:215; Mittleman, 1942:169; Smith and Taylor, 1950b:147); 15 mi. S Presidio (Smith, 1935a:171; Taylor, 1938:518).

Additional records.—Culiacán (AMNH 62343); 11 mi. N Culiacán, 150 ft. (TCWC 12782); 6 km. NE El Fuerte (KU 77878); 8 km. N El Fuerte (KU 77879-80); Elota (AMNH 62344); 10 mi. S Presidio (FMNH 106516); S Rincón de Urias, near Mazatlán (AMNH 19694).

Urosaurus ornatus lateralis (Boulenger)

Uta lateralis Boulenger, Ann. Mag. Nat. Hist., (ser. 5) 11:342, 1883 (based on specimens from Tres Marias Islands and Presidio, Sinaloa; type locality restricted to Presidio, Sinaloa by Oliver, Copeia, no. 2:97, June 30, 1943).

Uta ornata lateralis: Van Denburgh, Occ. Pap. California Acad. Sci., 10:199, November 23, 1922.

Urosaurus ornatus lateralis: Langebartel and Smith, Herpetologica, 10:133, August 1, 1954.

Remarks.—Boulenger (1883:342) described *Uta lateralis* (= *Urosaurus ornatus lateralis*) based on specimens collected by Alphonso Forrer from the Tres Marias Islands and Presidio. Oliver (1943:97) restricted the type locality to Presidio, Sinaloa. Subsequent collections from the vicinity of Presidio and throughout southern Sinaloa have failed to reveal additional specimens. It is possible that specimens of *ornatus* were included by mistake with *Urosaurus bicarinatus* from Presidio, which Boulenger (1883:342; 1885b:215) also reported at the same locality. Zweifel (1960:119) also questioned the presence of *Urosaurus ornatus* at Presidio, Sinaloa.

Sixteen females and 27 males have 18-24 (20.3) (KU 77859, 80738 excluded) and 17-24 (19.9) (KU 44644, 44650, 77850, 77871, 77873 excluded) femoral pores, respectively. All specimens examined (18 females and 32 males) have two rows of dorsal tubercles (plus a few variously scattered tubercles not in rows); the enlarged dorsals are present craniad to a line joining the anterior edges of the forelimbs; the postfemoral pocket is present, but reduced in some (KU 77864 excluded); the frontal is divided and in a few the

anterior part is partially or completely divided longitudinally; the ventrals are rounded and smooth. No geographic variation is evident among these specimens.

Urosaurus ornatus lateralis and *U. bicarinatus tuberculatus* occur sympatrically in Sinaloa. The two species have been collected together near Vaca, El Fuerte, and Culiacán, but nothing was observed regarding their ecological distribution at these localities. Field observations at other localities suggest a possible ecologic separation of the two species. *Urosaurus ornatus* is primarily a terrestrial lizard that seeks shelter in dense vegetation or beneath surface objects, whereas *U. bicarinatus* primarily inhabits tree trunks.

Distribution in Sinaloa.—Northern lowland thorn forest. See Fig. 53.

Specimens examined.—Ahome (LACM 5810); 16 km. NNE Choix, 370 m. (* KU 73741-42); 15.8 mi. N Culiacán (CSCLB 2004); 37 mi. N Culiacán (CSCLB 2003); 8 km. N El Fuerte, 150 m. (* KU 77863-68); 6 km. NE El Fuerte, 150 m. (* KU 77850-62, 77869-76); Estero la Ballena (UAZ 9585-87); 8 mi. N Guamúchil (SU 18250, 22300); 89.5 mi. N Guamúchil (LACM 6694); 3 mi. NW Guamúchil (UAZ 14387-94); 8.3 mi. NW Guamúchil (CSCLB 2011-12); Isla San Ignacio, 3 m. (* KU 6933-34); Los Mochis (CSCLB 2005-09); 36 mi. N Mazatlán (UIMNH 40154); Playa Visnaga (UAZ 9584); 2.7 mi. SE Playa Visnaga (UAZ 9579-83, 9588-90); San Miguel, 110 m. (* KU 44642-53); 1.5 mi. N Topolobampo (CSCLB 2013-15); 3.9 mi. NE Topolobampo (UAZ 4067-69); 0.5 mi. E Topolobampo (CSCLB 2010); 1.5 km. NW Topolobampo (* KU 73743); 13 km. NNE Vaca, 400 m. (* KU 80737-42).

Literature records.—Ahome; Culiacán (Oliver, 1943:99); El Carrizo (Lewis and Johnson, 1956:279); Presidio [needs verification] (Boulenger, 1883:343; Boulenger, 1885b:214; Van Denburgh, 1922:201).

Additional records.—Culiacán (AMNH 62346; USNM 46628); El Dorado (SM 11740); 1 mi. NNE El Fuerte (FMNH 71519-27); 4 mi. NNE El Fuerte (FMNH 71503-11); 8 mi. NNE El Fuerte (FMNH 71512-18); 7 mi. W Guamúchil (MVZ 59011-12); 43 mi. SE Guasave (SM 11737-39); 35 mi. N Los Mochis (UIMNH 62267-68); 2 mi. S Los Mochis (AMNH 96607); 1 mi. N Topolobampo (SM 11732-34); 6 mi. W Topolobampo (SM 11735-36).

Family Scincidae

Eumeces callicephalus Bocourt

Eumeces callicephalus Bocourt, Miss. Sci. Méxique et Cent. Amer., livr. 6:431, 1879 (type locality, Guanajuato [state]).

Remarks.—All specimens of *Eumeces* from the coastal lowlands are assigned to *E. callicephalus*, based on the findings of Richard B. Loomis and Robert C. Stephens (MS). *Eumeces bocourti* Boulenger, 1883:342 (= *E. humilis* Boulenger, 1887:377) is included with *E. callicephalus*.

One male (KU 73745) has a primary temporal; frontal and interparietal separated; postnasal present; two postmentals; prefrontals

in contact; superciliaries 7-8; supralabials ?-7; infralabials 7-7; 28 scale rows at midbody; snout-vent 49; adpressed limbs overlap lengths of digits. The dorsolateral light stripes, visible only on the head and neck, are less than one scale wide and are separated by four complete scale rows on the neck.

A single specimen was obtained beneath banana leaves at La Cruz on July 4. The leaves were piled beneath the trees and were in an advanced state of decay. Four skinks were uncovered but only one was collected. Two lizards had bright blue tails in life. Two clutches of eggs (six eggs in each) were found in separate depressions in moist soil beneath the leaves. In both instances the lizards were coiled around the eggs and only when attempts were made at capture did the lizards leave. Two other specimens, both juveniles, were collected in dry palm leaves near Teacapán. Zweifel (1962:64) reported a specimen found during bulldozing operations near Mazatlán in January.

Distribution in Sinaloa.—Throughout the lowlands below about 600 meters. See Fig. 54.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 73745); La Cruz (LACM 6768); Teacapán (LACM 6769-70).

Literature records.—5 mi. N Mazatlán (Zweifel, 1962:64); Presidio (Bou-lenger, 1883:342; Taylor, 1936c:363).

Eumeces colimensis Taylor

Eumeces colimensis Taylor, Field Mus. Nat. Hist., Zool. Ser., 20:77, May 15, 1935 (type locality, Colima, Colima).

Remarks.—Taylor (1935a:77-80) described *Eumeces colimensis* from one specimen having no primary temporal and the frontal and interparietal in contact. Taylor (p. 80) remarked that only additional collecting would determine if the temporal and frontal-interparietal conditions are normal. Since Taylor's description three additional specimens have become available. Two specimens from Michoacán were reported by Peters (1954:16-17); one specimen from Sinaloa was reported by Webb (1959:42).

Data from all known specimens reveal that the type is unique in the characters of the frontal-interparietal contact, absence of the primary temporal, and in that the adpressed limbs overlap the length of the foot. The prefrontals are in contact in two specimens and separated in two (KU 44733 and holotype). The type has 6 superciliaries (Taylor, 1935a:78), but as pointed out by Peters (1954:16-17) the illustration of the type (fig. 7) shows seven. Taylor (1936c:71, fig. 4, A, D) defined the superciliaries of the

genus *Eumeces*; according to these figures, the figure of the type shows seven superciliaries. Taylor (1935a:78) stated that the type has "six superciliaries, anterior largest, last next in size." According to Taylor's figure seven, the only count resulting in "anterior largest, last next in size" is seven. Accordingly, superciliaries are usually seven to nine. Infralabials six to seven, supralabials seven, scale rows at midbody 26 or 28.

Distribution in Sinaloa.—Known only from the southern highlands. See Fig. 54.

Specimens examined.—1.5 km. E Santa Lucía, 1700 m. (* KU 44733).

Eumeces parvulus Taylor

Eumeces parvulus Taylor, Proc. Biol. Soc. Washington, 46:175, October 26, 1933 (type locality, Tepic, Nayarit).

Remarks.—A small specimen of *Eumeces* was discovered in Sinaloa by Nelson and Goldman during their biological investigations of México, and was referred to the species *parvulus* by Taylor (1933:175). Taylor later (1936c:364) suggested that their specimen might represent a new species because of certain supposed anomalies including the presence of a distinct light lateral stripe. However, Smith (1943b:250), in a short summary of the known specimens of this species, suggested that the small (8.5 mm.) specimen from Plomosas is a juvenile, and that the distinct lateral stripe is a juvenile character.

An adult male from near Plomosas is 47 mm. in snout-vent length and has the following characters: 24 scale rows around body; 58 dorsal scales from parietal to above anus; frontal contracts frontonasal and third supraocular; interparietal longer than wide; parietals enclose interparietal; broad faint lateral stripes present enclosing six complete and two half scale rows; brown above changing to gray below; very faint pale brown stripes extend from rostral along supraoculars to shoulders; sides of head and neck darker brown than top of head and neck; lower parts of supralabials, chin, and throat cream-colored; tail brown at base, becoming black distally, but with ash-gray tip.

The single available specimen conforms to the scale characters and color pattern described by Taylor (1933:175-78), but the stripes may be less distinct than those possessed by the type (Taylor, 1936c:603, plate 31, fig. 4). This specimen differs from the description of the apparently closely related Sonoran species, *E. parviauriculatus*, by having the interparietal enclosed by parietals, relatively

larger ear openings than one illustrated (Taylor, 1933:179, fig. 2), postlabial scales not overlapping anterior edge of ear opening, and 24 scales around body rather than 20.

The specimen examined was found in a pocket gopher burrow in pine-oak forest.

Distribution in Sinaloa.—Known only from the southern highlands. See Fig. 54.

Specimens examined.—5 km. SE Plomosas, 1200 m. (* KU 91415).

Literature record.—Plomosas (Taylor, 1933:177).

Family Teiidae

Cnemidophorus costatus griseocephalus Zweifel

Cnemidophorus sacki griseocephalus Zweifel, Bull. Amer. Mus. Nat. Hist., 117:96, April 27, 1959 (type locality, 11.4 miles east of Navojoa, Sonora).

Cnemidophorus costatus griseocephalus: Duellman and Zweifel, Bull. Amer. Mus. Nat. Hist., 123:180, February 26, 1962.

Remarks.—See Zweifel (1959a:96-102) for a discussion of variation and distribution of this subspecies.

Twenty-five specimens have 31-43 (35.6) femoral pores; 201-254 (225.6) granules from occiput to rump (excluding KU 69935, 78769); 87-113 (101.1) granules around body at ventral 15 from axilla (GAB) (excluding KU 78769); 9-20 (15.5) granules between paravertebral stripes (PV) (excluding KU 73746, 73749, 78762-63); and snout-vent lengths of 46-120 (73.5) mm. (excluding KU 78769). The PV/GAB ratio is 0.091-0.192 (0.151). Two lizards (snout-vent lengths of 46, 57 mm.) have pattern type I (Zweifel, 1959a:66-67), 12 (46-76 mm.) have pattern II, four (74-101 mm.) have pattern III, three (90-93 mm.) have pattern IV, and four (80-120 mm.) have pattern V. The circumorbital scales contact the frontal in three and do not reach the frontal in 22.

Five large individuals from El Fuerte have white to gray chins and two have almost totally black chins. Three of these lizards have almost totally black bellies. Two lizards, not from El Fuerte, have black bellies.

Distribution in Sinaloa.—Throughout the northern lowlands and foothills, south to Badiraguato and Guamúchil and on adjacent coastal islands. See Fig. 55.

Specimens examined.—6 km. E Altamura, Isla Tachetizte (* KU 69937); Badiraguato, 210 m. (* KU 86606); 58 mi. N Culiacán (CSCLB 2055-59); 6 km. NE El Fuerte, 150 m. (* KU 78762-77); 14 mi. N Guamúchil (CSCLB 2050-51); 8.3 mi. NW, 5 mi. W Guamúchil (CSCLB 2052-53); Los Mochis (CSCLB 2054); 4 mi. N Los Mochis turnoff (LACM 25860-61); 6 km. SW

San Blas, 9 m. (° KU 73746-49); San Ignacio, Isla (° KU 69935); San Miguel (° KU 44698); 44 km. ENE Sinaloa, 180 m. (° KU 69936).

Literature records.—Ahome (Bogert and Oliver, 1945:402); 1 mi. NE El Fuerte; 7 mi. W Guamúchil; 10.1 mi. SE Los Mochis; 29.2 mi. SE Los Mochis; 37 mi. SE Los Mochis (Zweifel, 1959a:102).

Additional records.—Ahome (AMNH 85635-44); 1 mi. E Guasave (FAS 11425); 20.2 mi. S Los Mochis (FAS 10427-28, 10435, 10439); 22 mi. NNE Los Mochis (UIMNH 40498-510).

Cnemidophorus costatus huico Zweifel

Cnemidophorus sacki huico Zweifel, Bull. Amer. Mus. Nat. Hist., 117:85, April 27, 1959 (type locality, Peñitas, approximately 12 miles south-southeast of Rosamorada, Nayarit).

Cnemidophorus costatus huico: Duellman and Zweifel, Bull. Amer. Mus. Nat. Hist., 123:180, February 26, 1962.

Remarks.—Zweifel (1959a:85-89) described *Cnemidophorus sacki huico* (= *C. costatus huico*) and discussed its distribution and intergradation. The specimens reported herein mainly support Zweifel's conclusions, but present some new information regarding distribution.

Twenty-seven specimens examined have 32-43 (37.7) femoral pores (excluding KU 63720); 199-245 (225.6) granules from occiput to rump (excluding KU 63718-20, 63725); 93-122 (103.8) granules around body (GAB) at 15th ventral from axilla (excluding KU 63719-20, 63725, 73754); 11-19 (15.7) granules between the paravertebral stripes (PV) (excluding KU 73754, 73760); and are 37-111 (76.5) mm. in snout-vent length. The PV/GAB ratio is 0.116-0.178 (0.152) in 22 specimens. Two lizards (snout-vent lengths of 37, 47 mm.) have pattern I (Zweifel, 1959a:66-67), ten (45-75 mm.) have pattern II, six (71-95 mm.) have pattern III, six (92-111 mm.) have pattern IV, and three (97-101 mm.) have pattern V. The circumorbital scales contact the frontal in five lizards and do not reach the frontals in 21 (KU 63723 excluded). Three lizards (KU 78788, 78790, 78792) from 7.3 kilometers southwest of Mazatlán show evidence of intergradation with *C. c. mazatlanensis* by retaining distinct stripes (pattern III) at snout-vent lengths of 80-95 mm.; two of these lack any trace of gray on the chin. A single male (KU 75607) from Santa Lucía (1100 m.) is a typical *C. c. huico*, but has 23 granules between the paravertebral stripes. Several lizards from 5 kilometers southwest of El Palmito (Durango) are apparently more closely related to *C. c. mazatlanensis* than to *huico*.

This lizard is common along roads, in open areas, and along river beds. In December near Teacapán a large proportion of the active

individuals were juveniles, but adults predominated in July (Scott, 1962:27).

Distribution in Sinaloa.—Southern part of state, intergrading with *C. c. mazatlanensis* in an area a few kilometers south of Mazatlán. See Fig. 55.

Specimens examined.—1 km. S Concepción, 76 m. (* KU 63715-25); 7 mi. SW Concordia (* KU 33810); 5 km. NW Escuinapa, 150 m. (* KU 73755-59); 5.4 mi. NW Escuinapa (JMS osteo. coll.; LACM 6733-41); Isla Palmito del Verde, middle (* KU 73760); Isla Palmito de la Virgen, 5 m. (* KU 73750-51); 7.3 km. SW Matatán, 155 m. (* KU 78788-92); Palmillas (LACM 6761); Rancho Huanacastle (LACM 6742-56); Rosario, 150 m. (* KU 73752-54); Santa Lucía, 1100 m. (* KU 75607); Teacapán (LACM 6763-64); 2 mi. SE Teacapán (LACM 6762); 1 mi. S, 26 mi. E Villa Unión (CSCLB 2045-49, 2062-64).

Literature records.—Chele, about 300 ft.; Concordia (Zweifel, 1959a:89); 7 mi. SW Concordia (Chrapliwy and Fugler, 1955:126); 10 mi. W Concordia; Escuinapa; 16 mi. SE Escuinapa; 7 mi. NNW Escuinapa; 1.5 mi. W La Concha; Plomosas; 7 mi. WNW Rosario (Zweifel, 1959a:89).

Additional records.—19.4 mi. SE Escuinapa (UIMNH 6828-29); 17.5 mi. S Escuinapa (FAS 16894-98); 11 mi. N, 1.5 mi. E Mazatlán (UMMZ 119471); Presidio (UIMNH 19962; EHT-HMS 684-88); 10 mi. S Presidio (EHT-HMS 535-51); Rosario, 250 ft. (UIMNH 62754; USNM 47670); 3 mi. SE Rosario (UIMNH 6830-32).

Cnemidophorus costatus mazatlanensis Zweifel

Cnemidophorus sacki mazatlanensis Zweifel, Bull. Amer. Mus. Nat. Hist., 117:89, April 27, 1959 (type locality, two miles north of Coyotitán, Sinaloa).

Cnemidophorus costatus mazatlanensis: Duellman and Zweifel, Bull. Amer. Mus. Nat. Hist., 123:181, February 26, 1962.

Remarks.—This subspecies is discussed by Zweifel (1959a:89-93). Thirty specimens have 34-50 (38.5) femoral pores (excluding KU 29749); 190-240 (216.5) granules from occiput to rump (excluding KU 29736); 85-117 (98.5) granules around the body (GAB) at ventral 15 from axilla; 8-17 (13.3) granules between paravertebral stripes (PV) (excluding KU 78794); and are 43-103 (71.2) mm. in snout-vent length. The PV/GAB ratio is 0.90-0.179 (0.135) for 29 specimens. Seven lizards (snout-vent lengths of 59-91 mm.) have pattern I (Zweifel, 1959a:66-67), 14 (43-82 mm.) have pattern II, seven (58-91 mm.) have pattern III, one (90 mm.) has pattern IV, and one (89 mm.) has pattern V. The circumorbital scales contact the frontal in three specimens and do not reach the frontal in 27.

Five specimens (KU 75608-12) from five kilometers southwest of El Palmito, Durango (in Sinaloa) are unquestionably of pattern I; the belly is without black markings in three and with moderate black markings like *huico* and *mazatlanensis* in two; one has a

white chin, three have a white chin with a few black scales and one has a black spotted chin like *mazatlanensis*. Another specimen (KU 78808) from 19.2 kilometers northeast of Santa Lucía, between the population represented by the above five lizards and a population of *huico* represented by one specimen (KU 75607) from Santa Lucía, shows no noticeable trend toward *huico*.

Another series of nine lizards (KU 73761; LACM 6697-704) from La Cruz on the Río Elota is intermediate between *nigrigularis* and *mazatlanensis*.

These lizards are common in the coconut palm groves along the beach north of Mazatlán. Near San Ignacio, individuals were observed along the dry river bed, in denser vegetation along the river, and in arroyos surrounded by dense forest. No specimens were seen in heavily shaded portions of the forest. Nearly all adult females collected in July were gravid.

Distribution in Sinaloa.—From near Mazatlán northward to near La Cruz in the lowlands and near El Palmito (Durango) in the highlands. See Fig. 55.

Specimens examined.—1.5 km. SE Camino Real, Río Piaxtla, 120 m. (* KU 63726-29); 8.3 mi. ENE Concordia (UAZ 14230-39); 10 mi. S Elota (UAZ 11275, 11281-82, 11284-86); 5 km. SW El Palmito, 1900 m. (* KU 75608-12); La Cruz, 9 m. (* KU 73761; LACM 6697-704); N Mazatlán (LACM 6715-16; CSCLB 2060-61); 2 mi. N Mazatlán (LACM 6711-14); 7 mi. N Mazatlán (LACM 25856-58); 1.5 km. SE Mazatlán (* KU 29749); 5.4 mi. SE Mazatlán (UAZ 6262, 6271); 8 km. NW Mazatlán (* KU 63409-10); 5 km. NNW Mazatlán (* KU 29736, 29741); 1 mi. W Mexican hwy. 15, Río Piaxtla (CSCLB 2043); 21.2 mi. S Río San Lorenzo (UAZ 14220-29); 5 km. SW San Ignacio, 200 m. (* KU 78793-807); San Ignacio (LACM 6722-32); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78808); 54 mi. N Tropic of Cancer [on hwy. 15] (LACM 6717-21).

Literature records.—2 mi. N Coyotitán; 9 mi. S Coyotitán (Zweifel, 1959a:93); Isla de los Chivos (Martín del Campo, 1941:761); Mazatlán (Burt, 1935:176; Taylor, 1938:522; Van Denburgh, 1898:463; Zweifel, 1959a:93); N Mazatlán; 9 mi. N Mazatlán; 20 mi. N Mazatlán; 11 mi. N, 1.5 mi. E Mazatlán; 1 mi. SE Mazatlán; 2.3 mi. E, 1.5 mi. S Mazatlán; 5.4 mi. SE Mazatlán; 2.6 mi. N, 1.4 mi. W Mazatlán; 2.6 mi. NNW Mazatlán, 25 ft.; Rincón de Urías, E Mazatlán (Zweifel, 1959a:93).

Additional records.—Mazatlán (EHT-HMS 581, 588-90, 750-54; AMNH 86830; UIMNH 19954-61, 19963-64).

Cnemidophorus costatus nigrigularis Zweifel

Cnemidophorus sacki nigrigularis Zweifel, Bull. Amer. Mus. Nat. Hist., 117:93, April 17, 1959 (type locality, 10.5 miles northwest of Culiacán, Sinaloa).

Cnemidophorus costatus nigrigularis: Duellman and Zweifel, Bull. Amer. Mus. Nat. Hist., 123:181, February 26, 1962.

Remarks.—See Zweifel (1959a:93-96) for a discussion of variation and distribution of this subspecies.

Twenty-six specimens have 33-42 (36.6) femoral pores (excluding KU 44683, 44687, 44690); 214-252 (235.0) granules from occiput to rump (excluding KU 44687, 44690, 44694-95); 89-113 (105.1) granules around body at ventral 15 from axilla (GAB) (excluding KU 44683, 44685, 44687, 44690, 44694, 44696); 11-20 (15.8) granules between paravertebral stripes (PV) (excluding KU 44694, 62819, 73764); and snout-vent lengths of 44-105 (65.0) mm. (excluding KU 44694). The PV/GAB ratio is 0.108-0.190 (0.151). Dorsal pattern types I and III (Zweifel, 1959a:66-67) are not represented in the specimens at hand. Twenty-three specimens (snout-vent lengths of 97-103 mm.) have pattern V. The circumorbital scales contact the frontal in two and do not reach the frontal in 24.

All of the large individuals examined have black on the chin; the bellies of three specimens are almost totally black, and one male (KU 73764, snout-vent length 103 mm.) is completely black ventrally with the exception of some white spots on the hind legs and tail.

Distribution in Sinaloa.—Coastal lowlands approximately between Terreros and Abuya. See Fig. 55.

Specimens examined.—6 km. E Cosalá, 460 m. (* KU 73765); N. Culiacán (CSCLB 2041-42); 19 km. N Culiacán, 120 m. (* KU 44677-97); 14 mi. N Culiacán (CSCLB 2044); 1.5 km. NW Culiacán (KU 48207, 48508-09); 17.5 km. NW Culiacán (* KU 62819-20); 9 mi. S Guamúchil (LACM 25859); 4 km. SW Navolato, 6 m. (* KU 73763-64); 1.5 km. ENE San Lorenzo (KU 48491-507); Terreros (LACM 6705-06, 6710).

Literature records.—23.3 mi. S Caitime; 4 mi. S Culiacán; 10.5 mi. NW, 15.6 mi. NW, 16.5 mi. NW, 20 mi. NW Culiacán; 25-26 mi. NW Elota; 36.8 mi. NW Elota (Zweifel, 1959a:96).

Additional records.—Costa Rica (UIMNH 34934-35); 9.9 mi. N Culiacán (AMNH 86831); 12.1 mi. N Pericos (UIMNH 39242-46).

Cnemidophorus tigris Baird and Girard

Cnemidophorus tigris Baird and Girard, Proc. Acad. Nat. Sci., Philadelphia, 6:69, 1852 (type locality, Valley of the Great Salt Lake, Utah).

Remarks.—There are two populations of *Cnemidophorus tigris* in Sinaloa. One occurs in the northern lowlands and the other inhabits the foothills of the Río Fuerte drainage. The lowland population is represented by nine specimens from Topolobampo (CSCLB 1507-1515) and two specimens from San Miguel (KU 44724-25). These eleven lizards have the following characteristics: snout-vent length 52-69 (60.7) mm.; granules from occiput to rump, 192-217 (207.2) (except CSCLB 1513); granules around midbody, 79-95 (87.0) (except CSCLB 1510-13); femoral pores (total), 34-41 (36.7); lamellae beneath fourth toe, 29-34 (30.8); and scales be-

tween femoral pores, 3-5 (4.1). The same characteristics for one specimen (KU 48207) from Culiacán are respectively, 61, 192, 85, —, 32, and 4. The foothill population is represented by three specimens (KU 78885-87) from eight kilometers north of El Fuerte and 17 specimens (KU 78883-84, 78888-902) from six kilometers north-east of El Fuerte that have the following characteristics, respectively: 55-70 (61.3); 195-214 (204.9) (except KU 78886, 78897); 86-100 (91.7) (except KU 78883-84, 78896); 35-41 (37.9) (except KU 78893, 78896-97); 30-35 (32.2) (except KU 78897); and 2-4 (3.1) (except KU 78893).

Specimens from the lowlands have distinct stripes continuous on the back. Specimens from the foothills have distinct light stripes, but the vertebral and paravertebral stripes are broken and discontinuous from the shoulders to the rump, giving a reticulated appearance. Males of both populations have black chests and black and white mottled chins. Females have immaculate chests and bellies with small black specks on their chins. Young have orangish tails. All of the females except one contain eggs (KU 78884 was not examined for eggs). One female (KU 78891) with a snout-vent length of 60 mm. has two eggs, each 16 mm. long. Another female (KU 78898) with a snout-vent length of 57 mm. has two eggs 14 and 16 mm. long. In both cases the eggs are shelled and appear to be mature. The testes of one male (KU 78892), with a snout-vent length of 65 mm. contain sperm. Sinaloan specimens of *C. tigris* are much smaller than specimens of *Cnemidophorus tigris aethiops* from Sonora. John W. Wright and Charles H. Lowe, Jr., are currently studying these populations of *C. tigris*.

Distribution in Sinaloa.—This species inhabits the lowland thorn forest north of Culiacán and the foothills of the Río Fuerte drainage. See Fig. 50.

Specimens examined.—1.5 km. NW Culiacán (* KU 48207); 8 km. N El Fuerte (* KU 78885-87); 6 km. NE El Fuerte, 150 m. (* KU 78883-84, 78888-902); San Miguel, 110 m. (* KU 44724-25); 2.5 km. N Topolobampo (* CSCLB 1507-15).

Family Anguidae

Gerrhonotus kingii ferrugineus Webb

Gerrhonotus kingi ferrugineus Webb, *Herpetologica*, 18:73, June 22, 1962
(type locality, two miles north of Pueblo Neuvo, ca. 6000 ft., Durango).

Remarks.—One adult female with ovarian eggs has a snout-vent length of 108; tail length 268; 58 dorsals from interparietal to posterior edge of hind legs; 16 dorsal scale rows; 12 rows of scales

across nape; 12 ventral scale rows; granular scales on sides of neck; anterior internasals and postrostral absent; suboculars extending to lowest primary temporal; 15 complete brown bands across back, one scale or less in width; ventral body and tail cream colored; few dark brown spots on head posterior to eyes and on base of tail. The specimen agrees in other respects with the original description (Webb, 1962b:73).

Distribution in Sinaloa.—Known only from the tropical deciduous forest of the southern highlands. See Fig. 56.

Specimen examined.—1 km. NE Santa Lucía, 1155 m. (* KU 78903).

Gerrhonotus liocephalus liocephalus Wiegmann

[*Gerrhonotus*] *liocephalus* Wiegmann, Isis von Oken, 21:381, 1828 (type locality, México).

Gerrhonotus liocephalus liocephalus: Cope, Ann. Rept. U. S. Natl. Mus., 1898:516, 1900.

Remarks.—One male has a snout-vent length of 150; tail 265 (incomplete); 48 dorsals from interparietal to posterior edge of hind legs; 18 dorsal scale rows; eight rows of scales across nape; 12 rows of ventral scales; postrostral, anterior internasal, and frontonasal present; suboculars separated from lowest primary temporal. The dorsal coloration consists of nine indistinct pale blue bands on a ground color of pale brown.

Distribution in Sinaloa.—Known only from pine-oak forest in the southern highlands. See Fig. 56.

Specimen examined.—19.2 km. NE Santa Lucía, 1940 m. (* KU 78904).

Additional records.—5.0 mi. (by road) SW El Palmito, 6800 ft. (UMMZ 123044); 7.2 mi. (by road) E Santa Lucía (JFC 63:141).

Family Helodermatidae

Heloderma horridum exasperatum Bogert and Martín del Campo

Heloderma horridum exasperatum Bogert and Martín del Campo, Bull. Amer. Mus. Nat. Hist., 109:28, April 16, 1956 (type locality, near Guirocoba, Sonora).

Remarks.—One specimen, represented by a skin with head, tail and legs attached, has 81 caudals; preanals not enlarged; one pair of infralabials reaching chin shields; supranasal contacting postnasal; and eight scales present across head between posterior superciliaries. The specimen probably had a body length of about 300 mm. In pattern, the specimen resembles the holotype as illustrated by Bogert and Martín del Campo (1956, pl. 8, fig. 3), but the yellow coloration is more prominent.

Specimens from western México demonstrate wide overlap in characters of *horridum* and *exasperatum*. The supranasal contacts the postrostral in two of nine specimen of *horridum*; four of eight specimens of *horridum* have eight or more scales between superciliaries; the second supralabial contacts the nasal or prenasal in six of nine specimens of *horridum*. Although we have not seen an animal with a color pattern obviously intermediate between the two races in Sinaloa, Bogert and Martín del Campo (1956:65) suggested clinal variation in this character as well. A detailed study of *Heloderma* in northern Sinaloa probably will indicate that *exasperatum* is representative of the northern terminus of *Heloderma horridum* and that clinal variation accounts for the distinctiveness of this population, as visualized by Bogert and Martín del Campo (1956:28). However, we continue to recognize two races in Sinaloa until additional material from the foothills between the Río Culiacán and the Río Fuerte becomes available.

Distribution in Sinaloa.—Known only from the area drained by the Río Fuerte. See Fig. 57.

Specimen examined.—13 km. NNE Vaca, 400 m. (* KU 80743).

Literature record.—San Blas, 100 m. (Bogert and Martín del Campo, 1956:32).

Heloderma horridum horridum (Wiegmann)

Trachyderma horridum Wiegmann, Isis von Oken, 22:421, 1829 (type locality, "México"; type locality restricted to Cuernavaca, Morelos by Bogert and Martín del Campo, Bull. Amer. Mus. Nat. Hist., 109:21, April 16, 1956).

Heloderma horridum Wiegmann, Isis von Oken, 22:628, 1829.

Heloderma horridum horridum: Bogert and Martín del Campo, Bull. Amer. Mus. Nat. Hist., 109:20, April 16, 1956.

Remarks.—Three specimens of *Heloderma h. horridum* (KU 73770, 78905-06) have the following characteristics, respectively: snout-vent lengths 246, 310, 268; tail lengths 192, 227, 189; tail/snout-vent length ratios 0.78, 0.73, 0.72; ventrals from gular fold to anus 62, 64, 62; subcaudals 84, 78, 78; scales across head between posterior superciliaries 9, 7, 7; pairs of infralabials reaching chin shields 2, 1, 1; supranasal contacts postnasal no, yes, no; preanal scales not enlarged. Two specimens are essentially similar in pattern, having a brown ground color with yellow scales appearing just anterior to midbody; the yellow scales become more numerous from anterior to posterior, and there are five pairs of yellow bands on the tail. The yellow spots begin on the nape of the other lizard (KU 78906).

Most specimens were collected on the road in late evening or at night. A few individuals were active in the morning, suggesting a crepuscular activity period.

Distribution in Sinaloa.—Probably occurs throughout the state south of the Río Mocorito. See Fig. 57.

Specimens examined.—7.3 mi. S Elota, Río (LACM 6596); 41 mi. S Elota (JMS osteo. coll.); 25.2 mi. S Escuinapa (CSCLB 2106); Matatán, 170 m. (* KU 73770); 17.8 mi. N Mazatlán (CSCLB 2105); 24.9 mi. N Mazatlán (UAZ 7176); 26.8 mi. N Mazatlán (LACM 6594); 82 mi. N Mazatlán (CSCLB 2109); Palmillas (LACM 6597); San Ignacio (LACM 6595); 5 km. (by road) SW San Ignacio, 200 m. (* KU 78905-06); Terreros (JMS osteo. coll.).

Literature records.—Escuinapa, 100 m. (Bogert and Martín del Campo, 1956:27); Piaxtla, 75 m. [80 km. N Mazatlán] Bogert and Martín del Campo, 1956:27; Smith and Van Gelder, 1955:145; Palmillas (Scott, 1962:28); Presidio, 12 mi. NW Rosario, 100 m. (Bogert and Martín del Campo, 1956:27; Boulenger, 1885b:302).

Additional records.—Between Acaponeta [Nayarit] and Escuinapa (MVZ 66199); 2 mi. ENE Copala, 1400 ft. (TCWC 12430); Costa Rica (UIMNH 34932); Crucero de Piaxtla (UF 12836); 41.3 mi. N Culicán (MVZ 70256); 90 mi. N Culiacán (FAS 9077); 40 mi. S. Culiacán (MVZ 71318); 7 mi. SE Escuinapa (MVZ 68970); 28.4 mi. S Espinal (FAS 17002); 63 mi. N Mazatlán (FAS 16909); 15 mi. S Mazatlán (MVZ 66200); 1.3 mi. W, 2.5 mi. N Mazatlán (FAS 9054).

Heloderma suspectum suspectum Cope

Heloderma suspectum Cope, Proc. Acad. Nat. Sci. Philadelphia, 21:5, 1869 (type locality, Sierra de Moreno on the boundary between the United States and México).

Heloderma suspectum suspectum: Bogert and Martín del Campo, Bull. Amer. Mus. Nat. Hist., 109:35, April 16, 1956.

Remarks.—One specimen from El Dorado (Bogert, personal communication) is the first record for Sinaloa and the southernmost record for the species. There is an apparent overlap of about 310 kilometers in the range of the two species of *Heloderma* in northern Sinaloa.

Distribution in Sinaloa.—Known only from the central coastal lowlands. See Fig. 57.

Specimens examined.—None.

Additional record.—El Dorado (AMNH 90786).

Suborder SERPENTES

Family Typhlopidae

Typhlops braminus (Daudin)

Eryx braminus Daudin, Hist. Nat. . . des reptiles, 7:279-280, 1803 (type locality, Vizagapatam, India).

Typhlops braminus: Cuvier, Regne Animal, Ed. 2, 2:73, 1829.

Remarks.—Four specimens agree with the description given by

Boulenger (1893:16), and the illustration of the head plates by Taylor (1940b:444). These specimens have been compared with others of the same species from Ceylon, the Philippine Islands, and Guerrero. The five snakes (KU 63416-18, 73487 and 82980) have, respectively, 334, 307, 292, 309, 320, middorsal scales from the prefrontal to the tail spine, snout-vent lengths of 103, 99, 69, 160, 94 mm., and tail lengths of 3, 3, 2.5, 4, 3 mm. All have 20 scales around the midbody. The ratio of snout-vent length to total length is 0.97 in all specimens. All are brown dorsally with a lighter brown venter; the snout, chin, anus, and tip of tail are white. Each dorsal scale has a pale gray base which may be overlapped by the preceding scale.

This small burrowing reptile has been introduced into Mazatlán and Rosario and become well established. Three specimens (KU 63416-18) were unearthed by laborers digging near a trailer park in Mazatlán. Two other individuals (CSCLB 1147-48) were collected at night on the grounds of the trailer park in July. Another specimen (KU 734787) was found during the excavation of a flower bed. Campbell and Simmons (1962:202) reported a specimen (UCLA 14693) found under a rock at the Mazatlán airport.

Distribution in Sinaloa.—Known only from the vicinity of Mazatlán and Rosario. See Fig. 58.

Specimens examined.—Mazatlán (* KU 63416-18, 73487, 82980; CSCLB 1147-48).

Literature record.—Mazatlán (Campbell and Simmons, 1962:202).

Additional records.—Mazatlán (USNM 152455); 5 mi. N Mazatlán (AMNH 85777); Rosario (AMNH 91604).

Family Leptotyphlopidae

Leptotyphlops humilis dugesii (Bocourt)

Catodon dugesii Bocourt, Bull. Soc. Philom. (7), 6:81, 1881 (type locality, Colima).

Leptotyphlops humilis dugesii: Klauber, Trans. San Diego Soc. Nat. Hist., 9:129, April 30, 1940.

Remarks.—Klauber (1940:131) suggested that *Leptotyphlops humilis dugesii* was most closely related to *L. h. slevini*, but that intergradation of *dugesii* with *L. h. humilis* or *L. h. tenuiculus* might eventually be disclosed. The dorsal counts for his specimens are 235-257 (242) with the northernmost locality represented being Mazatlán. Bogert and Oliver (1945:349) referred one specimen from Alamos, Sonora, to *dugesii* on the basis of pigmentation and a dorsal scale count of 257. Langebartel and Smith (1954:134)

reported a specimen of *L. h. dugesii* from 45.1 miles south of Santa Ana, Sonora; it has 5 pigmented dorsal rows, suggestive of intergradation with *L. h. cahuilae* rather than *L. h. humilis*. They further point out that the central Sonoran population possibly is distinct from both *humilis* and *dugesii*. Fugler and Dixon (1961:12) obtained one specimen of *L. h. dugesii* from El Dorado, Sinaloa.

Three specimens examined have 14 rows of scales around body; 12 rows of scales around tail; 255, 255, 248 middorsal scales from rostral to tail spine. The seven median dorsal scale rows and half of each adjacent lateral scale row are brown; the remaining rows lack pigmentation. One specimen, a male, (KU 95951), has a snout-vent length of 307 and a tail length of 14. Our specimens confirm Klauber's contention (1940:131) that dorsal scales increase from south to north along the Pacific coast of México. Two individuals (LACM 6772, 6773) were found at night on the road following a heavy rain.

