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SPHAERODACTYLUS (GEKKONIDAE) IN THE GREATER PUERTO RICO REGION

RICHARD THOMAS AND ALBERT SCHWARTZ [1]

SYNOPSIS: The geckos of the genus *Sphaerodactylus* in Greater Puerto Rico (those West Indian islands between Mona Passage and Anegada Passage) are discussed in detail. *S. macrolepis* Günther and *S. grandisquamis* Stejneger are combined, and seven new subspecies of the resulting *S. macrolepis* are described from Puerto Rico and Isla Vieques. *S. nicholsi* Grant and *S. townsendi* Grant are regarded as races of a single species. *S. danforthi* Grant is considered a synonym of *S. macrolepis* Günther. A new subspecies of *S. beattyi* Grant is described from St. Croix. Variation, detailed discussions of coloration and pattern, and geographic distribution of the remaining Puerto Rican forms are given and a hypothetical history of the *macrolepis* complex is presented.

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[1] The authors have been engaged in studies on West Indian herpetology for 12 years; a portion of their field work in Cuba from 1957 to 1961 was supported by two National Science Foundation grants. They have collected 40,000 reptiles and amphibians from more than 100 islands. Earlier contributions to the Bulletin by the junior author deal with the systematics of *Leiocephalus cubensis* and (as junior author with William E. Duellman) the herpetology of southern Florida. Manuscript received 28 June, 1965.—ED.

Thomas, Richard, and Albert Schwartz. 1966. *Sphaerodactylus* (Gekkonidae) in the Greater Puerto Rico Region. Bull. Florida State Mus., vol. 10, no. 6, pp. 193-260.

INTRODUCTION

The term Greater Puerto Rico was used by Schmidt (1928) to denote the region containing Puerto Rico and the Virgin Islands. Although he used it to refer to a probable formerly unified land mass, we use it here in recognition of the faunal similarity of the islands involved. It includes all the islands between the Mona and Anegada Passages, though Desecheo, as one of the few West Indian islands from which *Sphaerodactylus* has not been recorded, is not pertinent to the present problem. *S. macrolepis parvus* King from the northwestern Leeward Islands is also discussed for the sake of completeness.

Not until Chapman Grant's herpetological investigations was the true richness of the genus *Sphaerodactylus* in this region suspected. Grant added seven forms, all but one of which this study regards as valid. To date no trinomens have been applied to these geckos; though *monensis* was originally described as a variety of *macrolepis*, it has not been subsequently recognized as such. The following names have been applied to Greater Puerto Rican *Sphaerodactylus*:

macrolepis Günther, 1859
monensis Meerwarth, 1901
grandisquamis Stejneger, 1904
roosevelti Grant, 1931
nicholsi Grant, 1931
danforthi Grant, 1931
klauberi Grant, 1931
townsendi Grant, 1931
gaigeae Grant, 1932
beattyi Grant, 1937
parthenopion Thomas, 1965

The sphaerodactyls of Greater Puerto Rico, with one possible exception, share a community of characteristics and doubtless developed from a single radiation within this region. The dorsal scales are flattened, keeled, acute, and imbricate and possess (with one exception) hair-bearing scale organs only. There is no middorsal zone of granules or granular scales. The presence of a scapular patch and ocelli, though not universal, appears to be basic. While some species among the forms considered are eminently distinct, few are separable by all-or-nothing differences in scalation, which reflects the community of similarities mentioned above. Differences are primarily of size, shape, and color.

The sequence in which the forms are treated begins with the most widespread, and therefore the least specialized with respect to habitat restriction; this form is also moderate in size and apparently basic in coloration. Beyond this the forms are arranged in a sequence of relationship which we hope to clarify in the discussion.

We have followed King (1962) in characters used and in methods of taking counts. In general we use his style of diagnosis and description, although we have defined species with an inclusive description. Stated average size differences of a few millimeters between taxa may seem of questionable importance until the miniscule size of these lizards is realized. In some cases we have indicated the size range of the adults of a population by utilizing only the upper 50% of the total size range of the specimens. We have then determined the average size of all specimens falling within this range.

In this study we have relied primarily on our own recently collected material, which we know to have accurate locality data, and which was carefully preserved and color-noted. Extensive series of some of the forms exist in collections; we have not drawn on these, except when they pertained to localities from which we had little or no material or when they were the basis for questionable identifications in the literature. The usefulness of a series of over 400 old and ill-preserved specimens of a form from one locality is dubious in this type of study.

Acknowledgments and Abbreviations

For the loan of additional specimens we are much indebted to the following people: Ernest E. Williams, Museum of Comparative Zoology at Harvard (MCZ); Charles F. Walker, George Zug and Kraig Adler, University of Michigan Museum of Zoology (UMMZ); and Charles M. Bogert and Grace M. Tilger, American Museum of Natural History (AMNH). ASFS designates the Albert Schwartz Field Series. RT specimens are from the senior author's private collection. Paratypes have also been deposited in the United States National Museum (USNM), University of Kansas Museum of Natural History (KU), University of Illinois Museum of Natural History (UIMNH) and the University of Florida collections (UF).

Felix Iñigo of the Department of Agriculture and Commerce of the Commonwealth of Puerto Rico has repeatedly given prompt and courteous service in obtaining official sanction for our collecting activities; for this he merits our utmost appreciation. Likewise, our sincere appreciation is due to Jesse E. Williams, who paved the way for our collecting on Ramey Air Force Base, Puerto Rico and to

George A. Seaman of St. Croix, who not only was of great help during a visit to that island, but who has subsequently furnished us with information about localities there. We also wish to thank Rowan Roy of Tortola for his aid during our visit to that and adjacent islands. Juan A. Wirshing has been our host on three trips to the island of Caja de Muertos; without his help visits to that island would not have been so easy or so profitable.

We thank the following people for assistance in the field: Robert I. Balfour, Donald W. Buden, Gerald D. Gagnon, Warren R. Faust, Ronald F. Klinikowski, David C. Leber, and Barton L. Smith. We would also like to thank Grady E. Lanier for use of his microscope for examination of scale organs and Wayne King for discussion of various aspects of this problem with us, particularly the taxonomic significance of scale organs. The illustrations are by the senior author, the maps by the junior author, and the escutcheons by R. F. Klinikowski and the senior author.

SYSTEMATIC LIST

Sphaerodactylus macrolepis Günther

Sphaerodactylus macrolepis Günther, 1859, Ann. Mag. Nat. Hist. (3), Vol. 4, p. 215.

TYPE LOCALITY: St. Croix, American Virgin Islands.

DISTRIBUTION: Puerto Rico, including Cayo Santiago and Isla Piñeros; Isla Vieques, including the islets of Cayo de Afuera and Cayo de Tierra; Culebra, including Culebrita and Cayo Luís Peña; the American and British Virgin Islands; the Leeward Islands from Dog Island and Anguilla south to St. Barthélemy. On Puerto Rico occurs almost island-wide from sea level to a known elevation of 2800 feet north of Sabana Grande, but absent from the southwestern region from the peninsula of Cabo Rojo eastward to near Ponce, and apparently absent from the Sierra de Luquillo. On smaller islands usually widely distributed altitudinally.

DEFINITION: A species of *Sphaerodactylus* with very large, acute, strongly keeled, flattened imbricate dorsal scales, axilla to groin 16-28; no area of middorsal granules or granular scales; dorsal body scales with one of two structures: 1, with both knob-like and hair-bearing organs, the latter, each with one hair, are located on the free posterior edge of each scale (Puerto Rico and some of its small satellite islands; Isla Vieques). 2, with only hair-bearing organs on the free posterior edge of each scale (Culebra and its associated islets, St. Croix, and the Virgin Islands from St. Thomas and its satellites north and east to Anegada; the northernmost Leeward Islands, except Sombrero,

south as far as St. Barthélemy). Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, enlarged midventrally; gular scales almost always keeled but occasionally smooth; chest scales smooth to keeled laterally or even somewhat keeled centrally; ventrals rounded, imbricate, scales axilla to groin 20-32, usually smooth, but occasionally keeled on the anterior part of the venter and rarely on the entire venter; scales around midbody 31 to 54; internasals 0 to 3 (mode 1); upper labials to mid-eye, 3 (some times 4); escutcheon (fig. 11a) with a broad and compact central area and extensions onto the thighs to near the underside of the knee (3-10 X 11-30).

Color pattern sexually dichromatic, except in the Leeward Island population, and variable among the subspecies. Males generally with a tan to brown dorsum, usually without lines, with scattered darker scales (salt-and-pepper), or patternless; a unicolor to faintly marked head, usually without a cephalic figure; a black or dark brown scapular patch which may be reduced or absent, with a pair of white to buffy ocelli which may be almost or entirely absent; throat pattern varying from immaculate to prominently marked; and a pale venter. Females with a unicolor tan to brown dorsum, with or without a series of longitudinally parallel lines, the paramedian pair partly fused to form a series of median blotches; an almost unicolor to boldly marked head; a black to brown scapular patch, at times reduced, with two white, buff, or gray ocelli, either enclosed within the patch or on or near its periphery; throat pale to heavily marked with darker; and a pale venter. Iris color variable, from greenish-gray or bluish to yellow, golden, or brown. Habitus moderate; snout fairly long and narrow. Adult size variable by subspecies from 23 mm to 35 mm snout-vent length. S. *macrolepis* ranks third in size of individuals among Greater Puerto Rican sphaerodactyls, the largest within the species being the populations from the Cordillera Central, the smallest the extralimital populations from the northern Leeward Islands.

REMARKS: When Stejneger (1904: 603) described *Sphaerodactylus grandisquamis* he differentiated it from S. *macrolepis* Günther solely on the basis of the size of the dorsal scales. Barbour (1921: 254-55) combined *grandisquamis* and S. *monensis* Meerwarth from Isla Mona with *macrolepis*, and gave the range of the latter as five of the Virgin Islands, Puerto Rico, and Vieques. Schmidt (1928: 72-73) followed Barbour's action. Grant (1931) removed *monensis* from obscurity and regarded it as a distinct species; later (1932d) he distinguished between S. *macrolepis* and S. *grandisquamis* and called each a separate species.

For reasons outlined below, the form *monensis* should be regarded as a distinct species. King (1962: 18) has suggested that at least *macrolepis* and *grandisquamis* (along with *notatus* of Cuba, Isla de Pinos, the Bahamas, southern Florida, and Little Swan Island, and *difficilis* of Hispaniola) might best be considered conspecific. Examination of their scale organs shows that *macrolepis* possesses only hair-bearing structures, whereas *grandisquamis* has both knob-like and hair-bearing types. If we consider that the type of scale organs is species constant, a course already followed by King (1962: 45) and with which we have concurred, we must regard *grandisquamis* as a species distinct from *macrolepis*. Using scale organs as the sole structural means of differentiating between the species, the range of *grandisquamis* is Puerto Rico and its satellites and Isla Vieques, whereas that of *macrolepis* includes all islands and islets from Culebra east to Anegada and the Leeward Islands south to St. Barthélemy. This diagnosis is zoogeographically sound.

However, specimens from Vieques have the scale organs of *grandisquamis* but the pattern and coloration of *macrolepis*. The Vieques sphaerodactyls are thus intermediate, but *not* intergradient in the orthodox usage of that word, between *grandisquamis* and *macrolepis*, in that they combine undiluted the characteristics of both forms.

As research into the characteristics of Antillean sphaerodactyls has progressed, many characteristics that previously were supposed to be on the specific level have been discarded one by one. Unfortunately the scale organs must now join the characters that must be interpreted in the light of other evidence; we feel that although they may still be employed as guideposts to relationships, they should be used with discretion. To regard the Puerto Rico-Vieques geckos as one species and the Culebra-Virgin Islands-Leeward Islands geckos as another would obscure the very obviously close relationships of these two forms. For those who feel that scale organs are species constant, *grandisquamis* and *macrolepis* must be separated at the specific level. Our choice, although without precedent, seems to us to reflect the biological situation in a more rational nomenclatorial manner.

It is surprising that previous workers, especially Grant, did not detect the striking geographic variation in *S. macrolepis* on Puerto Rico. This variation should not surprise anyone familiar with the ecological diversity of Puerto Rico, which ranges from the hot and arid southern littoral to the extremely wet, forested Cordillera Central, and the limestone Pepino Hills in the northwest. On the basis

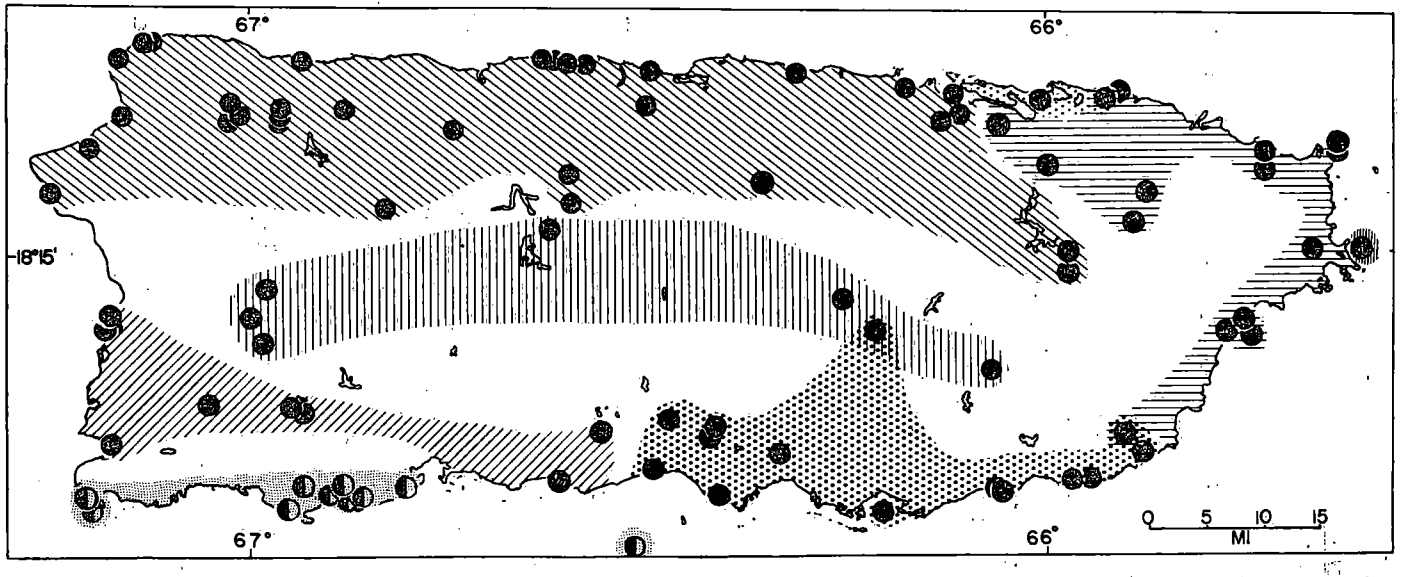

FIGURE 1. Puerto Rico, showing the ranges of *S. macrolepis* (solid symbols) and *S. roosevelti* (semi-solid symbols). Races of *S. macrolepis* as follows: *grandisquamis,* horizontal lines; *stibarus,* fine vertical lines; *phoberus,* medium stippling; *mimetes,* heavy stippling; *ateles,* diagonal lines from lower left to upper right; *spanius,* open vertical lines; *guarionex,* diagonal lines from upper left to lower right. Overlap of symbols represents intergradation between subspecies. *S. roosevelti,* fine stippling.

of the examination of 639 specimens of S. *macrolepis* from Puerto Rico six subspecies are recognizable; another race is confined to Isla Piñeros.

Sphaerodactylus macrolepis grandisquamis Stejneger

Sphaerodactylus grandisquamis Stegneger, 1904, Rept. U. S. Nat. Mus., 1902, p. 602. Type specimen USNM 27007.

TYPE LOCALITY: Luquillo, Puerto Rico.

DISTRIBUTION: Extreme eastern Puerto Rico, from the vicinity of Río Piedras (except the coast from San Juan to Loíza Aldea) south to near Punta Santiago; Cayo Santiago off Playa de Humacao (fig. 1).

DIAGNOSIS: A subspecies of S. *macrolepis* characterized by a combination of moderate size (males to 33 mm, females to 31 mm snout-vent length); high number of midbody scales (36 to 46, mean 41.2 ± .43 = one standard error of mean); escutcheon 5-9 X 23-30. Dorsum of males unicolor brownish or salt-and-pepper, head brown with or without a vague pattern, the most obvious features of which are a pair of pale lines from the orbits extending posteriorly to the anterior border of the scapular patch (the head may also be vaguely flecked with darker), a fairly conspicuous dark occipital spot, and occasionally a dark nuchal spot at the juncture of the two pale postorbital lines. Black scapular patch variable from large and conspicuous with an included pair of two transversely elongated buffy to white ocelli, the entire patch surrounded by a broad buff to white border, to an almost complete absence of the scapular patch, the remnants consisting of the transverse ocelli each with a dark border. Dorsum of females tan to brown, usually with a series of fairly prominent dark brown longitudinal lines, sometimes broken and fragmented and forming almost a series of transverse chevronate figures; head pattern much as in male except that the nuchal spot is more consistently present; scapular patch always present, large, bordered by a broad buff to white outline (fig. 2a). Iris blue to grayish-green, or yellow-gray.

REMARKS: The color of a series of 12 specimens from the vicinity of the type locality was noted in life as follows: Males: dorsal ground color yellow-tan, scattered scales darker brown; tail and head yellow; head pattern obscure and brownish to rusty-orange; ventral ground color yellow, underside of tail orange; chin and throat yellow to orange with some pale brown to rusty flecks; iris grayish-green. Females: dorsal ground color tan with brown longitudinal lines; head with a pale U set off by brown edging; ventral ground color yellowish, throat pale yellow-orange with brownish flecks.

Juveniles from this locality resembled the females in pattern and coloration except when very small; tiny specimens (snout-vent lengths 14 to 20 mm) are very dark uniform brown dorsally and ventrally, with a well developed and palely outlined black scapular patch and ocelli, and a white tail tip preceded by a black band. Coloration and pattern in live geckos from Las Croabas and Ceiba resembled that described above for topotypes; the iris of males from Ceiba was recorded as yellow-gray.

A moderately sized subspecies, *S. m. grandisquamis* males reach a maximum known snout-vent length of 33 mm and females 31 mm. The discrepancy is doubtless due to the smaller series of females. Scale counts are: dorsal scales axilla to groin 17-23, mean 20.7; ventral scales axilla to groin 24-32, mean 27.7; midbody scales 36-46, mean 41.2; escutcheon 5-9 X 23-30; internasals 0-3, mode 1; fourth toe lamellae 8-12, mode 12. All specimens have 3 supralabials to mid-eye. The usual condition is that the throat scales are keeled and both chest and ventral scales smooth; 2 specimens have only some of the throat scales keeled, 7 have some keeled chest scales, and two of these have all the chest scales keeled.

A single egg from near Luquillo measured 7.0 mm X 5.2 mm. Two hatchling *S. m. grandisquamis* had snout-vent lengths of 14 mm.

S. m. grandisquamis has been taken in littoral situations under palm trash and other debris, at times rather far back from the coast but still near it. The only major exception is the series from south of Luquillo which was collected in an abandoned shack in rolling, rather mesic, country. The series from near Ceiba was collected in a small patch of lowland forest with a leaf-littered floor and much trash. The single specimen from Cayo Santiago (MCZ 58826, a female with a snout-vent length of 24 mm) agrees with *S. m. grandisquamis* both in pattern and scale counts.