Distribution in Sinaloa.—Probably occurs throughout the lowlands of the state. See Fig. 58.

Specimens examined.—11 mi. N Culiacán (* LACM 6772); El Salado, 300 ft. (* KU 95951); 0.5 mi. N Terreros (* LACM 6773).

Literature records.—El Dorado (Fugler and Dixon, 1961:12); Mazatlán; Presidio (Klauber, 1940:131; Smith and Taylor, 1945:21).

Additional records.—11.4 mi. S Agua Caliente (UF 12790); 5.6 mi. N Culiacán (UMMZ 120228); El Dorado (AMNH 90760-64).

Family Boidae

Boa constrictor imperator Daudin

Boa imperator Daudin, Hist. Nat., . . . des reptiles, 5:150, 1803 (type locality, México).

Boa constrictor imperator: Forcart, Herpetologica, 7:199, December 31, 1951.

Remarks.—Four specimens have 66, 71, 70, 74 dorsal scales at midbody, 245, 233, 239, 242 ventrals, and 53, 61, 57, 60 subcaudals.

During the summer of 1962 more than 150 specimens of this ubiquitous species were collected but, because of the abundance and size of the species, only a few were preserved. Boas are more abundant in the southern part of the state. The snake is primarily nocturnal and most individuals were encountered on the road at night between 1930 and 2400 hours, when air temperatures ranged from 22° to 29°C. A few were taken in the dry season, but the snakes are most common during the rainy season.

Two boas approximately 1200 mm. in length were reported mating near Teacapán on April 6 (Scott, 1962:31). A female about 1200

mm. in length gave birth to 17 young on July 23 near San Ignacio. The largest boa collected, a female measuring 2250 mm., gave birth to 36 young on August 11 (Scott, 1962:32). The first young of the year were collected on July 30, and young individuals were collected almost every night thereafter through September 15.

Distribution in Sinaloa.—Low to moderate elevations throughout the state. See Fig. 59.

Specimens examined.—7.8 mi. [by hwy. 15] N Acaponeta [Nayarit] (LACM 6783); 7.7 mi. S Cerro Prieto (UAZ 9372); 16 km. NNE Choix, 519 m. (* KU 73484); 10 mi. NE Concordia (UAZ 16280); 7.1 mi. S Coyotitán (JFC 63:142); Culiacán (LACM 6774); 10.5 mi. S Culiacán (CSCLB 1967); 25.6 mi. S Culiacán (LACM 6780); 31.7 mi. S Culiacán (LACM 6781); 37.6 mi. S Culiacán (LACM 6782); 34 mi. NW Culiacán (JRM 1103); 24 mi. SSE Escuinapa (CSCLB 1958, 1966); Equinal [Espinal] (UCLA 14839); 7.2 mi. S Cuamúchil (LACM 6784); 6.7 mi. N La Cruz rd. on hwy. 15 (LACM 6777); 14.6 mi. NE Los Mochis junc. (UAZ 16284); Mazatlán (LACM 6778); N Mazatlán (UCLA 5875); 0-13 mi. N Mazatlán (UAZ 16281-83); 1.6 mi. N Mazatlán (CSCLB 1963); 5 km. N Mazatlán (* KU 73486); 4 mi. N Mazatlán (JFC 62:36); 5.2 mi. N Mazatlán (UAZ 16285); 6 mi. N Mazatlán (CSCLB 1965); 10.2 mi. N Mazatlán (CSCLB 1962); 29 km. N Mazatlán (* KU 61348); 38.5 mi. N Mazatlán (CSCLB 1960); 42.5 mi. N Mazatlán (CSCLB 1961); 50.6 mi. N Mazatlán (UAZ 16286); 58 mi. N Mazatlán (JFC 62:37); 15 mi. NNW Mazatlán (KU 69110); 15.7 mi. SE Mazatlán (UAZ 16287); 4.1 mi. N Piaxtla, Río (CSCLB 1964); Teacapán (LACM 6785-95); 14.4 mi. S Terreros (LACM 6779); 21 km. SE Villa Unión (* KU 73485).

Literature records.—Near Mazatlán (Lewis and Johnson, 1956:280); Sierra de Choix (Smith, 1943a:409).

Additional records.—Camino Real de Piaxtla (AMNH 69684); Choix (USNM 46503); 2 mi. N Culiacán (AMNH 76872); 4.2 mi. N Culiacán (FAS 7724); 20-24 mi. N. Culiacán (FAS 11357); 15 mi. NW Culiacán (AMNH 62988); 8.8 mi. N El Dorado (SU 23792); 5.7 mi. N Escuinapa (FAS 14840); Higuera de Zaragoza (SDSNH 18285, 38871-85, 38891-93, 40350-51); 19 mi. N Los Mochis (AMNH 77590); 4 mi. N Mazatlán (UF 12791); 12 mi. N. Mazatlán, 200 ft. (TCWC 12604); 25 mi. N Mazatlán (UF 12792); 30.3 mi. N Mazatlán (SU 23791); 2 mi. NE Mazatlán (MCZ 80908); 2 mi. E Mazatlán (EHT-HMS 711); 3 mi. NNW Mazatlán, 25 ft. (UMMZ 114651); 28.5 mi. NNW Mazatlán, 300 ft. (UMMZ 114647); 29.5 mi. NNW Mazatlán, 300 ft. (UMMZ 114662); 23.6 mi. SE Río Piaxtla (SU 23789); Presidio (EHT-HMS 691).

Family Colubridae

Arizona elegans noctivaga Klauber

Arizona elegans noctivaga Klauber, Trans. San Diego Soc. Nat. Hist., 10:343, March 29, 1946 (type locality, eight miles northwest of Owlshead, Pima County, Arizona).

Remarks.—A single specimen was reported from the lowland thorn forest by Greer (1964:215).

Distribution in Sinaloa.—Known only from the lowlands in the vicinity of Mazatlán. See Fig. 60.

Specimens examined.—None.

Literature record.—1.1 mi. N. Mazatlán (Greer, 1964:215).

Coniophanes lateritius lateritius Cope

Coniophanes lateritius Cope, Proc. Acad. Nat. Sci. Philadelphia, 13:524, 1862 (type locality, Guadalajara, Jalisco).

Coniophanes lateritius lateritius: Smith and Grant, Herpetologica, 14:20, April 25, 1958.

Remarks.—One male (KU 83401) and one female (LACM 28717) represent the first records in Sinaloa—a 270 kilometer northward extension of the known range. The two specimens, collected on the road, have 145, 146 ventrals; ♀, 84 subcaudals; 20-19-17, 19-19-17 dorsal scale rows; snout-vent lengths of 270, 521; and tail lengths of ♀, 163. The general coloration and pattern agree with the description by Smith and Grant (1958:20-22). The female is darker than other known specimens, in that the posterior two-thirds of the body and entire dorsal surface of the tail are nearly black.

Distribution in Sinaloa.—Known only from the southern lowlands in the vicinity of Villa Unión. See Fig. 60.

Specimens examined.—8 km. N Villa Unión (* KU 83401); about 30 mi. NE Villa Unión (* LACM 28717).

Conopsis nasus nasus Günther

Conopsis nasus Günther, Catalogue Collection Snakes British Mus., London, p. 6, 1858 (type locality, "California" [in error according to Taylor and Smith, Univ. Kansas Sci. Bull., 28(II):329, November 12, 1942]).

Conopsis nasus nasus: Tanner, Herpetologica, 17:15, April 15, 1961.

Remarks.—One male with an incomplete tail has 132 ventrals; smooth scales in 17 rows; supralabials, 7-7 (3 and 4 enter the eye); infralabials, 7-7; preoculars, 1-1; postoculars, 2-2; temporals, 1-2/1-2; anal divided; nasal divided below nare; no loreal or internasals (rostral contacts prefrontal); snout-vent length 112; dorsal dark brown spots, 46. The cream-colored venter is heavily checked with black and the subcaudal surface is immaculate with a mid-ventral zig-zag black stripe (black borders of adjacent subcaudal scutes). The posterior maxillary teeth are faintly grooved, suggestive of *Toluca*, but the dorsal pattern, other scale characters, and geographic position are more in accord with *Conopsis nasus*. There are no characters that agree with those diagnostic for *C. nasus labialis* as given by Tanner (1961:15).

This specimen was taken on August 8, 1963, in pine-oak forest.

Distribution in Sinaloa.—Tropical deciduous and pine-oak forest of the southern highlands. See Fig. 60.

Specimen examined.—19.2 km. NE Santa Lucía, 1935 m. (* KU 80872).

Literature record.—37 mi. E Concordia (Tanner, 1961:17).

Dryadophis cliftoni Hardy

Dryadophis cliftoni Hardy, Copeia, no. 4:714, December 31, 1964 (type locality, Plomosas, 22 kilometers east of Matatán, 762.5 meters, Sinaloa).

Remarks.—Seven specimens have 17-17-15 scale rows and a single preocular on each side. One specimen has three postoculars on the left and two on the right; the rest have two on each side. The number of temporals on the left and right sides respectively for the seven Sinaloan specimens are: 6-5, 6-6, 7-8, 5-6, 7-7, 6-6, and 7-7. Supralabials are eight on each side in all except one (KU 73491), which has eight on the right and nine on the left. The numbers of infralabials are 9-9, 9-9, 10-10, 10-10, 11-11, 11-11, 10-10; ventrals and subcaudals are respectively: 183, ?; 185, ?; 184, ?; 191, ?; 188, 139; 185, 145; 188, ?. Freshly killed specimens (KU 78932, 78934-35) had bright orange-red on the head, neck, and throat, followed by a salmon to pale pink belly at midbody. The dorsal blotches were dark brown, and the interspaces were tan. One juvenile (KU 78933) agrees with the adults in pattern, but differs in color by having chocolate brown dorsal blotches and tan interspaces. In all specimens the venter is immaculate creamy white.

The specimens from Plomosas (KU 73489-91) were taken in humid tropical deciduous forest. In the mountains above Santa Lucía one specimen (KU 78935) was taken in a boulder-strewn streambed bordered by dense tropical deciduous forest (Plate 7, Fig 2). Three other specimens (KU 78932-34) were taken at 1930 meters elevation in pine-oak forest. All were collected in July and August. Nickerson and Heringhi (1966:136) obtained this species in southern Sonora (near the Chihuahua border) during August.

Distribution in Sinaloa.—Known only from the vicinities of Plomosas and Santa Lucía in the highlands of southern Sinaloa, but might occur throughout the highlands. See Fig. 61.

Specimens examined.—Plomosas, 22 km. E Matatán, 762.5 m. (* KU 73489-91); 19.2 km. (via hwy. 40) NE Santa Lucía, 1937.5 m. (* KU 78932-34; 1 km. NE Santa Lucía, 1156.2 m. (* KU 78935); 1.1 mi. W Santa Rita on hwy. 40 (LACM 6888; this locality is 10.3 km. [via hwy. 40] NE Santa Lucía, 1586 m.).

Dryadophis melanolomus stuarti Smith

Dryadophis melanolomus stuarti Smith, Proc. U. S. Nat. Mus., 93:418, 1943 (type locality, near Acapulco, Guerrero).

Remarks.—One male has 178 ventrals, 9-9 supralabials, 10-10 infralabials, 19-17-15 scale rows, a snout-vent length of 660, and an incomplete tail.

Anterior ventral spotting is present but indistinct; the dorsal scales

are distinctly black edged, more pronounced laterally than mid-dorsally. On the anterior and posterior part of the body the black edging of the dorsal scales can be made visible by spreading the scales. The supralabials are lightly mottled with gray and there is no distinct ocular stripe. In other characters, this specimen agrees with the original description (Smith, 1943a:418).

This is the first record of the species in Sinaloa. The specimen was taken in tropical dry forest (Plate 7, Fig. 1).

Distribution in Sinaloa.—Known only from the southern lowlands, in the vicinity of Villa Unión. See Fig. 61.

Specimen examined.—8 km. N Villa Unión, 140 m. (° KU 80746).

Additional record.—15 mi. SE Escuinapa (UMMZ 118784).

Drymarchon corais rubidus Smith

Drymarchon corais rubidus Smith, Jour. Washington Acad. Sci., 31:474, November 11, 1941 (type locality, Rosario, Sinaloa).

Remarks.—Duellman (1961:93-94) reported specimens of *Drymarchon corais rubidus* from Michoacán that deviate from the uniform black dorsal coloration reported by Smith (1941d:475) by being either pale brown anteriorly with black flecks arranged as narrow transverse bands, or black above with reddish or "rust-colored" cross-bands on the anterior half of the body. Eight of the 19 specimens at hand have a pale brown dorsal coloration anteriorly that is either mottled or flecked with black; the amount of black increases progressively to the tail, which is uniformly black above. One specimen (LACM 6801) is reddish brown dorsally with black flecks on the anterior half of body; the flecks form bars near midbody; the posterior quarter of the snake is black. Another specimen (LACM 6802) is black with reddish, chevron-shaped cross bands on the anterior half of body. Scott (1962:46) reported snakes of glossy, jet black; dull grayish black, often with a red tint; and one or two dull, brick-red specimens. The ventral coloration varies from coral-red to white to gray anteriorly; the caudal coloration is dark gray or black. The geographical variation in coloration of *Drymarchon*, as pointed out by Duellman (1961:94) and supported by our data, points to a need for re-evaluation of the subspecific status of certain populations of *Drymarchon* and for a re-examination of the alleged intergrades (Smith, 1941d:476-77).

Smith (1941d:475) reported the range of ventrals for this subspecies as 190-203, and the range of subcaudals as 69-78. Seventeen specimens examined have 187-197 (190.1) ventrals (excluding KU 73492-93), and nine specimens have 59-73 (66.6) subcaudals. The

ventral counts reported here are generally lower than those reported by Bogert and Oliver (1945:360) for eight specimens from southern Sonora and by Fugler and Dixon (1961:12) for one specimen from central Sinaloa.

All specimens examined have 8-8 supralabials and 8-8 infralabials; the temporal formula $1/2 + 2$ occurs nine times, $2 + 1/2$ twice, $2 + 2$ occurs 17 times, $2 + 1$ once, $2 + 3$ seven times; the dorsal scale rows are 17-17-15 in five specimens, 17-17-16 in one, 18-17-15 in three, 18-17-16 in two, 19-17-15 in five, and 19-17-16 in one (excluding KU 73492-93).

This large terrestrial species is active in the morning or late afternoon. Perhaps it is associated mainly with aquatic situations. Scott (1962:45) observed an adult specimen floating on a mat of aquatic vegetation in a large pond near Teacapán, apparently searching for frogs. Zweifel and Norris (1955:238) reported that specimens were more common near streams than elsewhere at Guirocoba, Sonora. Food items taken from stomachs included *Sigmodon*, *Cnemidophorus costatus*, *Ctenosaura pectinata*, *Masticophis striolatus*, and a 250 mm. fish. A large specimen, found at about 2200 hours on the road in northern Nayarit, was in the process of eating a *Masticophis bilineatus*. Both of these snakes normally are considered to be diurnal. Two recently hatched young were found on August 16 near Teacapán and August 17 near Mazatlán. The smallest specimen measured 455 mm. total length. The longest specimen measured 2390 mm. total length.

Distribution in Sinaloa.—Probably occurs throughout the state. See Fig. 62.

Specimens examined.—2.5 km. N Badiraguato, 230 m. (° KU 83402); 2.5 km. S Concepción, 75 m. (° KU 63734; KU 63732-33); Isla Palmito del Verde, S end (° KU 73495-96); La Cruz (° LACM 6796-97); Mazatlán (KU 63419); 1.3 mi. N Mazatlán (° LACM 6799); 10.8 mi. N Mazatlán (CSCLB 1364); Plomosas, 760 m. (° KU 73494); Rosario, 150 m. (° KU 73492-93); 1 mi. S Rosario (° LACM 6800); San Ignacio (° LACM 6798); San Ignacio turnoff on highway 15 (° LACM 25900); 2.2 km. NE Santa Lucía, 1155 m. (° KU 78936); Teacapán (° LACM 6801-03); 8 km. N Villa Unión, 140 m. (° KU 80747-48).

Literature records.—Ahome (Bogert and Oliver, 1945:404); El Dorado (Fugler and Dixon, 1961:12).

Additional records.—El Dorado (AMNH 90692-95); 15 mi. SE Escuinapa, 300 ft. (UMMZ 118784); 19.8 mi. S Escuinapa (CAS 95828); 24 mi. SE Piaxtla (SM 11131); Rosario (UIMNH 62810); 13.4 mi. N San Lorenzo, Río (SU 23805).

Drymobius margaritiferus fistulosus Smith

Drymobius margaritiferus fistulosus Smith, Proc. U. S. Nat. Mus., 92:382, November 5, 1942 (type locality, Miramar, Nayarit).

Remarks.—Five specimens (three females and two males) have 1-1 preoculars, 2-2 postoculars, and 2+2/2+2 temporals. One female has 17-15-15 scale rows; the others have 17-17-15 rows. The three females and two males have, respectively: 143, 143, 145, 147, 144 ventrals; 8-9, 8-8, 8-9, 10-9, 9-9 supralabials; 9-9, 10-10, 10-9, 10-10, 10-10 infralabials; and 4-5/4-6, 4-5/4-5, 4-5/4-6, 5-7/4-6, 4-6/4-6 labials entering eye. One female has 127 subcaudals; all other specimens have incomplete tails. Eighteen specimens from near Teacapán have 142-151 (145) ventrals and 122-136 (129) subcaudals (Scott, 1962:48-50). The color and pattern of all specimens agree with the description by Smith (1942c:384).

Drymobius margaritiferus is a diurnal species that is abundant in the vicinity of Teacapán. Individuals commonly were collected in the ecotone between pastureland and forest. This snake is primarily terrestrial, invariably retreating on the ground. A specimen from San Ignacio was shot about 1.5 meters above the ground in a bush. Two snakes were found copulating in the forest on March 30. Two females each contained six well developed ova without shells on June 12 and in early August (Scott, 1962).

Distribution in Sinaloa.—Throughout the southern half of the state below 500 meters, and northward along the foothills into southern Sonora. See Fig. 63.

Specimens examined.—6 km. E Cosalá, 460 m. (* KU 73498); 17.9 mi. S Escuinapa (CSCLB 1365); 30.3 mi. S Escuinapa (CSCLB 1366); Isla Palmito del Verde, middle (* KU 73499-501); Isla Palmito del Verde, S end (* KU 73502); Mazatlán (JRM 1099); San Ignacio (LACM 6804); Teacapán (LACM 6805-15, 7237-39); 3 mi. NE Teacapán (LACM 6816-17); 1 mi. E Teacapán (LACM 6818); 2.5 mi. E Teacapán (LACM 6819).

Literature record.—Presidio (Boulenger, 1894:17).

Additional records.—El Dorado (AMNH 90696-98); Escuinapa AMNH 3477-79); 2.7 mi. N. Escuinapa (FAS 14469); 5 mi. N Mazatlán (AMNH 19596).

Elaphe triaspis intermedia (Boettger)

Pityophis intermedius Boettger, Ber. Offenb. Ver. Nat., 22:148, 1883 (type locality, "México"; restricted to Hacienda El Sabino, about 20 miles south of Uruapan, Michoacán by Dowling, Zoologica, 45:74, August 15, 1960).

Elaphe triaspis intermedia: Mertens and Dowling, Senckenbergiana, 33:201, November 15, 1952.

Remarks.—Two males have 8-9, 8-8 supralabials; 10-10, 10-10 infralabials; 248, 244 ventrals; 110, 101 subcaudals; 80, 84 dorsals (totals of three counts—neck, midbody, anterior to anus). Four females have 8-8, 8-8, 8-9, 9-9 supralabials; 9-9, 10-10, 10-9, 10-10 infralabials; 261, 268, 269, 275 ventrals; 86, 97 subcaudals (excluding

KU 73503, 83403); and 82, 90, 86, 89 dorsals. One juvenile of unknown sex has 8-8 supralabials, 9-9 infralabials, 249 ventrals, 106 subcaudals, and 88 dorsals.

The six larger specimens are gray dorsally in preservative. The smallest individual has 61 blotches on the body and 42 on the tail. All specimens agree with the description by Dowling (1960:74-75).

Elaphe triaspis is a nocturnal species in Sinaloa, and apparently is active later in the rainy season than many other snakes. Less than 20 per cent of the specimens were taken earlier than July 20.

Distribution in Sinaloa.—Probably occurs throughout the state with the possible exception of the arid northwestern lowlands. See Fig. 64.

Specimens examined.—20 km. N, 5 km. E Badiraguato, 550 m. (* KU 83403-04); 3 mi. S Coyotitán (LACM 2564); 7.5 mi. S Coyotitán (LACM 6823); 31.6 mi. N Culiacán (LACM 6832); 42.5 mi. N Culiacán (LACM 6827); 55 mi. N Culiacán (LACM 6820); 42 km. S Culiacán (* KU 73504); 70 mi. S Culiacán (LACM 6833); 75.7 mi. S Culiacán (UAZ 16288); 11 mi SE Escuinapa (LACM 6824); 12.4 mi. N La Cruz road on hwy. 15 (LACM 6821); 15.2 mi. S La Cruz road on hwy. 15 (LACM 6828); 9.5 mi. N Mazatlán (LACM 6822); 48 km. N Mazatlán (* KU 73503); 33.3 mi. N. Mazatlán (LACM 6831); 40.7 mi. N Mazatlán (LACM 6825); 73 mi. N Mazatlán (CSCLB 1438); 95.2 mi. N Mazatlán (LACM 6826); Santa Lucía (CSCLB 1442); 4 mi. S Terreros (LACM 6829); 3 mi. S Tropic of Cancer [hwy. 15] (JFC 63:154); 6 mi. E Villa Unión (JFC 63:155); 6.1 mi. E Villa Unión (JFC 63:156); 22.8 mi. E hwy. 15 [Villa Unión] on Durango rd. [hwy. 40] (LACM 6830).

Literature records.—11 mi. S Coyotitán (Duellman, 1957b:238); 13.8 mi. NNW Mazatlán, ca. 150 ft. (Dowling, 1960:77; Duellman, 1957b:238).

Additional records.—7.6 mi. W Concordia (SU 23831); 7.9 mi. W Concordia (SU 23830); 41.4 mi. N Culiacán (SU 23827); 4.9 mi. S Elota, Río (SU 23829); 21.7 mi. S El Salado (FAS 16798); 13.9 mi. S Escuinapa (SU 23832); 47.4 mi. N Mazatlán (CAS 95798); 55.7 mi. N Mazatlán (FAS 14465); 78.3 mi. N Mazatlán (FAS 13575); 16.4 mi. S. San Lorenzo, Río (SU 23828).

Geogras redimitus Cope

Geogras redimitus Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:141, 1876 (type locality, Tehuantepec, Oaxaca).

Remarks.—Inclusion of this species is based on the original description of *Sphenocalamus lineolatus* by Fischer (1883:5), who gave the locality as Mazatlán but did not designate the state. *Sphenocalamus lineolatus* was later referred to the synonymy of *Geogras redimitus* by Cope (1885-177). Duellman's report (1961:96) of two specimens from the lowlands of Michoacán supports the possibility that *Geogras redimitus* occurs along the coast from Oaxaca to Sinaloa.

Distribution in Sinaloa.—Known only from Mazatlán. See Fig. 65.

Specimens examined.—None.

Additional record.—Mazatlán (Cope, 1887:82; Fischer, 1883:5).

Geophis dugesii Bocourt

Geophis dugesii Bocourt, Mission scientifique au Mexique et dans l'Amérique centrale, Rept., livr. 9:573, 1883 (type locality, Tangancicuaro, Michoacán).

Remarks.—A female and a male have 154, 173 ventrals, and 38, 61 subcaudals. Both specimens have smooth scales in 15 rows, lacking apical pits; supralabials, 6; infralabials, 6; temporals 0+1+2; preoculars absent; postoculars, one; loreal, one; nasals divided; rostral visible from above; anal plate entire; supralabials three and four enter eye; mental does not contact chin shields; pupil round.

Both specimens are black with a white or pale yellow center in each third or fourth dorsal scale, imparting a faintly speckled appearance. Anteriorly, the speckles give the appearance of narrow bands three to four scales apart. The chin, ventrals, and subcaudals are white with the lateral edges of the ventrals black.

According to Floyd Downs (personal communication), who examined these specimens, their allocation to *Geophis dugesii* should be considered tentative.

Distribution in Sinaloa.—Southern highlands in lower montane dry forest. See Fig. 65.

Specimens examined.—5 km. SW Palmito, 1880 m. (* KU 75622); 19.2 km. NE Santa Lucía, 1935 m. (* KU 78939).

Gyalopion quadrangularis (Günther)

Ficimia quadrangularis Günther, Biologia Centrali-Americana, Rept., p. 99, pl. 35, fig. A., 1893 (type locality, Presidio, Sinaloa).

Gyalopion quadrangularis: Smith and Taylor, Jour. Washington Acad. Sci., 31:359, August 15, 1941.

Remarks.—Taylor (1936a:51) described *Ficimia desertorum* from a single specimen and compared it to *F. quadrangularis*, then known from a single specimen. When Smith and Taylor (1941:359) transferred *F. desertorum* and *F. quadrangularis* to the genus *Gyalopion*, the only specimens of each were the types. Bogert and Oliver (1945:404) reported three specimens of *G. desertorum* from Sinaloa that indicated individual variation in the size of the dark cross bands. Duellman (1957b:238) confirmed differences in coloration of the two nominal species, but suggested that they might be conspecific. A total of 13 specimens (six were examined) from nine localities in Sonora and Sinaloa, including a specimen of "intermediate" coloration and pattern from El Dorado, led Dixon and Fugler (1959:164) to regard *desertorum* as a subspecies of *G. quadrangularis*. They separated the populations on the basis of differ-

ences in color, pattern, and the presence or absence of the loreal. They found no populational differences in the numbers of ventrals, subcaudals, body or tail blotches, or the condition of the anal plate. Fugler and Dixon later (1961:13) reported on a second "intermediate" specimen from El Dorado. They based their interpretation on the presence of a loreal on one side of the head only, whereas *G. q. quadrangularis* lacks loreals and *G. q. desertorum* possesses them. Campbell and Simmons (1962:196) suggested that the dorsal bands are reduced in size in the southern part of the range, reaching the extreme condition in the vicinity of Mazatlán. They reported two specimens from south of Culiacán that have "characters intermediate between the two subspecies." Greer (1965a:69) noted that the width of the black dorsal body blotches varies clinally throughout the known range of the species, extending to the tips of the ventrals or first dorsal row in specimens from southern Arizona, to the second dorsal row at El Dorado (Sinaloa), to the fourth or fifth dorsal row near Mazatlán and to the seventh dorsal row in southern Sinaloa and Nayarit.

Since the above observations were made, many more specimens have been obtained at localities from Arizona to Nayarit. We have examined 67 specimens and have an additional 20 locality records from Sinaloa.

Geographic variation in the following 11 characteristics does not demonstrate the existence of two distinct or intergrading populations, nor does it clearly indicate clinal trends. The infralabials are 5-8 (6.3, N = 67) with variations occurring throughout the range. The sum of ventrals and subcaudals is 141-166 (153.5, N = 61; except KU 93492, LACM 6856, MCZ 61414, MVZ 50741-42, UMMZ 118946), and the number of dorsal caudal blotches is 3-10 (6.7, N = 66; except UMMZ 118946). Dorsal body-blotches are 16-41 (26.4, N = 66; except MVZ 50741), with many low counts due to fusion of spots in pairs and many high counts due to splitting of spots; however, neither change suggests a geographic trend. The lengths (in numbers of scales) of the first dorsal body blotches posterior to the nuchal collar are 1.5-7.5 (4.6, N = 66; except FAS 11653); middle dorsal body-blotches 1.5-6.5 (2.6, N = 66; except FAS 11653); last dorsal body-blotches 1.5-4.5 (2.6, N = 65; except FAS 11653, 14757). The nuchal collar extends beyond the posterior edge of the parietals 4-8 (5.7, N = 67) scale lengths; the collar is separated from the black head-cap in six (9.0%) specimens (ASDM 2234; KU 73513; LACM 6834-35, 6854, 6856), and contacts the

head-cap in the rest. In 39 specimens (58.2%) the pale scales of the ground color have black tips giving a dark appearance to the snakes, but 28 others (41.8%) lack black-tipped scales. The anal is entire on all specimens where the condition is known, including the holotype.

Eight of the characteristics examined demonstrate clinal trends. The number of dorsal scale rows around the neck is 17 in all specimens north of 24 degrees north latitude, but 20 per cent of the specimens examined from south of 25 degrees north latitude show reduction to 15 or 16 scale rows at the neck. At midbody, five per cent of the specimens from south of 25 degrees north latitude show reduction to 16 rows, but all other specimens have 17 rows. Anterior to the cloaca the scale rows are 18 in specimens from north of 24 degrees north latitude (six %) and are 15, 16 or 18 in specimens from south of 25 degrees north latitude (15%). The number of supralabials is 5-8 with a distinct gradation from a mode of 7 in the north to a mode of 6 in the south (Table 5 and Fig. 10). The presence or absence of the loreal scale was used by Dixon and Fugler (1959:163) to separate two populations. The loreal scale is present on both sides of the head in all specimens from Culiacán southward, but is absent in all specimens from Guaymas, Sonora, northward. Between Culiacán and Guaymas 17 specimens have loreals and seven lack loreals. One specimen (KU 73515) from

TABLE 5.—Three Characters that Show Clinal Variation from North to South in *Gyalopion quadrangulare*. (Each sample consists of all specimens available from the areas included in each degree latitude throughout the geographic range of the species.)

DEGREES NORTH LATITUDE	Number of supralabials			Black subcaudal spots		Black spots on ventrals	
	Number of specimens	Mean	Mode	Specimens with spots	Specimens without spots	Specimens with spots	Specimens without spots
31.....	4	7.0	7	5	0	3	2
30.....	0	.....	.....	0	0	0	0
29.....	2	7.0	7	2	0	2	0
28.....	1	6.0	6	1	0	1	0
27.....	2	5.8	6	2	0	0	2
26.....	2	6.5	.....	2	0	1	1
25.....	19	6.6	7	18	1	16	3
24.....	8	6.1	6	7	1	4	4
23.....	27	6.0	6	18	9	10	17
22.....	1	6.0	6	0	1	1	0

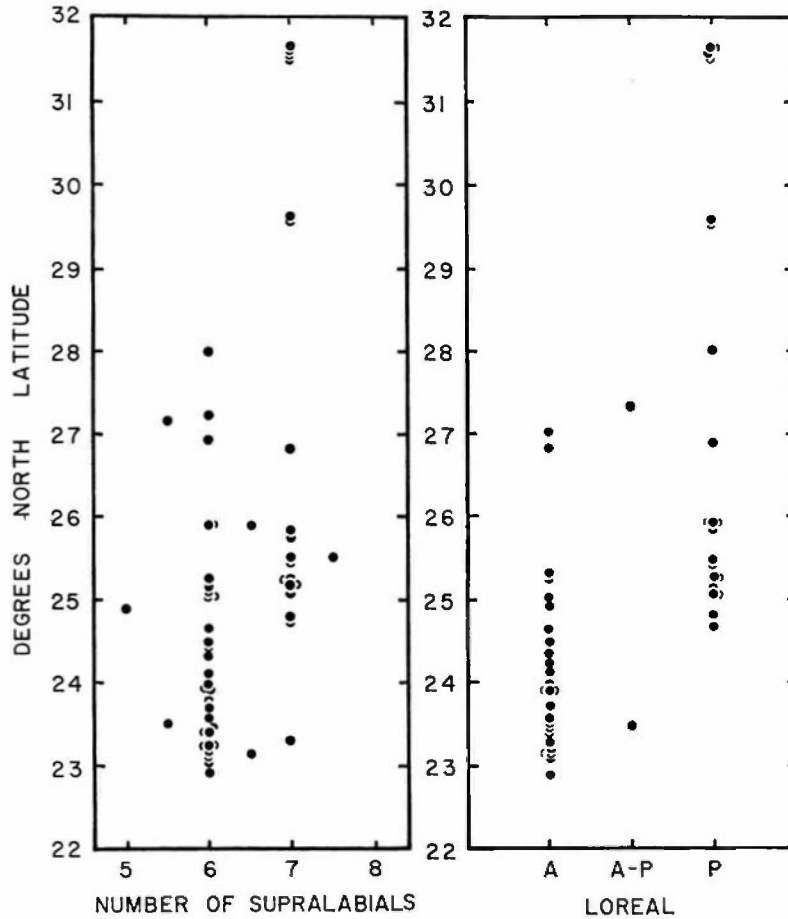


FIG. 10. Geographic variation in the number of supralabials in *Gyalopion quadrangularis*, using the mean of counts from both sides of the head.

FIG. 11. Geographic variation in the presence or absence of the loreal in *Gyalopion quadrangularis*. A = loreal absent on both sides of head; A-P = loreal absent on one side but present on the other; P = loreal present on both sides of head.

20 miles north of Mazatlán has a single loreal (on the left) and another specimen from 6.1 miles northwest of Navojoa, Sonora, (MVZ 50741) has one loreal (on the left). We do not regard these two specimens as intergrades because of their geographic separation and the large areas of sympatry of specimens with and without loreals (Fig. 11). The variation is of a clinal nature with loreals present in the north and absent in the south. The loss of the loreals

may be due to a single gene as suggested by Dixon and Fugler (1959:163).

The ratio of tail length/total length shows a clinal trend. The longest tails are those of males in the north (15.2, 15.3% for two specimens from southern Arizona). In males, the shortest tails are from southern Sinaloa (12.9%, south of Rosario); however, the shortest tails in females are from northern Sinaloa (12.4, 13.2, 13.3 and 13.5%).

In general, the lateral interblotches are absent in the south and present in the north. With one exception (LACM 6838 from 36.1 miles south of Coyotitán) all specimens south of El Dorado lack lateral interblotches. With one exception (ASDM 1925 from five miles north of Navojoa, Sonora) all specimens north of Terreros have lateral interblotches. The southernmost specimen with lateral interblotches has only a few blotches (LACM 6838); the next southernmost specimen with lateral interblotches is AMNH 79916 from El Dorado. A specimen from 0.8 miles south of Guamúchil (LACM 6857) has lateral interblotches that include the tips of the ventrals. To the south, at 46.4 miles north of Culiacán (LACM 6848), the lateral interblotches do not include the ventrals; the lateral interblotches decrease in number at 43 miles north of Culiacán (LACM 6847) and are absent at 9 miles north of Culiacán (LACM 6844). At least some lateral interblotch pigment is indicated in specimens from southern Sinaloa, but is infrequent in occurrence. In general, there is a gradual decrease in lateral interblotch pigment from the north to the south.

The amount of black pigment on the ventrals increases from south to north (Table 5). The subcaudal black spots also vary clinally; the number of specimens with black subcaudal spots increases from south to north (Table 5).

The lateral extent of the black dorsal body blotches can be measured by counting the scales separating the lateral margins of the dorsal blotches and the lateral margins of the ventrals. This separation varies from zero (dorsal blotch in contact with ventrals) at the northern limit of the distribution of the species (ASDM 1681 in southern Arizona) to eight in southern Sinaloa (KU 87449). The dorsal blotch contacts the ventrals in four specimens from Arizona, two specimens from Sonora and in several specimens in Sinaloa southward to Mazatlán. The dorsal blotches become smaller from north to south, being separated by a maximum of two scale rows in Arizona, three scale rows in Sonora, four scale rows in

northern Sinaloa and eight scale rows in southern Sinaloa. Although snakes with complete blotches occur almost throughout the range of the species, there are none with four or more rows separating blotches and ventrals north of Guamúchil.

Sinaloan specimens of this species are red or red-orange in dorsal ground color, with black blotches and a white venter. The color of a living specimen from Sonora (LACM 6834 from 15 miles south of Santa Ana) is as follows: black blotches have light centers laterally and are separated from each other by pale cream interspaces middorsally, to give the appearance of an interrupted mid-dorsal stripe; ground color laterally and between black blotches orange; first two scale rows above ventrals white; lateral interspaces with one or two black-tipped scales; head with orange border around black interorbital spot and anterior part of nuchal collar; snout white; ventrals and subcaudals white, some subcaudals with black spots.

The geographic irregularity of variation in some characteristics and the clinal nature of the variation in other characteristics does not justify the recognition of subspecies. Therefore, we place *Gyalopion quadrangularis desertorum* in the synonymy of *G. quadrangularis*.

Most specimens of this small nocturnal snake were taken on the road at night. None were collected when the air temperature was below 27°C, and the majority were active at night at an air temperature between 28° and 29°C. A specimen from near Terreros was found beneath a rock. Another was found after a morning rain on a floating stick in a water-filled irrigation ditch at Villa Unión. Greer (1966:372) reported the species to be oviparous.

Distribution in Sinaloa.—Throughout the state from sea level to 1220 meters elevation. See Fig. 66.

Specimens examined.—Ahome (* LACM 8651-53); 13 mi. ESE Badiraguato, 800 ft. (* KU 83405); 36.1 mi. S Coyotitán [San Ignacio turnoff] (* LACM 6838); 8.7 mi. N Culiacán (* LACM 6844); 17.3 mi. N Culiacán (CSCLB 1402); 31.2 mi. N Culiacán (* LACM 6845); 32.5 mi. N Culiacán (* LACM 6846); 43 mi. N Culiacán (* LACM 6847); 46.4 mi. N Culiacán (* LACM 6848); 63 mi. N Culiacán (* KU 73505); 19 km. SSE Culiacán (* KU 73517); 18 mi. S. Culiacán (* LACM 6853); 50.5 mi. S Culiacán (FAS 13776); 30 mi. W Culiacán (* ASDM 1791); El Cajon, 1700 ft. (* KU 93492); El Dorado (* AMNH 79916); 17.3 mi. S Escuinapa (CSCLB 1410); 34 mi. S Escuinapa (CSCLB 1404); 0.8 mi. S Guamúchil (* LACM 6857); 6.5 mi. S Guamúchil (* LACM 6855); 3.1 mi. E La Cruz (* LACM 6835); 1.5 mi. N Los Mochis (* FAS 11653); 8 mi. NE Los Mochis (* KU 73506); 2.9 mi. N Mazatlán (* LACM 6836); 3 mi. N Mazatlán (* MCZ 61415); 5-10 mi. N Mazatlán (* LACM 8654); 9.3 mi. N Mazatlán (CSCLB 1403); 9.6 mi. N Mazatlán (CSCLB 1412); 10.6 mi. N Mazatlán (CSCLB 1409); 11.5 mi. N Mazatlán (* LACM 6839); 12 mi. N Mazatlán (JFC 62:46); 13.3 mi. N Mazatlán

(* LACM 6840-41); 14.9 mi. N Mazatlán (CSCLB 1407); 26 km. N Mazatlán (* KU 73512); 32 km. N Mazatlán (* KU 73515); 22.9 mi. N Mazatlán (* LACM 6842); 66 km. N Mazatlán (* KU 73511); 74 km. N Mazatlán (* KU 73513-14); 50 mi. N Mazatlán (* LACM 6837); 54.6 mi. N Mazatlán (CSCLB 1408); 93 km. N Mazatlán (* KU 73516); 59.7 mi. N Mazatlán (CSCLB 1411); 70.4 mi. N Mazatlán (* LACM 6843); 18 km. E Mazatlán (* KU 73510); 4.2 mi. S Mazatlán (* LACM 8655); 5 km. S Mazatlán (* FAS 14757); 2.1 mi. SE Mazatlán (* MCZ 61416); 10 mi. SE Mazatlán (* MCZ 61414); 11 km. NW Mazatlán (* KU 73508-09); 4.2 mi. NNW Mazatlán, 50 ft. (* UMMZ 114481); 24 mi. NNW Mazatlán, 150 ft. (* UMMZ 114480); 44.1 mi. N Río Elota (* LACM 6849); 8.4 mi. N Río Fuerte (UAZ 16294); 1.8 mi. N Rosario (CSCLB 1406); 11 km. S Rosario, 15 m. (* KU 87449); halfway between Rosario and Villa Unión (JFC 62:45); 3.2 km. (by rd.) SW Santa Lucía, 4000 ft. (* KU 95953); 6.1 mi. N Sinaloa-Nayarit border (CSCLB 1405); Tecorito (* UMMZ 118946-47); 1.5 mi. N Terreros (* LACM 6854); 0.2 mi. S Terreros (* LACM 6852); 0.7 mi. S Terreros (* LACM 6856); 1.2 mi. S Terreros (* LACM 6851); 41 mi. S Terreros (* LACM 6850); 4.3 mi. N Tropic of Cancer (JFC 65:141); 25 mi. N Tropic of Cancer (CSCLB 1414); Villa Unión (* KU 73507).