SPECIMENS EXAMINED (all from Puerto Rico): UMMZ 73587, 73589, Río Piedras; UMMZ 73615 (8 specimens), Trujillo Alto; UMMZ 124804 (4 specimens), Campo Rico; UMMZ 73588, 73622, 10 km S Canóvanas; ASFS V4997-98, Luquillo (outskirts); ASFS V5001-10, V6002, V6211, 1.5 km SW Luquillo; MCZ 34519-23, Cabezas de San Juan; ASFS X7470-78, 0.5 mi. N Las Croabas; ASFS V5090-103, 1.8 km SSW Ceiba; MCZ 58824, Punta Santiago; ASFS X4059-61, 4.6 mi. E Humacao; MCZ 58826, Cayo Santiago.

Sphaerodactylus macrolepis stibarus, new subspecies

TYPE: MCZ 81022, an adult female from Isla Piñeros, Puerto Rico, one of a series taken 13 February 1965 by Albert Schwartz and Richard Thomas. Original number V5030.

PARATYPES: AMNH 94177-78, ASFS V5020-22, V5031-34, V5044-47, KU 79887-90, UF 21271-76, UIMNH 56915-18, same data as type.

DISTRIBUTION: Known only from Isla Piñeros, off the eastern end of Puerto Rico (fig. 1).

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of small size (maximum snout-vent length of both sexes 30 mm), moderate number of midbody scales (36 to 41, mean 38.6 ± .37); escutcheon 5-8 X 18-24. Males with a black scapular patch and two more or less rounded ocelli; females with or without longitudinal lines and a fragmented dark cephalic head pattern; iris brown with golden pupillary ring.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 28 mm, tail 24 mm. Dorsal scales axilla to groin 18; ventral scales axilla to groin, —; midbody scales 38; fourth toe lamellae 11; internasal 1; 3 supralabials to mid-eye; gular scales keeled, chest and ventral scales smooth. Dorsal body ground color uniform yellowish-tan; ground color of head unicolor, with a fairly prominent dark brown cephalic pattern consisting of a fragmented pair of lines on the snout, which join an irregular and fragmented pair of postorbital lines; the right postorbital line joins the dark nuchal spot, the left does not; between the two postorbital lines lies a very dark brown occipital spot; a dark loreal stripe passes through the eye and continues posteriorly onto the side of the neck. The scapular spot is irregular, not prominently margined with a pale zone, and encloses two buffy ocelli. The back has a series of three or four irregular longitudinal lines. The tail has two pale chevrons dorsally, outlined with dark brown or black. The throat is yellow and has some very fine inconspicuous dark stippling. The ventral surface is tan.

Variation: 9 males and 9 females show a maximum size of 30 mm in each sex and the following scale counts: dorsal scales axilla to groin 17-21, mean 19.6; ventral scales axilla to groin 21-28, mean 24.5; midbody scales 36-41, mean 38.6; escutcheon 5-8 X 18-24; internasals 0-3, mode 1; fourth toe lamellae, 9-11, mode 11. All specimens have 3 supralabials to the center of the eye. Usually the gular scales are keeled and the chest and ventral scales smooth; in two specimens the keeled scales extend onto the chest, and in four the gular scales are not completely keeled.

In live males the dorsum was tan to yellowish-tan to dull brown, head distinctly yellow and the throat vivid yellow-orange; head pattern an indistinct pair of rusty postorbital lines; diffuse occipital spot; dorsum completely devoid of pattern or with scattered, unaligned dark scales; scapular patch black, usually without a white border;

and the two white ocelli more or less round and included within the patch. The greatest reduction of the patch (ASFS V5024) is demonstrated as a single orthodox ocellus and a smaller mate included in a small restricted black area. The ventral surface is tannish, and the bright chin and throat have vague rusty markings in life.

The females have the same dorsal ground color as the males, but none was so pale as the palest males. The head patterns agree with that of the type, though the type shows the head pattern more clearly than do most other specimens; the usual condition is a deposition of dark pigment in the light head areas that obscures the pattern which is not particularly distinct. The ocelli are buff in adults, white in young, and included in the large black scapular patch; patch with a trace of a white border, but this is seldom broad and prominent; throat yellow in life, with vague stippled darker diagonal markings; venter tannish.

Juveniles are similar to adult females, but the head pattern may be even less conspicuous. The smallest juvenile (12 mm snout-vent length) is smaller than hatchlings of *S. m. grandisquamis* and is brown above and paler below. All juveniles that show any dorsal pattern (snout-vent lengths 17 to 23 mm) have a salt-and-pepper rather than a lined dorsum. The scapular spot in the juveniles is large and bold, and not outlined with a pale zone, in distinct contrast to that in young *grandisquamis*.

COMPARISONS: The Isla Piñeros race is differentiated from *S. m. grandisquamis* primarily by three characters: 1) indistinct head pattern in females; 2) smaller escutcheon in males; 3) lower number of midbody scales (table 1). Although the range of midbody scales of *grandisquamis* includes that of *stibarus*, the means (41.2 in the former, 38.6 in the latter) are statistically different. The breadth of the escutcheon in *grandisquamis* varies from 23 to 30 scales, that of *stibarus* from 18 to 24. Other features that help differentiate the two races are the less consistent pale and prominent border to the scapular spot in female *stibarus*, the round rather than transversely elongated ocelli in *stibarus*, the modal number of 11 fourth toe lamellae (*stibarus* never has counts of 12, the modal condition in *grandisquamis*), and tan rather than bright yellow ventral color in *stibarus*.

Remarks: *S. m. stibarus* is obviously a derivative of and very closely related to *S. m. grandisquamis*. The differences between the two are relatively minor but nonetheless constant and significant. It seems appropriate to recognize nomenclatorially the fact that on this islet differentiation has definitely taken place. The species shares

the island with S. *nicholsi* and S. *gaigeae*; that so small an island should harbor three species of the same genus is remarkable. The series of S. *m. stibarus* was collected in sea-grape (*Coccoloba*) leaves along the shore and in mango leaves and the coconut trash in an abandoned grove.

TABLE 1. COUNTS OF MIDBODY SCALES IN TEN SUBSPECIES OF S. *macrolepis*

Subspecies	N	Mean and extremes	Standard deviation	Standard error of mean (x2)
grandisquamis	28	41.2 (36-46)	2.29	.86
stibarus	16	38.6 (36-41)	1.49	.74
phoberus	39	37.5 (33-41)	2.62	.84
mimetes	29	36.1 (31-40)	2.10	.78
ateles	26	39.4 (36-42)	1.78	.70
spanius	26	43.6 (41-47)	1.68	.66
guarionex	92	41.3 (36-49)	2.60	.54
inigoi	33	36.8 (33-41)	1.84	.64
macrolepis	86	43.1 (38-50)	2.46	.54
parvus	14	48.4 (44-54)	2.87	1.54

Sphaerodactylus macrolepis phoberus, new subspecies

TYPE: MCZ 81023, an adult female from Isla Verde (San Juan International Airport), Puerto Rico, one of a series taken 15 June 1962 by Ronald F. Klinikowski and David C. Leber. Original number X919.

PARATYPES (all from Puerto Rico): AMNH 94179-84, KU 79891-94, MCZ 81024-35, UF 21242-51, UIMNH 56919-24, USNM 152593-96, same locality as type, 13 June 1962, R. F. Klinikowski, D. C. Leber, A. Schwartz; ASFS X899-918, X920-36, same data as type; ASFS X4134-58, same locality as type, 20 August 1962, R. I. Balfour, W. R. Faust, R. F. Klinikowski, and D. C. Leber.

ASSOCIATED SPECIMENS: ASFS X897, X944, X1355-56, X1710, X1716, X1792, X1945, X2029-30, X2034, X2240, X2246-47, X2264, X2329-31, X2365-66, X2898, X3135-37, X3267, X3313, X3551-52, X3860, X4019-20, X4044-46, all hatchlings from eggs taken at the type locality; ASFS X4637-43, 2.4 mi. W Loíza Aldea; UMMZ 124811, Punta Vacia Talega (see below).

DISTRIBUTION: Known only from the type locality; intergrades with S. *g. grandisquamis* to the east near Loíza Aldea (fig. 1).

DIAGNOSIS: A subspecies of S. *macrolepis* characterized by a combination of small size (maximum snout-vent length of both sexes 31 mm); moderate number of midbody scales (33-41, mean 37.5 ± .42); males usually dark wood brown, unicolor or with scattered dark brown

to blackish scales; scapular patch diffuse, not outlined by a pale zone. Females patterned like males; scapular patch usually fairly large, outlined by a pale zone that is fragmented and irregular in outline; head pattern reduced or almost obliterated; iris black with bronzy pupillary ring.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 30 mm, tail 27 mm; dorsal scales axilla to groin 20, ventral scales axilla to groin 29; midbody scales 39; fourth toe lamellae 12; internasal 1; 3 supralabials to mid-eye; gular scales keeled, chest and ventral scales smooth. Dorsal ground color dark brown with no indication of pattern; head brownish with vague indications of a pair of pale postorbital lines and dark occipital and nuchal spots; no markings on sides of dark brown head and neck; scapular spot black and irregularly diffuse, not outlined with a pale zone; no pale ocelli (fig. 2b); unregenerated tail brown and practically patternless; throat pale yellow without discrete darker markings; ventral ground color yellowish-tan; underside of tail pale yellow.

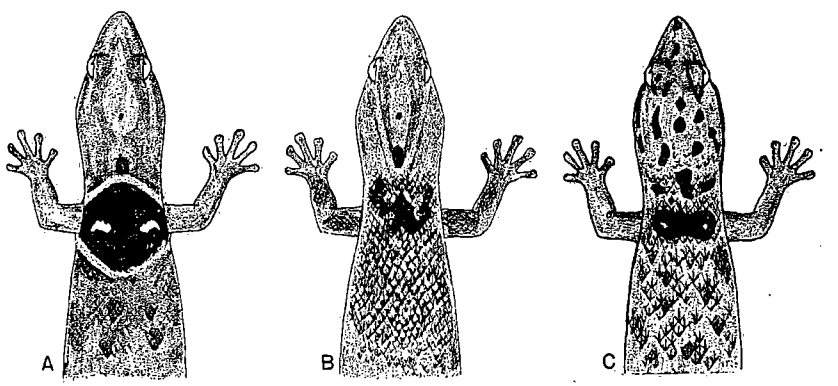

FIGURE 2. A, *S. macrolepis grandisquamis,* anterodorsal view, female, ASFS X7470, 0.5 mi. N Las Croabas, Puerto Rico. B, *S. macrolepis phoberus,* anterodorsal view, female, MCZ 81023, type, Isla Verde, Puerto Rico. C, *S. macrolepis mimetes,* anterodorsal view, male, MCZ 81036, type, 12.3 km SE Patillas, Puerto Rico.

Variation: 20 males and 20 females have maximum snout-vent lengths of 31 mm in each sex and the following scale counts: dorsal scales axilla to groin 17-22, mean 19.6; ventral scales axilla to groin 23-31, mean 26.4; midbody scales 33-41, mean 37.5; escutcheon 6-10 X 24-28; internasals (data from 144 individuals) 0-3, mode 1; fourth toe

lamellae 9-12, mode 10. All 40 specimens examined in detail have 3 supralabials to mid-eye. The usual condition of keeled gular scales and smooth chest and ventral scales obtains in most specimens; one has the chest scales completely keeled and two have some of the scales on the chest keeled.

The dorsal ground color of live males varies between tannish-gray and dark brown, with the darker hues more common; dorsum usually unicolor, but some with scattered darker brown scales; head pattern obscure, consisting at best of a pair of pale postorbital lines with a diffuse darker occipital spot; nuchal spot absent except in subadult males where it is faint. Some individuals have rather large brownish spotting on the occiput and neck, and the edges of the postorbital lines may be more heavily outlined in dark brown. The entire dorsal surface of the head suffused with yellow; dorsum of tail commonly spotted with dark brown, or with light crossbands; scapular spot very diffuse, without a pale outline, nearly absent in most specimens, sometimes reduced to only the small, more or less circular creamy ocelli; throat deep yellow; ventral ground color yellowish-tan with some fine dark stippling.

The females resemble the type closely, and the ground color of females shows the same variation as that of males, with the darker hues predominating. The scapular patch varies in extent, showing a strong tendency toward reduction of both size and intensity, and is absent in some specimens. Even the ocelli have disappeared in some females. When fully expressed the patch is surrounded by a buff outline. The ocelli vary in life from white to cream. The head in life is not yellow as in the males, and the head pattern is like that of the type, never bold and easily discernible, and often obscured by additional brown pigment. The occipital spot is usually present, the nuchal spot usually absent. The dorsum is either uniform and patternless or with a vague salt-and-pepper pattern, and only very rarely shows any alignment of the dark scales to form indistinct longitudinal lines. The throat is pale yellow, with occasional diffuse and inconspicuous pale brown spotting. The ventral coloring is as that described for males.

Hatchlings are drab brown dorsally, somewhat paler brown ventrally. The back is unpatterned except for the scapular patch, which lacks a pale border upon hatching, and ocelli. The head in juveniles lacks any pattern and is a simple brownish-tan. The tip of the tail is white in hatchlings, preceded by a dark brown region. This coloration may persist into adulthood if the original tail is not lost.

COMPARISON: *S. m. phoberus* differs from both *grandisquamis* and *stibarus* in being much darker dorsally, lacking a lined pattern in females, having round, rather than transversely elongate ocelli as in *grandisquamis,* and being slightly smaller. The bold scapular patch with its wide and conspicuous pale border and the more prominent female head pattern in *grandisquamis* differentiate this race from *phoberus.*

Although the midbody scales of *grandisquamis* and *phoberus* overlap in counts, those of *phoberus* are significantly lower (table 1); these counts show no significant difference between *stibarus* and *phoberus.* The modal fourth toe lamellar count of 10 in *phoberus* differs from those of 11 in *stibarus* and 12 in *grandisquamis.*

REMARKS: A small series (ASFS X4637-43) from 2.4 mi. W Loíza Aldea and a single individual (UMMZ 124811) from Punta Vacia Talega between Isla Verde and the range of *S. m. grandisquamis* are intermediate in color and pattern between *phoberus* and *grandisquamis,* but closer to *phoberus.*

The type locality of *S. m. phoberus* is in rich, mesic woods immediately adjacent to the San Juan International Airport, and lies within an old coconut plantation. The type series of *phoberus* was collected in both the plantation and the woods, where the lizards were found under almost any sort of debris including moist piles of rotting coconut husks, tires, rocks, concrete slabs, and palm logs. A series of ten eggs measures 6.7-7.2 X 5.0-5.8 mm. Hatchlings measure 13 or 14 mm in snout-vent length.

The range of *S. m. phoberus* is unknown. We assume that it encompasses the peninsula now occupied by San Juan and its suburbs, and probably extends eastward to near the Río Grande de Loíza. The intergradient specimens mentioned above are from west of the mouth of this river, so that some genetic influence of *grandisquamis* is manifest at least this far to the west.

We have tried in vain to collect *S. macrolepis* between Mameyes and Luquillo. This region has extensive but moderately dry deciduous woods near the coast that appear quite suitable for *S. macrolepis,* but intensive search has revealed no sphaerodactyls in this immediate area. The same situation applies elsewhere in Puerto Rico, bringing to mind Grant's statement (1931: 209) that this species is "distributed in foci throughout Porto Rico except in localities of extreme drought or moisture." Although we hesitate to state emphatically that *S. macrolepis* is absent from some regions, our experience in certain areas indicates that it is at least extremely rare.

Sphaerodactylus macrolepis mimetes, new subspecies

TYPE: MCZ 81036, an adult male from 12.3 km SE Patillas, Puerto Rico, taken 29 January 1965 by Richard Thomas. Original number V4777.

PARATYPES (all from Puerto Rico): ASFS V4778-83, V4790-95, UIMNH 56925-30, same data as type; AMNH 94186, 10 km SE Patillas, 1 February 1965, R. Thomas; AMNH 94185, 5 mi. W Las Mareas (south side Bahía de Jobos), 30 January 1965, R. Thomas; KU 79898-99, UF 21254-55, 1.5 km S Velázquez, 9 March 1965, A. Schwartz, R. Thomas; MCZ 81037-42, AMNH 94187-89, 12.2 km WNW, 1 km S Santa Isabel, 4 March 1965, A. Schwartz, R. Thomas; ASFS V5756-57, 2 km E Juana Díaz, 200 feet, 9 March 1965, R. Thomas; UF 21252-53, KU 79895-96, Baños de Coamo, 9 March 1965, A. Schwartz, R. Thomas; MCZ 34446-49, Baños de Coamo, 1931-32, C. Grant; MCZ 34556-57, between Coamo and Baños de Coamo, 16 November 1930, C. Grant; KU 79897, AMNH 94190, 1 mi. SE Río Jueyes, 9 March 1965, A. Schwartz, R. Thomas.

ASSOCIATED SPECIMENS: UMMZ 73592, 12814, Baños de Coamo; UMMZ 73586 (3 specimens), 73620, Arroyo; MCZ 34444-45, Punta Arroyo; UMMZ 73591 (4 specimens), beach near Maunabo. *S. m. mimetes* X *grandisquamis*: MCZ 34505-10, mountains between Maunabo and Yabucoa; ASFS X4057-58, 2.5 mi. SW Yabucoa, 800 feet.

DISTRIBUTION: Southern Puerto Rico from Maunabo west to the vicinity of Juana Díaz and Coamo (fig. 1).

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of small size (males to a maximum snout-vent length of 32 mm, females to 30 mm), low number of midbody scales (31-40, mean 36.1 $\pm$ .39); males yellow-brown to tan with a few scattered dark brown scales, scapular patch small to absent, and head and throat heavily spotted with black, females with a lineate dorsal pattern, scapular pattern present but often much reduced and not outlined by pale margin, head pattern bold and vivid, and throat usually heavily spotted with black in adults. Iris dark brown.

DESCRIPTION OF TYPE: An adult male with a snout-vent length of 30 mm, tail 22 mm, regenerated. Dorsal scales axilla to groin 17; ventral scales axilla to groin 21; midbody scales 33; fourth toe lamellae 9; internasal absent; 3 supralabials to mid-eye; escutcheon 6 X 22; gular scales keeled, chest and ventral scales smooth. Dorsal ground color yellow-brown with a few scattered brown scales; head ground color tan with large black discrete spots, two of which are the usual occipital and nuchal spots; scapular patch black, restricted, constricted medially, enclosing two small white round ocelli, not surrounded by a pale margin (fig. 2c); throat light gray with large discrete black spots; venter yellowish.

VARIATION: 33 specimens of both sexes have maximum snout-vent lengths of 32 mm in males, 30 mm in females, and the following

scale counts: dorsal scales axilla to groin 16-21, mean 18.1; ventral scales axilla to groin 20-29, mean 24.1; midbody scales 31-40, mean 36.1; escutcheon 4-5 X 21-24; internasals 0-2, mode 1; fourth toe lamellae 8-12, mode 10. All specimens have 3 supralabials to mid-eye; gular scales keeled, the chest and ventral scales smooth, though two individuals have some chest scales keeled, and another has all these scales keeled. Three lizards lack any keeled scales in the gular area.

The six paratypic males are much like the type in pattern and color. The heads are always boldly marked, and the basic female pattern described below is obscured in males by additional dark pigment, to give a darkly spotted head on a gray, tan, or straw ground color. The scapular patch is present and small in all but one specimen which lacks it and its ocelli completely. All males have the throat darkly spotted, though the intensity and degree of spotting vary somewhat. The ventral color is yellowish to tan; the tails are orange; the iris is dark brown to yellow-brown.