Arizona: 5 mi. N Arizona hwy. 289 on U. S. hwy. 89 (* ASDM 1680); 1.2 mi. W U. S. hwy. 89 on Arizona hwy. 289 (* ASDM 1681); Nogales, Santa Cruz co. (* ASDM 2234); 2 mi. S Patagonia, Alum Canyon (* ASDM 1682); 3 mi. W Patagonia (* ASDM 1679).

Sonora: ca. 12 km. NW Guaymas (* UIMNH 25065); Guirocoba (* MVZ 50742); 38.4 mi. N Hermosillo (* MVZ 71366); 5 mi. N Navojoa (* ASDM 1925); 6.1 mi. NW Navojoa (* MVZ 50741); 15 mi. S Santa Ana (* LACM 6834).

Literature records.—47.5 mi. S Culiacán; 55.2 mi. S Culiacán (Campbell and Simmons, 1962:196; Fouquette and Rossman, 1963:191); El Dorado (Dixon and Fugler, 1959:163; Fugler and Dixon, 1961:13); 4 mi. N Mazatlán; 24 mi. N Mazatlán (Dixon and Fugler, 1959:164); 20-40 mi. S Mazatlán (Campbell and Simmons, 1962:196); 4.2 mi. NNW Mazatlán, 150 ft.; 24 mi. NNW Mazatlán, 50 ft. (Duellman, 1957b:238); Presidio (Boulenger, 1894:272; Günther, 1893:99; Dixon and Fugler, 1959:164).

Additional records.—28.5 mi. N Culiacán, Río (SU 23807); 6.7 mi. N Escuinapa (SU 23811); 16.8 mi. N jct. La Cruz rd. and hwy. 15, on hwy. 15 (SU 23808); Los Mochis, proximity of (SU 23806); 9.3 mi. N Los Mochis (UF 16787); Mazatlán (SDSNH 52911); 28.8 mi. N Mazatlán (SU 23810); 30.6 mi. S Presidio, Río (SU 23812); 0.4 mi. N San Lorenzo, Río (SU 23809); Tecorito (UMMZ 118946-47).

Hypsiglena torquata (Günther)

Leptodeira torquata Günther, Ann. Mag. Nat. Hist., ser. 3, 5:170, pl. 10, fig. A, April, 1860 (type locality, Laguna Island, Nicaragua).

Hypsiglena torquata: Cope, Bull. U. S. Nat. Mus., 32:78, 1887.

Remarks.—The status of *Hypsiglena* in western México has been in question for many years. *Hypsiglena torquata* and *H. ochrorhyncha* have been treated as species by Taylor (1939b:368-75), Tanner (1944:45), Davis and Dixon (1957a:24-25), and Dixon (1965:125). *Hypsiglena ochrorhyncha* was considered a subspecies of *H. torquata* by Bogert and Oliver (1945:378-81), Zweifel and Norris (1955:245), Smith and Van Gelder (1955:146), Duellman (1957b:238-39), Fugler and Dixon (1961:13-14), Duellman (1961:99-100), and Fouquette and Rossman (1963:192-93).

Much of the confusion has involved the apparent occurrence of intergradation between the two forms in Sinaloa (Smith and Van Gelder, 1955:146). The population representing the name *torquata* is composed of individuals that have the dark nuchal blotch preceded by a creamy white band about as wide as the nuchal blotch, whereas individuals having the dark nuchal blotch preceded by the normal brown or pale brown dorsal coloration are referred to *ochrorhyncha*. Specimens having each pattern have been taken from several localities in Sinaloa. On September 28, two specimens, representing both patterns, were taken on Mexican highway 15, 74 kilometers north-northwest of Mazatlán, at 2210 and 2212 hours. Two other specimens, representing both patterns, were taken eight miles northeast of La Cruz at 2020 hours, on July 2, 1962. Snakes with the *ochrorhyncha* nuchal pattern have been taken throughout the lowlands of Sinaloa, at localities that completely overlap the range of snakes with the *torquata* nuchal pattern in southern Sonora and Sinaloa.

Examination of specimens from western México indicates that, with the exception of nuchal patterns, there is no way to distinguish the two taxa. Contrary to what Dixon (1965:126) stated, we find a decrease in the total number of ventral and subcaudal scales of *ochrorhyncha*-patterned snakes from Arizona and Sonora into Sinaloa and of *torquata*-patterned snakes from southern Sonora through Sinaloa and western México to Guerrero. In the area where snakes with both nuchal patterns occur the ventral-subcaudal scale counts fall within the same range. The cline in the number of ventral-subcaudal scales is independent of nuchal pattern. In addition, snakes with different nuchal patterns from the same area are virtually identical in other details of coloration and pattern. Our findings suggest that the presence of two nuchal conditions in *Hypsiglena* is a case of pattern dimorphism in a single, otherwise uniform, species. Therefore, we refer all Sinaloan specimens to *Hypsiglena torquata* pending results of a detailed study now in progress.

Distribution in Sinaloa.—Throughout the lowlands of the state. See Fig. 67.

Specimens examined.—Ahome (LACM 8650); 2.7 km. NE Chupaderos, 400 m. (KU 78940); 5.7 mi. S Coyotitán (JFC 65:142); 13.1 mi. S Coyotitán (LACM 7267); 41.2 mi. S Coyotitán (LACM 7258); 11.7 mi. N Culiacán (LACM 7274); 15.5 mi. N Culiacán (LACM 7284); 16.3 mi. N Culiacán (CSCLB 1933); 26.3 mi. N Culiacán (LACM 7277); 19.8 mi. S Culiacán (LACM 7278); 43 km. S Culiacán (CSCLB 1930); 73.7 mi. S Culiacán (LACM 7279); 97.2 mi. S Culiacán (LACM 7280); 29 km. NW Culiacán (by hwy.

15) (KU 73526); 3.1 mi. W El Guaybo (UAZ 9378); 13.4 mi. N Elota, Río (LACM 7257); 23.2 mi. S Elota, Río (LACM 7266); 28.9 mi. S Elota, Río (LACM 7265); 32.5 mi. S Escuinapa (CSCLB 1935); 34.2 mi. S. Esuinapa (CSCLB 1934); 4.8 mi. N Fuerte, Río (CSCLB 1932); 5.9 mi. S Guamúchil (LACM 7286); Isla Palmito del Verde, middle (KU 73527); 7 mi. NE La Cruz turnoff [on hwy. 15] (LACM 7262); 8.1 mi. NE La Cruz turnoff [on hwy. 15] (LACM 7260-61); 11.4 mi. S La Cruz turnoff [on hwy. 15] (LACM 7275); Mazatlán (KU 63421, 73518-19); 1.5 km. N Mazatlán (KU 40336); 5 mi. N Mazatlán (LACM 2374; CSCLB 1943); 10 km. N Mazatlán (KU 73520); 18.9 mi. N Mazatlán (LACM 7264); 19 mi. N Mazatlán (JFC 62:54); 39 km. N Mazatlán (KU 73521); 47 km. N Mazatlán (KU 73522); 74 km. N Mazatlán (KU 73523-24, 86607); 92 km. N Mazatlán (KU 73525); 112.2 mi. N Mazatlán (LACM 7271-72); 116.5 mi. N Mazatlán (LACM 7273); 2.8 mi. SE Mazatlán (LACM 7268); 5 mi. SE Mazatlán (CSCLB 1937); Piaxtla, Río (CSCLB 1938); 2 mi. NW Rancho Huanacastle (LACM 7327); San Ignacio (LACM 7259, 7288); 6 mi. S Sonora-Sinaloa border (CSCLB 1931); Teacapán (LACM 7282); 4.8 mi. N Terreros (LACM 7287); 90.4 mi. N Terreros (LACM 7256); 17.2 mi. S Terreros (LACM 7283); 3 mi. W Terreros (LACM 7285); 13.3 mi. S Tropic of Cancer (CSCLB 1936); 6.5 mi. SE Villa Unión (LACM 7263).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:146); El Dorado (Fugler and Dixon, 1961:13); 39 mi. N Los Mochis, 100 ft. (Davis and Dixon, 1957a:24); Mazatlán (Van Denburgh, 1898:464); 6-38 mi. NNW Mazatlán (Duellman, 1957b:238); Presidio (Boulenger, 1894:210; Taylor, 1939b:373); Villa Unión, 100 ft. (Davis and Dixon, 1957a:24).

Additional records.—6.9 N Cañas, Río (SU 23841); 9.9 mi. N Culiacán, Río (SU 23836); 36.6 mi. N Culiacán, Río (SU 23835); 13.0 mi. S Culiacán, Río (SU 23837); 58.3 mi. S Culiacán (UF 12801); El Dorado (AMNH 90699-702); 1 mi. NNE El Fuerte (FMNH 71529); 15.5 mi. S El Salado (FAS 16815); 19.2 mi. S El Salado (FAS 16816); 27.9 mi. S El Salado (FAS 16804); Escuinapa (AMNH 4312); Mazatlán (SDSNH 52903; USNM 147982, 151781); 2 mi. N Mazatlán (UIMNH 53057); 3 mi. N Mazatlán (AMNH 19785-86); 5 mi. N Mazatlán (AMNH 86939-40); 7 mi. N Mazatlán (AMNH 75893); 16 mi. N Mazatlán (MCZ 61417); 36 mi. N Mazatlán (FAS 10040); 70 mi. N Mazatlán (FAS 16803); 15.4 mi. N Mocorito, Río (SU 23833); 10.6 mi. S Mocorito, Río (SU 23834); 13.3 mi. S San Lorenzo, Río (SU 23838); 14.7 mi. S San Lorenzo, Río (SU 23839); 17.4 mi. S San Lorenzo, Río (SU 23840); 2 mi. SE Urías (AMNH 94804); 3 mi. SE Villa Unión, 100 ft. (TCWC 12601).

Imantodes gemmistratus latistratus (Cope)

Dipsas gemmistrata latistrata Cope, Bull. U. S. Nat. Mus., 32:68, 1887 (type locality, Valley of Toluca and Guadalajara, Jalisco; type locality restricted to southern Jalisco by Zweifel, Amer. Mus. Novitates, 1961:4, September 16, 1959).

Imantodes gemmistratus latistratus: Zweifel, Amer. Mus. Novitates, 1961:3, September 16, 1959.

Remarks.—Zweifel (1959d) assigned all *Imantodes* from western México to one species, *I. gemmistratus*, with the subspecies *latistratus* occurring in Sinaloa.

Six males have 224-236 (230.4) ventrals, 114-126 (120.8) subcaudals (except KU 67673, 78947). Seven females have 226-237 (231.0) ventrals, 115-129 (121.6) subcaudals. Coloration and pattern generally are typical of the race (Zweifel, 1959d:4-7). Twenty-one males have 36-63 (48.3) body blotches, 15-25 (19.3) middorsal

scales in the anterior three body blotches; and faint posterior coloration (except LACM 6867). Head pattern "A" (Zweifel, 1959d:5, fig. 2) occurred 17 times, "B" twice and "C" twice. Fourteen females have 38-63 (48.2) body blotches; 14-24 (18.9) middorsal scales in the anterior three body blotches; fainter posterior coloration (except LACM 6881); head pattern "A." One male has 114 subcaudal scales, slightly fewer than the range of 117-130 that Zweifel (1959d:7) reported for northern males. All other characteristics are within the ranges observed by Zweifel (1959d).

More than 30 specimens of this supposedly arboreal snake were collected on the road at night. Individuals were especially abundant during or following rains. A specimen was collected in daytime beneath palm leaves on the ground near Teacapán.

Distribution in Sinaloa.—Throughout the lowlands south of Guamúchil and at higher elevations along the foothills into southern Sonora. See Fig. 68.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 68752); 9.7 S Coyotitán (JFC 65:143); Culiacán (CSCLB 1446-47); 22 km. N Culiacán (* KU 73532); 43 mi. N Culiacán (* LACM 6867); 5 mi. S Culiacán (JFC 62:52); 8.4 mi. S Culiacán (* LACM 6874); 36.8 mi. S Culiacán (* LACM 6875); 42.4 mi. S Culiacán (CSCLB 1451); 74 km. S Culiacán (* KU 73531); 50.9 mi. S Culiacán (* LACM 6881); 57.8 mi. S Culiacán (UAZ 16296); 61.5 mi. S Culiacán (* LACM 6876); 18 km. NE Elota, 30 m. (* KU 67673); 32.4 mi. N Elota, Río (* LACM 6871); 24.7 mi. S Elota, Río (LACM 6863); 31 mi. S Elota, Río (* LACM 6864); hwy. 15 between Escuinapa and Palmillas (* LACM 6884-87, 7244); 27.3 mi. S Escuinapa (CSCLB 1448); 31.6 mi. S Escuinapa (CSCLB 1449); 32.2 mi. S Escuinapa (CSCLB 1450); 5 mi. S Espinal (CSCLB 1456); 14 mi. N La Cruz turnoff [hwy 15] (* LACM 6861); 66.4 mi. S La Cruz turnoff [hwy. 15] (JMS osteo. coll.); 1 km. N Mazatlán (CSCLB 1444); 1.4 mi. N Mazatlán (* LACM 6868); 3.2 mi. N Mazatlán (UAZ 16297); 8 km. N Mazatlán (* KU 73530); 5.9 mi. N Mazatlán (* LACM 6880); 9.5 km. N Mazatlán (* KU 73528); 11.9 mi. N Mazatlán (* LACM 6858); 12.1 mi. N Mazatlán (* LACM 6860); 13.7 mi. N Mazatlán (* LACM 6859); 16.8 mi. N Mazatlán (* LACM 6865); 17.8 mi. N Mazatlán (* LACM 6862); 18.8 mi. N Mazatlán (* LACM 6879); 50 km. N Mazatlán (* KU 73529); 65.4 mi. N Mazatlán (* LACM 6870); 95.1 mi. N Mazatlán (* LACM 6866); 16.5 mi. SE Mazatlán (* LACM 6869); 1 mi. N Palmillas (* LACM 6877); 2 mi. S Palmillas (* LACM 25912); 11 mi. N Rosario (CSCLB 1452); 2.4 mi. NW Rosario (* LACM 6873); 2.2 km. NE Santa Lucía, 1155 m. (* KU 78941); Teacapán (* LACM 6878); 7 mi. S Terreros (* LACM 6882); 17 mi. S Terreros (* LACM 6872); 32 km. (by hwy. 15) N Tropic of Cancer (* KU 80752); S Tropic of Cancer (CSCLB 1445).

Literature records.—3 mi. S Coyotitán, 450 ft. (Zweifel, 1959d:12); 18 mi. NW Culiacán (Conant, 1965:17); Escuinapa (Zweifel, 1959d:12); 6-31 mi. NNW Mazatlán (Duellman, 1957b:239); 6.6 mi. NNW Mazatlán, 100 ft.; 8.3 mi. NNW Mazatlán; 10.3 mi. NNW Mazatlán, 200 ft.; 31.8 mi. NNW Mazatlán, 400 ft. (Zweifel, 1959d:12).

Additional records.—39.8 mi. N Culiacán, Río (SU 23820); 8 mi. S Culiacán, (CAS 95759); 10.2 mi. S El Salado (FAS 16805); 16.2 mi. S El Salado (FAS 16808); 19.2 mi. S El Salado (FAS 16800); 5.2 mi. S Escuinapa (SU 23823); 9.7 mi. N Espinal (UF 16538); 3.8 mi. E La Cruz (SU 23822); 1 mi. N Mazatlán (UF 12803); 1.9 mi. N Mazatlán (ASDM 1753); 3 mi. N Mazatlán (UF 12802); 6.8 mi. N Mazatlán (UF 16539); 11.2 mi. N Mazatlán (FAS

14833); 12 mi. N Mazatlán (MCZ 61418); 16 mi. N Mazatlán (MCZ 61419); 18 mi. N Mazatlán (MCZ 61420); 18.8 mi. N Mazatlán (MCZ 61421); 26.4 mi. N Mazatlán (UF 12804); 31 mi. N Mazatlán (FAS 14776); 45 mi. N Mazatlán (FAS 16819); 46.6 mi. N Mazatlán (FAS 14505); 15.3 mi. S San Lorenzo, Río (SU 23821).

Lampropeltis getulus nigrinus Zweifel and Norris

Lampropeltis getulus nigrinus Zweifel and Norris, Amer. Midland Nat., 54:238, August 27, 1955 (type locality, 30.6 miles [by road] south of Hermosillo, Sonora).

Remarks.—One specimen has been reported from Sinaloa (Campbell and Simmons, 1962:196). Two additional specimens (CSCLB 1417, LACM 28715) are males and have 216, 221 ventrals; 46, 55 subcaudals in two rows; 23-23-19 dorsal scale rows; 8-8, 7-7 supralabials; 9-9 infralabials; 1-1 preoculars; 2-2, 1-2 postoculars; and 1 + 2, 2 + 3 temporals. The dorsum is black with a very small light spot on many scales; the ventrals are black with one or two white marks on each ventral, decreasing in area posteriorly; the subcaudals are black with a few small light spots on the lateral edges. The head, labials, neck, and gular area are black, and chin shields are nearly all white. In coloration these specimens are similar to a specimen from Arizona reported by Zweifel and Norris (1955:239-40) as an intergrade between *L. getulus nigrinus*, *L. g. splendida*, and *L. g. yumensis*. The presence of an "intermediate" color pattern in Sinaloa suggests that the race *nigrinus* is much more variable than previously understood and probably is nothing more than the intermediate population or color phase between *splendida* and *yumensis*. All specimens were collected at night on Mexican highway 15.

Distribution in Sinaloa.—Known only from the extreme northern lowlands. See Fig. 60.

Specimens examined.—6 km. SE Los Mochis turnoff (LACM 28715); 25.6 mi. S Los Mochis (CSCLB 1417).

Literature records.—5.6 mi. S Sonora-Sinaloa state line (Campbell and Simmons, 1962:196).

Lampropeltis triangulum nelsoni Blanchard

Lampropeltis triangulum nelsoni Blanchard, Occ. Pap., Mus. Zool., Univ. Michigan, 81:6, fig. 1, April 28, 1920 (type locality Acámbaro, Guanajuato).

Remarks.—The 13 specimens examined include eight males, three females, and two specimens of unknown sex. The eight males have 217-230 (220.6) ventrals; 49-56 (53.7) subcaudals (excluding KU 73537); 10-13 (12.0) white bands on the body; and 3-4 (3.9) white

bands on the tail (excluding KU 73537). Seven to 13 (10.6) of the white bands on the body are complete ventrally. The dorsal scale rows are 21 behind the head, 21 at midbody and 17-19 just anterior to the vent. The three females and two specimens of unknown sex (KU 63422, 40355) have the following characteristics respectively: 216, 207, 217, ♀, ♀ ventrals; 16, 11, 12, 15, 13 white bands on the body; 16, 10, 12, ♀, 13 of the white bands are complete ventrally; 21 scale rows behind the head and at midbody and 19, 19, 19, 18, 19 scale rows anterior to the anus. All females have incomplete tails. One specimen (KU 73541) from Isla Palmito del Verde has black tips on the red scales and the snout is black with white mottling. All of the other specimens lack black tips on the red scales. Six specimens have white snouts that are mottled with black, and four specimens have black snouts that are mottled with white (excluding KU 40355, 63422). Two specimens (KU 73533-34) have one incomplete white band on the posterior part of the body. Another specimen (KU 73539) has two white bands that are incomplete dorsally by four and 12 scales. A fourth specimen (KU 73536) is even more unusually marked by having three lateral black-bordered white blotches alternating between the second and third complete white bands. The white blotches (two on the right and one on the left side) are 4, 14, and 7 scales long from anterior to posterior, and are bordered by black pigment which is confluent ventrally; dorsally the black pigment of any blotch does not contact the vertebral scale row.

Blanchard (1921:157) suggested that *nelsoni* probably intergrades with *annulata* somewhere on the Mexican plateau. Fugler and Dixon (1961:14) regarded one specimen that has only eight of the 15 white bands continuous ventrally as an indication of intergradation with *L. t. arcifera*. Five specimens with one to five white bands discontinuous ventrally are from the southern part of the state, and may indicate intergradation. We suspect that this color variant is inherent in the population here referred to *nelsoni*. Zweifel (1960: 104-07) pointed out that the coastal population of *Lampropeltis triangulum* may be distinct from *nelsoni*. Zweifel outlined the problem in some detail and discussed the variation in coloration in this species. Based on the color variation of material from Sinaloa and the lack of knowledge of the variation and distribution of different populations, as pointed out by Duellman (1961:102), we refer the Sinaloan specimens to *nelsoni*. Only a detailed study of all specimens of *Lampropeltis triangulum* from México will clarify the status

of the recognized subspecies and adequately demonstrate the relationship of the Sinaloan population.

This snake is nocturnal and apparently is a mimic of *Micrurus distans*. The local people generally are unable to differentiate between the two snakes and equally fear both species.

Distribution in Sinaloa.—Known from throughout the southern part of the state below an altitude of 1000 meters. *Lampropeltis triangulum* probably ranges northward in Sonora along the foothills of the northern part of the state. See Fig. 69.

Specimens examined.—Sinaloa (no specific locality) (CSCLB 1907); 6 km. SW Concordia (* KU 73538); 15.1 mi. S Coyotitán (LACM 6894); 44 mi. N Culiacán (LACM 6904); 9 mi. S Culiacán (LACM 6907); 31 mi. S Culiacán (JFC 62:38); 47 mi. S Culiacán (LACM 6901); 50 mi. S Culiacán (LACM 6908); 54.9 mi. S Culiacán (CSCLB 1906); 58 mi. S Culiacán (CSCLB 1908); 60.6 mi. S Culiacán (LACM 6902); 66 mi. S Culiacán (CSCLB 1909); 7 mi. NW Culiacán (JRM 1102); 47.7 mi. S Elota, Río (LACM 6895); 13.7 mi. S Guamúchil (LACM 6906); 54.5 mi. SE Culiacán (UAZ 16298); Isla Palmito del Verde, S end (* KU 73541); 1.6 mi. E La Cruz (LACM 6892); Matatán, 170 m. (* KU 73537); Mazatlán (* KU 63422); 5 mi. N Mazatlán (LACM 25913); 10 km. N Mazatlán (* KU 73535); 9 mi. N Mazatlán (LACM 6889); 14 mi. N Mazatlán (LACM 6891); 16.9 mi. N Mazatlán (LACM 6890); 18.5 mi. N Mazatlán (UAZ 16299); 22.1 mi. N Mazatlán (LACM 6898); 22.4 mi. N Mazatlán (LACM 6896); 32.4 mi. N Mazatlán (CSCLB 1913); 58 km. N Mazatlán (* KU 73534); 69 km. N Mazatlán (* KU 73536); 52 mi. N Mazatlán (CSCLB 1912); 57 mi. N Mazatlán (JFC 62:39); 63 mi. N Mazatlán (JFC 62:40); 10 km. NE Mazatlán (* KU 73533); Plomosas, 760 m. (* KU 73540); 4.8 mi. N Rancho Huanacastle (LACM 6903); 1.5 km. NW Rosario (* KU 73539); San Ignacio (LACM 6893); 3 km. E San Lorenzo, 90 m. (* KU 91421); Teacapán (LACM 6909, 7241); 1 mi. N Teacapán (LACM 6911); 2 mi. SE Teacapán (LACM 6910); 34.6 mi. N Terreros (LACM 6899); 12 mi. S Terreros (LACM 6900); 21.3 mi. S Terreros (LACM 6905); 13 km. NNE Vaca, 400 m. (* KU 80754); 8.5 mi. N Villa Unión (CSCLB 1910); 2.3 mi. E Villa Unión (CSCLB 1914); 13 km. E Villa Unión (* KU 40355); 18.4 mi. SE Villa Unión (LACM 6897); 11 mi. S Villa Unión (CSCLB 1911).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); 22.6 mi. N Culiacán (Fouquette and Rossman, 1963:193); El Dorado (Fugler and Dixon, 1961:14); Escuinapa (Blanchard, 1920:7 and 1921:158; Tanner and Loomis, 1957:37); 1 mi. NW Guamúchil (Tanner and Loomis, 1957:37); Mazatlán; Presidio (Boulenger, 1894:204; Blanchard, 1921:157).

Additional records.—Costa Rica (UIMNH 34919); 9.6 mi. N Culiacán, Río (SU 23847); 32 mi. N Culiacán (UF 16541); El Dorado (AMNH 90703-10); 17 mi. N Espinal (UF 16542); 22.0 mi. S La Cruz road, on hwy. 15 (SU 23849); La Noria (MVZ 10353); 2 mi. N Mazatlán (UMMZ 114297); 6.6 mi. N Mazatlán (FAS 12973); 17 mi. N Mazatlán (MVZ 59295); 19 mi. N Mazatlán (MVZ 70268); 23.8 mi. N Mazatlán (MVZ 70269); 24 mi. N Mazatlán, 150 ft. (TCWC 12646); 30.5 mi. N Mazatlán (FAS 12406); 14 mi. NNW Mazatlán, 150 ft. (UMMZ 114652); 19.6 mi. S Mocorito, Río (SU 23846); 4.9 mi. S Presidio, Río (SU 23850); 0.8 mi. S San Lorenzo, Río (SU 23848).

Leptodeira maculata Hallowell

Leptodeira maculata Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 1861 (for 1860):488 (type locality, "Tahiti"; type locality restricted to Manzanillo, Colima by Duellman, Bull. Amer. Mus. Nat. Hist., 114:54, February 24, 1958).

Leptodeira personata Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:310, 1869 (type locality, Mazatlán, Sinaloa).

Remarks.—There are more body blotches (*ca.* 22-27) and lateral intercalary spots are more frequent in specimens of *Leptodeira maculata* in Sinaloa than in specimens from farther south (Duellman, 1958a:55-56). Two males from southern Sinaloa have 167, 165 ventrals; 69, 69 subcaudals; 23, 24 dorsal body blotches; and 10, 15 dorsal tail blotches. Both specimens have 21-23-17 scale rows; the lateral blotches are faintly evident and the upper labials are smudged with brown. Most specimens were collected at night in proximity to roadside ponds, where the snakes were attracted by the multitude of breeding amphibians. An individual (LACM 6913) was collected with a half-engulfed *Bufo mazatlanensis* in its mouth. The toad was dislodged but died shortly. An obvious discoloration was noted on the anterior portion of the toad, probably a result of the mild venom utilized by the snake in securing prey. Scott (1962:54) reported specimens feeding on the smashed remains of frogs and toads on the highway near Palmillas. A specimen taken from a hole in the buttress roots of a large fig tree regurgitated a *Bufo mazatlanensis*. During the dry season specimens have been collected beneath rocks or surface debris along rivers or near dry ponds.

Distribution in Sinaloa.—Occurs throughout the state from Mazatlán southward. See Fig. 70.

Specimens examined.—3 mi. NE Concordia (CAS 91920); 3.7 mi. NE Concordia (CSCLB 1889-90); 4.9 mi. NE Concordia (LACM 6912); between Escuinapa and Palmillas (on hwy. 15) (LACM 6919-20, 7243); 17 mi. S Escuinapa (JFC 62:55); Matatán, 170 m. (* KU 73543); 15 mi. S Mazatlán, Río Presidio (SU 18260); 5.7 mi. S Rancho Huanacastle (LACM 6917); Rosario, 150 m. (* KU 73542); 7 mi. SE Rosario (LACM 6914); 7.2 mi. NW Rosario (LACM 6915); Santa Lucía (CSCLB 1888); 5.1 mi. N Sinaloa-Nayarit border (LACM 6918); Teacapán (LACM 6921); 2.5 mi. E Teacapán (LACM 6923); 2 mi. SE Teacapán (LACM 6922); 8.4 mi. NE Villa Unión (LACM 6913).

Literature records.—Chele, 300 ft. (Duellman, 1958a:57); Mazatlán (Smith, 1943a:440; Duellman, 1958a:57); Presidio (Duellman, 1958a:57); 1 mi. N Presidio; 10 mi. S Presidio (Taylor, 1938:526); Rosario (Smith, 1943a:440; Duellman, 1958a:57).

Additional records.—Concordia (UMMZ 102484-85); 11 mi. NE Concordia (SM 10936-40); 12 mi. NE Concordia (SM 11022); 18.9 mi. SE Escuinapa (FAS 14848); 36.9 mi. S Escuinapa (FAS 14764); 4 mi. E Villa Unión (UF 16827); 24.8 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23853-54).

Leptodeira punctata (Peters)

Crotaphopeltis punctata Peters, Monatsber. Akad. Wiss. Berlin, for 1866:93, 1867 [type locality, South Africa (by error)].

Leptodeira pacifica Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:310, 1869 (type locality, Mazatlán, Sinaloa).

Leptodeira punctata: Boulenger, Zoologist, ser. 3, 11:178, 1887.

Remarks.—Ten specimens of *Leptodeira punctata*, which include two males, seven females and one specimen of undetermined sex, have ventrals, 152-159 (156.5); dorsal scale rows, 20-19-14 (1), 19-19-15 (8), 18-19-15 (1); supralabials, 7-7 (10); infralabials, 9-9 (8), 10-10 (1), 10-9 (1); preoculars, 2-2 (9), 2-1 (1); postoculars, 2-2 (10); temporals, 1-2/1-2 (9), 1-1-2/1-1-2 (1); lower preoculars usually very small. One male has 69 subcaudals and six females have 51-64 (56.7) subcaudals (excluding KU 73546-47). The dorsal spots are separate and distinct in seven of the specimens. The dorsal pairs of spots are fused together over most of the body in one specimen, over the anterior half of the body in another specimen, and over the posterior half in the remaining snake. A specimen collected near Guasave (LACM 6939) exhibits an aberrant color pattern. The black nuchal blotches and about six anterior dorsal blotches are all that remain of the normal dorsal pattern. The remainder of the dorsum is uniform yellow brown.

Although *Leptodeira punctata* was once considered rare (Taylor, 1938:527), we found it to be the most common snake encountered during the course of field work. Most specimens were taken at night on the road, but some were found under rocks, beneath an oyster shell, and under a stove pipe. The majority were taken from late June through September but a few were collected in December, February, and April. A large female caught on July 20 laid six eggs on July 29. Another female taken on the same night laid seven eggs on August 7 (Scott, 1962:56).

A more complete treatment of the species, including sexual dimorphism and color in life, is in a monograph of the genus (Duellman, 1958a:94-95).

Distribution in Sinaloa.—Throughout the lowlands. See Fig. 71.

Specimens examined.—9.8 mi. NW Acaponeta [Nayarit] (LACM 6942); Concepción; near Concepción (JMS osteo. coll.); about 10 km. SW Concordia (* KU 73547); Coyotitán (JFC 62:4); N edge Culiacán (CSCLB 1891); 27 km. N Culiacán (* KU 73550); 26.7 mi. N Culiacán (LACM 6936); 85 mi. N Culiacán (LACM 6935); 40.3 mi. S Culiacán (LACM 6940); 41.4 mi. S Culiacán (LACM 6941); 74 km. S (on hwy. 15) Culiacán (* KU 73551); 71.3 mi. SE Culiacán (UAZ 16289); 3.6 mi. E El Guaybo (UAZ 9374); between Escuinapa and Palmillas, hwy. 15 (LACM 6962-65); 0.5 mi. S Escuinapa (CSCLB 1905); 18.3 mi. S Escuinapa (CSCLB 1896); 19 mi. S Escuinapa (CSCLB 1897); 28.4 mi. S Escuinapa (CSCLB 1898); 30.2 mi. S Escuinapa (CSCLB 1895); 31.3 mi. S Escuinapa (CSCLB 1894); 33.4 mi. S Escuinapa (CSCLB 1900); 8.6 mi. S Espinal (CSCLB 1903); 2.9 mi. S Guamúchil (LACM 6945); La Cruz (LACM 6931); 2 mi. NE La Cruz turnoff, hwy. 15 (LACM 6928); 4.7 mi. NE La Cruz turnoff, hwy. 15 (LACM 6929); 5.2 mi. NE La Cruz turnoff, hwy. 15 (LACM 6926); 8.1 mi. NE La Cruz turnoff, hwy. 15 (LACM 6927); 39 mi. S Los Mochis turnoff, hwy. 15 (LACM 6939); Mazatlán (* KU 63424; CAS 89691-93; LACM 6925, 6951-55, 6957); N Mazatlán (CSCLB 1892-93; LACM 6944); 2 mi. N Mazatlán (UAZ 16290);

3.3 mi. N Mazatlán (UAZ 16291); 3.6 mi. N Mazatlán (UAZ 16292); 4.2 mi. N Mazatlán (LACM 6932); 5 mi. N Mazatlán (CSCLB 2963); 10-20 mi. N Mazatlán (JFC 62:145); 20 mi. N Mazatlán (LACM 6943); 20.4 mi. N Mazatlán (CSCLB 1901); 21 mi. N Mazatlán (LACM 6930); 45.3 mi. N Mazatlán (JMS osteo. coll.); 74 km. N (hwy. 15) Mazatlán (* KU 73548); 98 km. N (hwy. 15) Mazatlán (* KU 73549); 111 mi. N Mazatlán (LACM 6934); 7 mi. SE Mazatlán (LACM 6924); 1 mi. NW Mazatlán (LACM 6956); 2.5 mi. N, 0.5 mi. W Mazatlán (LACM 2563); 12.6 mi. SE Mazatlán (UAZ 16293); 1 mi. N Palmillas (LACM 25917); 1 mi. W hwy. 15 along Río Piaxtla (CSCLB 2962, 2964-65); 6 mi. SE Rancho Huanacastle (LACM 7326); between Rosario and [Sinaloa]-Nayarit border (LACM 8656); 2.7 mi. S Rosario (JMS osteo. coll.); 3.8 mi. NW Rosario (LACM 6938); 9.9 mi. W San Blas (CSCLB 1899); 21.3 mi. S San Ignacio turnoff and hwy. 15 (JMS osteo. coll.); Teacapan (LACM 6958-61, 7242); 15 mi. S Terreros (LACM 6937); Villa Unión (* KU 73545-46); 2.8 mi. N Villa Unión (CSCLB 1902, 1904); 3.9 km. N (on hwy. 15) Villa Unión (* KU 78943); 22.5 mi. SE Villa Unión (LACM 6933); 6 km. NE (on hwy. 15) Villa Unión (* KU 75623).

Literature Records.—6 mi. N Caitime; 10.9 mi. S Caitime (Duellman, 1958a:95); El Dorado (Fugler and Dixon, 1961:14); Mazatlán (Smith, 1943a:441; Smith and Taylor, 1945:89; Duellman, 1958a:95; Fugler and Dixon, 1961:15); 1 mi. E Mazatlán (Taylor, 1938:527 and 1939a:319); 2 mi. E Mazatlán (Duellman, 1958a:95); 3 mi. E Mazatlán, 50 ft. (Davis and Dixon, 1957a:25; Duellman, 1958a:95); 2-4 mi. NNW Mazatlán (Duellman, 1957b:239; 1958a:95); 5 mi. NNW Mazatlán (Duellman, 1958a:95); 6 mi. NNW Mazatlán, 10 ft. (Davis and Dixon, 1957a:25; Duellman, 1958a:95); 19 mi. NNW Mazatlán (Duellman, 1957b:239; 1958a:95); Presidio (Boulenger, 1896:91; Smith and Taylor, 1945:89; Duellman, 1958a:95).

Additional records.—6.3 mi. N Caitime (FAS 8505); 0.2 mi. N Cañas, Río (SU 23933); 2.8 mi. N Cañas, Río (SU 23943); 3.5 mi. N Cañas, Río (SU 23934); 4-8 mi. N Culiacán (FAS 11360); 60-65 mi. N Culiacán (FAS 12924); 56.5 mi. S Culiacán (FAS 15014); 68.5 mi. S Culiacán (FAS 15013); 0.8 mi. N Culiacán, Río (SU 23881); 7.5 mi. N Culiacán, Río (SU 23879); 7.6 mi. N Culiacán (UMMZ 120232); 26.7 mi. N Culiacán, Río (SU 23878); 27.5 mi. N Culiacán, Río (SU 23877); 28.0 mi. N Culiacán, Río (SU 23876); 42.6 mi. S Culiacán (UF 12811); 52.3 mi. S Culiacán (UF 12810); 55.2 mi. S Culiacán (UF 12809); 0.8 mi. W hwy. 15 on Culiacánquito road (SU 23880); 1.6 mi. W hwy. 15 on Culiacánquito road (SU 23882); 3.8 mi. W hwy. 15 on Culiacánquito road (SU 23883); 9.3 mi. W hwy. 15 on Culiacánquito road (SU 23884); 10.4 mi. W hwy. 15 on Culiacánquito road (SU 23885); El Dorado (AMNH 90711-19); 30.7 mi. N El Dorado (SU 23900); 31.1 mi. N El Dorado (SU 23899); 31.7 mi. N El Dorado (SU 23897-98); 12.5 mi. N Escuinapa (SU 23927); 2.1 mi. S Escuinapa (SU 23928); 2.6-7.6 mi. S Escuinapa (FAS 13305); 5.6 mi. S Escuinapa (SU 23929); 13.4 mi. S Escuinapa (SU 23930); 18.2 mi. S Escuinapa (SU 23931-32); 1 mi. N La Cruz road on hwy. 15 (SU 23913); 2.5 mi. N La Cruz road on hwy. 15 (SU 23911); 2.7 mi. N La Cruz road on hwy. 15 (SU 23910); 9.5 mi. N La Cruz road on hwy 15 (SU 23912); 12.4 mi. N La Cruz road on hwy. 15 (SU 23909); 4.2 mi. E La Cruz (SU 23915); 4.4 mi. E La Cruz (SU 23914); 9.6 mi. E La Cruz (SU 23916); Mazatlán (USNM 6836, 151782); N Mazatlán (MCZ 61425; SDSNH 52899-902; SU 23917); 1.1 mi. N Mazatlán (FAS 14825); 3 mi. N Mazatlán (USNM 146458); 4 mi. N Mazatlán (AMNH 19853-54); 5 mi. N Mazatlán (AMNH 86554-56, 87391-93; MCZ 61424); 5.1 mi. N Mazatlán (FAS 14462); 20 mi. N Mazatlán (MCZ 61422-23); 75 mi. S Mazatlán (FAS 1446); 2-4 mi. NW Mazatlán (AMNH 19853; UMMZ 114469, 114471-76, 115383); 5 mi. NW Mazatlán (AMNH 75883); 2-4 mi. NNW Mazatlán, 25 ft. (UMMZ 114471-76, 115383); 3.8 mi. NNW Mazatlán, 50 ft. (UMMZ 114469); 9.3 mi. N Mocorito, Río (SU 23875); 1.8 mi. E Navolato (SU 23887); 3.4 mi. E Navolato (SU 23888, 23890); 6.6 mi. E Navolato (SU 23889); 8.6 mi. E Navolato (SU 23891); 9.0 mi. E Navolato (SU 23892); 9.8 mi. E Navolato (SU 23893); 9.9 mi. E Navolato (SU 23894); 10.3 mi. E Navolato (SU 23895); 10.4 mi. E Navolato (SU 23896); 12.5 mi. E Navolato (SU 23902); 16.1 mi. E Navolato (SU 23903);

1.6 mi. SE Navolato (SU 23886); 11.4 mi. SE Navolato (SU 23901); 0.9 mi. N Presidio, Río (SU 23918); 7.1 mi. N Rosario (SU 23926); 7.5 mi. N Rosario (SU 23925); 4.6 mi. S Rosario (CAS 95753); 7 mi. NW Rosario (SM 10571); 11.7 mi. N San Lorenzo, Río (SU 23904); 4.2 mi. S San Lorenzo, Río (SU 23906); 10.8 mi. S San Lorenzo, Río (SU 23905); 11.1 mi. S San Lorenzo, Río (SU 23907); 13.2 mi. S San Lorenzo, Río (SU 23908); 0.3 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23919); 0.5 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23920); 0.7 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23921); 3.0 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23922); 3.8 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23923); 4.3 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23924).

Leptodeira septentrionalis polysticta Günther

Leptodeira polysticta Günther, *Biologia Centrali-Americana*, Reptilia, p. 172, May, 1895 (type locality, Belice, British Honduras).

Leptodeira septentrionalis polysticta: Duellman, *Bull. Amer. Mus. Nat. Hist.*, 114:72, February 24, 1958.

Remarks.—Two females and one male have 202, 206, 202 ventrals; 96, 83, 109 subcaudals; 21-21-15, 21-24-16, ?-23-15 dorsal scale rows; 3-2, 2-3, 2-2 preoculars; 2-2, 2-2, 2-2 postoculars, 8-8, 8-8, 8-8 supralabials; 10-10 infralabials (LACM 6967 only); 53, 60, 64 dorsal blotches anterior to vent that extend laterally to dorsal scale rows 8, 5-7, 5-6 and are 1½ to 2 scales long; 27, 26, 27 dorsal blotches on tail that are united distally; a single median nape stripe extends posteriorly three to four scales from the parietals.

Duellman (1958a:73) regarded typical *polysticta* as having body blotches that are one to three scales long and that extend laterally to scale rows five to seven. Duellman (1958a:74) recorded the range of this species as extending from Nayarit southward along the Pacific Coast into Middle America. Three specimens were collected at night north of Mazatlán and represent the first records from Sinaloa, extending the known range of the species about 250 kilometers. The specimens are similar in all characters to specimens from the south and seemingly continue north-south clinal variation in numbers of body blotches, ventrals, and midbody scale rows.

Distribution in Sinaloa.—Known only from the southern lowlands. See Fig. 72.

Specimens examined.—29 km. N Mazatlán (* LACM 6966); 45 km. N Mazatlán (* LACM 6967); 55 km. N Mazatlán (* LACM 6968).

Leptodeira splendida ehippiata Smith and Tanner

Leptodeira ehippiata Smith and Tanner, *Copeia*, no. 3:131, September 30, 1944 (type locality, 8.3 miles west-northwest of Alamos, Sonora).

Leptodeira splendida ehippiata: Duellman, *Bull. Amer. Mus. Nat. Hist.*, 114:82, February 24, 1958.

Remarks.—A specimen of this subspecies from Plomosas has been referred to *Leptodeira bressoni* (= *L. s. bressoni*) by Taylor (1939a:

324) and to *L. ephippiata* by Smith and Tanner (1944:131). Duellman (1958a:84) considered the same specimen to be an intergrade between *L. s. ephippiata* in the north and *L. s. bressoni* in the south.

Seven females examined by us have 21-31 (24.7) dorsal body spots that extend to scale row one (4) or two (3); 174-178 (175.7) ventrals; and 76, 80, 83 subcaudals (KU 73552-54, 78945, and CSCLB 2001 not counted). One male has 29 dorsal body spots that extend to the second scale row, 169 ventrals, and an incomplete tail. All of the specimens (8) have 3-3 preoculars; 8-8 (6), 8-9 (2) supralabials, and 10-10 (7), 9-10 (1) infralabials. The nuchal blotch is continuous with the nape stripe in two and is not continuous in the other six specimens; however, the postocular stripe is continuous with the nuchal blotch in four (only on right in one) and is not continuous in four specimens. The dorsal scale rows are 19-21-16 (1), 19-21-17 (1), 21-21-17 (5), and 23-21-17 (1).

One specimen (CSCLB 2001) has a body length of 793 mm. and a total length of 888 mm. (tail incomplete), 280 mm. longer than the longest reported by Duellman (1958a:83). This specimen probably had more dark tail bands (16 on incomplete tail); all specimens have fewer ventrals than reported by Duellman (1958a:82).

The two specimens from Cosalá have 29 and 31 dorsal blotches, which approach the lower limit for *L. s. bressoni* (Duellman, 1958a:84), but they are widely separated geographically from the range of *bressoni*. Other specimens from southern Sinaloa have lower blotch counts.

One specimen was found at night among the exposed roots of a tree overhanging a pool of a small rocky stream in the lowland thorn woodland of northern Sinaloa.

Distribution in Sinaloa.—Probably occurs at moderate to high elevations throughout the state. See Fig. 72.

Specimens examined.—8 km. N Carrizalejo, 460 m. (* KU 77976); about 10 km. SW Concordia (* KU 73554); 6 km. E Cosalá, 460 m. (* KU 73552-53); 38.5 mi. N Mazatlán (* CSCLB 2001); San Ignacio, 210 m. (* KU 73555); 2.4 km. NE (on hwy. 40) Santa Lucía, 1155 m. (* KU 78945); 12.3 km. SW (on hwy. 40) Santa Lucía (* KU 78944).

Literature records.—14 mi. SW El Batel [Durango]; Plomosas (Duellman, 1958a:84); Plomosas (Smith, 1943a:439; Smith and Tanner, 1944:131); Presidio (Boulenger, 1896:94).

Leptophis diplotropis (Günther)

Ahaetulla diplotropis Günther, Ann. Mag. Nat. Hist., ser. 4, 9:25, 1872 (type locality, Tehuantepec, Oaxaca).

Leptophis diplotropis: Günther, Biologia Centrali-Americana, Rept., p. 130, 1894.

Remarks.—Two specimens from the Tres Mariás Islands have 185, 186 ventrals and 160, 160 subcaudals (Boulenger, 1894:111). Smith (1943a:443) referred these specimens to a new subspecies on the basis of the high ventral and subcaudal counts. Specimens of *L. diplotropis* from Sonora have more ventrals than do snakes of this species from Oaxaca. Oliver (1948:210), in a monograph of the genus, believed that the variation in ventral count is clinal and did not recognize the subspecies described by Smith. However, Oliver suggested that when more material became available northern and southern subspecies might be defined.

Nineteen specimens examined by us have one preocular and two postoculars on each side. The supralabials are 8-8 in 18 specimens and 7-8 in one; infralabials are 10-10 in 14, 11-10 in one, and 10-9 in two specimens (excluding KU 29507, 78948); temporals are 1 + 2/1 + 2 in 12, 1 + 1/1 + 2 in two, 1 + 1 + 2/1 + 1 + 2 in one, 1 + 1/1 + 1 in one, 1 + 2/1 + 1 + 2 in one, and 1 + 2/1/1 + 2/1 in one specimen (excluding KU 78948). The dorsal scale rows are 15-15-11 in 14 specimens, 15-14-11 in one, 14-13-11 in one, 14-15-13 in one, 14-15-11 in one, and 15-15-12 in one. Sexual dimorphism is present in the number of ventrals, but not in the number of subcaudals. Seven females have 171-178 (175.4) ventrals and 145, 149, 154 subcaudals (excluding KU 73558, 73565, 80755-56), and 12 males have 163-177 (169.9) ventrals and 144-158 (150.2) subcaudals (excluding KU 73562-63, 73566, 73651, 78948, 91423). These counts are slightly lower than those recorded by Oliver (1948:209) for Sonora. Only three of the specimens examined are from localities north of Mazatlán: two males have 173 and 177 ventrals and one female has 178 ventrals, indicating that ventral scales of snakes from northern Sinaloa are probably more numerous than in specimens from the southern part of the state. Based on our material there is no evidence to warrant recognition of subspecies in northwestern México.

This snake is one of the most abundant species in the southern coastal lowlands, but its arboreal habit and cryptic coloration make it exceedingly inconspicuous. Most specimens were collected in the morning or late afternoon in bushes or trees well above the ground. Scott (1962:69) found a specimen at night loosely coiled in the top of an isolated, sparsely leaved shrub. The snake was sluggish from the cold and covered with dew droplets. Another specimen was taken at night in a tree along a creek in the southern lowlands. This is one of the few snakes known to be active through-

out the year; specimens were collected in every month. *Phyllo-medusa dacnicolor* and *Hyla smithi* have been found in stomachs. These snakes are extremely wary; when captured they will expand their neck vertically, thereby displaying blue skin. The mouth is held wide open and the head moved from side to side. When the snakes bite they imbed their rear fangs in a fast chewing movement. A mild sting, attributed to poison, persists for some time at the location of the bite. A specimen collected on August 1 and two taken August 10 exhibit umbilical scars and are presumably hatchlings.

Distribution in Sinaloa.—Throughout the state below about 2000 meters. See Fig. 73.

Specimens examined.—9.6 km. NE El Fuerte (* KU 77977); 9.4 mi. S Escuinapa (LACM 6977); Isla Palmito del Verde, S end (* KU 73566, 73651); Labrados (CAS 64975); La Cruz (LACM 6970-71); Mazatlán (* KU 63425; LACM 6972, 6980; UAZ 16300); 4 mi. N Mazatlán (LACM 6969); 6.8 mi. N Mazatlán (UAZ 16301); 8 mi. N Mazatlán (LACM 6974); 42 mi. NW Mazatlán (JRM 1101); Plomosas, 760 m. (* KU 73563-65); Rosario, 150 m. (* KU 73559-62; LACM 6975); Rosario, Río (JFC 62:50); 30 mi. N Rosario (JFC 61:203); 4 km. NW Rosario (* KU 29507); San Ignacio (LACM 6973); 3 km. E San Lorenzo, 90 m. (* KU 91423); 2.2 km. NE Santa Lucía, 1155 m. (* KU 78946); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78947-48); 10.6 mi. E Santa Lucía (JFC 63:151); 10 km. S, 38 km. E Sinaloa, 240 m. (* KU 73558); Teacapán (LACM 6981-85, 7233-34); Terreros (LACM 6978-79); 8 km. N Villa Unión, 140 m. (* KU 80755-56).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); El Dorado (Fugler and Dixon, 1961:15); Mazatlán (Van Denburgh, 1898:464); Presidio (Boulenger, 1894:111).

Additional records.—Costa Rica (UIMNH 34922); 62 mi. SE Culiacán (UMMZ 118785); El Dorado (AMNH 90720-27; UIMNH 46979); 11 mi. S Escuinapa (CAS 95804); 21 mi. S Escuinapa (CAS 95803); 36.3 mi. S Escuinapa (CAS 95805); N Mazatlán (SU 23945); 9 mi. N Mazatlán (MVZ 59296).

Masticophis bilineatus Jan

Masticophis bilineatus Jan, Elenco sistematico degli Ofidi . . . p. 65, 1863 (type locality, Western México [?]).

Remarks.—Eight specimens have 187-201 (193.3) ventrals; 127-134 (130.8) subcaudals (excluding KU 73569, 80757); 2-2 preoculars (excluding KU 78949); 2-2 postoculars (excluding KU 78949); and 8-8 supralabials. There are 9-9 infralabials in four specimens, 10-9 in one, 9-10 in one, and 10-11 in another (excluding KU 78949). Dorsal scale counts are 20-17-13 in three, 19-17-13 in two, 20-18-13 in one, and ?-17-13 in another (excluding KU 78949).

The dorsolateral light stripe is separated from the supralabials by 8-19 scales, the sublateral dark stripe is fused anteriorly and includes the tips of the ventrals, and the chin and throat are spotted with black in all specimens examined by us. Our specimens

are similar to the race of *bilineatus* purported to be restricted to the Ajo Mountains, Arizona (Hensley, 1950:344). The subspecies of *M. bilineatus* presently are being reviewed.

Although most specimens were collected during the day, there are indications that the species may be partially nocturnal in habit. A specimen was found alive at 2220 hours on the road south of Acaponeta, Nayarit, with a large *Drymarchon*. A second individual (LACM 6989) was found dead on the road at midnight on August 3. This snake was active between 2315 hours and midnight, for the same stretch of highway was carefully searched at about 2315 hours. Several other large colubrid snakes were seen on the highway at night, but due to their speed they eluded capture. Judging from their size the snakes might well have been *Masticophis bilineatus*. Certain ecological factors, such as competition from other large diurnal predatory snakes, may explain the apparent nocturnal activity of this species in Sinaloa.

Distribution in Sinaloa.—Lowlands and foothills below about 550 meters throughout the state. See Fig. 74.

Specimens examined.—6.5 km. S Casa Blanca, 520 m. (* KU 83406); 1.9 km. NE Chupaderos, 350 m. (* KU 78949); 0.2 mi. W Concordia (LACM 6992); 16 km. W Concordia (* UMMZ 102483); 15.8 mi. N Culiacán (CSCLB 1946); 5.9 mi. S Culiacán (UAZ 16302); 17 mi. NW Escuinapa on hwy. 15 (TNHC 25475); Isla Palmito del Verde, middle (* KU 73569-70); 4 mi. E. La Cruz (LACM 6987); 16 km. NNW Los Mochis (* KU 37599); Mazatlán (JRM 1095); 26.8 mi. N Mazatlán (CSCLB 1948); 31 mi. N Mazatlán (LACM 6988); Rosario, 150 m. (* KU 73568); 3.7 mi. NW Rosario (UAZ 16303); San Ignacio (LACM 6986); 5 mi. N Sinaloa-Nayarit border (LACM 6989); Terreros (LACM 6993); 8 km. N Villa Unión, 140 m. (* KU 80757); 34 mi. E Villa Unión (CSCLB 2231).

Literature records.—Mármol (Lewis and Johnson, 1956:280); Mazatlán (Van Denburgh, 1898:463); 2 mi. E Mazatlán (Taylor, 1938:523); Presidio (Boulenger, 1893:391; Günther, 1894:121); 3.6 mi. NW Rosario (Fouquette and Rossman, 1963:195).

Additional records.—Camino Real de Piaxtla (AMNH 69680); 15.6 mi. N Culiacán (FAS 8508); 15.9 mi. N Culiacán (FAS 11349); 37.5 mi. N Culiacán (FAS 9078); Elota (FAS 11479); 12 mi. N Escuinapa (UNIMNH 41593); 30 mi. S Escuinapa (FAS 11356); 1.1 mi. N Mazatlán (FAS 15906); 29 mi. N Mazatlán (FAS 15865); 52.4 mi. N Mazatlán (FAS 11369); 9 mi. NW Piaxtla (SM 11125); 6.2 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23955); 10.6 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23954); 5.8 mi. NW Villa Unión (SU 24114).

Masticophis flagellum piceus (Cope)

Bascanium piceum Cope, Proc. U. S. Nat. Mus., 14:625, 1892 (type locality, Camp Grant, Graham county, Arizona).

Masticophis flagellum piceum: Smith, Jour. Washington Acad. Sci., 31:397, September 15, 1941.

Remarks.—Ortenburger (1928:112) reported the red color phase of *Masticophis flagellum piceus* from Sinaloa under the name *M. f.*

frenatus. The black color phase has not been reported from Sinaloa; however, several literature records do not state the color phase represented. Both color phases have been reported from Sonora by Klauber (1942:88-89). The taxonomic significance of these color phases has been clarified by Klauber (1942), who denied them separate taxonomic status.

An adult female has 198 ventrals, 9-8 supralabials, a horizontal cream colored line through the loreal; the tail is incomplete. The anterior body bands and light-edged head scales are as described by Smith (1941b:397). A male with the juvenile color pattern has 196 ventrals, 99 subcaudals, 8-8 supralabials, 10-10 infralabials, horizontal light line through the loreal, distinct anterior body bands, and light-edged head scales. A larger male (TCWC 21905) has 192 ventrals, incomplete tail, 8-8 supralabials, 10-10 infralabials, anterior one-half of loreal with a white dash, and no distinct body bands; the chin and throat are white, with brown spots forming two rows on the throat.

Although the Sinaloan specimens are not typical of *piceus* in their coloration, they are similar to specimens from southern Sonora discussed by Bogert and Oliver (1945:363) and mentioned by Zweifel and Norris (1955:242).

Masticophis flagellum occurs in sympatry with *Masticophis bilineatus* and *Masticophis striolatus* at Terreros.

Distribution in Sinaloa.—Lowland thorn woodland of the northern half of the state. See Fig. 61.

Specimens examined.—28 mi. N Culiacán (CSCLB 1974); 51.5 mi. N Culiacán (LACM 6995); 16 km. NW Guamúchil 15 m. (* KU 67688); hwy. 15, 3 mi. E Los Mochis (* TCWC 21905); 22.7 mi. SE Los Mochis (UAZ 16295); Terreros (LACM 6996); 13 km. NNE Vaca, 390 m. (* KU 80758).

Literature records.—Ahome (Bogert and Oliver, 1945:403); Altata (Ortenburger, 1928:120; Smith, 1941b:397; Smith, 1943a:447); Costa Rica (Smith and Van Gelder, 1955:146).

Additional records.—7.6 mi. N Culiacán (UMMZ 120233); 26.2 mi. N Culiacán (FAS 11359); El Dorado (AMNH 90728-33); 9.5 mi. N Guamúchil (AMNH 86838); 13.4 mi. S Guamúchil (SU 23964); 8.3 mi. S Los Mochis (FAS 10984); 12.6 mi. S Terreros (FAS 16808).

Masticophis striolatus (Mertens)

Coluber striolatus Mertens, Die Insel-Reptilien, ihre Austretung, Variation und Artbildung 32:190, 1934 (based on a specimen from México).

Masticophis flagellum striolatus: Smith, Jour. Washington Acad. Sci., 31:393, September 15, 1941.

Masticophis striolatus striolatus: Zweifel and Norris, Amer. Midland Nat., 54:242, July, 1955.

Remarks.—The name of this species has long been problematical. According to article 59(c) (International Code Zool. Nomencl., 1964), if a junior secondary homonym was rejected before 1961 it is always a homonym and is unavailable (according to the interpretation by Curtis W. Sabrosky in personal communication to E. Raymond Hall, June 14, 1965). Mertens (1934:190) proposed *Coluber striolatus* as a replacement name for *Bascanion lineatus* (Bocourt, 1890:700) which is a secondary homonym of *Coluber lineatus* Linnaeus, 1758 (= *Lygophis lineatus*). *Coluber lineatus* Linnaeus was placed in the genus *Lygophis* Fitzinger, 1843, by Dunn (1944:489) and has remained there to the present. Some workers, apparently, did not choose to suppress secondary homonyms, for example: the name *lineatus* has been used as *Masticophis flagellum lineatus* by Smith and Taylor (1950a:343) and *M. lineatus lineatus* by Fugler and Dixon (1961:15). Although the name *striolatus* has been used as a subspecific name in several combinations—*Masticophis flagellum striolatus* by Smith (1941b:393), *M. taeniatus striolatus* by Inger and Clark (1943:143), *Coluber striolatus striolatus* by Bogert and Oliver (1945:362), and *Masticophis striolatus striolatus* by Zweifel and Norris (1955:242)—according to article 59(c) (International Code Zool. Nomencl., 1964), the correct name for this species is *Masticophis striolatus* (Mertens, 1934).

Five males have 179-184 (182.0) ventrals and 13 or 14 preanal dorsal scales, whereas seven females have 178-189 (183.7) ventrals and 13-16 (14.9) preanal dorsal scales; the sex of two skins is not known. Both sexes combined have the following characteristics: 18 (1), 19 (8), 20 (2), and 21 (1) dorsal scales around the neck (excluding KU 73574 and UNM 10193); 17 dorsal scales at midbody; 8-8 (13) and 8-9 (1) supralabials; 10-10 (3), 11-10 (3), 10-11 (2), and 11-11 (4) infralabials (excluding KU 63736 and UNM 10193); 2-2 preoculars; 2-2 postoculars; temporals varying from 8 + 9 to 11 + 13; supralabials four and five entering eye. The chin and throat are immaculate white or creamy white in nine and sparsely spotted in four; all specimens have the dorsal scales tipped with black; only one specimen (KU 75627) has the anterior half of the loreal white, the others lack a white loreal stripe; on all specimens the faint dark stripes on the posterior part of the body are absent from scale rows one and three.

Recently hatched specimens were collected on July 9 and July 24. These specimens have about 18 light neck bands that gradually fade into the uniform body color. There is little or no indication of

the black spots on the tips of the dorsal scales that are characteristic of the adults.

Morphological variation in this species has been reported by Ortenburger (1928:137) and by Smith (1943a:447-48). Zweifel and Norris demonstrated (1955:242) that the head length/head width ratios of *Masticophis flagellum* and *M. striolatus* are different. The sympatric distributions of *M. flagellum* and *M. striolatus* were reported by Bogert and Oliver (1945:364).

This large diurnal snake is common in open areas, near cultivated regions, and around heavily grazed grassland interspersed with forest. This species is primarily terrestrial but, on occasion, has been seen three to four meters above ground in dense vegetation.

Distribution in Sinaloa.—*Masticophis striolatus* has been reported from various localities throughout the lowland thorn woodland at elevations up to 600 meters in the northern part of the state, and also in tropical deciduous forest up to about 2000 meters in southern Sinaloa. See Fig. 75.

Specimens examined.—Ahome (LACM 8647-49); 16 km. NNE Choix, 520 m. (* KU 73572); 1 km. S Concepción, 75 m. (* KU 63736); 17.3 mi. N Culiacán (JFC 63:148); 30 mi. N Culiacán (CSCLB 1957); 22 mi. S Culiacán (LACM 25921); Guamúchil, 45 m. (* KU 73571); 5 mi. S Guamúchil (* UNM 10193); Isla Palmito del Verde, middle (* KU 73576-78); La Cruz (LACM 7003-04); 2.8 mi. N Los Mochis junc. (UAZ 9370); Mazatlán (LACM 7005-06); N edge Mazatlán (CSCLB 1950); N Mazatlán (JFC 62:60); 13 mi. N Mazatlán (UAZ 16304); 13.8 mi. N Mazatlán (UAZ 16305); 5 mi. NW Mazatlán (JRM 1100); Plomosas, 760 m. (* KU 73574-75); Rosario, 150 m. (* KU 73573); 23.8 mi. SE Rosario (UAZ 16306); 13.9 mi. W San Miguel (UAZ 9371); Santa Lucía, 1100 m. (* KU 75627); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78961); Teacapán (LACM 7009); 2 mi. N Teacapán (LACM 7240); 2 mi. NE Teacapán (LACM 7008); 2.5 mi. E Teacapán (LACM 7010); 10 km. NNW Teacapán (* KU 91425-26); Terreros (LACM 7007).

Literature records.—El Dorado (Fugler and Dixon, 1961:15); Presidio (Boulenger, 1893:388); 1 mi. N Presidio (Taylor, 1938:524); “. . . on the highway near the Río San Lorenzo” (Lewis and Johnson, 1956:280).

Additional records.—14 km. E Concordia, by rd. (UAZ 16307); El Dorado (AMNH 90734-38); 30 mi. N El Dorado (SU 24112-13); 22.4 mi. S El Fuerte (UIMNH 39199); 7 mi. NNW Escuinapa (AMNH 75886); 5.2 mi. E La Cruz (SU 23962); 6.6 mi. N Los Mochis turnoff (SU 23961); 22.2 mi. N Mazatlán (SU 23963); 2 mi. E Mazatlán (FMNH 117847); 21 mi. N Pericos (UIMNH 39200); Presidio (FMNH 117832, 117846, 17846 [?]); Rosario (UIMNH 62815); 8 mi. NNW Rosario (UMMZ 112763).

Natrix valida valida (Kennicott)

Regina valida Kennicott, Proc. Acad. Nat. Sci. Philadelphia, 12:334, 1860
(type locality, Durango).

Natrix valida valida: Cope, Proc. U. S. Nat. Mus., 14:670, 1891.

Remarks.—The range and mean for four males and five females from southern Sinaloa are, respectively, 140-148 (143.8); 139-145 (143.0) ventrals and 77-83 (79.6) (excluding KU 63738); 67-74

(71.2) subcaudals. All have eight supralabials on each side and 10 infralabials on each side (one has 11 on the left). The dorsal scale counts are 19-17-16, 19-18-15, 19-19-15, 19-19-16, 19-19-17, 20-17-15, 20-18-17, 20-19-15, and 21-17-17. This species will be reviewed in a report on Mexican snakes of the genus *Natrix* by Roger Conant (personal communication).

Natrix valida is a nocturnal species restricted to rivers and other permanent water in the northern portion of the state, but in southern Sinaloa, because of the overall increase of available moisture, the snake is more widespread. Individuals were taken in a narrow channel of an estuary near Teacapán (Scott, 1962:77). A female gave birth to twenty young on July 13.

Distribution in Sinaloa.—Coastal lowlands from sea level to approximately 250 meters elevation. See Fig. 76.

Specimens examined.—1.5 km. SE Camino Real (* KU 63737-38); 8 mi. N Concordia (LACM 7129); 2.1 mi. E Concordia (CSCLB 2201); 11.8 mi. N Culiacán (LACM 7131); 80 mi. N Culiacán (LACM 7122); 7.8 mi. N El Dorado (SU 24010, 24099-108); 13.5 mi. N El Dorado (SU 23990-24009); 1 mi. S Escuinapa (LACM 7148-49); 31.7 mi. S Escuinapa (CSCLB 2200); 33.3 mi. S Escuinapa (CSCLB 2199); 1 mi. NW Escuinapa (LACM 7130); La Concha (LACM 7132); Mazatlán (* KU 63427); CAS 89708; CSCLB 2202, 2204-26; JMS osteo. coll.; LACM 7125, 7144-46); 2 km. N Mazatlán (LACM 8657); 5 mi. N Mazatlán (CSCLB 2961); 19.9 mi. N Mazatlán (LACM 7123); 12.3 mi. E Navolato (SU 23966-89); Rosario, 150 m. (* KU 73579-83); San Ignacio (LACM 7126-28; JMS osteo. coll.); Teacapán (LACM 7147, 7150); 1 mi. E Teacapán (LACM 7151-66); Villia Unión, 16 m. (* KU 78911; CSCLB 2203; LACM 7140-43); 1.4 mi. NW Villa Unión (LACM 7124).

Literature records.—Culiacán (Conant, 1946:259); 18.5 mi. E Culiacán (Duellman, 1957b:240); El Dorado (Fugler and Dixon, 1961:20); about 10 mi. NE Concordia, Río Pánuco (Duellman, 1957b:240); Mazatlán (Conant, 1946:259); near Mazatlán (Martín del Campo, 1941:761); N Mazatlán (Conant, 1946:259); 1 mi. NNW Mazatlán, 25 ft. (Duellman, 1957b:240); Presidio (Boulenger, 1893:238; Taylor, 1938:525); 10 mi. S Presidio (Conant, 1946:259); 0.5 mi. N Villa Unión, nr. Río Presidio (Dixon and Webb, 1965:140).

Additional records.—Baluarte, Río, 3 mi. upstream from hwy. 15 (SU 24001-02); Camino Real de Piaxtla (AMNH 69682-83); 3.4 mi. N Cañas, Río (SU 24005); 5.2 mi. N Cañas, Río (SU 24004); Chupaderos (RGW 2922); 0.4 mi. W Costa Rica (SU 23983); 2.2 mi. W Costa Rica (SU 23982); Culiacán (AMNH 75190, 80083; UIMNH 46973); 11 mi. NW Culiacán (AMNH 88885); 7.8 mi. N El Dorado (SU 24010, 24098-108); 10 mi. N El Dorado (SM 11654-55); 10.2 mi. N El Dorado (SU 23994); 11.1 mi. N El Dorado (SU 23993); 12.7 mi. N El Dorado (SU 23992); 13.0 mi. N El Dorado (SU 23991); 13.5 mi. N El Dorado (SU 23989-90); 14.9 mi. N El Dorado (SU 23988); 21.0 mi. N El Dorado (SU 23987); 21.4 mi. N El Dorado (SU 23985-86); 21.5 mi. N El Dorado (SU 23984); 21.7 mi. N El Dorado (SU 23981); 21.8 mi. N El Dorado (SU 23980); 28.3 mi. N El Dorado (SU 23979); 28.7 mi. N El Dorado (SU 23978); 29.9 mi. N El Dorado (SU 23977); 31.1 mi. N El Dorado (SU 23976); 32.5 mi. N El Dorado (SU 23975); 32.7 mi. N El Dorado (SU 23974); 32.8 mi. N El Dorado (SU 23973); 33.1 mi. N El Dorado (SU 23972); within 7 km. El Dorado (AMNH 90739-50); Escuinapa, 100 ft. (TCWC 20811); 14 mi. S Escuinapa (CAS 95801); 14.4 mi. S Escuinapa (CAS 95800); 15.5 mi. S Escuinapa (SU 24003); 21 mi. SE Escuinapa (SM 11661); Guasave, Río

Sinaloa (AMNH 84080-83); 2 mi. N Ixpalino, Río Piaxtla (AMNH 88886-92); N Los Mochis, Río Fuerte (AMNH 84078-79); 21 mi. S Los Mochis (USNM 151783); Mazatlán (AMNH 19390; SDSNH 41248); near Mazatlán (FMNH 115619; UIMNH 18658); N edge Mazatlán (AMNH 85354; UF 16545); N Mazatlán (SU 23995); 0.4 mi. N Mazatlán (AMNH 85355); 1 mi. N Mazatlán (AMNH 87578; SM 11651-53); 6.6 mi. N Mazatlán (FAS 14078); 16 mi. N Mazatlán (AMNH 85356); 22.5 mi. N Mazatlán (AMNH 85357); 15 mi. ESE Mazatlán, near Presidio (FMNH 115620); 12.3 mi. E Navolato (SU 23966); 14.2 mi. E Navolato (SU 23967); 4.8 mi. SE Navolato (SU 23968); 10.2-10.8 mi. SE Navolato (SU 23969-71); 9 mi. NW Piaxtla (SM 11656-60); near Presidio (UIMNH 18657-58); near Quelite, Río Quelite (AMNH 87573-77); Rosario (UIMNH 6391); 0.5 mi. E Rosario, Río de Baluarte (UU 3788); 7 mi. NW Rosario, 100 ft. (TCWC 12610-16); 11 mi. NW Rosario (SM 11662); 24.8 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 23996-24000).

Oxybelis aeneus auratus (Bell)

Dryinus auratus Bell, Zool. Jour., 2:324-326, pl. 12, 1825 (type locality, "México").

Oxybelis aeneus auratus: Bogert and Oliver, Bull. Amer. Mus. Nat. Hist., 83:381, March 30, 1945.

Remarks.—Fifteen males have 17-17-13 dorsal scales; 179-189 (185.4) ventrals; 169-175 (172.3) subcaudals (only KU 73585-88); and 1 + 2/1 + 2 temporals. Labials 4-6 enter the eye on both sides in 13 males; labials 4-6/5-7 enter the eye in one and 5-6/5-7 enter the eye in another. The supralabials are 8-8 in nine males, 8-9 in two, 9-9 in two, 9-8 in one, and 9-10 in one; the infralabials are 9-9 in 11, 9-8 in one, 10-9 in one, and 10-10 in one (excluding KU 73595). Five females have 17-17-13 dorsal scales, and one has 16-15-13; five have 183-195 (190.4) ventrals (excluding KU 77978); two have 175 and 176 subcaudals (KU 73596, 77978); five have 1 + 2/1 + 2 temporals, and one has 1 + 2/1 + 1 temporals. Labials 4-6/4-6 enter the eye in two, 5-7/4-6 enter the eye in two, 4-6/4-5 in one, and 5-7/5-7 in one. The supralabials are 8-8 in two, 8-7 in one, 9-9 in one, 10-9 in one, and 10-10 in one; the infralabials are 9-9 in four, 8-7 in one, and 9-10 in one. The diameter of the eye is less than the internasal length, and preoculars are 1-1 in all specimens. The ventral counts are noticeably lower than those (195-200) reported from Sonora by Bogert and Oliver (1945:381); since nearly all of the specimens are from southern Sinaloa the differences are probably real.

In Sinaloa this species has a variable dorsal color pattern of gray or grayish brown, usually with some individual scales on the anterior part of the body that have either the lower half or the upper half of the scale black (Bogert and Oliver, 1945:382). The size and number of the anterior black spots is quite variable throughout Sinaloa. The lips and throat are white or creamy white

in color and contrast with a black suborbital stripe that is indistinct above and distinct, sharp-edged below. The suborbital stripe gradually disappears on the neck.

Field observations indicate the species is diurnal, perhaps crepuscular, in activity; it probably feeds on lizards and frogs encountered in the arboreal habitat. Two females preserved on August 16 contained four and six large oviducal eggs (Scott, 1962:64).

Distribution in Sinaloa.—Throughout the lowlands, and in the foothills to about 550 meters. See Fig. 77.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 73584); 4.4 mi. SW Concordia (CSCLB 2162); 47.4 mi. N Culiacán (LACM 7014); 6 km. NE El Fuerte, 150 m. (* KU 77978); Isla Palmito del Verde, middle (* KU 73586-600); Labrados (CAS 64981); La Cruz (LACM 7012-13); 10.2 mi. N Mazatlán (LACM 7015); 44 mi. N Mazatlán (LACM 7011); Rosario, 150 m. (* KU 73585); Teacapán (LACM 7017-20, 7235-36); 2 mi. N Teacapán (LACM 7016); 8 km. N Villa Unión, 140 m. (* KU 80759, 83409); 1.5 km. NE Villa Unión (* KU 37593); 20 mi. E Villa Unión (CSCLB 2163).

Literature records.—Costa Rica (Smith and Van Gelder, 1955:145); 10 mi. S Culiacán (Fugler and Dixon, 1961:16); Presidio (Boulenger, 1896:193).

Additional records.—26 mi. N Culiacán (FAS 11373); Escuinapa (AMNH 3887-88, 4308-09); 5 mi. N Mazatlán (MVZ 59298); 9 mi. N Mazatlán (MVZ 59297); 50-55 mi. N Mazatlán (FAS 12920); 58.5 mi. N Mazatlán (UIMNH 41575); 70 mi. N Mazatlán (FAS 16818); 77 mi. N Mazatlán (FAS 14835); 3 mi. S Mazatlán (ASDM 1751); 11.5 mi. S Río Presidio (SU 24011).

Phyllorhynchus browni Stejneger

Phyllorhynchus browni Stejneger, Proc. U. S. Nat. Mus., 13:152, 1890 (type locality, Tucson, Arizona).

Remarks.—Bogert and Oliver (1945:351) described *Phyllorhynchus browni fortitus* from Sonora based on differences in color and size of blotches, relative sizes of the blotches and interspaces, and the shape of the rostral; they suggested that in the south the body blotches are much longer than the interspaces and ventrals are fewer.

Shannon and Humphrey described *P. b. klauberi* from the central Sinaloan lowlands and separated it from *P. b. fortitus* as having "generally greater total pigmentation" (1959a:145), the interspace pigment clumped into irregular macules, a posterior extension of the interorbital black band to form dark parietal spots, dorsal blotches not bordered laterally with darker pigment, longer frontal, and a narrower and less truncate rostral.

Eight males have 148-164 (156.9) ventrals; 27-34 (30.6) subcaudals; 10-18 (12.8) body blotches; 2-4 (2.8) tail blotches; and frontal width/frontal length of 0.76-0.96 (0.84) (excluding KU 73606). These characters for two females are 175, 168; 22, 21; 14, 14; 2, 2; and 0.88, 0.75 respectively. The dorsal scale rows at

midbody are 19 in nine specimens and 20 in one; 19-22 at the neck, and 16, 17 or 19 at the vent. The supralabials are 6-6 in three, 6-5 in one, 6-7 in one, and 7-7 in three (excluding KU 73602, 73604); infralabials are 7-7 in one, 8-8 in two, 8-9 in one, 9-7 in one, 9-9 in one and 10-9 in one (excluding KU 73601-02, 73604). The preoculars are either two or three, postoculars two or three (four in KU 73603), and suboculars 2 to 4. The temporals are numerous (6-12) and highly variable.

Dark pigment in the lateral interspaces is absent, or present as indistinct clumps; all dorsal blotches, except the anterior first or second, have dark edges. The interorbital band barely touches the parietals in a snake from northern Sinaloa (KU 73601); a specimen from near Guamúchil (KU 73607) has a distinct extension of the band to include part of the parietals. Six specimens from south of Guamúchil to about 24 kilometers north of Mazatlán have above one half or more of the parietals included in the interorbital band. One specimen (KU 73602) from 10 kilometers north of Mazatlán has the band barely including the parietals. A specimen from near Piaxtla has a second black band that crosses the parietals posterior to the interorbital band; the interorbital band and parietal band are connected laterally.

The ventral counts of the males, arranged in sequence from south to north, are 160, 163, 164, 158, 148, 156, 155, and 151. The numbers of body blotches for both sexes from south to north are 10, 13, 14, 12, 12, 14, 18, 15, 11, and 11. Four specimens, from localities in northern and southern Sinaloa, have dorsal bands that are more than twice the length of the interspaces and in five specimens the dorsal bands are distinctly less than twice the width of the interspaces.

None of the characteristics used by Shannon and Humphrey to distinguish *P. b. klauberi* (1959a:145) from *P. b. fortitus* is consistent in the Sinaloan specimens at hand. The variation in the number of ventrals, extent of the interorbital band, frontal width/frontal length, and the number of body blotches appear to be clinal for *P. browni* from Sinaloa and therefore casts doubt on the validity of *P. b. klauberi*. We use the binomial rather than attempting to allocate specimens from Sinaloa to either of the subspecies *fortitus* or *klauberi*. *Phyllorhynchus browni* is presently being studied by H. W. Campbell and the second author.

Nearly all specimens were collected at night on the road.

Distribution in Sinaloa.—*Phyllorhynchus browni* has been re-

corded from many localities throughout the Sinaloan lowlands. See Fig. 78.