The 28 females were yellow-brown to tan in life, with a prominent dorsal pattern of dark longitudinal lines. The head ground color varies between gray, tan, and brownish. The bold dark brown or black cephalic pattern is composed of a pair of lines from the snout to the orbits, a pair of postorbital lines from the orbits onto the neck where they join with one another and usually with the dark nuchal spot to give a dark U-shaped postorbital figure, a bold dark occipital spot, and a canthal line from the snout through the eye and onto the side of the neck. Occasional specimens have additional dark pigment in the light areas between the lines, but this does not obscure the main pattern. The black scapular spot is always small and restricted, never outlined with a pale zone, and may be completely absent; the white ocelli are either included in the spot when it is larger, or are peripheral if it is restricted. The throats are light gray, with dark spots prominent in 19 specimens and faint to absent in 9, most of which are smaller females. However, 3 adult individuals lack spotting, and some spot-throated females are as small as some that lack spots. In general the throat spotting in females is less extensive than in males, though some females have throats as darkly and regularly spotted as those of some males. The ventral ground color is yellowish to tan, and the undersides of the tails are deep yellow or straw.

Even tiny juveniles with snout-vent lengths of 14 mm show the female lineate pattern, as well as a scapular patch and ocelli and the female head pattern. The throats of juveniles are unspotted.

COMPARISONS: S. *m. mimetes*, as the trivial name implies, mimics S. *m. macrolepis* of the Virgin Islands in basic head pattern and color (see the discussion of the nominate race for comparisons). It differs from all other subspecies on Puerto Rico in its heavily spotted throat. The lower number of midbody scales is statistically different from those of both *grandisquamis* and *stibarus*, but not of *phoberus* (table 1). The lineate female pattern, the heavily spotted throats, and paler coloration of *mimetes* easily distinguish it from *phoberus*. Absence of a large scapular patch surrounded by a pale border distinguishes *mimetes* from *grandisquamis*, and the distinct head patterns of *mimetes* distinguish it from the three more northern races.

REMARKS: Eight specimens (ASFS X4057-58, MCZ 34505-10) are from the Serranía de Panduras; this rather low (1700 feet) mountain range lies immediately north of the range of *mimetes* and extends to the coast. North of these mountains, S. *m. grandisquamis* occurs, at least in the vicinity of Humacao. The three males from the Panduras have plain throats and very vaguely patterned heads; of the four females, one (MCZ 34506) has a heavily dotted throat which the others lack. All females have the head pattern well developed and are thus like *mimetes* despite their plain throats. Because of their geographically intermediate position, the occurrence of throat spotting in one of the females, the vaguely patterned heads of the males, and the prominently patterned heads of the females, we regard these lizards as intergradient between *mimetes* and *grandisquamis*.

Specimens of S. *m. mimetes* were collected in a lowland *cafetal* near Juana Díaz, in coastal palm groves near Santa Isabel, Velázquez, and Las Mareas, and under logs and rocks in dry hills and plains at Baños de Coamo and Río Jueyes. Only the *cafetal* locality can be considered more or less mesic; all others were extremely hot and dry, at least at the time of our visit.

Sphaerodactylus macrolepis ateles, new subspecies

TYPE: MCZ 81043, an adult female from Balneario de Boquerón, Puerto Rico, one of a series taken 26 February 1965 by Albert Schwartz and Richard Thomas. Original number V5522.

PARATYPES (all from Puerto Rico): KU 79900-03, 9.6 km SSW Mayagüez, 26 February 1965, A. Schwartz, R. Thomas; AMNH 94191-94, ASFS V5515-17, V5523-28), same data as type; UF 21256, 9 mi. NW Yauco, 1000 feet, 27 February 1965, R. Thomas; UIMNH 56931-35, 8.5 mi. NW Yauco, 700 feet, 27 February 1965, A. Schwartz, R. Thomas; UF 21257, 8 mi. NW Yauco, 600 feet, 27 February 1965, R. Thomas; UF 21258, 2.1 km SW San Germán, 28 February 1965, A. Schwartz.

ASSOCIATED SPECIMENS: MCZ 34460-62, 5 mi. S Playa de Mayagüez; UMMZ 73627, Playa de Ponce; ASFS V6629-30, V6641, 4.6 km W, thence 4.6 km NW Juana Díaz.

DISTRIBUTION: Southwestern Puerto Rico from the vicinity of Mayagüez south to Balneario de Boquerón and thence eastward, north of the Valle de Lajas, to the vicinity of Ponce (fig. 1).[1]

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of moderate size, maximum snout-vent length of both sexes 33 mm, moderate number of midbody scales, 36-42, mean 39.4 ± .35. Males dull grayish-tan, usually with many scattered dark brown scales; head patternless and yellow-tan but with a few dark brown spots; scapular patch very reduced or absent; ocelli very faintly discernible and gray, not white; and throat unpatterned or with a few brown dots forming a vague collar. Females tan with dark brown longitudinal lines; head prominently patterned; scapular patch rather small, without pale margins; ocelli peripheral, at times enclosing the patch remnant between them; and throat gray, not yellow, without definite markings. Iris grayish with a greenish tinge.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 32 mm, tail 27 mm, regenerated. Dorsal scales axilla to groin 20; ventral scales axilla to groin 28; midbody scales 41; fourth toe lamellae 12; internasal 1; 3 supralabials to mid-eye; gular scales keeled, chest and ventral scales smooth. Dorsal ground color tan with four distinct darker brown longitudinal lines; head unicolor with back and with a dark brown pattern consisting of a faint pair of dark lines from snout to eyes, a pair of postorbital lines which join the nuchal spot and surround a dark occipital spot, a dark line from the lores through the eye and onto the neck, meeting the dorsolateral longitudinal line in the region of the small, restricted dark brown scapular patch; ocelli peripheral rather than enclosed (fig. 3a); throat gray, unspotted; ventral ground color flesh-gray; tail nearly unicolor, tan above and yellowish below.

VARIATION: 14 males and 14 females including the type and paratypes have maximum snout-vent length of 33 mm in both sexes and the following scale counts: dorsal scales axilla to groin 18-22, mean 20.1; ventral scales axilla to groin 24-29, mean 26.8; midbody scales 36-42, mean 39.4; escutcheon 4-8 X 21-27; internasals 0-3, mode 1; fourth toe lamellae 9-13, mode 10; gular scales usually keeled; chest

[1] Three specimens of *S. m. ateles* (ASFS V6629-30, V6641) were collected by the senior author at a locality 4.6 km W, thence 4.6 km NW Juana Díaz. These specimens extend the range of *ateles* inland from the eastermost locality of Playa de Ponce and narrow the gap between the races *ateles* and *mimetes* in the Juana Díaz region. The locality is not shown on the map.

and ventral scales smooth, except for six lizards in which the gular scales are only partially keeled and one with some keeling on the chest scales.

Dorsal ground color of males grayish-tan to tan in life, rather heavily spotted with dark brown; head yellow-tan, with some dark spotting, especially on the occiput and neck; scapular patch small and restricted to absent; ocelli inconspicuous, gray, and often not discernible; throat yellow-orange, with scattered dark brown flecks forming a diffuse and narrow collar in some specimens; ventral coloration grayish to flesh-gray.

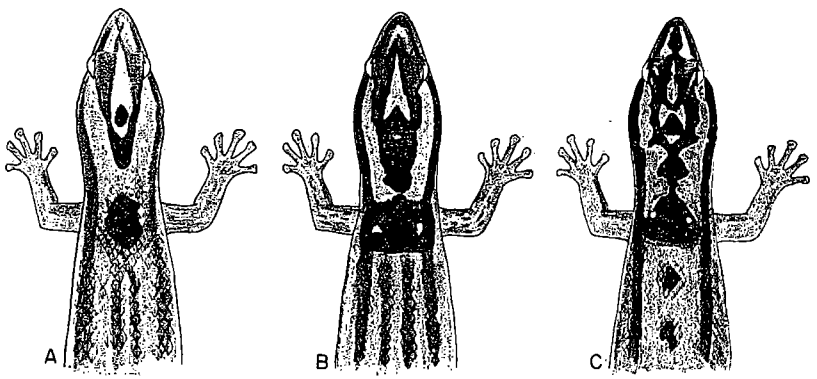

FIGURE 3. A, S. *macrolepis ateles*, anterodorsal view, female, ASFS V5525, paratype, Balneario de Boquerón, Puerto Rico. B, S. *macrolepis guarionex*, anterodorsal view, female, MCZ 81048, type, Officers' Club Beach, Ramey Air Force Base, Puerto Rico. C, S. *macrolepis inigoi*, anterodorsal view, female, MCZ 81055, type, Ensenada Sun Bay, Isla Vieques.

Females tan dorsally in life, with regular and prominent dark brown longitudinal lines; head ground color unicolor with that of the back, and with a bold and conspicuous dark brown head pattern. In four specimens the occipital spot is joined to the postorbital lines, forming a more complex figure. The scapular patch is small and may be represented by a longitudinal stripe with the white ocelli along its lateral margins. The throat is gray and unpatterned, and the ventral ground color is flesh-gray.

Four juveniles are much like the females, with prominent head patterns, restricted scapular patches, and longitudinal dark lines.

The three geckos from 5 mi. S Playa de Mayagüez (MCZ 34460-62) are regarded as *ateles* more on geographical grounds than for any other reason. One male has a larger scapular patch with included

ocelli than that of any other male; the female has the head pattern faint rather than bold, and also a large black patch with included ocelli. They may represent a variant local population within the southwestern subspecies, but as this locality is quite close to two recent localities for *ateles*, possibly the labeling of the three old specimens is in error.

COMPARISONS: From its neighbor S. *m. mimetes* to the east, *ateles* can be readily distinguished by lack of a heavily spotted throat in either sex and the extreme reduction of the scapular patch with the ocelli peripheral. The lower number of midbody scales (mean 36.1) of *mimetes* is significantly different from the higher number (mean 39.4) of *ateles*. From the more northern subspecies *grandisquamis, stibarus,* and *phoberus,* the southwestern race differs in color, in having females with prominent lines and with bold and vivid head patterns. In midbody scales *ateles* differs significantly from *phoberus* and *grandisquamis* but not from *stibarus* (table 1). Juveniles of *ateles* are lined in contrast to the unicolor juveniles of the northeastern races.

REMARKS: S. *m. ateles* occupies southwestern Puerto Rico north of the Valle de Lajas; south of this valley, it is replaced by the large S. *roosevelti*. The two species approach each other closely (9 km) at Boquerón and Pole Ojea, but have never been taken together. *Sphaerodactylus roosevelti* occupies the southern coast as far east as Punta Ventana, and the first southwestern coastal record for *ateles* is from Playa de Ponce. Schmidt (1928: 71) reported "S. *grandisquamis*" from Ensenada, where we are reasonably certain that S. *macrolepis* does not occur; examination of Schmidt's material shows that he had at least S. *roosevelti* and S. *nicholsi* from this locality.

Stejneger (1904: 608) reported taking 8 specimens of "S. *grandisquamis*" in the white clay hills about 3 miles east of Ponce. His detailed description of these specimens does not mention the heavily spotted throat of *mimetes,* the race we would expect in that area. His descriptions and figure agree very well with S. *m. ateles,* even to the almost longitudinally strap-like scapular patch in the female. Although we have not examined his material, we regard these geckos as S. *m. ateles*. The single specimen (UMMZ 73627) from Playa de Ponce is clearly *ateles* and confirms this supposition.

The southwestern race was collected in palm trash along the coast at Balneario de Boquerón, localities SSW of Mayagüez, and inland under rocks on exposed hillsides on the southern slopes of the Cordillera Central above Yauco and Susúa. In this same region, several specimens were taken in a wet and shaded ravine.

Sphaerodactylus macrolepis spanius, new subspecies

TYPE: MCZ 81047, an adult female from 17.7 km NE Utuado (= about 8 km airline), 1100 feet, Puerto Rico, taken 20 January 1965 by Donald W. Buden and Richard Thomas. Original number V4618.

PARATYPES (all from Puerto Rico): ASFS V4617, V4619, same data as type; USNM 15397-98, UIMNH 56936-37, UF 21259-60, KU 79904-05, same locality as type, 1 September 1962, R. F. Klinikowski, D. C. Leber, A. Schwartz; ASFS V4490-92, V4502, same locality as type, 17 January 1965, R. Thomas.

ASSOCIATED SPECIMENS (all from Puerto Rico): ASFS V5194, 6 km SE Las Marías; MCZ 34492-93, MCZ 62182-83, Maricao; ASFS X4258-65, 13.8 km N Sabana Grande, 2800 feet; ASFS V6022, 2 km NE Barranquitas, 2100 feet; ASFS X7572, 8 km SE Las Cruces, 2080 feet, Bosque de Guavate; intergrades between S. *m. spanius* and S. *m. mimetes*: AMNH 13035, 13037, Aibonito.

DISTRIBUTION: The interior uplands of the Cordillera Central and the Sierra de Cayey at elevations from 1100 feet to 2800 feet. Intergrades with S. *m. mimetes* at Aibonito (fig. 1).

DIAGNOSIS: A subspecies of S. *macrolepis* characterized by a combination of large size (maximum snout-vent length of males 34 mm, of females 35 mm), high number of midbody scales (41-47, mean 43.6 ± .33). Males grayish-tan to yellowish-brown with dorsal dark scales arranged in longitudinal rows, much like females only considerably fainter, or unicolor; head ground color yellow, with a faint residual female pattern, often with additional dark spots on the neck; scapular patch small and restricted but with two white included ocelli; throat gray to bright yellow, at times with a few faint brown dots. Females light brown to tan with fairly prominent longitudinal lines; head light brown with a bold head pattern, nuchal and scapular patches often joined; scapular patch variable in size, usually moderate without a pale edge and with the ocelli included; throat gray, often with some diffuse darker gray marbling; iris variable, yellow-green, golden, or brown.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 33 mm, tail 33 mm. Dorsal scales axilla to groin 23; ventral scales axilla to groin 28; midbody scales 42; fourth toe lamellae 12; internasal 1; 3 supralabials to mid-eye; gular scales keeled, chest scales partly keeled, ventral scales smooth. Dorsal ground color light brown with four regular longitudinal lines with lighter brown edges; head light brown with a dark pattern of a preocular V representing the usual pair of snout lines, a wide pair of postorbital lines which form a V by joining the nuchal spot and enclosing the occipital spot between them, a dark canthal line passing through the eye and pro-

ceeding onto the neck and thence almost to join the scapular patch; scapular patch moderate in size with no pale margin and including two dull ocelli; throat gray with some darker gray stippling along the margin of the lower jaw; ventral ground color yellowish; underside of tail bright orange.

VARIATION: 11 males and 16 females, including type and paratypes have maximum snout-vent lengths of 34 mm in males and 35 mm in females and the following scale counts: dorsal scales axilla to groin 19-26, mean 22.0; ventral scales axilla to groin 24-32, mean 28.0; midbody scales 41-47, mean 43.6; escutcheon 4-7 X 19-27; internasals 0-3, mode 1; fourth toe lamellae 8-12, mode 10. *Spanius* shows a higher incidence of chest-scale keeling than other races; 8 specimens have some chest scales keeled and 2 have all the scales keeled. The normal condition is to have the gular scales keeled and the chest and ventral scales smooth.

The dorsal ground color in males varies in life from grayish-tan, yellowish-tan, or tan, to light brown. One lizard (ASFS X4473) has a dense salt-and-pepper pattern, two (ASFS X4258, MCZ 34492) are unicolor, and the balance have the faint longitudinal lines typical of females of several races of *S. macrolepis*, including female *spanius*. The head is distinctly yellowish and shows fairly prominent remnants of the female head pattern, especially the pale postorbital or temporal lines, which may be outlined or indicated by some dark brown to rusty spotting; nuchal region may also have some dark spotting; scapular patch small to moderate in size, never with a pale margin, never completely absent, and always including two pale ocelli; tail often grossly spotted; hindlimbs conspicuously banded with buff; throat bright yellow to gray with small grayish dotting; ventral ground color pale creamy gray to yellowish or faintly orange; underside of tail orange; iris variable: yellowish north of Sabana Grande, yellow near Las Marías, yellow to brown near Utuado, golden near Barranquitas, or bright yellow at Guavate. The brighter iris colors are found in the eastern portion of the range.

In life the dorsum of females is tan to light brown with prominent and regular longitudinal lines; head pattern like the type; three specimens have the nuchal spot joined with the scapular patch, and several have these two elements approximating each other; scapular patch variable in size and usually including two ocelli, although five females have the ocelli peripheral and one (ASFS X4259) apparently lacks them completely and has a much reduced scapular patch; tail dull orange above with some indication of clearer orange crossbands, or plain with a yellowish wash; underside of tail from pinkish to

bright orange; throat gray, sometimes vaguely marbled with slightly darker gray; ventral ground color from creamy or yellowish to gray.

Three juveniles are like the females, having pale tan dorsa with faint longitudinal lines and a scapular patch; one has the ocelli included within the patch, and the two smaller have the ocelli peripheral. As usual the tail tip in the smallest is white, preceded by a darkened band.

COMPARISONS: *S. m. spanius* differs from all other races in having longitudinally lined males. This upland race is larger than any other subspecies, being approached most closely by *ateles, grandisquamis,* and the race from the north coast. It is also noticeably bulkier than the other forms. *S. m. spanius* has more midbody scales than any other race (mean 43.6) (table 1). The absence of a dark spotted throat separates *spanius* from *mimetes.* No other race thus far described has the head pattern as fused with the nuchal and scapular patches as does *spanius.*

REMARKS: Two specimens from Aibonito (AMNH 13035, 13037) are clearly intermediate between *spanius* and *mimetes.* These lizards have very heavily spotted throats like *mimetes,* and the female has 44 midbody scales (the male is uncountable), a *spanius* character. The male (32 mm) is at the upper size limit of *mimetes,* and the female (31 mm), is slightly larger than any female *mimetes.* Considering that Aibonito lies at an intermediate elevation of about 1800 feet, and is more or less geographically between Barranquitas (*spanius*) and Patillas and Coamo (*mimetes*), the locality seems appropriate for intergradation between these two races.

The range of *S. m. spanius* is long, extending from Maricao in the west to Las Cruces in the east, and we do not feel that the populations of this race are continuous. Large regions seem unsuitable for it as, for example, the bare mountains between Casa Blanca-Orocovis-Barranquitas, though in such areas the species may occur in residual wooded ravines as at Barranquitas. We have also failed to find *spanius* in some areas that appear suitable, as at Monte Guilarte, Cerro de Punta, and Cerro de Doña Juana. It is not plentiful at Guavate. *Sphaerodactylus klauberi* is the dominant gecko at most of the upland localities where *spanius* is rare or absent.

Sphaerodactylus m. spanius is more commonly found in forested areas than any other subspecies. However, within such areas it is often most common or more easily secured about clearings where there is trash. At the type locality, Hacienda Roses, we found these lizards under trash and leaves at the base of banana plants in a high-canopied *cafetal.* At Barranquitas a single specimen was found in

a similar situation, where the coffee grove was in a wooded and moist ravine. North of Sabana Grande the series was taken about the edges of a temporarily disused picnic area. The animals were extremely active at dusk, when several were taken crossing open tracts of lawn grass.

Sphaerodactylus macrolepis guarionex, new subspecies

TYPE: MCZ 81048, an adult female from Officers' Club Beach, Ramey Air Force Base, Puerto Rico, one of a series taken 23 February 1965 by Albert Schwartz and Richard Thomas. Original number V5402.