Specimens examined.—15.4 mi. N Culiacán (CSCLB 1975); 40.2 mi. N Culiacán (LACM 7317); 40.8 mi. N Culiacán (LACM 7318); 44.9 mi. N Culiacán (LACM 7319); 37.2 mi. S Elota, Río (LACM 7310); 24 km. S Guamúchil (* KU 73607); 37 km. S Guamúchil (* KU 73608); 7 mi. S La Cruz turnoff (LACM 7320); 13.3 mi. N Los Mochis (CSCLB 1422); 51 km. N Los Mochis (* KU 73601); 10 km. N Mazatlán (* KU 73602); 12.3 mi. N Mazatlán (LACM 7322); 13.8 mi. N Mazatlán (LACM 7314); 14.2 mi. N Mazatlán (LACM 7316); 15.7 mi. N Mazatlán (LACM 7308); 16 mi. N Mazatlán (UCLA 14499); 17.3 mi. N Mazatlán (UCLA 14500); 17.6 mi. N Mazatlán (LACM 7315); 34 km. N Mazatlán (* KU 73604); 21.9 mi. N Mazatlán (LACM 7311); 22.4 mi. N Mazatlán (CSCLB 1426); 22.9 mi. N Mazatlán (LACM 7312); 40 km. N Mazatlán (* KU 73603); 51 km. N Mazatlán (* KU 86608); 42.5 mi. N Mazatlán (LACM 7309); 53.2 mi. N Mazatlán (CSCLB 1425); 85 km. NNW Mazatlán (* KU 73605); 93 km. NNW Mazatlán (* KU 73606); 1.3 mi. N Piaxtla, Río (CSCLB 1424); 4.3 mi. N Piaxtla, Río (CSCLB 1423); 1 km. E Piaxtla (* KU 37597); 3 mi. S San Ignacio turnoff (LACM 7313); 1.7 mi. N Terreros (LACM 7321); 2.6 mi. N Terreros (LACM 7325); 10.9 mi. N Terreros (LACM 7323); 11.3 mi. N Terreros (LACM 7324).

Literature records.—45.7 mi. S Culiacán; 55-60 mi. N Mazatlán (Shannon and Humphrey, 1959a:145).

Additional records.—El Dorado (AMNH 90792); 4.8 mi. S Elota, Río (SU 24016); 55.8 mi. N Mazatlán (FAS 14707); 12.3 mi. S Mocerito, Río (SU 24015).

Phyllorhynchus decurtatus Cope

Phyllorhynchus decurtatus Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:310, 1869 (type locality, "the upper part of Lower California").

Remarks.—One female from southern Sinaloa has 35 body blotches that are wider than the interspaces, 171 ventrals, and 20 subcaudals. This specimen appears to be closely related to *P. d. norrisi*; however, because of the hiatus between the range of *norrisi* and this specimen, and the large amount of variation in snakes of this species (Smith and Langebartel, 1951:183), a subspecific designation is withheld pending the discovery of more specimens from western México.

Distribution in Sinaloa.—Known only from the southern lowland tropical semiarid forest near Mazatlán. See Fig 78.

Specimen examined.—42 km. N Mazatlán (* KU 73609).

Pituophis melanoleucus affinis Hallowell

Pityophis affinis Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 6:181, 1852 (type locality, Zuni, McKinley county, New Mexico).

Pituophis melanoleucus affinis: Smith and Kennedy, Herpetologica, 7:96, September 13, 1951.

Remarks.—Seven specimens (two females and five males) of *Pituophis melanoleucus affinis* have 217-230 (226.3) ventrals; 52-58

(56.7) subcaudals (excluding KU 73611); 37-50 (42.9) body blotches; 9-15 (11.7) tail blotches (excluding KU 73611); 25-31 dorsal scale rows at the neck (excluding KU 73611); 30-33 scale rows at midbody; and 21-24 scale rows at the vent. The supralabials are 8-8 in five, 9-8 in one, and 9-9 in one; infralabials are 11-11 in one, 11-12 in one, 11-13 in one, 12-11 in one, 12-12 in two, and 13-13 in one; preoculars are 1-1 in four and 2-2 in three; postoculars are 2-2 in four, 3-2 in one, and 3-3 in two; suboculars are 1-0 in one, 1-1 in four, and 2-2 in two; labials 4/4 enter the eye in four, 5/4 in one, and 5/5 in one (excluding KU 73615).

The color pattern is essentially like that described by Stull (1940: 126) and Davis and Dixon (1957a:21). A black stripe along the subcaudal surface, as reported by Zweifel (1954b:147) and Fugler and Dixon (1961:16), is present in three snakes (KU 73613-15). This nocturnal species apparently has not been affected, except perhaps to increase its abundance, by the agricultural development in northern Sinaloa, for several specimens were collected in areas of extensive cultivation.

Distribution in Sinaloa.—Throughout Sinaloa below about 500 meters elevation. See Fig. 79.

Specimens examined.—5 km. SW Concordia (*KU 73611); 32 mi. N Culiacán (CSCLB 1969); 22 mi. S Culiacán (LACM 25929); 34.6 mi. S Culiacán (LACM 7035); 10.4 mi. SW El Fuerte (CSCLB 1968); 10 km. ESE Guasave (*KU 43563); 21 km. N Mazatlán (*KU 73614); 26 km. N Mazatlán (*KU 73613); 17.6 mi. N Mazatlán (LACM 7031); 23.9 mi. N Mazatlán (LACM 7036); 39 km. N Mazatlán (*KU 73612); 27 mi. N Mazatlán (LACM 7033); 45 km. N Mazatlán (*KU 73615); San Ignacio (LACM 7030); 4 mi. S Terreros (LACM 7034); 21.7 mi. S Terreros (LACM 7037); 13 km. NNE Vaca, 400 m. (*KU 83410); 12.1 mi. SE Villa Unión (LACM 7032).

Literature records.—Ahome (Bogert and Oliver, 1945:403); El Dorado (Fugler and Dixon, 1961:16); 10 mi. NW Escuinapa, 150 ft. (Davis and Dixon, 1957a:20); 9 mi. SE Guamúchil (Duellman, 1957b:239); 13 mi. N Mazatlán; 17 mi. N Mazatlán (Zweifel, 1954b:147).

Additional records.—21.5 mi. N Culiacán, Río (SU 24018); 4 mi. NNE El Fuerte (FMNH 71530); 13 mi. N Escuinapa (FAS 15909); 16.1 mi. S Escuinapa (SU 24021); 34.7 mi. N Mazatlán (FAS 15910); 29.6 mi. NNW Mazatlán (SU 24019); 20.7 mi. N Rosario (CAS 95824); 7 mi. N San Blas (AMNH 75890); 15 mi. N Santo, Río, nr. Los Mochis (FAS 12923); 3.3 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 24020).

Pseudoficima frontalis (Cope)

Toluca frontalis Cope, Proc. Acad. Nat. Sci. Philadelphia, 16:167, 1864 (type locality, Colima).

Pseudoficimia frontalis: Günther, Biologia Centrali-Americana, Rept. Batr., p. 96, 1893.

Remarks.—Bogert and Oliver (1945:375) described *P. hiltoni*

TABLE 6.—Comparison of Ten Characteristics of 17 Specimens of *Pseudoeurycea frontalis*, Arranged in the Order of Their Localities from North (Top of Table) to South. (AMNH 63717 is the holotype of *P. hiltoni* Bogert and Oliver, 1945; USNM 31424-25 are the paralectotype and lectotype, respectively, of *P. frontalis*. C = complete; I = incomplete.)

SPECIMEN NUMBER	Sex	Total length	Ventrals	Sub-caudals	Supra-labials	Infra-labials	Total length tail length (per cent)	Width of light dorsal spots at mid-body	Frontal lines		Dorsal blotches	Caudal blotches
									Ant.	Post.		
AMNH 63717.....	♂	700	153	50	7-7	8-8	18.8	3	C	C	44	20
FAS 9108.....	♀	705	152	51	7-7	8-8	18.4	2	C	I	38	17
LACM 7046.....	♂	510	148	45	7-7	7-7	18.8	3	C	I	26	11
CSCLB 1384.....	♂	568	153	44	7-7	8-7	17.8	3	C	I	38	17
AMNH 75753.....	♂	437	.....	46	7-7	7-7	18.8	3	C	C	33	13
LACM 7043.....	♂	566	159	45	7-7	8-8	18.5	2	C	I	33	13
UCLA 14644.....	♂	402	155	40	7-7	8-7	19.9	2	C	I	34	16
KU 73618.....	♂	7-7	8-7	.....	2	C	I	40	.....
KU 73617.....	♀	374	159	45	7-7	8-8	18.2	4	C	C	37	15
LACM 7041.....	♀	343	156	50	7-7	7-7	19.5	3	I	C	44	20
LACM 7045.....	♂	410	156	46	7-7	8-8	18.0	2	C	C	37	13
LACM 7044.....	♂	566	158	50	7-7	8-8	19.4	2	C	I	43	21
LACM 7042.....	♂	366	160	43	7-7	7-7	17.5	4	C	I	38	11
UAZ 16308.....	♂	392	155	47	7-7	7-7	18.6	2	C	C	36	16
LACM 7040.....	♂	354	157	56	7-7	8-8	20.9	2	C	I	35	17
USNM 31424.....	♂	393	154	39	7-7	7-7	16.3	1	C	I	45	18
USNM 31425.....	♂	503	139	43	7-7	6-7	19.3	1	C	I	35	15

from southern Sonora as different from other species of *Pseudoficimia* by having light dorsal spots two or more scales wide, eight infra-labials, and a double line across the frontal region. Campbell and Simmons (1962:196) reduced *hiltoni* to subspecific rank based on one specimen from near Espinal that was apparently intermediate between *frontalis* and *hiltoni*.

Additional specimens from Sinaloa clarify the relationships between the nominal populations. Analyses of ten characters (Table 6) show a complete overlap in all characters throughout the range of the species. These data do not support the subspecific arrangement suggested by Campbell and Simmons (1962:197). We suggest that *Pseudoficimia frontalis hiltoni* be placed in the synonymy of *P. frontalis*, which is monotypic as now understood. The first author currently is evaluating the validity of *P. pulcherrima* and reviewing the generic relationship of *Pseudoficimia*. All specimens were found at night on the highway.

Distribution in Sinaloa.—Occurs throughout the lowland thorn forest and tropical deciduous forest of the state. See Fig. 80.

Specimens examined.—30 mi. SSE Alamos [Sonora] (* FAS 9168); 4 mi. NE Concordia (* LACM 7040); 26 mi. N Culiacán (* CSCLB 1384); 4 mi. S Culiacán (* AMNH 75753); 34.4 mi. N Elota, Río (* LACM 7043); 11.5 mi. N Espinal (* UCLA 14644); 0.8 mi. S Guamúchil (* LACM 7046); Guirocoba [Sonora] (* AMNH 63717, holotype of *P. hiltoni*); 12.8 mi. N Mazatlán (* UAZ 16308); 16 mi. N Mazatlán (* LACM 7042); 17.9 mi. N Mazatlán (* LACM 7044); 18 mi. N Mazatlán (* LACM 7045); 18.3 mi. N Mazatlán (* LACM 7041); 61 km. N Mazatlán (* KU 73617); 125 km. NNW Mazatlán (* KU 73618); Colima [state] (* USNM 31424, paralectotype and 31425, lectotype).

Literature record.—Presidio (Boulenger, 1894:270; Taylor and Smith, 1942:243).

Additional record.—6.8 mi. N Elota, Río (SU 24022).

Rhadinaea hesperia hesperioides Smith

Rhadinaea hesperia hesperioides Smith, Proc. Biol. Soc. Washington, 55:186, December 31, 1942 (type locality, Magdalena, Jalisco).

Remarks.—Three specimens (a male, female, and one of unidentified sex) have 154, 149, 153 ventrals; 110, 122 subcaudals (excluding KU 80870); ♀-17-17, 17-17-17, 18-17-17 dorsal scale rows; 9-8, 8-8, 8-8 supralabials; and 10-10, 10-9 infralabials (excluding KU 80870). The preoculars are 2-2, postoculars 2-2, temporals 1 + 2; labials 4-5 enter the eye on all specimens except the male (KU 80870), which was damaged.

Distribution in Sinaloa.—Tropical deciduous forest of the southern highlands and foothills. See Fig. 81.

Specimens examined.—Santa Lucía (* KU 75629); 19.2 km. (via hwy. 40)

NE Santa Lucía, 1890 m. (* KU 80871); 12.3 km. (via hwy. 40) SW Santa Lucía, 1200 m. (* KU 80870).

Literature record.—Plomosas (Smith, 1942b:186 and 1943a:464; Smith and Taylor, 1945:118).

Rhinocheilus lecontei antonii Dugés

Rhinocheilus antonii Dugés, Proc. Amer. Philos. Soc., 23:290, 1886 (based on a specimen from San Blas, Nayarit).

Rhinocheilus lecontei antonii: Klauber, San Diego Soc. Nat. Hist., 9:314, September 26, 1941.

Remarks.—Six females and seven males have the following characteristics, respectively: 188-199 (194.5), 194-202 (197.1) ventrals; 41-48 (44.7), 46-52 (48.5) subcaudals (KU 91420 excluded). For all specimens: dorsal scale rows, 23-25 at the neck, 23-25 at mid-body, 19-21 at vent (KU 61100, 73624 excluded); supralabials, 8-8 (excluding the right side of KU 73621); infralabials, 9-9 in nine, 9-8 in one, 8-8 in two and one (KU 73621) has 9 on left (right excluded); preoculars, 1-1 in ten, 2-1 in one, 1-2 in one, 2-2 in one; postoculars, 2-2; temporals, 2 + 3 in all except one that has 3 + 3 on left and one that is injured on the right (KU 73621); labials 4-5 enter eye. The coloration agrees with the description of Sonoran specimens by Bogert and Oliver (1945:370).

Rhinocheilus lecontei antonii is a moderate-sized nocturnal species and one of the most common snakes encountered in the state. More than 80 specimens were taken on the roads at night from mid-June through August. This species is one of the first to become active with the onset of the rainy season. Their activity drops off markedly in August in contrast to some species which apparently reach peak activity during late July and August. Individuals were most abundant on nights when the air temperature ranged from 26.4° to about 28.2°C.

Distribution in Sinaloa.—Throughout the lowlands below about 200 meters, but most abundant from the vicinity of Culiacán southward. See Fig. 82.

Specimens examined.—1 mi. N Cerro Prieto (UAZ 9611); 5.6 mi. SW Charay (CSCLB 1928); 1.4 mi. E Concordia (CSCLB 1927); 7.3 mi. S Concordia (CSCLB 1920); 6 km. SW Concordia (* KU 73622); 2.4 mi. W Concordia (JFC 63:161); 4.8 mi. N Coyotitán (LACM 7061); 0.1 mi. S Coyotitán (LACM 7062); 1908 mi. S Coyotitán (LACM 7076); 29 mi. S Coyotitán (LACM 7075); 2.9 mi. N Culiacán (JFC 63:160); 18.4 mi. N Culiacán (JFC 63:159); 66.3 mi. N Culiacán (LACM 7082); 11.7 mi. S Culiacán (LACM 7055); 21.1 mi. S Culiacán (LACM 7056); 22 mi. S Culiacán (CSCLB 1916); 30 mi. S Culiacán (LACM 7083); 35.2 mi. S Culiacán (LACM 7057); 89.6 mi. S Culiacán (LACM 7058); El Dorado (* KU 61100); 6.9 mi. N Escuinapa (CSCLB 1929); 0.2 mi. SE Escuinapa (LACM 7079); 8 km. SE Escuinapa (* KU 73625); 18.5 mi. SE Escuinapa (LACM 7080); 20 mi. S Escuinapa (CSCLB 1919); 5.5 mi. S Espinal (CSCLB 1918); 10 km. W La Concha, 3

m. (* KU 91420); 3.4 mi. N La Cruz road (on hwy. 15) (LACM 7071); 10 mi. E La Cruz (LACM 7072); 10.3 mi. N La Cruz road (on hwy. 15) (LACM 7070); Matatán, 170 m. (* KU 73620-21); 7.3 km. SW Matatán, 155 m. (* KU 78916); 5 mi. N Mazatlán (CSCLB 2960); 5-10 mi. N Mazatlán (LACM 8658-59); 13.2 mi. N Mazatlán (UAZ 4555); 15 mi. N Mazatlán (CSCLB 1915); 15.7 mi. N Mazatlán (LACM 7066); 16.1 mi. N Mazatlán (UAZ 13651); 16.5 mi. N Mazatlán (LACM 7077); 16.6 mi. N Mazatlán (LACM 7081); 19.2 mi. N Mazatlán (CSCLB 1923); 23.1 mi. N Mazatlán (LACM 7078); 32.6 mi. N Mazatlán (LACM 7073); 33 mi. N Mazatlán (LACM 7065); 58 km. N Mazatlán (* KU 73623); 45.2 mi. N Mazatlán (CSCLB 1924); 52.7 mi. N Mazatlán (CSCLB 1926); 72.5 mi. N Mazatlán (CSCLB 1917); 26 km. NW Mazatlán (* KU 86609); 62.3 mi. NW Mazatlán (UAZ 4554); 2.9 mi. S Rancho Huanacastle (LACM 7059); 5.8 mi. S Rancho Huanacastle (LACM 7060); 3.2 mi. N Rosario (CSCLB 1922); San Ignacio (LACM 7074); Teacapán (LACM 7084); 10 km. NW Teacapán (* KU 93498-99); 10 km. NNW Teacapán (* KU 91427); 10.9 mi. S Terreros (LACM 7063); 17.3 mi. S Terreros (LACM 7064); 0.7 mi. N Villa Unión (CSCLB 1925); 10.6 mi. NE Villa Unión (LACM 7067); 19 km. NE Villa Unión (* KU 73624); 1 mi. SE, 2 mi. NE Villa Unión (on hwy. 40) (CSCLB 1921); 0.2 mi. NW Villa Unión (LACM 7069); 2.2 mi. NW Villa Unión (LACM 7068).

Literature records.—Culiacán (Klauber 1941:318; Smith, 1943a:466); El Dorado (Fugler and Dixon, 1961:16); Escuinapa (Klauber, 1941:318); 4 mi. SE Escuinapa, 50 ft. (Davis and Dixon, 1957a:19); Mazatlán (Cope, 1887:82); 15-28 mi. NNW Mazatlán (Duellman, 1957b:240).

Additional records.—1 mi. SE Aguacaliente, 300 ft. (TCWC 12619); 12.0 mi. NW Baluarte, Río (SU 24036); 1.9 mi. S Caitime (FAS 15011); 4.5 mi. S Caitime (FAS 8506); 4.6 mi. S Caitime (FAS 14808); Culiacán (USNM 46370); 3 mi. N Culiacán (UMMZ 118945); 35.7 mi. N Culiacán (FAS 16991); 55-60 mi. N Culiacán (FAS 12781); 62.6 mi. N Culiacán (FAS 14685); 7 mi. S Culiacán, hwy. 15 (AMNH 77524); 47-52 mi. S Culiacán (FAS 14086); 61.8 mi. S Culiacán (FAS 12402); El Dorado (AMNH 90751-52); Escuinapa (AMNH 3764-72); 6.9 mi. N Escuinapa (FAS 14793); 10-15 mi. N Escuinapa (FAS 13287); 3.2 mi. SE Escuinapa (SU 24039); 5.9 mi. SE Escuinapa (SU 24040); 6 mi. SE Escuinapa (SM 10591); 7.4 mi. SE Escuinapa (SU 24041); 22.6 mi. SE Escuinapa (SU 24042); 25.3 mi. SE Escuinapa (SU 24043); 29 mi. SE Escuinapa (SM 10590); 29.7 mi. S Escuinapa (FAS 14464); 22.7 mi. NNW Escuinapa (SU 24037); 34.3 mi. S Espinal (ASDM 1752); 8 mi. N Guamúchil (FAS 16993); 2.9 mi. E La Cruz (SU 24030); 16 mi. N Mazatlán (AMNH 75891); 19 mi. N Mazatlán (MCZ 61426); 28 mi. N Mazatlán (UMMZ 117367); 47.1 mi. N Mazatlán (CAS 95807); 7.9 mi. S Mazatlán (FAS 15010); 23.6 mi. S Mazatlán (FAS 15025); 24 mi. S Mazatlán (FAS 13576); 35-40 mi. S Mazatlán (FAS 13298, 15024); 41.6 mi. S Mazatlán (FAS 14702); 65 mi. S Mazatlán (FAS 16813); 75.5 mi. S Mazatlán (FAS 12407); 90 mi. S Mazatlán (FAS 13283); 17.5 mi. NNW Mazatlán (SU 24033); 30.6 mi. NNW Mazatlán (SU 24032); 6.9 mi. S Mocerito, Río (SU 24027); 11.7 mi. S Mocerito, Río (SU 24028); 16.0 mi. SE Piaxtla, Río (SU 24031); 2.8 mi. ESE Presidio, Río (SU 24034); 7.8 mi. ESE Presidio, Río (SU 24035); 37.8 mi. SE Presidio, Río (SU 24038); 4.4 mi. N San Lorenzo, Río (SU 24029); 10.4 mi. NE Villa Unión (UF 16536); 6.5 mi. SE Villa Unión (AMNH 94806).

Salvadora bairdi Jan

Salvadora bairdi Jan, Iconographie générale des ophidiens, livr. 2, pl. 2, fig. 2, 1860 (type locality, México).

Remarks.—Four males have 190, 185, 184, 174 ventrals; 100, 103, 96, 97 subcaudals; 18-15-13, 17-17-13, 17-17-13, 17-15-13 dorsal scale rows; and 2 + 2/2 + 2, 2 + 3/2 + 3, 2 + 2/2 + 2, 2 + 3/2 + 2

temporals respectively (in order as listed in specimens examined). Each specimen has 8-8 supralabials, 9-9 infralabials, 2-2 preoculars, 2-2 postoculars, supralabials four and five entering the eye, and the posterior pair of chin shields separated medially by a series of small scales.

Smith (1943a:467) reported that the anterior nasal is separated from the second supralabial in all (10) of the specimens (from Guanajuato, Michoacán, Puebla, and Veracruz) that he examined. Davis and Smith (1953:137) found the same condition in three snakes from Morelos. The anterior nasal is in contact with the second supralabial on every specimen from Sinaloa. The contact of the anterior nasal and the second supralabial is reported to be characteristic of *S. grahamiae* by Smith (1939b:233), but is considered to be of little, if any, taxonomic importance by Charles M. Bogert (personal communication).

In the specimens from Sinaloa, the dorsolateral dark stripes terminate on the nape just posterior to the parietal and temporal regions. This characteristic distinguishes *S. bairdi* from *S. lineata*, in which the dorsolateral dark stripes diverge on the neck and pass through the temporal region to the eye. The Sinaloan specimens of *bairdi* also have a dark lateral stripe on the third scale row. The right maxilla of one specimen (KU 78918) has nine teeth anterior to the diastema that separates them from larger teeth at the posterior end of the jaw. In contrast, *S. grahamiae* lacks a dark lateral stripe on the third scale row and usually has ten maxillary teeth anterior to the fangs (Smith and Taylor, 1945:122). However, it is of interest to note that the anterior nasal and the second supralabial are separated in the southern part of the range of *bairdi* (away from the range of *grahamiae*) and the nasal and supralabial are in contact in the northern part of the range (close to the range of *grahamiae*).

Bogert and Oliver (1945:403) suggested that *S. bairdi* and *S. lineata* might intergrade in Hidalgo and Distrito Federal. Davis and Dixon (1957a:21-22) reported a specimen from Michoacán that was intermediate between *bairdi* and *lineata* and suggested that they are probably subspecies of a single species. However, Davis and Dixon regarded them as distinct species pending the availability of more material. Duellman (1961:108) found only one specimen that resembled *lineata* among 89 specimens from Michoacán. Our specimens are typical of *bairdi* in most characters but the overlap in some characters previously discussed suggests

the need for a detailed study of specimens obtained throughout the ranges of *Salvadora bairdi*, *grahamiae*, and *lineata*.

Distribution in Sinaloa.—Known from the northern and southern highlands; probably occurs throughout the highlands. See Fig. 83.

Specimens examined.—18 km. NNE Choix (* KU 68753); 2.2 km. NE (by hwy. 40) Santa Lucía, 1155 m. (* KU 78917; CSCLB 733); 19.2 km. NE (by hwy. 40) Santa Lucía, 1935 m. (* KU 78918).

Salvadora hexalepis deserticola Schmidt

Salvadora hexalepis deserticola Schmidt, Zool. ser., Field Mus. Nat. Hist., 24:146, May 31, 1940 (type locality, Government Spring, near Chisos Mountains, Brewster county, Texas).

Remarks.—One female and four males (two adults, two juveniles, with yolk scars) have the following characters, respectively: ventrals 190, 189, 187, 189, 193; subcaudals 72, 81, 81, 83, 83; dorsal scale rows 20-17-18, 19-17-15, 18-17-13, 18-17-13, 18-17-13; infralabials 10-10, 9-9, 9-10, 10-10, 10-10; preoculars 2-1, 2-2, 2-2, 3-3, 1-2; temporals 2 + 3/3 + 3, 2 + 3/2 + 3, 3 + 3/3 + 3, 3 + 3/3 + 3, 2 + 2/2 + 3; and loreals 2-2, 1-1, 1-1, 2-2, 1-1. All of the specimens examined have 9-9 supralabials, 2-2 postoculars, labials five and six entering the eye, the lateral black line on scale rows three and four, and the chin shields separated by a series of small scales. In one specimen with 2-2 loreals (KU 83412), the lower loreal on each side appears to be a fragment of supralabials 4-4. The supranal scales are smooth in the juvenile males (KU 83411-12) and keeled in the adults.

Smith (1941a:9) described *S. h. celeris* based on one female from San Blas, Sinaloa. According to Smith (1941a:11) the only difference between *deserticola* and *celeris* is in the ventral counts (200, 205 in *celeris*; 198 or fewer in *deserticola*). Bogert and Oliver (1945:366) placed *celeris* in the synonymy of *S. h. deserticola*. Two specimens from Vaca (KU 83411-12) examined by us have ventral counts typical of *deserticola*. The other scale counts are typical of both subspecies except that Smith (1941a:9) reported 11-11 infralabials in the holotype of *celeris*. We agree with Bogert and Oliver (1945:366) in referring *celeris* to the synonymy of *deserticola*. The status of this species is being studied by Charles M. Bogert, who is reviewing the genus *Salvadora*. This snake is a diurnal terrestrial species and inhabits the more open portions of forest.

Distribution in Sinaloa.—Throughout the lowlands and foothills, below about 500 meters. See Fig. 83.

Specimens examined.—Rosario, 150 m. (* KU 73626-27); San Ignacio (* LACM 7086); 13 km. NNE Vaca, 400 m. (* KU 83411-12).

Literature records.—Ahome (Bogert and Oliver, 1945:403); 9 mi. N Mazatlán, 100 ft. (Zweifel, 1954b:147); San Blas (Smith, 1941a:9 and 1943a:467); Yecorato (Smith, 1941a:11; Bogert and Oliver, 1945:403).

Additional records.—Culiacán (MVZ 70273); 16 mi. SE Los Mochis (SM 11153); 9 mi. N Mazatlán (MVZ 59287); 10 mi. S Villa Unión (MCZ 61428).

Sonora aemula (Cope)

Procinura aemula Cope, Proc. Amer. Philos. Soc., 18:262, 1879 (type locality, Batopilas, Chihuahua).

Sonora aemula, Bogert and Oliver, Bull. Amer. Mus. Nat. Hist., 83:371, March 30, 1945.

Remarks.—Charles H. Lowe, Jr., obtained an adult male north of Culiacán on September 1, 1956. On August 25, 1966, Lynn W. Robbins found an adult female (DOR) near Cerro Prieto at 1745 hours. These specimens are the first and second records for the state and have the following characteristics, respectively: 145 (?), 156 ventrals; 40, 36 subcaudals; 18-15-15, 17-15-15 dorsal scale rows; single, divided anal plate. Both specimens have 7-7 supralabials, 7-7 infralabials, 1-1 loreals, 1-1 preoculars, 2-2 postoculars, and 1 + 2 temporals. On one specimen (LACM 28714) the dorsal scales are smooth anteriorly with keeling apparent at about ventral number 125 and increasing posteriorly to the strongly keeled tail; the total length is 414.5, tail length 60, and tail length to total length ratio is 0.17. The other specimen has smooth anterior dorsal scales that become keeled at the sixth black band and are progressively more keeled to the tail; the nasal is complete.

The coloration and pattern of LACM 28714 is as follows: dorsum red, with black spot on most dorsal scales; red caudal scales nearly lacking black pigment; a single dyad, beginning at ventral 147 and continuing to ventral 152, consists of 2 black bands separated by a white band, each band two scales long on midline; tail tip white, preceded by a narrow (2 scales long) black band; ventrals white with slight reddish wash on lateral edges; slight black pigmentation at position of dorsal dyad; subcaudals uniform reddish, except where black band nearly encircles tail tip; black spot covers most of parietals, frontal, supraoculars, and encircles eye; three scales behind the parietals is a black band three scales wide extending $2\frac{1}{2}$ scales below angle of mouth; snout, labials, and chin white.

The other specimen has nine black bands, 3-6 scales long (longer posteriorly), on body with the second and third bands separated only by a dirty white band two and one-half scales long; the body bands are incomplete across the belly anteriorly, but complete at midbody and posteriorly. The interspaces between the black bands

are yellow, 11-16 scales long, and include faint indications of small black bands before and after each large black band; there are two black bands on the tail; the snout is pale yellowish white to the posterior third of prefrontals and contacts the black head-cap that extends nearly to posterior edge of parietals.

These specimens agree well with the specimens reported by Bogert and Oliver (1945:371-74) in all characters except coloration. As pointed out by Zweifel and Norris (1955:244), and supported by additional material from Sonora (Nickerson and Heringhi, 1966:136-138), the color pattern is variable. Specimens are known that are unicolor, that have one, two, or several dyads, and that are ringed in no definite color arrangement. The dyad may be two black rings separated by a white ring or two white rings separated by a black ring. These color patterns could provide interesting material for a study of natural selection and mimicry, especially with the sympatric occurrence of two potential models, *Micrurus distans* and *Micruroides euryxanthus*.

Stickel (1943:111) remarked that "the color pattern of *Procinura* is developed along a different line than that seen in any described form of *Sonora*." Wright and Wright (1957:672-73) discussed the many color variations of *Sonora episcopa*. The other character mentioned by Stickel to separate *Procinura* from *Sonora* is the modified caudal scales. We agree with Bogert and Oliver (1945:374) that the recognition of a monotypic genus based on a single character tends to obscure its relationship with *Sonora*.

One specimen (LACM 28714) contained the remains of a scorpion and a terrestrial orthopteran.

Distribution in Sinaloa.—Known only from the northern lowlands. See Fig. 81.

Specimens examined.—13 km. S Cerro Prieto on hwy. 15 (* LACM 28714); 46.6 mi. (by hwy. 15) N Culiacán (* UAZ 16533).

Storeria storerioides (Cope)

Tropidoclonium storerioides Cope, Proc. Acad. Nat. Sci. Philadelphia, 17: 199, 1863 (based on four specimens from the "Mexican plateau between the eastern ranges and the valley of México").

Storeria storerioides, Garman, Mem. Mus. Comp. Zool., 8:29, 1883.

Remarks.—One male has 129 ventrals, 41 subcaudals, 15-15-15 dorsal scale rows, 5-5 supralabials, 7-7 infralabials, 2-2 preoculars, 2-2 postoculars, 1 + 2/1 + 2 temporals, and labials two and three entering the eye on each side. This specimen was caught in pine-oak forest on August 5, 1963; a heavy rain fell on the previous day.

Distribution in Sinaloa.—Known only from the lower montane dry forest of the southern highlands. See Fig. 78.

Specimen examined.—19.2 km. NE Santa Lucía, 1935 m. (* KU 78922).

Additional record.—9.6 mi. SW El Palmito (UMMZ 123036).

Sympholis lippiens Cope

Sympholis lippiens Cope, Proc. Acad. Nat. Sci. Philadelphia, 13:524, 1862 (type locality, Guadalajara, Jalisco).

Remarks.—Six specimens have 207-227 (214.3) ventrals; 15-23 (19.8) subcaudals; 228-241 (236.3) total ventrals plus subcaudals; 5-6 (mode 5) supralabials; 6-7 (mode 6) infralabials; 1-1 postoculars in three, 1-0 postoculars in two, no postoculars in one. All specimens have 19-19-19 scale rows; 1-1 preoculars; third supralabial entering orbit. Dorsal body bands number 17-23 (20) and are 5-13 scales long on the middorsal line. The light interspaces are 2-4 scales long on the middorsal line; there are black flecks in the light dorsal interspaces of three specimens. Caudal bands number 2 or 3.

Humphrey and Shannon (1958:260), in a redescription of the species, suggested that specimens from Sinaloa and Nayarit (one each) might represent distinct subspecies. Hensley (1966:51) described a northern subspecies, *Sympholis lippiens rectilimbus*, as different from the nominal population in color pattern and head scutellation.

Specimens from Sonora and northern Sinaloa generally have a straight anterior margin of the white nuchal collar across the posterior edges of the parietals. Most specimens from southern Sinaloa and Nayarit have a loop-like extension of the light nuchal collar onto the frontal as figured by Hensley (1966:51). A specimen (LACM 6501) from near Mazatlán and a specimen (CSCLB 1389) from near San Blas, Nayarit, have a white spot on the frontal scale but a straight anterior margin of the nuchal collar. Hensley (1966:50, 54) interpreted this white spot as characteristic of *S. l. lippiens*. Two specimens from north of Mazatlán (KU 73628; UAZ 16309) have the same collar pattern as that figured for *S. l. lippiens* from near Tepic, Nayarit (Hensley, 1966:51). This variation in the southern segment of the population suggests a clinal trend northward, from the looped to the straight collar margin. There is no definite break in this character but rather a 240 kilometer range of the intermediate collar patterns. There is also some variation in the nuchal collar in northern specimens (Hensley, 1966:53). The ventral pattern varies in the condition of the dark bands on the ventrals. In some speci-

mens the margins of the dark bands are symmetrical and meet at the same point; in some specimens the margins are offset two or three ventral scales; in others the ventral extensions of the dorsal bands are separated by two or three white ventral scales; in some the dorsal band is continuous onto the ventral midline on one side, but extends only to the second scale row on the other side; some dorsal bands fuse laterally, others show indications of lateral splitting by light color. The dorsal dark bands of some individuals completely encircle the body to form rings; in others the dorsal band may be interrupted on the midventral line by a white area of varying width and shape. The length of the white interspaces on the middorsal line shows clinal variation increasing from two scales in the north to five scales in the south. The scales of the head exhibit a wide range of variation, a characteristic frequently associated with burrowing snakes. Inger and Marx (1965:14) demonstrated that variation in size and shape of the frontal scale and the ratios of frontal to supraocular scales increase with sample size in another burrowing snake of the genus *Calamaria*. We suspect the same is true in *Sympholis*. Fusions and divisions of the loreal, postocular, and supralabial scales are common. Other details of head scutellation show considerable variation.

Because of the lack of adequate material, the range of variation in certain characters of coloration and scutellation, and the clinal variation in other characters, we refrain from recognizing the subspecies of *Sympholis lippiens* described by Hensley (1966:51) at this time.

Distribution in Sinaloa.—Known from scattered localities throughout the lowlands of the state. See Fig. 65.

Specimens examined.—Alamos [Sonora] (° ASDM 1269); 18 mi. W Alamos [Sonora] (CSCLB uncatalogued); 4.8 mi. N Culiacán (° FAS 11374); 5 mi. S Culiacán (° CSCLB 1388); 31 km. SE Escuinapa (° KU 80760); 9 mi. N Mazatlán (° LACM 6501); 10.8 mi. N Mazatlán (° UAZ 16309); 56 km. N Mazatlán (° KU 73628); 39.2 mi. N Mazatlán (° CSCLB 1387); 14.7 mi. E San Blas [Nayarit] (° CSCLB 1389); 10 mi. E Tepic [Nayarit] (° LACM 6500); Terreros (° LACM 6502).

Literature records.—4 mi. N Culiacán (Humphrey and Shannon, 1958:257; Zweifel, 1959b:6).

Additional records.—36.7 mi. NW Río Culiacán (SU 24045); 13.3 mi. SE Río Presidio (SU 24046).

Tantilla calamarina Cope

Tantilla calamarina Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 320, 1866 (type locality, Guadalajara, Jalisco; type locality probably in error, see Peters, Occ. Papers, Mus. Zool., Univ. Michigan, 554:31-32, June 23, 1954).

Remarks.—*Tantilla bimaculata* was described by Cope (1874-1881:143) on the basis of a specimen from Mazatlán. Taylor (1936b:346) placed *T. bimaculata* in the synonymy of *T. calamarina*, a species that occurs in the lowlands of western México. A second specimen (MCZ 61430, a male) has a total length of 153; tail length, 38; 127 ventrals; 36 subcaudals; 6-6 supralabials; 6-6 infralabials; 1-1 preoculars; 1-1 postoculars. The body is tan above rather than gray and the lateral dark stripe is on the third and fourth scale rows. Other characteristics are as described by Smith (1942a:35).

Distribution in Sinaloa.—Known only from the southern coastal lowlands around Mazatlán. See Fig. 84.

Specimen examined.—29 km. N Mazatlán (* MCZ 61430).

Literature records.—Mazatlán (Cope, 1874-1881:143 and 1887:84; Smith, 1942a:35 and 1943a:474).

Tantilla yaquia Smith

Tantilla yaquia Smith, *Zoologica*, 27:41, April 30, 1942 (type locality, Guasaremos, Río Mayo, Chihuahua).

Remarks.—Zweifel and Norris (1955:243) proposed that *T. bogerti* Hartweg be considered a subspecies of *T. yaquia* on the basis of a single specimen from Mirasol, Sonora. They distinguished *yaquia* from *bogerti* by the presence (in *yaquia*) of more ventrals, more subcaudals, and a less extensive black cap. Tanner (1966:135) considered *bogerti* and *yaquia* subspecies of *Tantilla planiceps*. We agree with Tanner's proposal that *Tantilla yaquia* is allied to *T. planiceps* of Baja California, but we cannot accept his contention that *yaquia*, *atriceps* and *planiceps* represent the same species. Furthermore, we have found that the characteristics utilized by Tanner (1966:148) and Zweifel and Norris (1955:243) to distinguish between *bogerti* and *yaquia* show clinal variation. On this basis we place *T. y. bogerti* in synonymy with *T. y. yaquia*. A detailed study of *T. yaquia* will be presented elsewhere.

Seven specimens of *T. yaquia* have 134-150 (145.8) ventrals; 48-61 (52.8) subcaudals (except UIMNH 34921); 7-7 (7-8 in 1) supralabials; 6-6 infralabials; 1-1 preocular; 2-2 postoculars. The mental is separated from the chin shields in all specimens examined.

Distribution in Sinaloa.—Probably occurs throughout the state. See Fig. 84.

Specimens examined.—Costa Rica (* UIMNH 34921); 43.8 mi. S Culiacán (* UAZ 16310); 1 km. ENE El Cajon, 1000 m. (* KU 93500); Labrados (* CAS 64976); 5.8 mi. N Mazatlán (* LACM 6998) 16 mi. N Mazatlán (* JFC 62:53); Teacapán (* LACM 7001).

Literature record.—Costa Rica (Smith and Van Gelder, 1955:147).

Additional Record.—22.4 mi. SE Piaxtla, Río (SU 23788).

Thamnophis cyrtopsis collaris (Jan)

T[ropidonotus] collaris Jan, Elenco Sistemático degli Ofidi . . . , p. 69, 1863 (based on a specimen from "Messico"; type locality restricted to Guanajuato, Guanajuato by Smith, Copeia, no. 2:140, June 8, 1951).

Thamnophis cyrtopsis collaris: Webb, Tulane Studies Zool., 13:60, August 30, 1966.