PARATYPES (all from Puerto Rico): ASFS V5400-01, V5403-06, same data as type; ASFS V5408, V5415, AMNH 94195-98, MCZ 81049-54, KU 79906-09, UF 21261-64, Rifle Range Beach, Ramey Air Force Base, 23 February 1965, A. Schwartz, R. Thomas; ASFS V5477, 1 km E Ramey Air Force Base, 24 February 1965, R. Thomas.

ASSOCIATED SPECIMENS (all from Puerto Rico): ASFS V5127-35, 0.9 km S Córsega; ASFS V3204-19, 1.0 mi. SW Aguada; ASFS V3225-26, ca. 1.5 mi. SW Aguadilla; ASFS V5104-13, 3 km NW Quebradillas; ASFS V5327-28, 7.0 km S Mora, 800 feet; ASFS V5301-04, 11 km S Mora, 800 feet; ASFS V5149, 9.6 km S, 0.8 km E Mora, 700 feet; ASFS V3227, 2 mi. S Pueblito de Ponce; ASFS V6152, 2 km S Pueblito de Ponce, 800 feet; ASFS V5181, 1 km S Pueblito de Ponce; ASFS V5245, 7.2 km SE Quebradillas, 900 feet; ASFS V5880, 4 mi. W Las Llanadas, 600 feet; ASFS V5914-16, 18.8 km SW Arecibo, 800 feet; ASFS V5884-90, 8 mi. E Arecibo; ASFS X7499-500, 0.7 mi. E Palmas Altas; ASFS X7503, 1.9 mi. W Palmas Altas; ASFS X7516-19, 2.8 mi. W Palmas Altas; ASFS V5996-97, 2.5 km SW Florida; ASFS V5854-65, 10.2 km E Dos Bocas; ASFS V5963-67, Playa Mar Chiquita; MCZ 12242, Manatí; UMMZ 73614 (2 specimens), 2 mi. W Morovis; ASFS X7674-79, 6 mi. WNW Dorado; ASFS X7680-92, 5.8 mi. NW Cataño; AMNH 12983, Cataño; MCZ 34511, 34513-18, Camp Buchanan; MCZ 34496-504, 1 mi. NE Bayamón; UMMZ 73610 (2 specimens), between Caguas and Juncos; MCZ 34490-91, Gurabo.

DISTRIBUTION: Northwest and north-central Puerto Rico, from Punta Higuero in the west, eastward as far as Gurabo, and inland to include the Pepino Hills as far south as Florida (fig. 1).

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of moderate size (maximum snout-vent length of both sexes 33 mm), high number of midbody scales (36-49, mean 41.3 ± .27). Males yellowish-brown to chocolate brown dorsally with scattered dark brown scales; head dull yellowish, often with a pair of pale buffy postorbital stripes and some dark head spotting; scapular patch large and almost always present, at times somewhat disintegrated, and enclosing two large white ocelli; throat without extensive dark markings, occasionally with a brown stippled "collar". Females yel-

lowish-tan to brown with about five dark brown and fairly regular longitudinal lines; head pattern bold with the nuchal spot often extensive and fused either with the scapular patch or with the dark postorbital lines and occipital spot into a large dark occipito-nuchal figure; scapular patch large, without pale edges, and including two large white ocelli (fig. 3b); throat with some faint tan dotting or stippling; iris variable, greenish-yellow, black suffused with yellow, golden, or grayish-yellow.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 32 mm, tail 26 mm. Dorsal scales axilla to groin 23; ventral scales axilla to groin 29; midbody scales 43; fourth toe lamellae 11; internasals 2; 3 supralabials to mid-eye; gular scales keeled, chest and ventral scales smooth. Dorsal ground color tan with four wide dark brown longitudinal lines; head ground color straw with a prominent pattern of a preocular reversed V on the snout, a broad pair of dark postorbital lines fused broadly posteriorly with the occipital and nuchal spots into a large occipito-nuchal figure, and a bold canthal line through the eye and onto the side of the neck, fusing broadly with the scapular patch; scapular patch large and extensive, without pale edges, and enclosing two fairly large and bold white ocelli; throat yellow with a few scattered dark brown flecks; ventral ground color pale yellow, underside of tail yellow, upper side of tail yellowish with diffuse dark brown blotching.

VARIATION: 104 adults of *S. m. guarionex*, including type and paratypes have a maximum snout-vent length of 33 mm in both sexes and the following scale counts: dorsals axilla to groin 18-26, mean 21.3; ventrals axilla to groin 22-31, mean 27.4; midbody scales 36-49, mean 41.3; escutcheon 4-9 X 16-29; internasals 0-3, mode 1; fourth toe lamellae 8-13, mode 11. One lizard has 4 supralabials to mid-eye on both sides. Although most specimens have the gular scales keeled and the chest and ventral scales smooth, 8 specimens have the gular scales incompletely keeled, 28 have the chest scales partly keeled, and three have the chest scales completely keeled. A single gecko has the keeling extending onto the anterior portion of the belly scales as well.

The dorsal ground color of males in life varies from tan or yellowish-tan to brown, with scattered dark brown scales, not aligned into longitudinal rows; head yellowish to distinctly orange; the pale (buff) postorbital stripes are often faintly visible, and may be outlined by irregular dark brown blotching; occipital spot diffuse and often absent; nuchal spot more often absent than present, and when present rather vague; scapular patch fairly large, though it may be reduced

or even asymmetrical, and the ocelli large, white and enclosed within the patch; throat yellow to yellow-orange or bright orange with at times rather dim brownish stippling or spotting, often forming a poorly defined collar; ventral ground color gray to whitish or pinkish yellow to clear yellow; underside of tail yellow to bright orange, often with large dark spots.

The females resemble the males in dorsal ground color and usually have a series of four or five longitudinal dark brown lines; head pattern typical of the species, except that the nuchal and occipital spots and the postorbital lines tend to fuse into a large dark brown occipital figure. Even when not fused, the nuchal spot is often large and extensive, at times approaching the scapular spot; scapular spot large, lacking any pale outline, and regularly including two large white ocelli. Only occasional specimens (6 of 61 females) show any reduction or obliteration of the scapular patch. The throat is yellow, usually with at least some indication of brownish or tannish dots which are inconspicuous after preservation. The throat markings are never prominent, even in life. The ventral ground color is variable as is that of the males, ranging from grayish-white to yellow. The underside of the tail is yellow to orange.

The iris color is yellow to grayish-yellow near Palmas Altas, black suffused with pale yellow and with a pale pupillary ring near Quebradillas, greenish-yellow to golden near Mora, brown near Dos Bocas, or golden at Ramey AFB.

Juveniles are longitudinally lined dorsally, although the lines may be obscured by the dark brown dorsal ground color; the scapular patch is large and prominent, the ocelli are included within, and the head pattern is like that of the female, although the various elements are less bold; the ventral ground color may vary between grayish and very pale yellow, and the underside of the tail from yellow to orange.

COMPARISONS: In midbody scales *S. m. guarionex* differs significantly from all other races except *grandisquamis* (fig. 6), from which it can be distinguished by its lack of a pale outline to the scapular patch and its round rather than transversely elongate ocelli. The consistently included ocelli differentiate *guarionex* from *ateles*; the restricted scapular patch of the latter is also noteworthy. The lined males of *spanius* are quite different from those of *guarionex*. The heavily spotted throats of *mimetes* are very different from the more diffusely and paler spotted throats of *guarionex*. *S. m. phoberus* lacks lined females. Persistent head patterns in male *mimetes* differ from the condition in *guarionex*.

REMARKS: The trivial name *guarionex* is derived from the Montañas Guarionex, a portion of the Pepino Hills in which S. *m. guarionex* occurs.

The distribution of S. *m. guarionex* is the most extensive of any of the Puerto Rican races of S. *macrolepis*. Ecologically the race occurs from sandy beaches and coastal coconut groves to elevations of 800 feet in the forested or pseudo-forested dolines of the Pepino Hills. Inland it was more often encountered in association with banana trash than in natural situations, very much like *spanius* in the Cordillera Central. Of the two species of geckos in the Pepino Hills, S. *m. guarionex* is by far the less common, and S. *klauberi* outnumbered S. *macrolepis* where the two were taken together. The major center of abundance of *guarionex* is coastal, where it was collected in habitats typical of those for the species in coastal localities elsewhere, coconut groves being especially favored. At the type locality and at Rifle Range Beach, the lizards were abundant in lowland coastal deciduous woods where they were found under logs and trash in the heavy leaf litter. Farther east along the coast occasional specimens were encountered in *Coccoloba* leaves.

No intergradation is known between *spanius* or *ateles* and *guarionex*. The Dos Bocas specimens from a coffee plantation immediately at the foot of the Pepino Hills escarpment and only about 5 kilometers from the type locality of *spanius*, are definitely *guarionex*. This is the closest these two subspecies are known to approach each other. Presumably the valley between the escarpment and the ascending slopes of the Cordillera Central divides the two races. The two localities where *guarionex* and *ateles* approach most closely are Córsega (*guarionex*) and south of Mayagüez (*ateles*). We could find no suitable localities for S. *macrolepis* in the intervening region, a distance of about 27 kilometers. Possibly the lowlands in the region of Añasco act as a barrier between these two races.

Sphaerodactylus macrolepis inigoi[1], new subspecies

TYPE: MCZ 81055, an adult female from Ensenada Sun Bay (= Ensenada Sombe), Isla Vieques, Puerto Rico, one of a series taken 2 September 1964 by Richard Thomas. Original number V4042.

PARATYPES (all from Isla Vieques): ASFS V4040-41, V4043-46, same data as type; ASFS V4028-30, V4037-38, UF 21265-70, UIMNH 56938-44, 7 km W

[1] We are aware that the International Code of Zoological Nomenclature, 1961, Appendix C, article 13 suggests that the Spanish *ñ* be represented by *gn*, but we prefer to render it as *n* in this case in order to retain the visual approximation of the written word as nearly as possible.