Remarks.—Four males have 159, 164, 161, 167 ventrals; 109, 112 subcaudals (excluding KU 75632, 78928); 19-19-17, 19-18-17, 19-19-19, 19-19-18 dorsal scale rows; 8-8, 8-8, 8-8, 9-8 supralabials; 3-3, 3-3, 3-4, 3-3 postoculars; and 1 + 3/1 + 3, 1 + 3/1 + 3, 1 + 2/1 + 3, 1 + 3/2 + 3 temporals. All of the males have 10-10 infralabials, 1-1 preoculars, and the fourth and fifth supralabials entering the eye (except KU 78927 which has supralabials five and six entering the eye on the left). Nine females have 149-159 (153.4) ventrals and 98, 98, 99, 92 subcaudals (only KU 40349, 75633, 78924-25). There are 19 dorsal scale rows at the neck in six, 20 scale rows in two and 18 in one; 8-8 supralabials in eight and 8-9 in one; 10-10 infralabials in seven, 10-9 in one, and 10-11 in one; 3-3 postoculars in five, 3-4 in one, 4-4 in two, and 4-5 in one; 1 + 2/1 + 2 temporals in four, 1 + 2/1 + 3 in two, and 1 + 3/1 + 3 in three; 4-5/4-5 supralabials entering the eye in eight and 4-5/5-6 in one; all females have 1-1 preoculars. The vertebral stripe is confined to the vertebral scale row on all specimens examined.

Gloyd and Smith (1942:234) recognized *T. eques cyrtopsis* as distinct from *T. e. eques* by having 167 or more ventrals (86%) in males and 163 or more ventrals (100%) in females. Smith used this same character in a synonymy of the garter snakes (1942d:108). Later, Smith (1951:139) resurrected *Eutaenia cyrtopsis* Kennicott for the black-necked garter snakes referred to *T. eques* by Gloyd and Smith (1942:234); *T. eques* was applied by Smith to a different species that inhabits the Mexican plateau and is currently recognized. According to Milstead (1953:353), only *T. c. cyrtopsis* (= *T. eques cyrtopsis*, Gloyd and Smith, 1942:234) occurs in Sinaloa, with 161-184 ventrals in males and 152-177 ventrals in females (p. 371); and *T. cyrtopsis cyclides* (= *T. e. eques*, Gloyd and Smith, 1942:234) occurs on the southern part of the Mexican plateau, with 140-172 ventrals in males and 138-168 ventrals in females.

Chrapiwy and Fugler (1955:127) referred a specimen from Durango to *T. c. cyclides*, and Fouquette and Rossman (1963:197) referred a specimen from northern Sinaloa to *T. c. cyrtopsis*. Fitch and Milstead (1961:112) suggested that *Thamnophis dorsalis* is

the correct name by priority for *T. cyrtopsis*. However, according to Webb (1966:56), the name *dorsalis* probably belongs to the upper Río Grande population of *Thamnophis sirtalis* and would replace *T. sirtalis ornata* Baird. This would allow conservation of the name *cyrtopsis* for the snakes as understood by Smith (1951). Webb also stated (pp. 60-63) that *Tropidonotus collaris* Jan, 1863, is the earliest name for the population of *cyrtopsis* in the coastal lowlands and subtropical highlands of western México [Sinaloa]. Therefore, the Sinaloan population of black-necked garter snakes should be known as *Thamnophis cyrtopsis collaris*, one of five subspecies of *cyrtopsis* listed by Webb (p. 69). The other subspecies are *T. c. cyrtopsis* in the southwestern United States and Mexican plateau, *T. c. ocellata* in central Texas, *T. c. postremus* in Michoacán, and *T. c. pulchrilatus* in highland areas from Durango to Morelos and Veracruz.

Thamnophis has been collected in a variety of habitats in the state: along irrigation ditches near Los Mochis, in forest near Culiacán, and along rivers near Presidio. The species has successfully occupied the extensive agricultural areas of the Río Fuerte floodplain.

Distribution in Sinaloa.—Throughout the state from near sea level to about 2000 meters. See Fig. 85.

Specimens examined.—N edge Culiacán (CSCLB 1939); 4.7 mi. N Culiacán (CSCLB 1970); 23 km. N Culiacán (CSCLB 1945); 68.7 N Culiacán (LACM 7173); 4.2 mi. S Culiacán (LACM 7183); 5.5 mi. S Culiacán (LACM 7178); 6.7 mi. S Culiacán (LACM 7179); 6.9 mi. S Culiacán (LACM 7180); 17 km. S Culiacán (CSCLB 1944); 15 mi. S Culiacán (LACM 25936-37); 16.9 mi. S Culiacán (LACM 7181); 19 mi. S Culiacán (LACM 25935); 22 mi. S Culiacán (LACM 25934); 5 km. SW El Palmito, 1900 m. (* KU 75632-33, 80781); 8 mi. W El Palmito (LACM 25198-99); 8 mi. N Guamúchil (CSCLB 1940); 3.8 mi. N La Cruz turnoff, hwy. 15 (LACM 7172); 5.6 mi. E La Cruz (LACM 7174); 1.2 mi. N Los Mochis (CSCLB 1941); 47 km. N Los Mochis (* KU 67725); 2-3 mi. S Los Mochis (UCLA 12513); 7.3 mi. S Los Mochis (UAZ 9373-77); 13.6 mi. S Los Mochis turnoff, hwy. 15 (LACM 7177); 3.3 mi. SW Los Mochis (JFC 63:147); 5.3 mi. SW Los Mochis (JFC 63:146); 15 mi. S Mazatlán, Río Presidio (SU 18261-62); San José del Oro, 230 m. (* KU 83413); 1 km. NE Santa Lucía (CSCLB 1942); 2.2 km. NE Santa Lucía, 1155 m. (* KU 78923-24); 19.2 km. NE Santa Lucía, 1935 m. (* KU 78925-29); 1.5 km. E Santa Lucía, 1700 m. (* KU 40349); 4.1 mi. N Terreros (LACM 7176); 0.7 mi. S Terreros (LACM 7184); 15.7 mi. S Terreros (LACM 7175).

Literature records.—Copala (Webb, 1966:63); Costa Rica (Smith and Van Gelder, 1955:147; Webb, 1966:63); El Batel, 70 km. NE Mazatlán (Webb, 1966:63); El Dorado (Fugler and Dixon, 1961:16; Webb, 1966:63); 1 mi. NE El Fuerte; 8 mi. W El Palmito (Webb, 1966:63); 6.6 mi. S Guasave (Fouquette and Rossman, 1963:197); 70 km. NE Mazatlán (Milstead, 1953:372); Rosario (Smith, 1942d:108 and 1943a:479; Webb, 1966:63); 1 mi. E Santa Lucía (Webb, 1966:63).

Additional records.—4.8 mi. N Culiacán (FAS 11364); 26.7 mi. N Culiacán (FAS 11353); 44.6 mi. N Culiacán (FAS 17013); 44.8 mi. N Culiacán (FAS

9080); 10.3 mi. S Culiacán (FAS 12425); 31.3 mi. NW Culiacán, Río (SU 24078); 1.9 mi. W hwy. 15 on Culiacáncito road (SU 24079); El Dorado (AMNH 90753); 29.8 mi. N El Dorado (SU 24089); 29.9 mi. N El Dorado (SU 24088); 30.6 mi. N El Dorado (SU 24087); 31.3 mi. N El Dorado (SU 24085-86); 31.7 mi. N El Dorado (SU 24084); 32.0 mi. N El Dorado (SU 24082-83); 32.4 mi. N El Dorado (SU 24081); 9.6 mi. N Guamúchil (FAS 16998, 17016); 9.7 mi. N Mazatlán (UF 16537); 87.2 mi. N Mazatlán (FAS 12409); 6.4 mi. S Mazatlán (CAS 95755); 1.4 mi. WNW Mocerito, Río (SU 24077); 5.4 mi. WNW Mocerito, Río (SU 24076); 9.5 mi. WNW Mocerito, Río (SU 24075); 10.2 mi. WNW Mocerito, Río (SU 24074); 7.3 mi. E Navolato (SU 24080); 0.9 mi. N San Lorenzo, Río (SU 24090); 7.1 mi. NNE Topolobampo (SU 74073); 7.4 mi. NNE Topolobampo (SU 70072).

Trimorphodon lambda paucimaculata Taylor

Trimorphodon paucimaculatus Taylor, Univ. Kansas Sci. Bull., 24:527, February 16, 1938 (type locality, Mazatlán, Sinaloa).

Trimorphodon lambda paucimaculata: Fugler and Dixon, Publ. Mus. Michigan State Univ., Biol. ser., 2:17, July 20, 1961.

Remarks.—Taylor (1938:527) distinguished *T. paucimaculatus* from *T. biscutatus* by the presence in the former of preoculars separated from the frontal and the presence of dorsal spots "greatly elongated and fewer in number." *Trimorphodon paucimaculatus* is further distinguished from *T. biscutatus* by the absence of keels or ridges on the scales of males (Taylor, 1939b:360). Davis and Dixon (1957a:24) stated that *lambda* has fewer ventrals and darker dorsal blotches than *paucimaculatus*, and that intergradation between them probably occurs in Sinaloa north of Mazatlán. Duellman (1957b:240) suggested that more material may prove that the populations known as *T. paucimaculatus*, *T. lambda*, and *T. biscutatus* are subspecies. Fugler and Dixon (1961:17) concluded that *paucimaculata* is a subspecies of *lambda* and that the "zone of intergradation probably lies to the north of El Dorado, perhaps in the coastal plain between El Dorado and Alamos, Sonora." Fouquette and Rossman (1963:198-99) reported an intergrade with 240 ventrals from 30.7 miles north of Culiacán.

Six females have 250-259 (253.8) ventrals and 73-81 (77.3) subcaudals. The dorsal scale rows at the neck are 21 in two, 22 in one, 23 in one, 24 in one, and 25 in one; the scale rows at midbody are 24 in three, 25 in two and 27 in one; the scale rows at the vent are 17 in two, 18 in two, 19 in one, and 20 in one. The supralabials are 8-9 in one and 9-9 in five; infralabials 12-12 in one, 13-13 in two, ?-13 in one, 14-13 in one, and 13-14 in one; preoculars 3-3 in three, 3-4 in one, and 3-4 in two (one preocular on right very small); postoculars 3-3 in five, and 3-4 in one; temporals 3 + 3/2 + 3 in one, 3 + 3/4 + 3 in one, 3 + 4/3 + 4 in two, and 3 + 4/3 + 5 in two. Supralabials 4-5/4-5 enter the eye in five, and 5-6/5-6 in one; the

preoculars touch the frontal in three and the preoculars are separated from the frontal in three; 21-24 (22.2) dorsal dark body blotches (KU 78930 excluded); 9-11 (9.8) dorsal dark tail blotches (KU 78930 excluded).

One male (KU 37592) has 21-22-17 dorsal scale rows; the head is missing so no other counts are available. Characters of seven additional males are as follows: ventrals, 243-249 (246.9); subcaudals, 81-87 (84.3) (KU 83416 excluded); dorsal scale rows at neck, 21 in two, 22 in three, and 23 in two; scale rows at midbody, 23 in three, and 24 in four; scale rows at vent, 16 in one, 17 in two, 18 in three, and 19 in one; supralabials, 8-8 in one, 9-9 in five, and 9-10 in one; infralabials, 12-12 in three, and 13-13 in four; preoculars, 3-3 in seven; postoculars, 3-3 in six, and 4-3 in one; temporals, 2 + 3/3 + 3 in one, 3 + 3/3 + 4 in one, 3 + 4/3 + 4 in two, 3 + 3/3 + 3 in two, and 4 + 3/4 + 3 in one. Supralabials 4-5/4-5 enter the eye; the preoculars contact the frontal in one, the preoculars do not contact the frontal in six. Dorsal dark body blotches, 17-25 (21.7), and dorsal dark tail blotches, 11-14 (12.0) (KU 80765, 83416 excluded).

A female and male from the vicinity of Badiraguato (KU 83415-16) have more ventrals (251 and 248) than the intergrade reported by Fouquette and Rossman (1963:198-99). Two of the specimens examined from the southern half of Sinaloa (KU 73638, 80765) have 243 and 244 ventrals. If these specimens and one from 13 miles north of the Sinaloa-Sonora state line (Dixon, Sabbath, and Worthington, 1962:98) are intergrades, then the zone of intergradation would include most of Sinaloa northward from Mazatlán, as pointed out by Davis and Dixon (1957a:24). A zone of intergradation covering more than 500 kilometers is a condition untenable to most biologists. Although we refer all Sinaloan specimens to *T. l. paucimaculata* we recognize that clinal variation is probably a more reasonable explanation of evolutionary divergence in *Trimorphodon* in western México. In addition we suspect that a detailed study of *Trimorphodon biscutatus*, *lambda*, *lyrophanes*, *paucimaculata* and *vandenburghi* will show that these nominal populations are all representative of a single species.

Trimorphodon is a nocturnal species that is frequently found in or about rocky areas. Two specimens from San Ignacio were found about 3 meters above the ground in the rock foundation of a bridge.

Distribution in Sinaloa.—Throughout the state below about 1200 meters. See Fig. 86.

Specimens examined.—1.5 km. N Badiraguato, 230 m. (* KU 83415); 20 km. N, 5 km. E Badiraguato, 560 m. (* KU 83416); 6.5 mi. NE Concordia (CSCLB 557); 30 mi. N Culiacán (LACM 7094); 18 mi. S Culiacán (CSCLB 554); 78 mi. S Culiacán (LACM 7095); 26.7 mi. S Escuinapa (CSCLB 1375); 34.1 mi. S Escuinapa (CSCLB 1376); 6 km. S Guamúchil (LACM 28716); 0.1 mi. E La Cruz (LACM 7089); 5 mi. E La Cruz (LACM 7090); 18.5 mi. N La Cruz turnoff [hwy. 15] (LACM 7102); 7.9 mi. S La Cruz turnoff [hwy. 15] (LACM 7098); 16 km. NNW Los Mochis (* KU 37592); 7.3 km. SW Matatán, 155 m. (* KU 78931); 5 mi. N Mazatlán (CSCLB 556); 6.5 mi. N Mazatlán (UAZ 16311); 12.6 mi. N Mazatlán (JFC 62:143); 18.6 mi. N Mazatlán (LACM 7100); 21.1 mi. N Mazatlán (UAZ 16312); 21.3 mi. N Mazatlán (LACM 7093); 25.5 mi. N Mazatlán (LACM 7099); 26 mi. N Mazatlán (LACM 7087); 27.3 mi. N Mazatlán (LACM 7091); 48 km. N Mazatlán (* KU 73636); 50 km. N Mazatlán (* KU 73638); 33.6 mi. N Mazatlán (LACM 7101); 66 km. N Mazatlán (* KU 73637); 41.5 mi. N Mazatlán (LACM 7088); 53.3 mi. N Mazatlán (UAZ 16313); 67.3 mi. N Mazatlán (CSCLB 1374); 110 km. N Mazatlán (* KU 73639); Panuco, 625 m. (* KU 83414); 1 mi. W hwy. 15 along Río Piaxtla (CSCLB 2966); 15.9 mi. N Rosario (CSCLB 558); 17.5 mi. N Rosario (CSCLB 1379); 1 km. W Rosario, 30 m. (* KU 29496); San Ignacio, 210 m. (* KU 73635; LACM 7092); Santa Lucía (CSCLB 1378); 4.8 km. NE (by hwy. 40) Santa Lucía, 1315 m. (* KU 78930); 4.1 mi. S Terreros (LACM 7097); 5 mi. S Terreros (LACM 7096); 12 mi. N Tropic of Cancer (CSCLB 555); 8 km. N Villa Unión, 140 m. (* KU 80764); 12 km. N Villa Unión, 120 m. (* KU 80765).

Literature records.—6 mi. N Coyotitán, 300 ft. (Davis and Dixon, 1957a:23); 30.7 mi. N Culiacán (Fouquette and Rossman, 1963:198); El Dorado (Fugler and Dixon, 1961:17); Mazatlán (Boulenger, 1896:54; Van Denburgh, 1898:464); 24 mi. N Mazatlán, 150 ft.; 36 mi. N Mazatlán, 500 ft.; 6 mi. E Mazatlán, 50 ft. (Davis and Dixon, 1957a:23); 2-36 mi. NNW Mazatlán (Duellman, 1957b:240); Presidio (Boulenger, 1896:54; Smith, 1941c:155).

Additional records.—17 mi. S Coyotitán (AMNH 87613); 37.5 mi. N Culiacán (FAS 9079); 8.5 mi. S Culiacán (AMNH 77523); 11 mi. S Culiacán (AMNH 77522); 65.4 mi. S Culiacán (FAS 12411); 95.4 mi. S Culiacán (FAS 12424); 1.8 mi. W hwy. 15 on Culiacáncito road (SU 24052); El Dorado (AMNH 90754-56); Escuinapa (AMNH 4310); 14.5 mi. SE Escuinapa (SU 24062); 5.1 mi. NW Escuinapa (SU 24063); 20.2 mi. N Guamúchil (UF 16786); 4.9 mi. E La Cruz (SU 24057); 0.6 mi. SE La Cruz road on hwy. 15 (SU 24056); 17.4 mi. SE La Cruz road on hwy. 15 (SU 24058); 2.1 mi. NW La Cruz road on hwy. 15 (SU 24055); 49.6 mi. N Los Mochis (SU 24051); 19.9 mi. N Mazatlán (CAS 95809); 27.4 mi. N Mazatlán (UF 12832); 51.5 mi. N Mazatlán (FAS 14461); 53.5 mi. N Mazatlán (FAS 14743); 75 mi. N Mazatlán (FAS 16884); 94.1 mi. N Mazatlán (FAS 14715); 43.9 mi. NW Mazatlán (SU 24059); 23.0 mi. N Rosario (CAS 95822); 14.8 mi. NW Rosario (SU 24061); 12.1 mi. SE San Lorenzo, Río (SU 24053); 15 mi. SE San Lorenzo, Río (SU 24054); 2.2 mi. E hwy. 15 (Villa Unión) on hwy. 40 (SU 24060).

Trimorphodon tau Cope

Trimorphodon tau Cope, Proc. Amer. Philos. Soc., 11:151, 1869 (type locality, Quiotepec, Oaxaca according to Smith, Proc. U. S. Nat. Mus., 91:166, 1941, not "Tehuantepec").

Remarks.—Eight males have 217-229 (222.3) ventrals (excluding LACM 9510); 78-84 (81.0) subcaudals; 16-21 (18.4) dark body blotches; 9-12 (9.6) tail blotches. A single female (CSCLB 553) has 227 ventrals, 66 subcaudals, 19 dark body blotches, and 8 caudal blotches. All specimens of this group from Sinaloa, including the

two specimens reported as *T. latifascia* by Fouquette and Rossman (1963:199), are tentatively assigned to *T. tau*, pending completion of a study of the *tau* group of *Trimorphodon* by Norman J. Scott and the second author. All specimens were collected on the highway at night.

Distribution in Sinaloa.—Foothills in north. See Fig. 87.

Specimens examined.—16 km. NNE Choix, 520 m. (* KU 68754); 22.1 mi. N Culiacán (* CSCLB 553); near Terreros (* LACM 7112, 9510); 2.5 mi. N Terreros (* LACM 7108); 5 mi. N Terreros (* LACM 7109); 7 mi. N Terreros (* LACM 7111); 10 mi. N Terreros (* LACM 7110); 10.2 mi. S Terreros (* LACM 7113).

Literature records.—8.3 mi. N Guacamil [Guamúchil]; 1.6 mi. S Guacamil [Guamúchil] (Fouquette and Rossman, 1963:100).

Additional records.—15.5 mi. N Culiacán (FAS 16995); 29.9 mi. N Culiacán (FAS 16996); 4 mi. NNE El Fuerte (FMNH 71531); 8 mi. NNE El Fuerte (FMNH 71532-33).

Tropidodipsas annulifera Boulenger

Tropidodipsas annulifera Boulenger, Catalogue of the Snakes in the British Museum (Natural History), 2:297, 1894 (based on a specimen of unknown provenance).

Remarks.—One female and two males have smooth dorsal scales in 15 rows without apical pits; 146, 149, 152 ventrals; 42, 44, 41 subcaudals; 6-6 supralabials; 7-7, 7-7, 6-7 infralabials; 1-1, 0-0, 0-0 preoculars; 2-2 postoculars; 1 + 2/1 + 2 temporals; anal entire (only KU 75621); nasal divided; loreal and supralabials 3 and 4 enter the eye; mental separated from chin shields; pupil vertically elliptical. The dorsal coloration is black with eight and 12 lateral white spots or rings (about two scales wide) anterior to the vent.

Most specimens were collected at night in July, during and immediately after a hard rain, probably the first hard rain of the season. One specimen (KU 75621) was found above ground in daylight on July 15, 1963.

Greer (1965b:237) reported *T. malacodryas* from the lowlands north of Culiacán. Scott (1967:281) referred *T. malacodryas* Shannon and Humphrey and four of the specimens reported as *T. occidentalis* (UCLA 14640-43) by Campbell and Simmons (1962:198) to *T. annulifera*.

Distribution in Sinaloa.—Occurs below 1200 meters in the lowland thorn woodland and tropical deciduous forest in the southern two-thirds of the state. See Fig. 87.

Specimens examined.—7 mi. S Escuinapa (LACM 7115); 16.2 mi. N Espinal (* UCLA 14643); 10.5 mi. N Mazatlán (CSCLB 565); 13.7 mi. N Mazatlán (* UCLA 14642); 19.5 mi. N Mazatlán (CSCLB 566); Santa Lucía, 1100 m. (* KU 75621).

Literature records.—36.7 mi. NW Culiacán (Greer, 1965b:237); 13 mi. S Escuinapa (Scott, 1967: 285); 16.2 mi. N Espinal (Campbell and Simmons, 1962:198); about 10 mi. N Mazatlán; 10.5 mi. N Mazatlán (Scott, 1967:285); 13.7 mi. N Mazatlán (Campbell and Simmons, 1962:198); 19.5 mi. N Mazatlán (Scott, 1967:285).

Tropidodipsas philippii (Jan)

Leptognathus philippii Jan, Elenco sistematico degli Ofidi . . . , p. 101, 1863 (type locality, Mazatlán, Sinaloa).

Tropidodipsas philippi: Boulenger, Catalogue of the Snakes in the British Museum (Natural History), 2:295, 1894.

Remarks.—One male has 193 ventrals; 87 subcaudals; 7-7 supralabials; 8-8 infralabials; 15 dorsal scale rows at midbody and 18 black bands on the body and tail. The male reported by Greer (1965b:237) has fewer ventrals (188), subcaudals (81), and white rings (17).

Tropidodipsas freiae was described from a single specimen by Shannon and Humphrey (1959b:220) and placed in the synonymy of *T. philippii* by Scott (1967:284). Nearly all known specimens were collected at night during or after a light rain.

Distribution in Sinaloa.—Known only from the southern lowlands of the state. See Fig. 87.

Specimens examined.—Between Escuinapa and Palmillas (LACM 7117); 31.6 mi. N Mazatlán (LACM 7119); 58 km. N Mazatlán (* KU 73640); 53 mi. N Mazatlán (LACM 7118); Teacapán (LACM 7116).

Literature records.—3.5 mi. NW Elota (Greer, 1965b:237); 63.5 mi. N Mazatlán (Shannon and Humphrey, 1959b:220).

Additional record.—57 mi. NW Mazatlán (TMM 36932).

Family Elapidae

Micruroides euryxanthus neglectus Roze

Micruroides euryxanthus neglectus Roze, Amer. Mus. Novitates, 2287:4, April 13, 1967 (type locality, sixteen and three-tenths miles north-northwest of Mazatlán, Sinaloa).

Remarks.—Duellman (1957b:240) reported an adult male of *M. euryxanthus* from the vicinity of Mazatlán that has fewer ventrals (210) and more dorsal red scales (113) than those reported in the original description of *M. e. australis* Zweifel and Norris. Also, none of the white rings are more than one scale wide, whereas all of the white rings of the holotype of *australis* (Zweifel and Norris, 1955: plate 1, lower left) appear to be more than one scale wide. Roze (1967:4) used the Sinaloan specimen (UMMZ 114637) as the holotype of *M. euryxanthus neglectus*. Joseph F. Copp kindly supplied data on a second specimen (JFC 62:56), a paratype of *neg-*

lectus (Roze, 1967:4): adult male; ventrals 208; subcaudals 25; dorsal scales 17-15-?; supralabials 7; infralabials 7; preocular 1; postoculars 2; temporals 1 + 2. The snake has 12 red and 12 black body rings; no black markings in the red rings; 107 red scales along the midline; two black and three white tail rings including the tip. This specimen is similar to the holotype in having fewer ventrals than *M. e. australis*, but is more like *australis* in the number of red scales along the midline. The holotype is the southernmost known specimen of the genus *Micruroides*.

Distribution in Sinaloa.—Known only from near Mazatlán, but probably occurs in the northern lowlands. See Fig. 88.

Specimen examined.—20 mi. N Mazatlán (JFC 62:56).

Literature record.—Type locality (Duellman, 1957b:240, *M. e. australis*).

Micrurus distans distans (Kennicott)

Elaps distans Kennicott, Proc. Acad. Nat. Sci. Philadelphia, 12:338, 1860 (type locality, Batosegatchie, Chihuahua).

Micrurus distans distans: Zweifel, Amer. Mus. Novitates, 1954:7, June 26, 1959.

Remarks.—Zweifel (1959c:7) commented on the nomenclatural history of this species. According to Zweifel, *M. d. distans* can be identified by the presence of "immaculate scales of the red rings, presence of pale coloration on the anterior supralabials and (usually) snout, and a broad pale head ring with its rear margin behind the posterior tips of the parietal scales."

A male and two females have the following characters, respectively: ventrals, 213, 235, 222; subcaudals, 51, 44, ?; black tail rings, 6, 5, ?. All specimens have 7-7 supralabials; 7-7 infralabials; 1-1 preoculars; 2-2 postoculars; 1 + 1/1 + 1 temporals; and 14 black body rings. On all specimens some of the black body rings are constricted laterally, the anterior supralabials are pale, the pale head band includes the tips of the parietals, and the scales of the red rings lack black tips.

Specimens were collected at night on several occasions following light rains, at air temperatures of 24.2° to 26.3°C, indicating the species is active at lower temperatures than most other snakes from the state.

Distribution in Sinaloa.—Throughout the lowlands. See Fig. 88.

Specimens examined.—9.1 mi. NE Concordia (LACM 7186); 6.5 km. SW Concordia (* KU 73641); El Salado, 90 m. (* KU 95971); La Cruz turnoff, hwy. 15 (LACM 7189); 2.5 mi. E La Cruz (LACM 7187); 9 mi. E La Cruz (LACM 7188); 11.6 mi. N Mazatlán (LACM 7190); Rosario, 150 m. (* KU 73642).

Literature record.—12 mi. SE Los Mochis (Bogert and Oliver, 1945:407).
Additional records.—9.9 mi. N Mazatlán (FAS 14479); Sinaloa [state?] (AMNH 3928-31, 62264).

Family Hydrophiidae

Pelamis platurus (Linnaeus)

Anguis platura Linnaeus, Syst. Nat., 12th ed. p. 391, 1766 (based on a specimen from Pine Island, Pacific Ocean).

Pelamis platurus: Gray, Ann. Philos., p. 15, 1825.

Remarks.—Two specimens are black above and yellow below, and the two colors are sharply defined. This is pattern type one according to M. Smith (1926:118). One specimen (KU 63430) has lateral black spots posteriorly and represents pattern type four.

Two specimens (KU 63430, 63741) were found on the beach on February 15 and March 1, 1961, respectively. Other individuals were taken in October and June.

Distribution in Sinaloa.—This sea-snake is known from the ocean adjacent to southern and extreme northern Sinaloa and from an estuary near Teacapán. See Fig. 81.

Specimens examined.—Isla Lechuguilla "near Río del Fuerte" (RSF 473); Mazatlán (* KU 63430; LACM 7231); 1 mi. N Mazatlán (* KU 63741); Teacapán (LACM 7232).

Literature records.—Mazatlán (Smith, 1943a:458); 15 mi. offshore between Mazatlán, Sinaloa and San Blas, Nayarit (Burt and Burt, 1932:572).

Additional record.—Sinaloa? (USNM 65833).

Family Viperidae

Agkistrodon bilineatus bilineatus (Günther)

Ancistrodon bilineatus Günther, Ann. Mag. Nat. Hist., ser. 3, 12:364, 1863 (type locality, Pacific Coast of Guatemala).

Agkistrodon bilineatus bilineatus: Burger and Robertson, Univ. Kansas Sci. Bull., 34:213, October 1, 1951.

Remarks.—Two males have 133, 131 ventrals; 24, 24 single and 42, 39 divided subcaudals; 25-23-20, 24-23-19 dorsal scale rows; 8-8, 8-8 supralabials; 11-11, 11-11 infralabials; 2-2, 2-2 preoculars; 2-2, 2-2 postoculars; 2-2, 2-2 suboculars; and 4 + 4/4 + 4, 3 + 5/3 + 5 temporals. The lower white line on the side of the head is bordered below by a dark line posterior to the second supralabials (see Burger and Robertson, 1951:214, diagnosis) and the body and tail blotches are indistinguishable. Two specimens of unknown sex (KU 73643-44) have 133, 131 ventrals, and 23 scale rows at mid-body.

Several individuals were collected at night on the road in areas

of heavy forest and in regions cleared for agriculture. One was found alive near San Ignacio about 60 meters from a stream. Although uncommon, this snake is known and feared throughout the coastal lowlands.

Distribution in Sinaloa.—Coastal lowlands south of Culiacán. Specimens from Sonora (Bogert and Oliver, 1945:393) suggest the species inhabits the foothills of northern Sinaloa. See Fig. 89.

Specimens examined.—49 mi. S Culiacán (LACM 7193); 7.5 mi. N Mazatlán (LACM 7192); 1 mi. S Rancho Huanacastle (LACM 7191); Rosario, 150 m. (* KU 73644); San Ignacio, 210 m. (* KU 73643).

Literature records.—Escuinapa; Mazatlán (Gloyd, personal communication); Mazatlán (Bogert and Oliver, 1945:393); Presidio (Boulenger, 1896:522).

Additional record.—Escuinapa (AMNH 4002-05).

Crotalus atrox Baird and Girard

Crotalus atrox Baird and Girard, Cat. North Amer. Rept., part 1, p. 5, 1853 (type locality, Indianola, Calhoun county, Texas).

Remarks.—According to Klauber (1952:102) there were no valid records of *C. atrox* from Sinaloa. Dixon, Sabbath, and Worthington (1962:98) reported the sympatric occurrence of *atrox* and *C. basiliscus* in Sinaloa.

Two males and two females have the following characters: ventrals, 168, 172, 173, 178; subcaudals, 25, 26, 20, 19; dorsal scale rows, 25-25-23, 27-25-22, 23-24-23, 27-25-22; supralabials, 15-14, ♀-15, 15-14, 14-14 (excluding left side of KU 67738); infralabials, 18-17, ♀-16, 16-16, 16-15 (excluding left side of KU 67738); preoculars or postoculars, 2-2 in each specimen; suboculars, 3-4, 4-4, 2-3, 4-4; width of black tail rings (in scales), 3.5, 3.0, 3.0, 2.0; and width of white tail rings (in scales), 3.5, 4.0, 3.0, 3.0.

Distribution in Sinaloa. Known only from the northern lowlands. See Fig. 89.

Specimens examined.—El Carrizo, 12 m. (* KU 83418); 5 km. NW El Carrizo, 12 m. (* KU 83417); 48 km. N Los Mochis, 15 m. (* KU 67738); Santa Maria Island, 3 m. (* KU 69938).

Additional records.—15.5 mi. N Fuerte, Río (SU 24092); 33.2 mi. N Los Mochis (FAS 14678).

Crotalus basiliscus basiliscus (Cope)

Caudisoma basilisca Cope, Proc. Acad. Nat. Sci. Philadelphia, 16:166 (type locality, Colima).

Crotalus basiliscus basiliscus: Gloyd, Nat. Hist. Misc., 17:1, April 23, 1948.

Remarks.—Nine males, seven females, and four specimens of unknown sex have the following characters, respectively: ventrals, 179-188 (183.9), 182-198 (189.3), 187, 187, 184, 185; subcaudals,

27-31 (28.8), 22-24 (23.1), 28, 28, 30, 22; dorsal scale rows at neck, 25-29 (26.8), 26-29 (27.4), 28, 29, 26, 28; dorsal scale rows at mid-body, 25-29 (26.3), 25-27 (26.4), 27, 27, 25, 27; dorsal scale rows at vent, 21-23 (21.8), 21-23 (21.7), 22, 21, 21, 23; supralabials, 13-17 (14.9), 14-17 (15.3), 14/15, 15/15, 13/16, 16/15; infralabials, 15-19 (16.1), 14-17 (15.4) (excluding left side of KU 67740), 17/17, 16/17, 16/17, 17/18; dorsal body blotches, 32-35 (33.4) (excluding KU 80770, 29513, 83419, and 78966), 31-38 (33.4) (excluding KU 40364 and 83420), 33, 33, 33, ?; tail rings 8-10 (8.9) (excluding KU 29513), 7-9 (7.7) (excluding KU 40364); 9, 9 (excluding KU 80767, 80769). The proximal rattle is gray in all except three which have damaged tails (KU 67739-40, 80767). The characters of these specimens agree with characters given by Klauber (1952:79-84) for the subspecies and with those given by Fugler and Dixon (1961:21) for *basiliscus* in central Sinaloa.

Crotalus basiliscus is one of the more common snakes in the state, and has been collected in both the wet and the dry seasons. On July 25, a litter of 20 baby *C. basiliscus* was located on the southwestern slope above a river near Escuinapa. The snakes were found in a small clearing in dense forest sunning themselves near a burrow. These specimens were the first young encountered during the field work in that season, and because of their concentration near the burrow were probably recently born. Through late September, baby rattlesnakes were frequently collected at night on the highway.

Distribution in Sinaloa.—Throughout state at elevations from near sea-level to about 2000 meters. See Fig. 90.

Specimens examined.—21 km. ESE Badiraguato, 240 m. (* KU 83419-20); 16 km. NE Choix, 520 m. (* KU 73645); 7.9 mi. N Coyotitán (JFC 65:146); 1.9 mi. S Coyotitán (JFC 65:147); 3 mi. S Coyotitán (JFC 65:148); 19 km. N Culiacán, 120 m. (* KU 40364); 50 km. N Culiacán (* KU 73648); 15 mi. S Culiacán (JFC 62:59); 17 mi. S Culiacán (JFC 62:58); 19 mi. S Culiacán (CSCLB 1204); 21.3 mi. S Culiacán (LACM 7197); 27 mi. S Culiacán (JFC 62:57); El Carrizo (LACM 7223); 2 mi. N El Salado (CSCLB 1205); 5 km. NW Escuinapa, 150 m. (* KU 73647); 5.4 mi. NW Escuinapa (LACM 7202-18); 2.7 mi. N Guamúchil (CSCLB 1973); 7.4 mi. W Guamúchil (CSCLB 1209); N Guasave (LACM 8660); Labrados (CAS 64974); 10.4 mi. N La Cruz turnoff [hwy. 15] (LACM 7199); 2 mi. NE La Cruz turnoff [hwy. 15] (LACM 7222); 58 mi. S Los Mochis turnoff [hwy. 15] (CSCLB 1216); 48 km. N Los Mochis, 15 m. (* KU 67739); 56 km. N Los Mochis (* KU 67740); 3 mi. N Mazatlán (UAZ 16314); 4.4 mi. N Mazatlán (UAZ 16315); 5.5 mi. N Mazatlán (UAZ 16316); 10.9 mi. N Mazatlán (UAZ 16317); 15.8 mi. N Mazatlán (UAZ 16318); 17.5 mi. N Mazatlán (JMS osteo. coll.); Rosario 150 m. (* KU 73646; LACM 7219); 10.4 mi. N Rosario (CSCLB 1206); 22.2 mi. N Rosario (CSCLB 1207); 2.7 mi. S Rosario (CSCLB 1208); San Ignacio (LACM 7200-01); 6 km. NE San Lorenzo, 150 m. (* KU 83421); Santa Cruz, 120 m. (* KU 83422); Santa Lucía 1135 m. (* KU 75637-38, 78965; CSCLB 1218); 5 km. NE Santa Lucía 1520 m. (* KU 80767); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78966); Teacapán (LACM 7224); Terreros (CSCLB 1217); 28 mi.

N Terreros (LACM 7220); 115 mi. N Terreros (LACM 7221); 3 mi. S Terreros (JMS osteo. coll.); 16 mi. S Terreros (LACM 7198); 25.5 mi. S Terreros (JMS osteo. coll.); 4 mi. S Tropic of Cancer (JFC 63:163); 13 km. NNE Vaca, 400 m. (* KU 80770); 8 km. N Villa Unión, 140 m. (* KU 80768-69); 25.5 mi. NE Villa Unión [hwy. 40] (JMS osteo. coll.); 3 km. W Villa Unión (* KU 29513).

Literature records.—6 km. W Costa Rica (Smith and Van Gelder, 1955: 145); 2 mi. S Coyotitán, 300 ft.; 12 mi. S Culiacán, 300 ft. (Davis and Dixon, 1957a:25); El Dorado (Fugler and Dixon, 1961:21); Labrados (Gloyd, 1940: 145); 30 mi. N Los Mochis, 100 ft.; 16 mi. N Mazatlán, 200 ft. (Davis and Dixon, 1957a:25); Presidio (Günther, 1895:195); Retes (Gloyd, 1940:145).

Additional records.—2 mi. N Agua Nuevo (SDSNH 41204); Costa Rica (UIMNH 34923); Culiacán (SDSNH 3034); 16-20 mi. N Culiacán (FAS 11370, 11372); 46.6 mi. N Culiacán (FAS 17003); 57.9 mi. N Culiacán (FAS 14407); El Dorado (AMNH 90757-59); 8 mi. NNE El Fuerte (FMNH 95982; SDSNH 42427); 2.4 mi. SE Elota, Río (SU 24094); 4.4 mi. S Espinal (FAS 17001); 1.2 mi. E La Cruz (SU 24093); 35 mi. S Los Mochis (USNM 151780); 5 mi. N Mazatlán (AMNH 75892); 14 mi. N Mazatlán (MCZ 61431); 28.4 mi. N Mazatlán (FAS 12430); 32.5 mi. N Mazatlán (UIMNH 39184); 14.4 mi. NNW Mazatlán (UMMZ 114666); 18 mi. NNW Mazatlán, 200 ft. (UMMZ 114593); 19 mi. NNW Mazatlán (UMMZ 114667); Palos Blancos (SDSNH 3133-35); 12.1 mi. N Pericos (FAS 10408); Retes (SDSNH 3061); 9.8 mi. N Rosario (CAS 95765); 5.9 mi. NW Rosario (SU 24095); 2.8 mi. NW Villa Unión (AMNH 94809).

Crotalus lepidus (Kennicott)

Caudisona lepida Kennicott, Proc. Acad. Nat. Sci. Philadelphia, 13:206, 1861 (based on specimens from Presidio del Norte and Eagle Pass, Texas).

Crotalus lepidus: (part), Cope, Proc. Acad. Nat. Sci. Philadelphia, 35:13, 1883.

Remarks.—Two juveniles of unknown sex have 169, 159 ventrals; 23, 28 subcaudals; 26-23-21, 23-23-17 dorsal scale rows; 12-12, 12-12 supralabials; 11-11, 11-10 infralabials; 33, 35 dorsal body blotches. One specimen has the upper preocular split in a manner typical for the species, but the other specimen (KU 79232) has undivided upper preoculars that curve over the canthus rostralis. Both specimens have a pair of black occipital spots and a distinct black stripe from the eye to the angle of the jaw.

Although these specimens are from the western edge of the range of *C. l. klauberi* they possess high numbers of dorsal blotches that are characteristic of *C. l. morulus* from Tamaulipas; they also have postocular stripes and separated occipital blotches that are characteristic of *C. l. lepidus* from the eastern part of the Mexican plateau. Klauber (1956:37, footnote 16) has commented that *C. lepidus* from this general area require further study. For these reasons we use no subspecific designation for the Sinaloan specimens.

Distribution in Sinaloa.—Known only from the southern highlands. See Fig. 88.

Specimens examined.—5 km. SE Palmito, Durango (*in Sinaloa*), 1880 m. (* KU 79232); 19.2 km. NE Santa Lucía, 1940 m. (* KU 78973).

Literature record.—7 and 9 mi. (by road) NE El Batel (Zweifel, 1954:149).

Crotalus molossus molossus Baird and Girard

Crotalus molossus Baird and Girard, Catalogue of North American reptiles, p. 10, 1853 (type locality, Fort Webster, Santa Rita del Cobre, New Mexico).

Crotalus molossus molossus: Gloyd, Occ. Pap. Mus. Zool. Univ. Michigan, 325:2, January 28, 1936.

Remarks.—Klauber (1952:87) reported that specimens of *Crotalus basiliscus* and *C. molossus* from southern Sonora show intergradation in several characters, and that no actual overlap in the ranges of the two species had been demonstrated.

A female, collected near El Fuerte, has 181 ventrals, 20 subcaudals, 25-25-22 dorsal scale rows, 17-16 supralabials, 16-16 infralabials, 32 dorsal body blotches, and six tail rings. The dorsal blotches are open laterally (see Klauber, 1936:259, fig. 78), and the tail is nearly solid black. The tail length is 5.3 per cent of the total length. Our specimen shares certain characters with *C. basiliscus*, but because of the low number of ventrals and subcaudals, the distinctive dorsal pattern, the nearly solid black tail, and a knowledge of *C. basiliscus* from the same general area we assign the specimen to *C. molossus*.

Specimens of *C. basiliscus* have been taken within about 50 kilometers southwest (near sea-level) and about 50 kilometers northeast (about 520 meters elevation) of the locality of this specimen of *molossus* (elevation about 150 meters). It is probable that the two species are sympatric in northern Sinaloa. We leave the final clarification of the relationships between *C. basiliscus* and *C. molossus* to future workers.

Distribution in Sinaloa.—Known only from the northern foothills. See Fig. 89.

Specimen examined.—6 km. NE El Fuerte, 150 m. (* KU 78964).

Crotalus stejnegeri Dunn

Crotalus stejnegeri Dunn, Proc. Biol. Soc. Washington, 32:214, 1919 (type locality, Plomosas, Sinaloa).

Remarks.—One male of this rare species has 175 ventrals, 42 subcaudals, 28-27-22 dorsal scale rows, 14-14 supralabials, 14-16 infralabials, 2-2 preoculars, 4-3 postoculars, 3-3 suboculars, 38 dorsal body blotches, about 12 tail bands (indistinct on posterior part of tail); the tail length is 13.9 per cent of body length. The color pattern

and scale characteristics agree with the description by Klauber (1952:107-09).

Distribution in Sinaloa.—Southern highlands in tropical deciduous forest. See Fig. 88.

Specimen examined.—2.2 km. NE Santa Lucía, 1155 m. (* KU 78972).

Literature records.—Plomosas (Gloyd, 1940:232; Smith, 1943a:414).

Order CROCODYLIA

Family CROCODYLIDAE

Crocodylus acutus Cuvier

Crocodylus acutus Cuvier, Ann. Mus., 10:55, pls. I, II, 1807 (based on a specimen from Santo Domingo, West Indies).

Remarks.—The crocodile occurs in the lowland drainages, coastal lagoons, and estuaries of southern Sinaloa. Residents of Culiacán have reported "caimanes" from near Altata, but verification of these accounts must await the securing of specimens. Recently hatched young were reported from near Teacapán on August 10 (Scott, 1962:84). A large specimen from near Teacapán measured 3 meters.

Distribution in Sinaloa.—Known only from extreme south. See Fig. 91.

Specimens examined.—Palmillas (LACM 6558, 6560); 4 mi. SE Teacapán (LACM 6559).

Literature records.—Mazatlán (Boulenger, 1889:281; Cope, 1900:175; Zweifel, 1959a:3); Presidio (Boulenger, 1889:281).

Additional records.—Mazatlán (AMNH 15162-63; USNM 72342).

SPECIES OF QUESTIONABLE OCCURRENCE

Records of several species that have been reported from Sinaloa are doubtful for various reasons. Five such species are discussed below.

Rana montezumae Baird

Rana montezumae Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:61, 1854 (type locality, City of México, Distrito Federal).

There is a single specimen in the collections of the Museum of Comparative Zoology (MCZ 8629) recorded from Mazatlán. Dunn (1922:222) reported this specimen as *Rana pustulosa*. Oliver (1937:7-8) re-examined the frog and assigned it to *Rana montezumae*. We have examined the specimen and agree with Oliver that the frog definitely is not *R. pustulosa*. The presence of paired lateral vocal sacs and dorsolateral glandular folds indicate the specimen is a member of the *pipiens* group. Certain characteristics suggest the frog might represent *Rana megapoda*, but because of its poor condition we follow Oliver and refer the specimen to *Rana montezumae*. Because both *Rana montezumae* and *Rana megapoda* are restricted to the Mexican plateau and because Mazatlán represents a habitat distinct from those known for the species, we do not include *Rana montezumae* in the fauna of the state.

Kinosternon hirtipes Wagler

Kinosternon hirtipes Wagler, Naturl. Syst. der Amphibien, p. 137, pl. 5, figs. 29, 30, 1830 (based on a specimen from México).

In 1885-1902, Günther (page 15, plates 12-15) reported specimens of *Kinosternon* from Mazatlán, Sinaloa, and from the Tres Marias Islands as *K. hirtipes*. Boulenger (1889:42) referred the same specimens to *K. integrum*. Subsequent authors (Taylor, 1938:529; Smith and Taylor, 1950b:25) reported *K. hirtipes* from Sinaloa. Zweifel (1960:94) referred the Tres Marias *Kinosternon* to the species *integrum*. Our work in Sinaloa complements Zweifel's work on the fauna of the Tres Marias Islands and we agree that all specimens of *Kinosternon* from Sinaloa are typical *integrum*. On this basis we reject the records and reports of *K. hirtipes* from Sinaloa, and suggest that these records are based on misidentified specimens of *K. integrum*. Additional information pertaining to the differences between *K. integrum* and *K. hirtipes* are presented in the account for *K. integrum*. It should be pointed out that the wholesale restrictions of type localities, as exemplified by the restriction of the type locality for *K. hirtipes* to Mazatlán by Smith and Taylor (1950a:343) have no validity and such restrictions should be ignored. This is especially relevant in the above instance where the type locality is restricted to a place where the species apparently does not occur.

Anolis nebuloides Bocourt

Anolis nebuloides Bocourt, Mission scientifique au Mexique . . ., Etudes sur les reptiles, livr. 2, pp. 74-75, pl. 13, fig. 10, 1873 (type locality, Putla, Oaxaca).

An examination of specimens of *Anolis* from Sinaloa has convinced us that the reports of *Anolis nebuloides* are based on misidentified specimens of *Anolis nebulosus*. In addition, all specimens examined had, to the best of our knowledge, an orange dewlap. *Anolis nebuloides* has a pink dewlap.

Gerrhonotus imbricatus ciliaris Smith

Gerrhonotus levicollis ciliaris Smith, Proc. U. S. Nat. Mus., 92:365, 1942 (type locality, Sierra Gaudelupe, Coahuila).

Gerrhonotus imbricatus ciliaris: Stebbins, Amer. Mus. Novitates, 1883:23, March 21, 1958.

There is a specimen of *Gerrhonotus imbricatus ciliaris* in the American Museum of Natural History (AMNH 585) collected by Paul R. Ruthling at "Escuinapa." The lizard was re-examined and the identity confirmed as reported by Tihen (1949:245) and Smith and Taylor (1950b:202). According to Tihen (1949:252), Stebbins (1958:18, fig. 4), and Duellman (1961:88) *Gerrhonotus imbricatus* is found at relatively high altitudes usually in pine forests. Escuinapa is located on the coastal plain at less than 50 meters elevation in tropical dry or deciduous forest. Because of the obvious differences in habitat between Escuinapa and other localities at which *Gerrhonotus imbricatus* has been collected, and because of the provenance of certain other specimens from the Ruthling collection, we do not consider Escuinapa, Sinaloa, to be the

likely collecting site for this specimen. For this reason we do not consider *Gerrhonotus imbricatus ciliaris* as a member of the Sinaloan herpetofauna. Future collecting in the pine-oak forest to the east of Escuinapa may reveal its presence in the state.

Thamnophis melanogaster melanogaster (Peters)

Tropidonotus melanogaster Peters, Monatsb. Akad. Wiss. Berlin, pp. 389-390, 1864 (based on two specimens from México).

Thamnophis melanogaster melanogaster: Smith, Zoologica, 27:116, 1942.

Two specimens (AMNH 19526-27) of this snake were purportedly collected by Paul R. Ruthling at Mazatlán. The amount of black on the belly of these specimens, a characteristic of the central Mexican plateau race of *T. melanogaster*, necessitates a rejection of Mazatlán as the collecting site. Roger Conant examined the specimens and arrived at the same conclusion concerning the probable origin of these specimens.

SUMMARY

The herpetofauna of Sinaloa consists of 137 taxa, including 131 species. Reported from Sinaloa for the first time are 21 species or subspecies as follows: *Eleutherodactylus hobartsmithi*, *Syrrophus modestus*, *Rana pustulosa*, *Hyla smaragdina*, *Chrysemys scripta hiltoni*, *Hemidactylus frenatus*, *Phyllodactylus h. homolepidurus*, *Sceloporus m. magister*, *Cnemidophorus tigris*, *Gerrhonotus kingii ferrugineus*, *G. l. liocephalus*, *Heloderma s. suspectum*, *Coniophanes l. lateritius*, *Dryadophis melanolomus stuarti*, *Geophis dugesii*, *Leptodeira septentrionalis polysticta*, *Phyllorhynchus decurtatus*, *Salvadora bairdi*, *Sonora aemula*, *Storeria storerioides*, and *Crotalus m. molossus*.

Based on more extensive systematic studies of several species the following taxonomic changes are proposed. Each synonym is followed by the name recognized in this paper.

Phrynohyas latifasciata Duellman (1956) equals *Phrynohyas venulosa* (Laurenti, 1768)

Sceloporus clarkii uriquensis Tanner and Robison (1959) equals *Sceloporus clarkii boulengeri* Stejneger (1893)

Sceloporus nelsoni barrancorum Tanner and Robinson (1959) equals *Sceloporus nelsoni* Cochran (1923)

Gyalopion quadrangularis desertorum (Taylor, 1936) equals *Gyalopion quadrangularis* (Günther, 1893)

Pseudoficimia frontalis hiltoni Bogert and Oliver (1945) equals *Pseudoficimia frontalis* (Cope, 1864)

Tantilla yaquia bogerti Hartweg (1944) equals *Tantilla yaquia* Smith (1942)

The following polytypic species are not assigned to subspecies in Sinaloa at this time: *Syrrhophus modestus*, *Ctenosaura hemilopha*, *Masticophis bilineatus*, *Phyllorhynchus browni*, *P. decurtatus*, and *Sympholis lippiens*.

Several species are not included in the fauna of Sinaloa even though some have been reported from the state and others are likely to be found there in the future; these are: *Leptodactylus melanonotus*, *Rana montezumae*, *Anolis nebuloides*, *Hysiglena ochrorhyncha*, *Kinosternon hirtipes*, *Gerrhonotus imbricatus ciliaris*, and *Thamnophis melanogaster melanogaster*.

Each species that occurs in the state is discussed in terms of its taxonomic status, habitat, and geographical distribution. In addition, information on life history, ecology, and morphological variation are presented when such facts are known or are pertinent.

No new taxa are described in this paper.

GAZETTEER

The following names of places and geographical features are those to which reference is made in this paper. The spellings are based principally on Gazetteer number 15 for México prepared by the United States Board on Geographic Names and published by the Department of the Interior (1956). Latitude north of the equator is followed by longitude west of Greenwich. There are many places in Sinaloa with identical or similar names. Where several coordinates are given for a single name, the first one listed is the one used in this paper. Numbers in brackets refer to the position of the places on the accompanying map (Fig. 12, p. 224).

- Abuya 24 09 N, 107 04 W (not shown on Fig. 12)
Acaponeta [Nayarit] 22 30 N, 105 22 W [99]
Agua Caliente 23 09 N, 106 06 W; 23 27 N, 106 06 W; 24 03 N, 106 38 W; 24 38 N, 106 46 W; 24 56 N, 107 23 W; 25 58 N, 108 08 W; 26 22 N, 107 49 W; 26 31 N, 108 22 W; 26 49 N, 108 23 W [85]
Aguaje 25 22 N, 108 02 W [32]
Agua Nuevo 24 05 N, 106 50 W; 24 45 N, 107 14 W; 26 42 N, 108 27 W [58]
Aguapepe 25 04 N, 107 39 W; 25 07 N, 107 10 W; 25 27 N, 108 16 W [38]
Ahome 25 55 N, 109 11 W [18]
Altamura, Isla 25 00 N, 108 10 W [42]
Altata 24 38 N, 107 55 W [49]
Bacubirito 25 49 N, 107 55 W [15]
Badiraguato 25 22 N, 107 31 W [33]
Barrón, Río Presidio 23 07 N, 106 17 W [86]
Caitime 25 21 N, 107 56 W [34]
Camino Real 23 52 N, 106 39 W [64]
Cañas, Río (at hwy. 15) 23 32 N, 106 29 W [70]
Carrizalejo 25 42 N, 107 50 W; 24 49 N, 107 19 W [23]
Casa Blanca 26 16 N, 108 48 W [8]
Cerro Prieto Approximately 26 07 N, 109 03 W [9]
Charay 26 01 N, 108 50 W [13]
Chele 23 13 N, 105 53 W [80]
Chivos, Isla 23 11 N, 106 26 W [84]
Choix 26 43 N, 108 17 W [4]
Chupaderos 23 22 N, 105 58 W [77]
Colonia de la Reforma Approximately 25 12 N, 108 17 W [37]
Concepción 22 32 N, 105 28 W [98]
Concordia 23 17 N, 106 04 W [78]
Copala 23 23 N, 105 56 W [75]
Cosalá 24 23 N, 106 41 W [52]
Costa Rica Approximately 24 33 N, 107 23 W [50]
Coyotitán 23 47 N, 106 35 W [66]
Crucero de Piaxtla 23 49 N, 106 36 W [65]
Culiacán 24 48 N, 107 24 W [46]
El Batel 23 27 N, 105 49 W [72]
El Burrion 25 34 N, 108 24 W [28]
El Cajón 26 52 N, 108 20 W; 23 21 N, 106 02 W [1]
El Carrizo 25 58 N, 108 57 W; 26 15 N, 109 03 W; 23 04 N, 105 35 W [16]
El Dorado 24 17 N, 107 21 W; 25 32 N, 108 28 W [53]
El Fuerte 26 25 N, 108 39 W [6]

- El Limón 23 44 N, 106 31 W; 24 16 N, 106 44 W; 24 16 N, 107 04 W; 24 43 N, 107 08 W; 26 06 N, 108 46 W; 26 56 N, 108 28 W [68]
- Elota 23 58 N, 106 42 W [60]
- El Palmito [Durango] (=Palmarito) 23 35 N, 105 49 W; 23 45 N, 106 28 W; 24 36 N, 106 55 W; 25 32 N, 108 16 W; 25 38 N, 107 46 W [69]
- El Quelite (=Quelite) 23 32 N, 106 28 W [70]
- El Salado 23 53 N, 106 49 W [62]
- El Venadillo 23 17 N, 106 24 W (not Kellogg, 1932:138, 188) [79]
- Escuinapa 22 51 N, 105 48 W [91]
- Espinal (=El Espinal) 23 47 N, 106 24 W; approximately 24 04 N, 106 54 W [67]
- Estero la Ballena This is a locality for *Urosaurus ornatus lateralis* (UAZ 9585-87) presumably from the coastal lowlands just north of Ahome (not shown on Fig 91).
- Guacamil This is the northwest edge of Guamúchil according to Howard W. Campbell (personal communication).
- Guamúchil 25 28 N, 108 06 W; 22 35 N, 105 36 W; 22 54 N, 105 45 W; 23 07 N, 105 51 W; 23 55 N, 106 37 W; 24 07 N, 106 45 W; 24 54 N, 108 06 W; 25 14 N, 107 42 W; 25 22 N, 108 22 W; 25 27 N, 108 06 W; 25 58 N, 109 18 W ([31])
- Guasave 25 34 N, 108 27 W [26]
- Guayvo Approximately 26 02 N, 109 23 W [11]
- Higuera de Zaragoza 25 59 N, 109 16 W [14]
- Higueres 24 14 N, 107 02 W; 23 04 N, 105 56 W (Higueras); 23 41 N, 106 06 W (Las Higueras); 24 25 N, 107 21 W; 24 15 N, 107 19 W (Higueral); 25 22 N, 108 28 W; 25 23 N, 108 32 W; 25 56 N, 108 59 W [55]
- Ixpalino 23 54 N, 106 38 W [64]
- La Boca 24 12 N, 107 12 W; 24 56 N, 107 25 W [56]
- Labrados 23 24 N, 106 01 W; 23 03 N, 106 07 W [76]
- La Concha 22 45 N, 105 34 W [93]
- La Cruz 23 55 N, 106 54 W; 24 20 N, 107 19 W; 24 40 N, 107 38 W; 25 58 N, 108 54 W [61]
- La Noria 23 30 N, 106 18 W; 22 53 N, 105 54 W [71]
- Las Teposanas 24 03 N, 106 42 W [59]
- Las Trancas 24 43 N, 107 44 W [48]
- Los Mochis 25 45 N, 109 03 W [21]
- Madero (=ejido Francisco Madero) 25 35 N, 108 37 W [27]
- Mármol Approximately 23 30 N, 106 29 W [70]
- Matatán 23 02 N, 105 45 W [88]
- Mazatlán 23 13 N, 106 25 W [82]
- Mocorito 25 29 N, 107 55 W [30]
- Navolato 24 47 N, 107 42 W [47]
- Obispo 24 18 N, 107 06 W; 24 17 N, 107 09 W [54]
- Ohura, Bahía de 25 38 N, 108 58 W [24]
- Palmar 24 56 N, 107 07 W; 23 39 N, 106 02 W; 25 11 N, 107 23 W [45]
- Palmer de Sepulveda (=Palmar de Sepúlveda) 25 43 N, 107 55 W [22]
- Palmillas 22 48 N, 105 36 W; 23 16 N, 106 18 W [92]
- Palmito de la Virgen, Isla 23 00 N, 106 10 W [90]
- Palmito del Verde, Isla 22 39 N, 105 48 W [95]
- Palos Blancos 24 54 N, 107 46 W; 23 41 N, 106 18 W; 25 08 N, 107 56 W; 25 35 N, 108 21 W [44]
- Pánuco 23 25 N, 105 55 W [75]
- Pericos 25 03 N, 107 42 W; 26 06 N, 107 28 W [39]
- Pixtla 23 52 N, 106 39 W [64]
- Playa Visnaga Approximately 26 02 N, 109 18 W [12]
- Plomosas 23 04 N, 105 29 W [87]
- Potrerillos 23 27 N, 105 52 W; 23 02 N, 105 56 W; 25 28 N, 108 19 W [74]
- Presidio 23 14 N, 106 08 W; 23 09 N, 106 13 W [83]

- Quelite 23 32 N, 106 28 W; 25 20 N, 108 14 W [70]
Rancho Huanacastle 22 36 N, 105 36 W [96]
Rancho de los Pocitos 25 02 N, 107 51 W [40]
Rancho Rosalito Approximately 26 53 N, 108 01 W [2]
Retes Locality unconfirmed, but according to Gloyd (1940:145, map 10) it appears to be in the vicinity of 25 02 N, 107 20 W [41]
Rincon de Urias 23 14 N, 106 23 W [82]
Rosario 23 00 N, 105 52 W [89]
San Benito 25 32 N, 107 45 W [29]
San Blas 26 05 N, 108 46 W [10]
San Francisquito [Nayarit] 22 44 N, 105 30 W; 25 36 N, 108 16 W; 26 20 N, 108 56 W [94]
San Ignacio 23 55 N, 106 25 W; 25 25 N, 108 54 W (San Ignacio, Isla [100]) [63]
San José del Oro 25 21 N, 107 16 W [35]
San Lorenzo 24 25 N, 107 07 W; 25 41 N, 108 04 W [51]
San Miguel 25 56 N, 109 03 W; 23 02 N, 105 32 W; 25 41 N, 108 06 W; 25 48 N, 108 40 W; 25 59 N, 108 22 W [17]
San Pedro Approximately 26 25 N, 108 30 W [5]
Santa Cruz 25 36 N, 108 26 W; 25 35 N, 107 33 W [28]
Santa Lucía 23 27 N, 105 53 W [74]
Santa Rita 23 28 N, 105 50 W (= Rancho Santa Rita); 23 04 N, 105 31 W; 23 12 N, 106 15 W [72]
San Rosa 24 59 N, 107 20 W; 25 59 N, 108 26 W; 26 31 N, 107 53 W [43]
Sinaloa 25 50 N, 108 14 W [20]
Tazon 24 07 N, 107 06 W [57]
Teacapán 22 33 N, 105 45 W [97]
Tecorito 25 01 N, 107 23 W [41]
Terreros 25 14 N, 107 55 W; 25 12 N, 107 58 W; Approximately 26 23 N, 108 42 W [36]
Topolobampo 25 36 N, 109 03 W [25]
Tropic of Cancer (at hwy. 15) Approximately 23 28 N, 106 28 W [73]
Tule 25 52 N, 108 31 W; 25 28 N, 108 39 W [19]
Vaca 26 48 N, 108 25 W [3]
Venados, Isla 23 14 N, 106 29 W [84]
Villa Unión 23 12 N, 106 14 W [81]
Yecorato 26 22 N, 108 18 W [7]

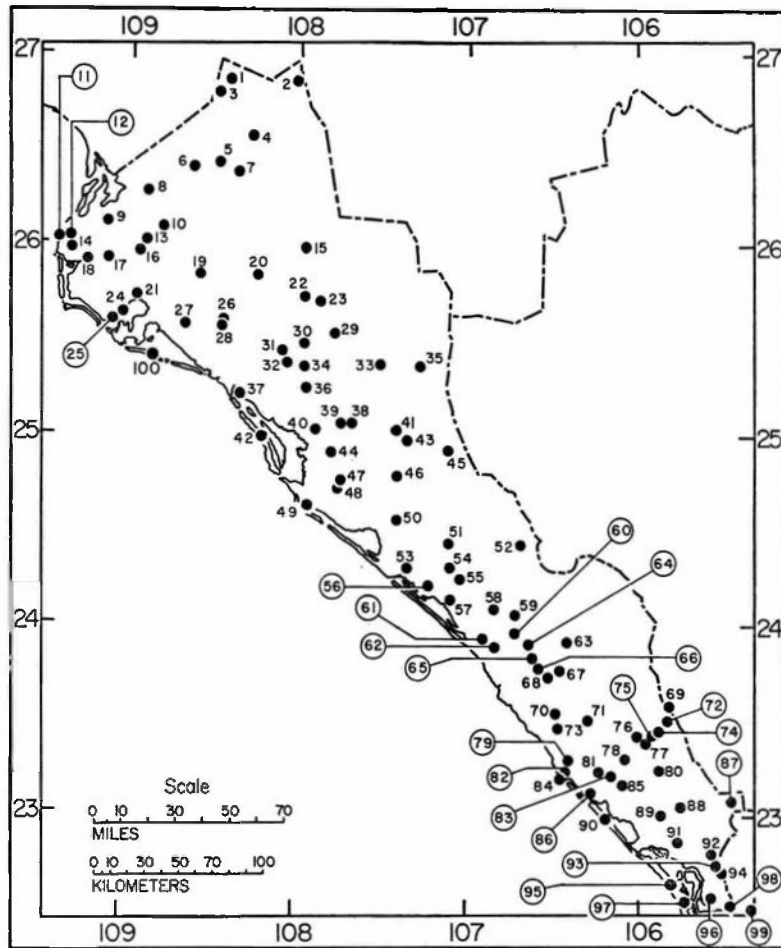
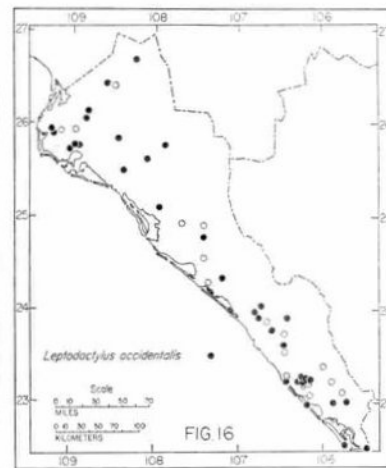
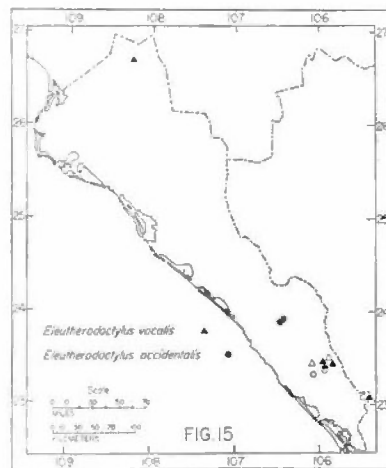
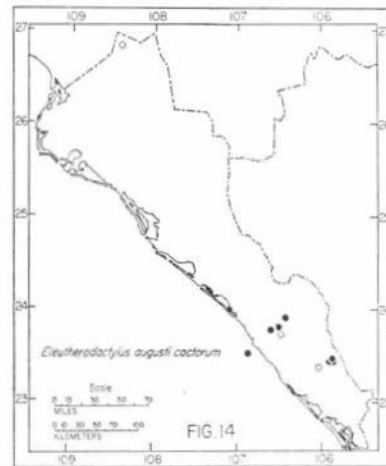
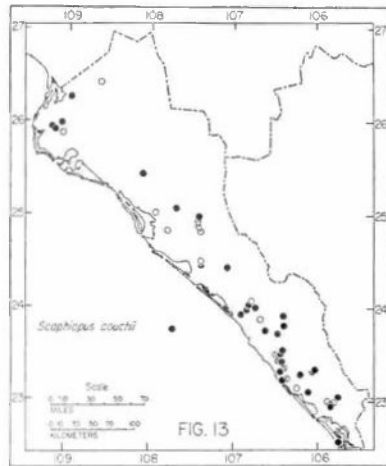


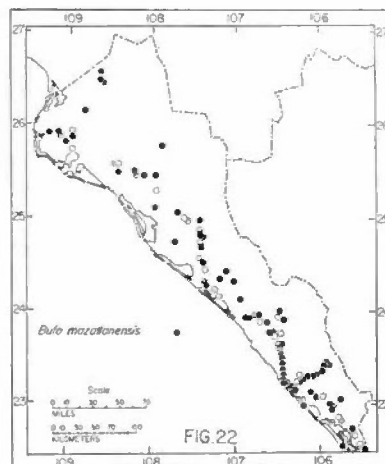
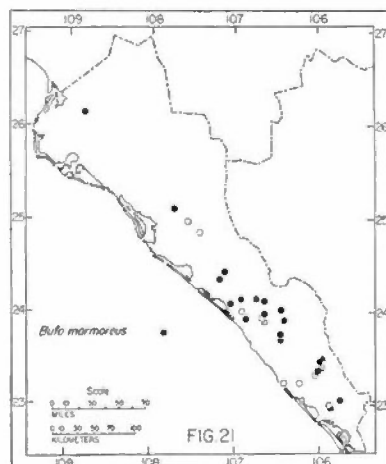
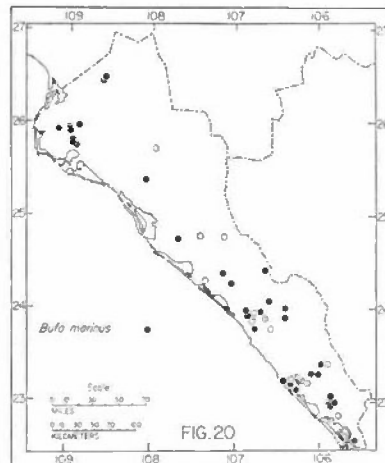
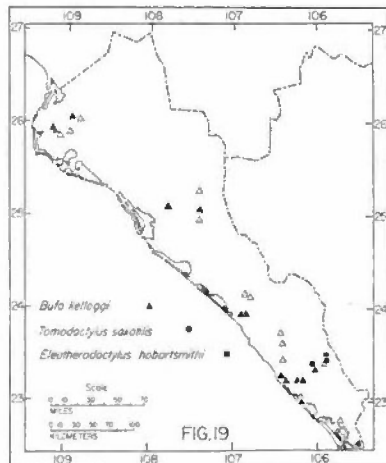
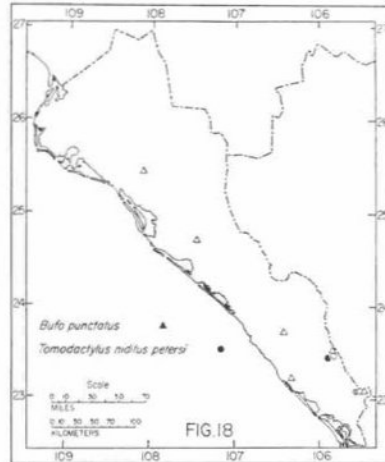
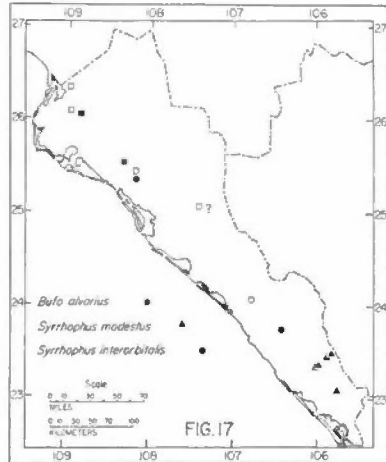
FIG. 12. Map of Sinaloa showing named places and geographic features referred to in this paper. In the numerical sequence north takes precedence over south. Each number represents a single dot, but each dot may represent one or more localities.

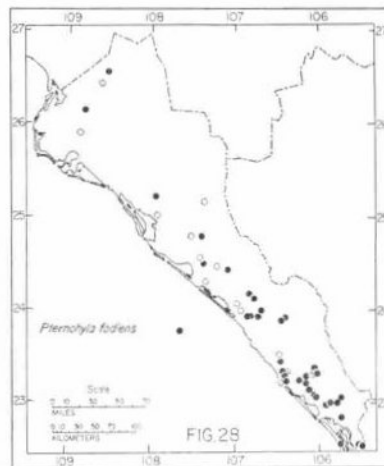
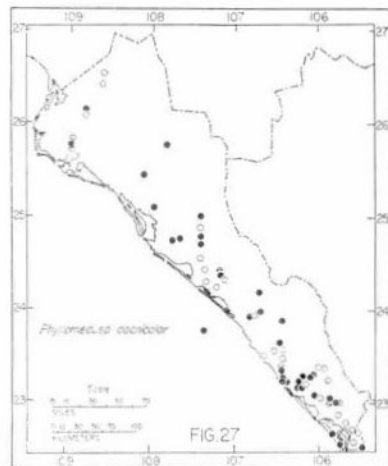
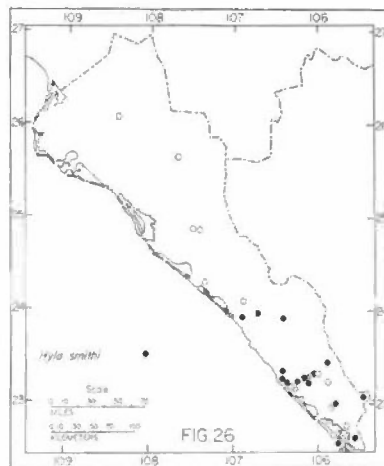
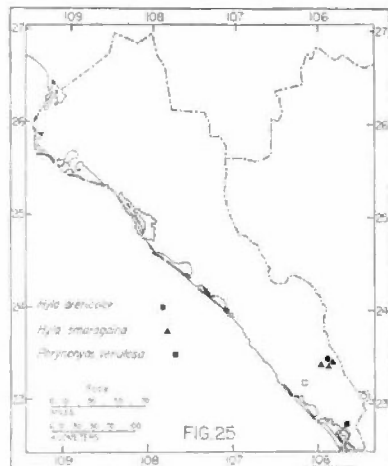
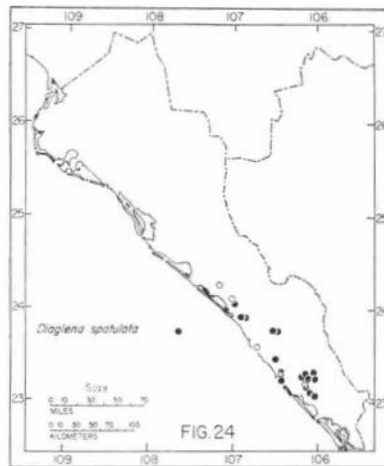
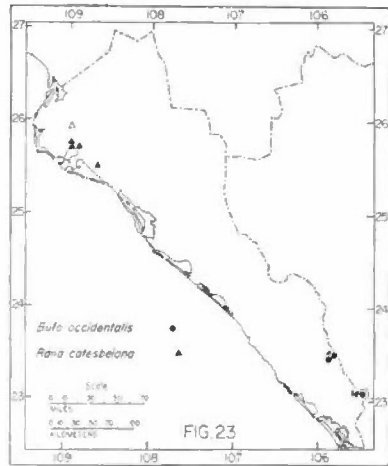
1. El Cajón
2. Rancho Rosalito
3. Vaca
4. Choix
5. San Pedro
6. El Fuerte
7. Yecorato
8. Casa Blanca
9. Cerro Prieto
10. San Blas
11. Guayvo
12. Playa Visnaga
13. Charay
14. Higuera de Zaragoza
15. Bacubirito
16. El Carrizo
17. San Miguel
18. Ahome
19. Tule
20. Sinaloa
21. Los Mochis
22. Palmer de Sepulveda
23. Carrizalejo
24. Ohura, Bahía de
25. Topolobampo
26. Guasave
27. Madero
28. El Burrion
Santa Cruz
29. San Benito
30. Mocerito
31. Guamúchil
32. Aguaje
33. Badiraguato
34. Caitime
35. San José de Oro
36. Terreros
37. Colonia de la Reforma
38. Aguapepe
39. Pericos
40. Rancho de los Pocitos
41. Retes
Tecorito
42. Altamura, Isla
43. Santa Rosa
44. Palos Blancos
45. Palmar
46. Culiacán
47. Navolato
48. Las Trancas
49. Altata
50. Costa Rica
51. San Lorenzo
52. Cosalá
53. El Dorado
54. Obispo
55. Higuera
56. La Boca
57. Tazon
58. Agua Nuevo
59. Las Teposanas
60. Elota
61. La Cruz
62. El Salado
63. San Ignacio
64. Camino Real
Ixpalino
Piactla
65. Crucero de Piactla
66. Coyotitán
67. Espinal
68. El Limon
69. El Palmito [Durango]
70. Cañas, Río
El Quelite
Marmol
Quelite
71. La Noria
72. El Batel
Santa Rita
73. Tropic of Cancer (at hwy. 15)
74. Potrerillos
Santa Lucía
75. Copala
Panuco
76. Labrados
77. Chupaderos
78. Concordia
79. El Venadillo
80. Chele
81. Villa Unión
82. Mazatlán
Rincón de Uriás
83. Presidio
84. Chivos, Isla
Venados, Isla
85. Agua Caliente
86. Barrón
87. Plomosas
88. Matatán
89. Rosario
90. Palmito de la Virgen, Isla
91. Escuinapa
92. Palmillas
93. La Concha
94. San Francisquito [Nayarit]
95. Palmito del Verde, Isla
96. Rancho Huanacastle
97. Teacapán
98. Concepción
99. Acaponeta [Nayarit]

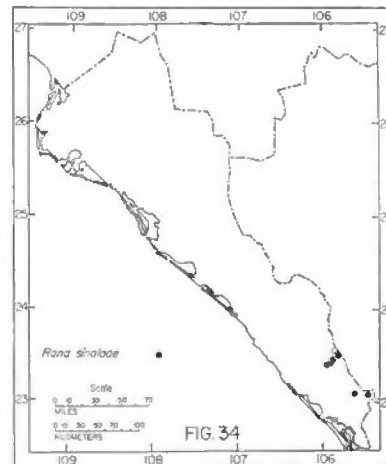
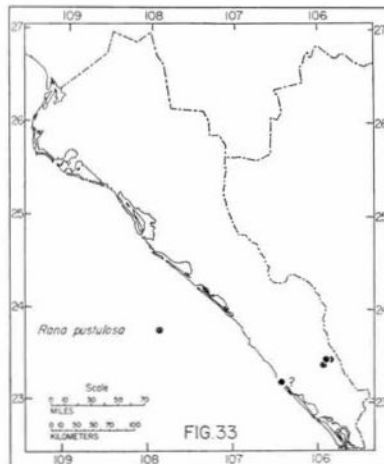
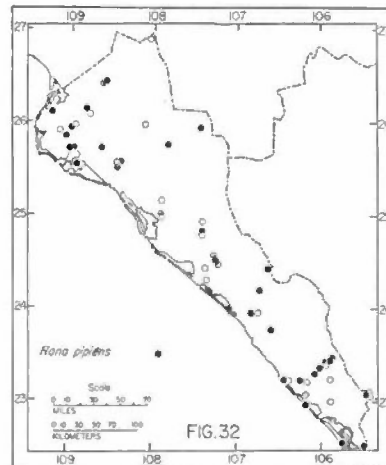
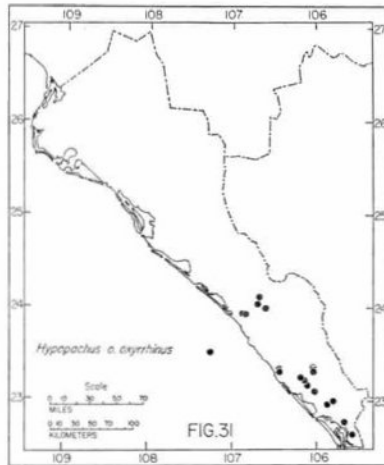
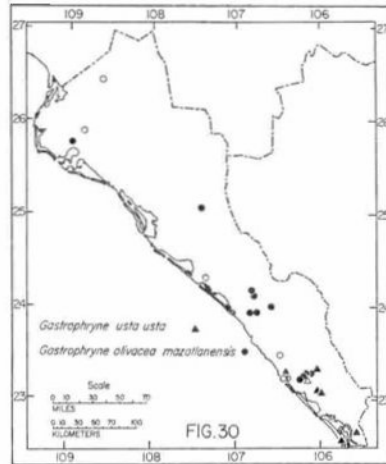
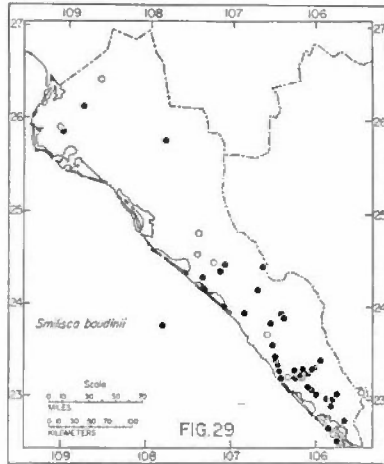
EXPLANATION OF DISTRIBUTION MAPS

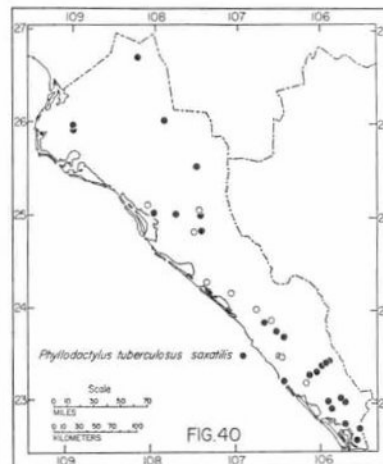
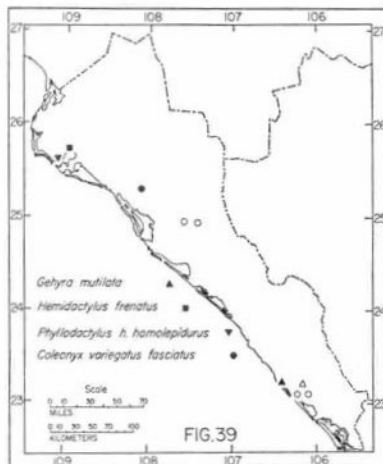
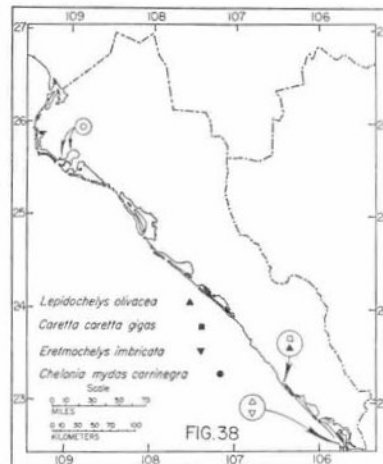
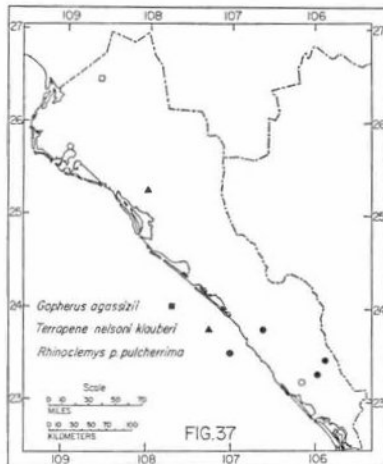
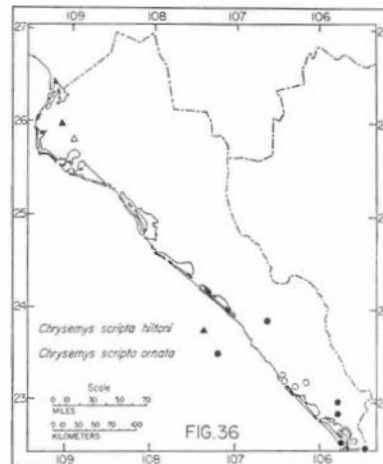
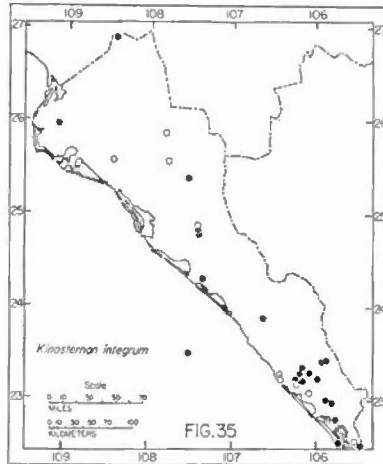
On distribution maps that follow (Figs. 13-91), solid symbols indicate localities of capture for specimens examined by us; open symbols indicate records for which we have not seen specimens.

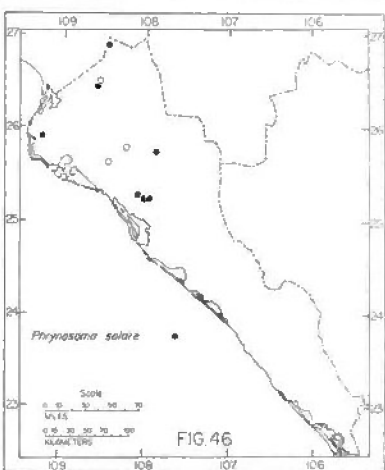
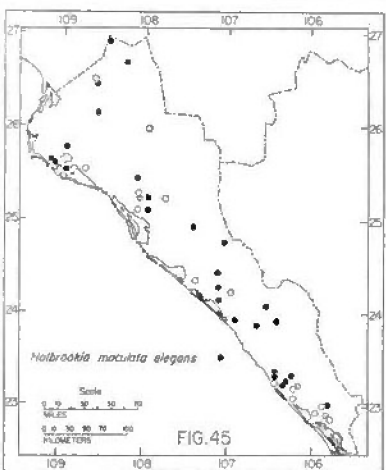
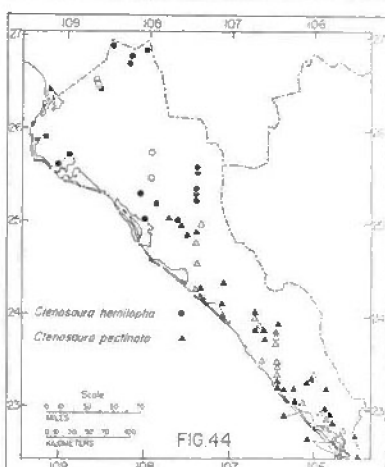
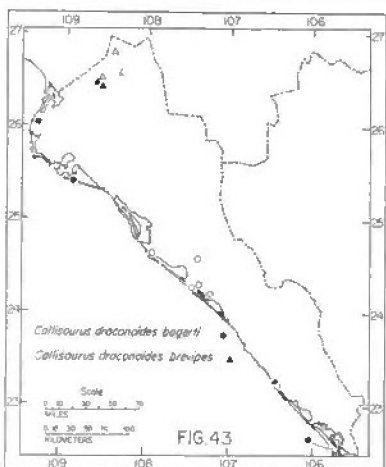
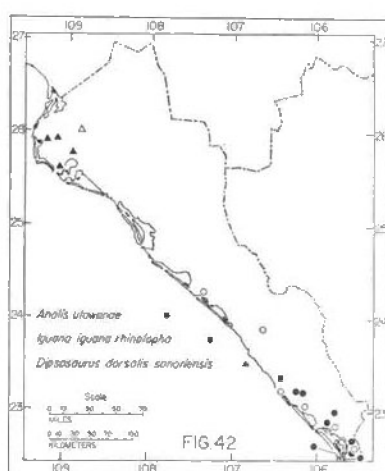
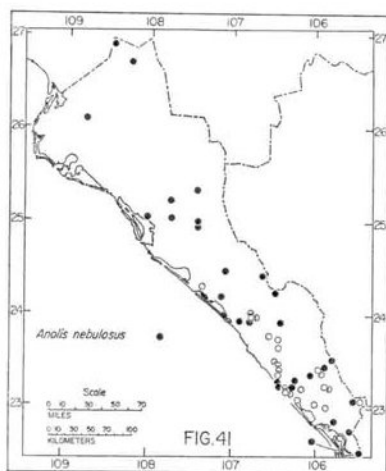


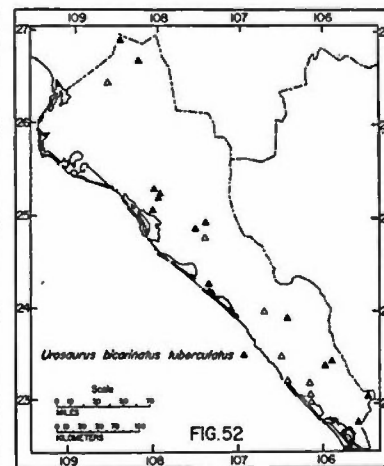
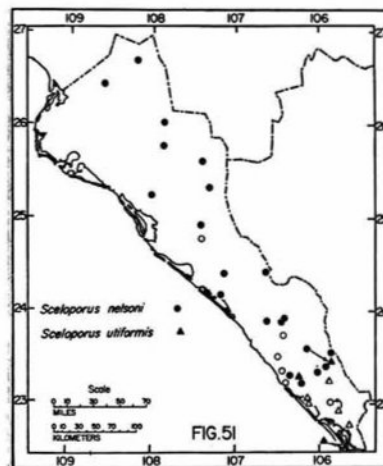
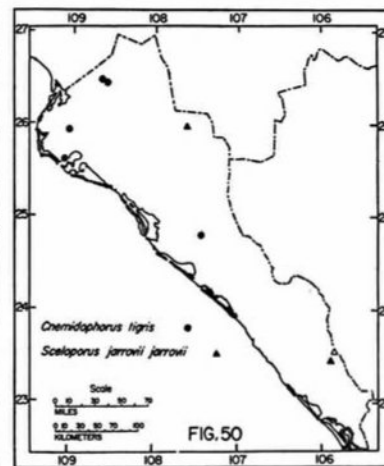
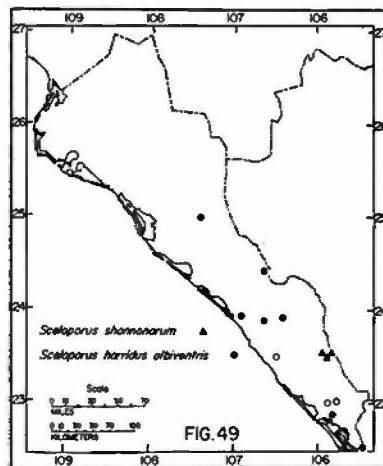
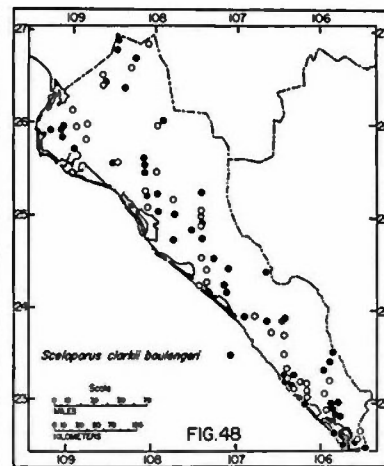
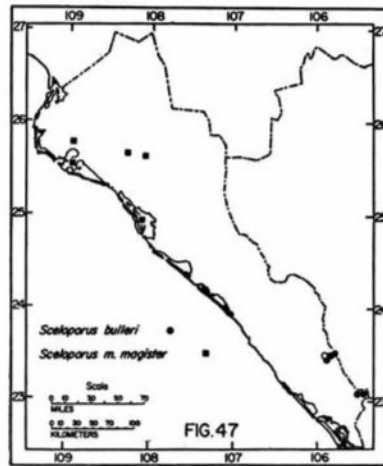


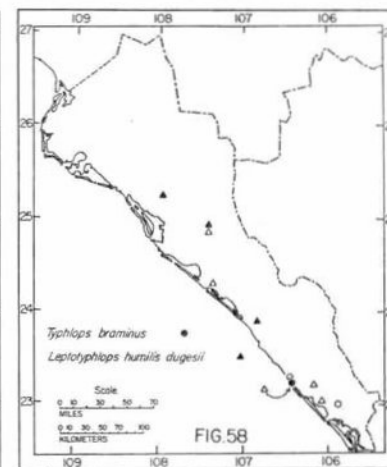
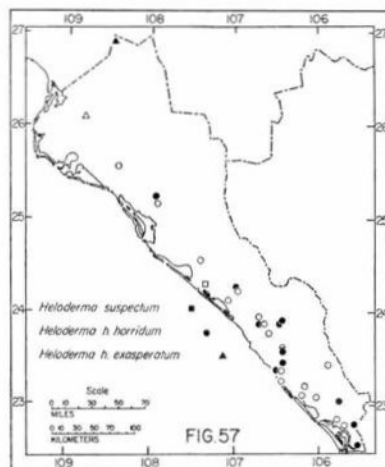
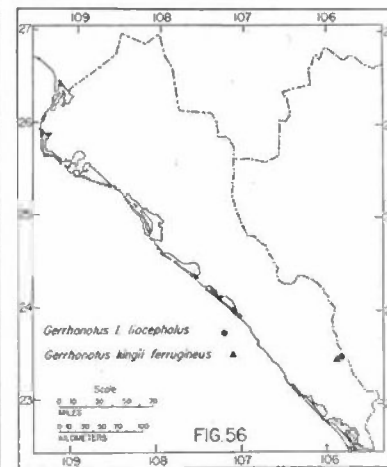
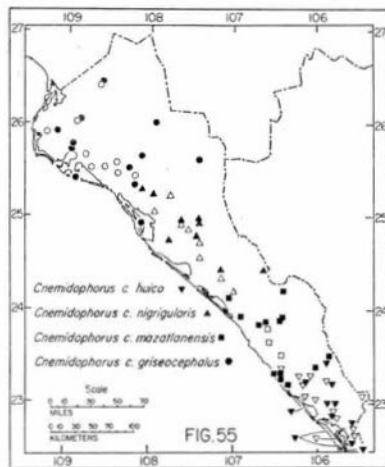
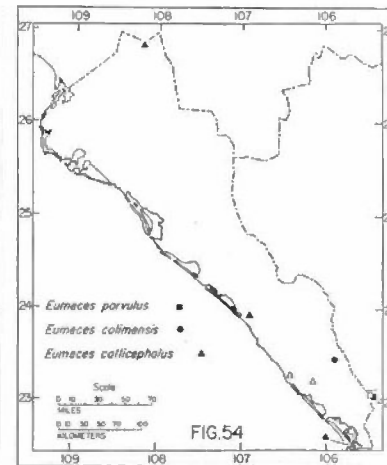
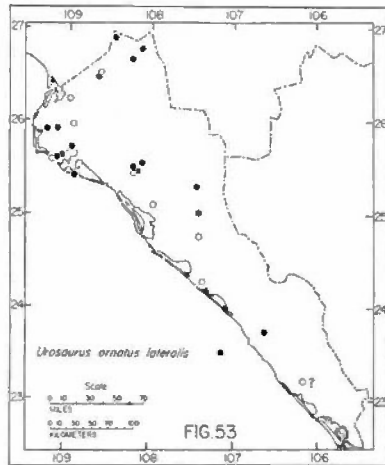


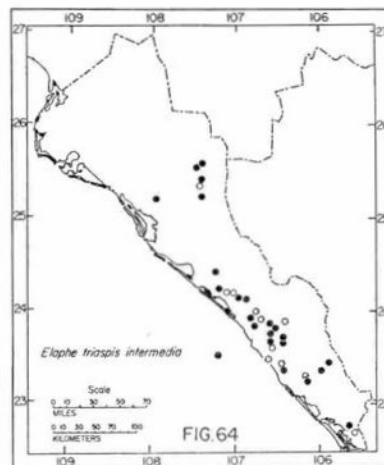
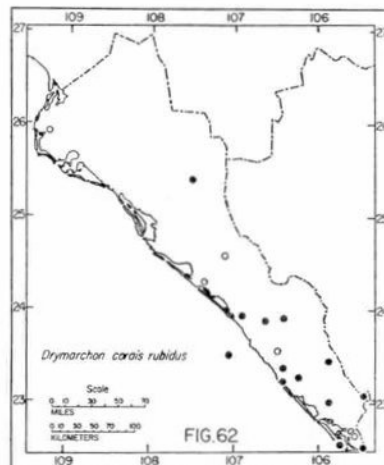
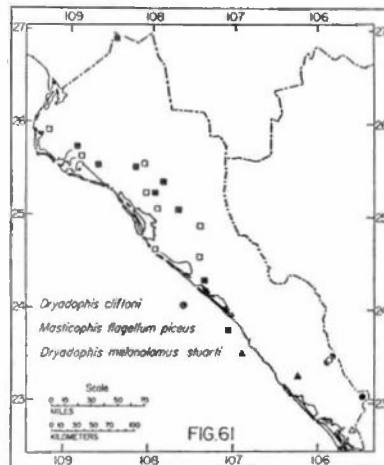
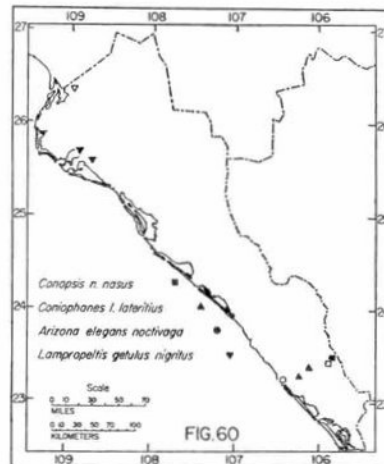
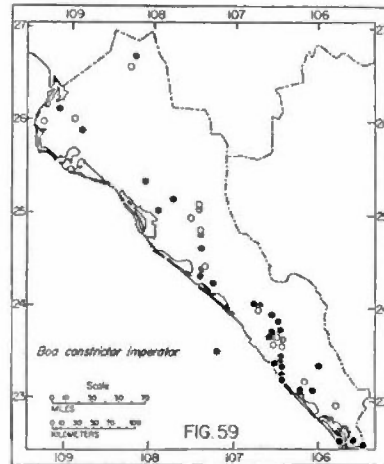


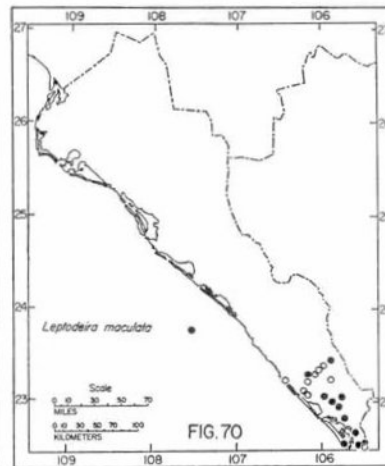
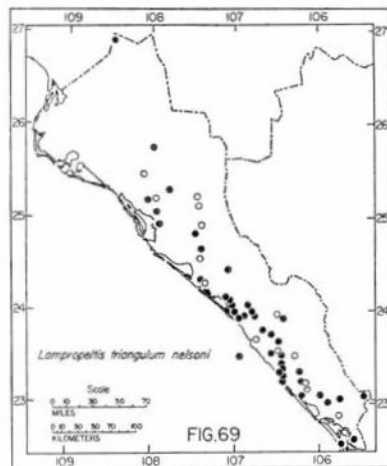
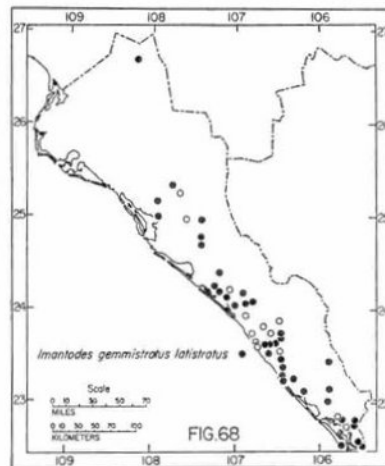
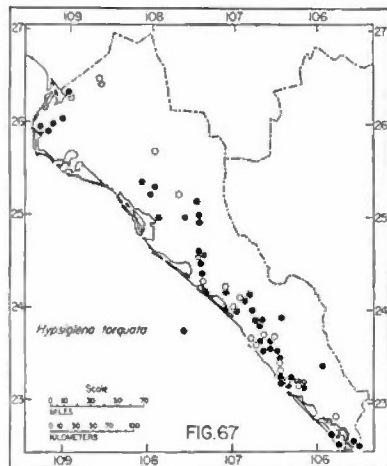
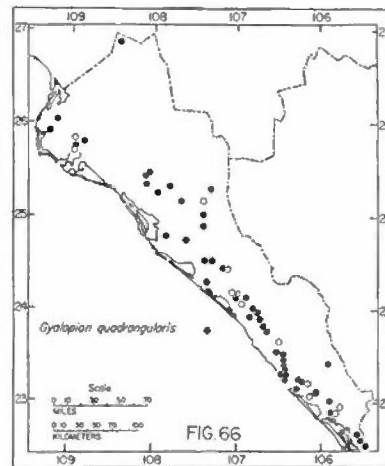
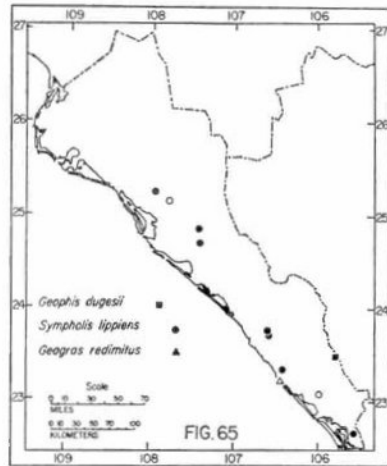


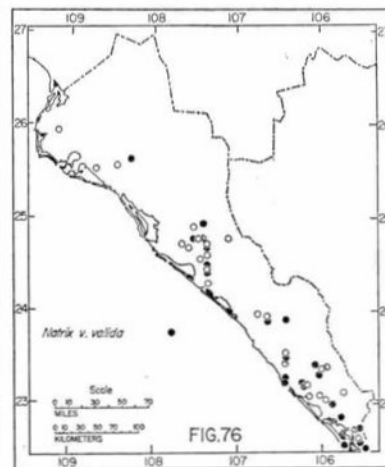
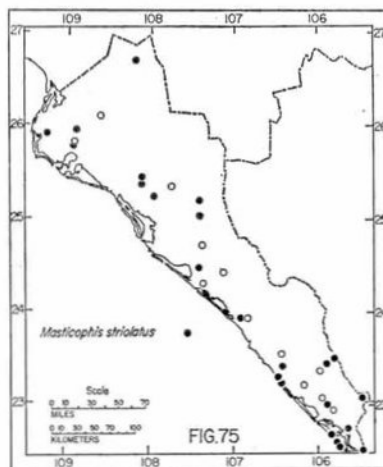
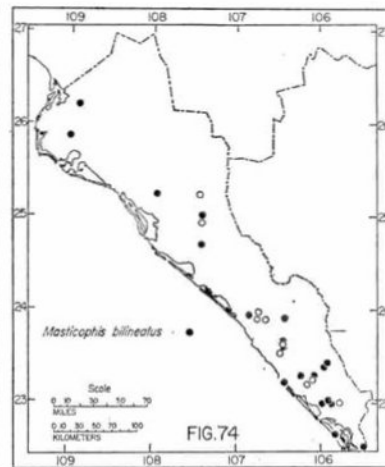
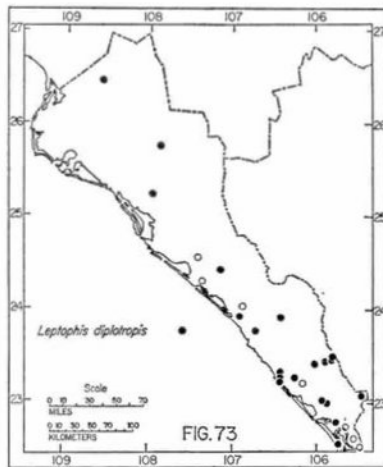
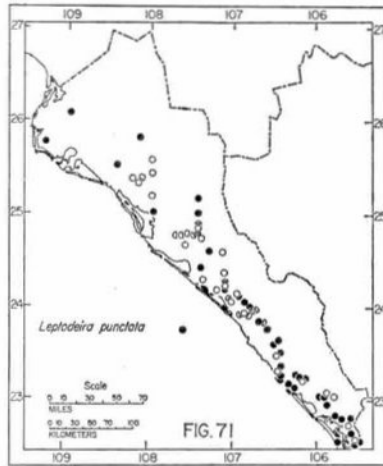


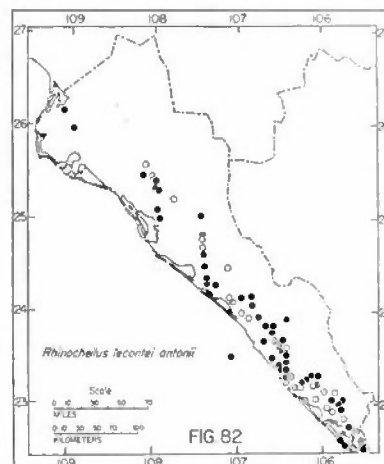
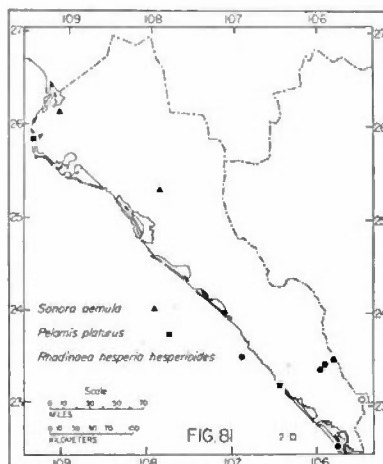
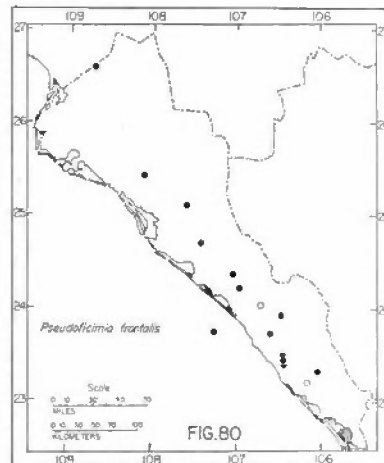
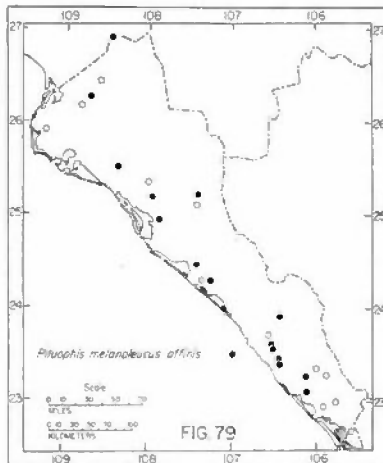
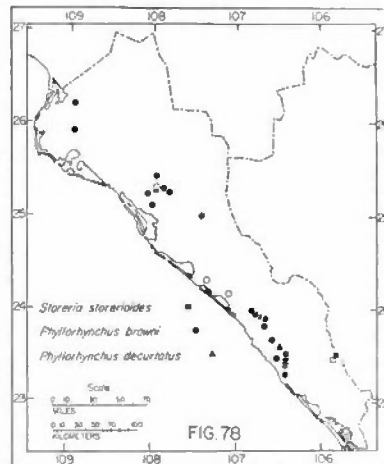
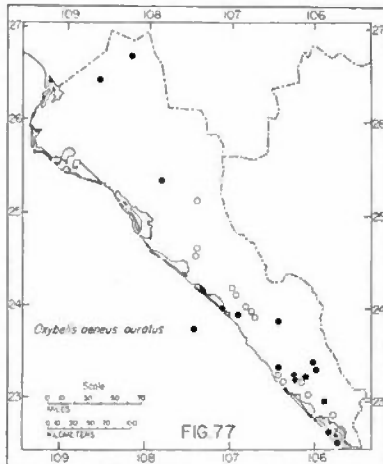


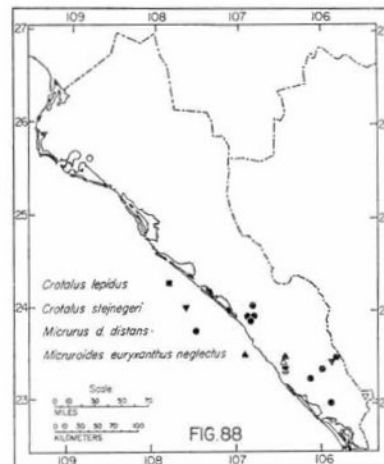
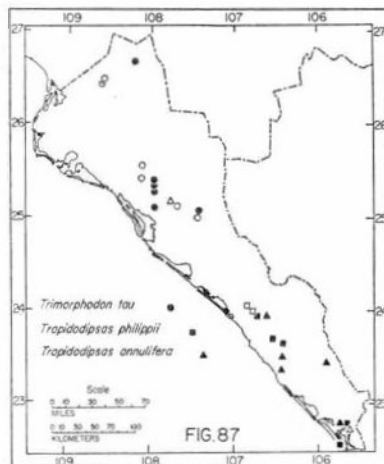
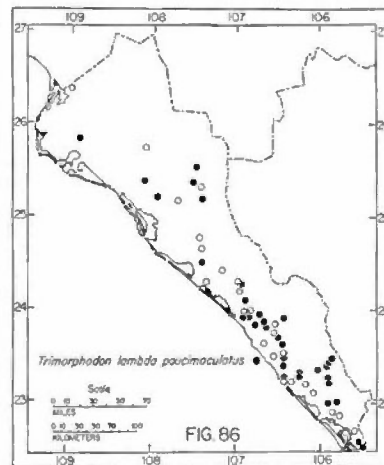
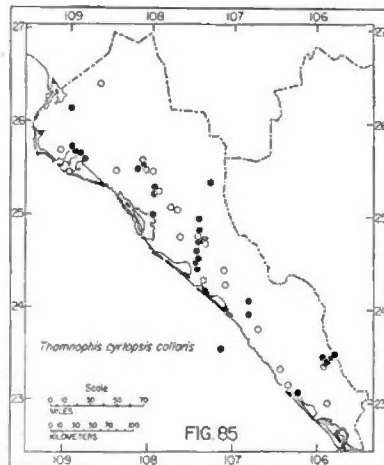
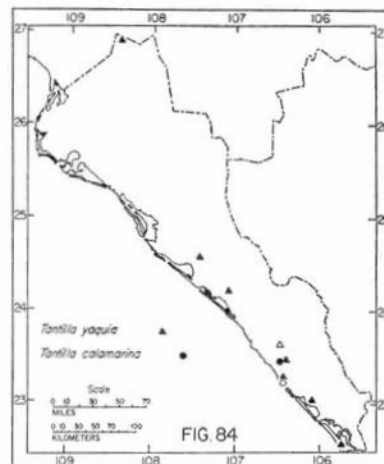
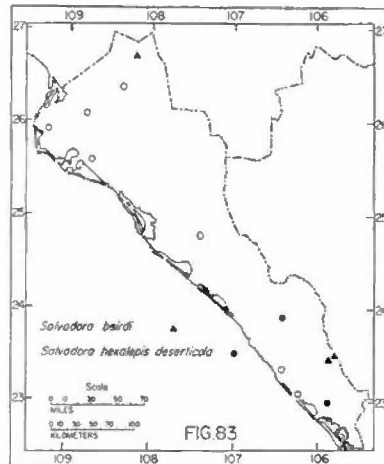


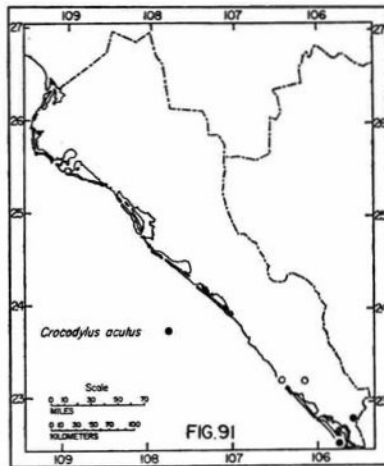
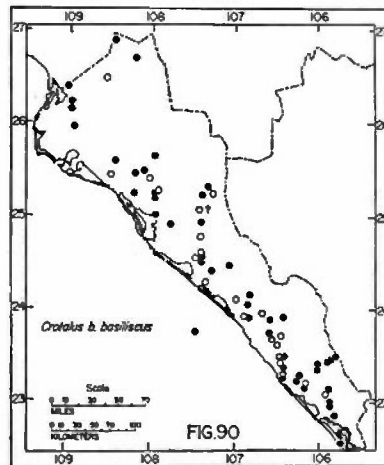
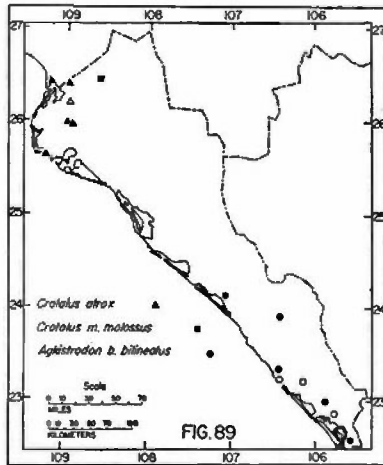












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PLATE 1



FIG. 1. Tropical Thorn Woodland at five kilometers northeast of El Fuerte, 60 meters elevation. Photograph by Percy L. Clifton on December 26, 1961.



FIG. 2. Tropical Thorn Woodland in the dry season near Tule, Sinaloa. June 18, 1963.

PLATE 2



FIG. 1. Xeric coastal vegetation in Tropical Thorn Woodland at Topolobampo, Sinaloa. June 17, 1963.



FIG. 2. Tropical Thorn Woodland, 24 kilometers south of Guasave, Sinaloa. Photograph by Percy L. Clifton on March 14, 1962.

PLATE 3

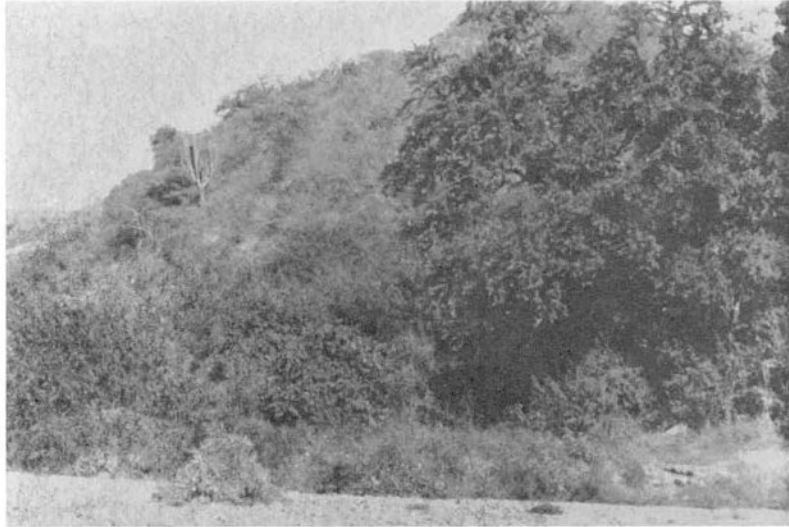


FIG. 1. Tropical Semiarid Forest, 13 kilometers north-northeast of Vaca, Sinaloa, 400 meters elevation. Photograph by Percy L. Clifton on November 26, 1963.



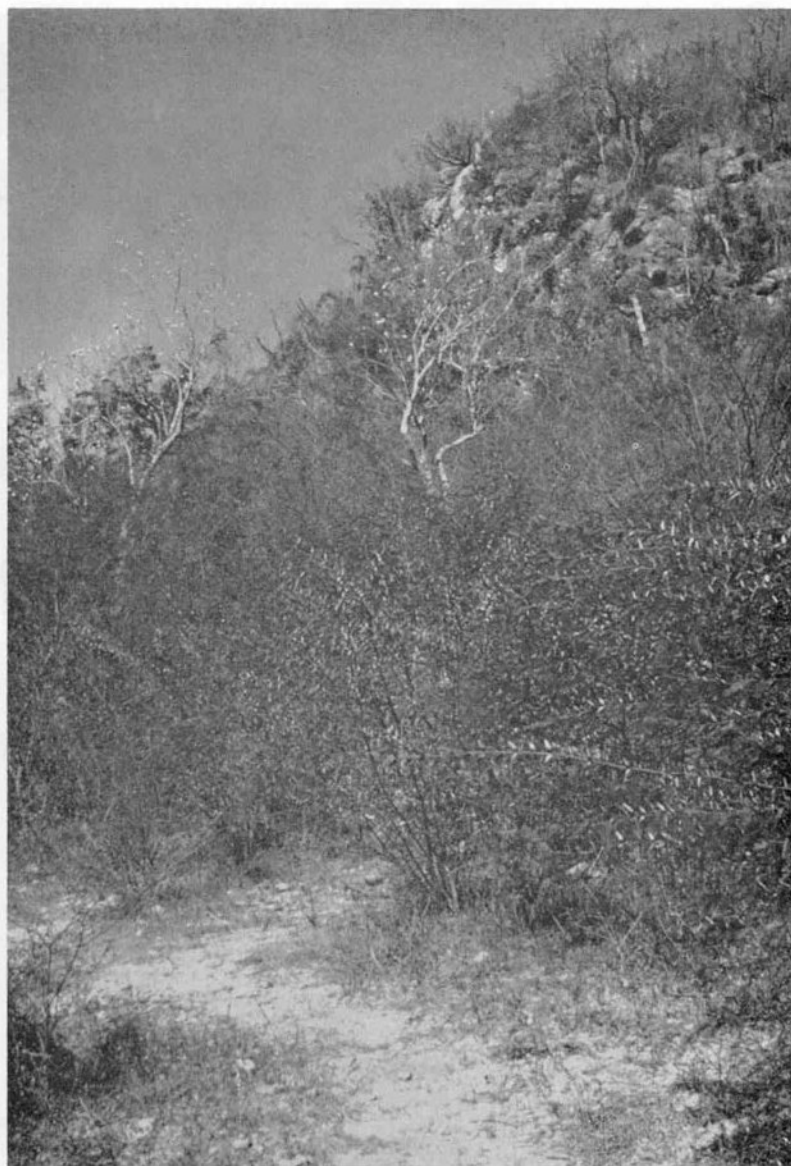
FIG. 2. Tropical Semiarid Forest about 10 miles north of Culiacán, Sinaloa. Open areas of forest are the result of cattle grazing. Photograph by James R. Dixon; September, 1960.

PLATE 4



Tropical Semiarid Forest about 20 miles south of Culiacán in the dry season. The columnar cacti, *Pachycereus pecten-arborescens*, is abundant in this formation. Photograph by Richard B. Loomis; June, 1962.

PLATE 5



Trail through Tropical Semiarid Forest near Rio Piaxtla, Sinaloa. *Acacia cymbispina* is the dominant plant in this area. Photograph by Richard B. Loomis on December 28, 1964.

PLATE 6



Tropical Dry Forest in the dry season one kilometer south of Pamuco, Sinaloa.
Photograph by Richard B. Loomis on December 9, 1964.

PLATE 7



FIG. 1. Tropical Dry Forest eight kilometers north of Villa Unión, Sinaloa, 45 meters. Photograph by Percy L. Clifton, October 20, 1963.



FIG. 2. Mountain stream through Subtropical Dry Forest, 2.2 kilometers north-east of Santa Lucía, Sinaloa, 1100 meters. July 30, 1963.

PLATE 8



FIG. 1. Subtropical Dry Forest in a canyon, 2.2 kilometers northeast of Santa Lucía, Sinaloa. July 30, 1963.



FIG. 2. Lower Montane Dry Forest five kilometers southwest of El Palmito (Durango), 1850 meters, Sinaloa. Photograph by Percy L. Clifton, July 19, 1963.