Isabel Segunda, 1 September 1964, R. Thomas; ASFS V6147-51, Colonia Puerto Real, 24 March 1965, R. Thomas; ASFS V6155, approximately 1.5 km NE Colonia Puerto Real, 24 March 1965, R. Thomas; ASFS V6156-61, 5 km SW Isabel Segunda, 24 March 1965, R. Thomas; AMNH 94201-03, bay bordered by Punta Negra, 24 March 1965, R. Thomas; AMNH 94199-200, Puerto Mosquito, east of Ensenada Sun Bay, 25 March 1965, R. Thomas; KU 79910-16, 3.8 km W Esperanzas, 25 March 1965, R. Thomas; MCZ 34414-23 + 33 untagged specimens, Isla Vieques, 1931-32, C. Grant.

ASSOCIATED SPECIMENS: ASFS V6169-71, Cayo de Afuera, Isla Vieques; ASFS V4068-69, V6185, Cayo de Tierra, Isla Vieques.

DISTRIBUTION: Isla Vieques and the two southern islets, Cayo de Afuera and Cayo de Tierra (fig. 5).

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of small size (maximum snout-vent length in both sexes 30 mm), low number of midbody scales (33-41, mean 36.8 ± .32). Males with dorsal ground color yellowish-brown and without pattern except for occasional scattered darker scales; head orange to rusty and without pattern except for a dull occipital spot and occasional remnants of the nuchal spot; scapular patch small, usually medially constricted and including two tiny white ocelli; and throat almost always unpatterned. Females brown with a pattern of longitudinal dark lines; ground color of head gray to yellow-brown with typical head pattern at times somewhat fragmented; throat always heavily stippled or blotched with dark brown to black; iris brown.

DESCRIPTION OF TYPE: An adult female with a snout-vent length of 27 mm, tail 28 mm. Dorsal scales axilla to groin 20; ventral scales axilla to groin 27; midbody scales 40; fourth toe lamellae 10; internasal 1; 3 supralabials to mid-eye; gular scales keeled, chest and ventral scales smooth. Dorsal ground color brown with two dorsolateral longitudinal lines and a median series of four irregular blotches which represent the two paramedian longitudinal lines; head ground color gray with a dark pattern consisting of a preocular reversed V, which is the usual pair of snout lines, a pair of irregular postorbital lines which fuse with the nuchal spot, enclose the occipital spot, and almost meet the scapular patch, and a dark canthal line through the eye which continues onto the neck and becomes confluent with the dorsolateral body line; scapular patch small, without pale margins and enclosing two small indistinct ocelli (fig. 3c); tail brown dorsally with a series of four pale irregular crossbands, each outlined with darker; throat gray with a dense reticulum of dark gray; ventral ground color pale gray.

VARIATION: 22 males and 15 females, including type and paratypes and associated specimens, have a maximum snout-vent length

of 30 mm in both sexes and the following counts: dorsals axilla to groin 17-21, mean 18.6; ventrals axilla to groin 21-27, mean 24.6; mid-body scales 33-41, mean 36.8; escutcheon 5-8 X 19-26; internasals 1-3, mode 1; fourth toe lamellae 8-12, mode 10. All specimens have 3 supralabials to mid-eye; exceptions to having the gular scales keeled and the chest and ventral scales smooth are four lizards with the gular scales only partly keeled.

The males present little variation in color or pattern. All are tan, gray-brown, or yellow-brown dorsally, and only occasional specimens have any dorsal body markings in the form of isolated dark scales. The head is orange or rusty without pattern except for the vague occipital spot and rarely a remnant of the nuchal spot which regularly is absent; scapular spot regularly present, small, and usually constricted medially into a dumb-bell shape, and the ocelli are white and small. Three males have the scapular patch almost or entirely obliterated. The throat is clear gray or yellowish to orange, normally without any pattern, although two males have a heavily reticulate throat. The venter is light gray, and the iris brown.

The females were recorded as having a brown dorsal ground color in life; and usually, in contrast to the type, they have four longitudinal lines; seven females resemble the type in having a single median row of dark blotches resulting from the fragmentation and subsequent fusion of the two paramedian longitudinal lines. The head pattern is like that of the type. The occipital spot may be very closely approximated to and almost fused with the postorbital lines. The dark head elements are always irregularly scalloped and rough-edged and are not so neat and diagrammatic as those of other races. The scapular patch is small, often restricted, not outlined with pale, and may have the ocelli included or on the periphery, depending upon the size of the patch itself. The throat is pale gray, always with a heavy dark brown to black reticulum. The venter is light gray. Unregenerated tails are brown and show some crossbanding, the pale bands outlined with dark brown.

Juveniles show the same variation in dorsal pattern as the females; 7 of 14 show the median series of dark dorsal blotches rather than lines; no juvenile shows a clear pattern of four dorsal lines, though several have this indicated. The head pattern is like that of the females, and one juvenile has the nuchal spot fused to the scapular spot. Tail tips of very small lizards (16 and 17 mm) are very pale gray rather than white.

Comparisons: The only mainland Puerto Rican race of S. *macrolepis* with which *inigoi* requires comparison is *mimetes*. Both are the

only subspecies that regularly have very heavily spotted throats in one or both sexes. In *mimetes* the throats are spotted in both sexes, and the males retain the female head pattern, accenting it with dark dorsal head spotting; *inigoi* males have brightly colored heads without spotting or pattern, and almost always have the throats without pattern. Females of the two races are very much alike, as both have head patterns and spotted throats. The latter is a much more constant feature in *inigoi*, for all females examined possess it. The irregular median series of dorsal blotches occurs in *inigoi* and not in female *mimetes*. The two races show no scale differences, but male *mimetes* reach a larger size than either sex of *inigoi*. Detailed comparisons with the other races on Puerto Rico is unnecessary; none has the heavily spotted throat of female *inigoi* and the regularly unpatterned males with brightly colored heads. The mean number of midbody scales of *inigoi* is significantly different from those of *grandisquamis, stibarus, ateles, spanius,* and *guarionex* (table 1).

REMARKS: We take great pleasure in naming the Vieques race of *S. macrolepis* for Sr. Felix Iñigo of the Department of Agriculture and Commerce of the Commonwealth of Puerto Rico, for his unfailing courtesy toward us in our endeavors in his country.

Stejneger (1904: 602 *et seq.*) included the Vieques sphaerodactyls in his newly described species *grandisquamis*. By placing *grandisquamis* in the synonymy of *S. macrolepis*, Schmidt (1928) put the Vieques geckos also in that species. Grant (1932b, chart) considered the Vieques lizards as *S. danforthi* Grant, a species very close to *macrolepis* that he described from Isla Culebra to the east and characterized (1931: 205-06) as having a "vividly speckled throat, black and white, stopping abruptly at the neck" and by males having either a red-headed or speckled-headed phase. In two subsequent papers, one dealing with the herpetofauna of Vieques (1932c) and another (1932d) dealing with the reestablishment of *S. grandisquamis* as a distinct species, he continued to regard the Vieques animals as *danforthi*.

The above brief historical outline shows how the Vieques geckos have puzzled everyone who has studied them. As we do not regard *danforthi* as distinguishable from *S. macrolepis* even subspecifically, Grant's assignment of the Vieques population to that form is untenable. We have already commented on the fact that in scale organs *inigoi* is clearly associated with mainland Puerto Rican races, rather than with *S. m. macrolepis* to the north and east. These two races are distinct not only in scale organs but in head coloration and

throat pattern of males; the females of each are extremely similar to each other.

On Cayo de Tierra *inigoi* was collected under rocks, primarily on an exposed and sunny hillside. On Vieques proper these lizards were taken in mesic ravines, in coastal *Coccoloba*, and in palm trash; the sea-grape habitat yielded the most specimens.

Sphaerodactylus macrolepis macrolepis Günther

Sphaerodactylus macrolepis Günther, 1859, Ann. Mag. Nat. His. (3), vol. 4, p. 215.

Sphaerodactylus danforthi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 205. Type locality Culebra Island. Type specimen MCZ 34403.

TYPE LOCALITY: St. Croix, American Virgin Islands.

DISTRIBUTION: Culebra including Culebrita and Cayo Luís Peña; American Virgin Islands, St. Croix including Protestant Cay; St. Thomas and its satellites, Water, Buck, Hans Lollick, Little St. James, Little Saba, Savana, Cockroach; St. John including Congo Key; and British Virgin Islands, Tortola and Beef, Guana, Great Camanoe, Peter, Virgin Gorda, Anegada (fig. 5).

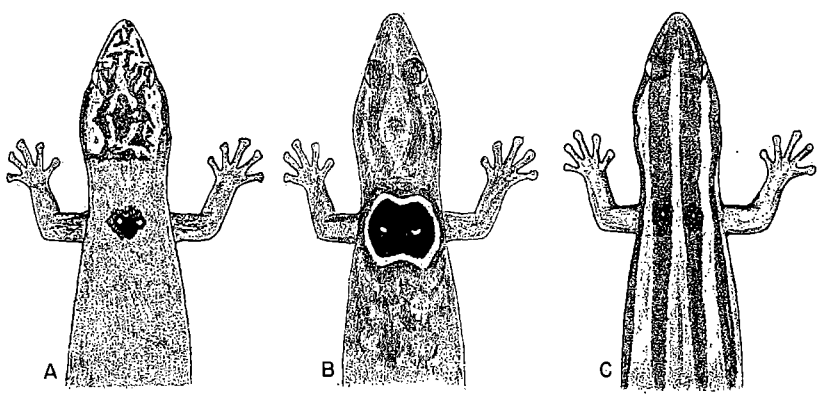

FIGURE 4. A, *S. macrolepis macrolepis*, anterodorsal view, male, ASFS V3306, 1.0 mi. W Cane Bay, St. Croix, American Virgin Islands. B, *S. monensis*, anterodorsal view, female, MCZ 34571, Isla Mona. C, *S. roosevelti*, anterodorsal view, female, ASFS V5627, 8.5 km SE Guánica, Puerto Rico.

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of small size (males to 30 mm snout-vent length, largest females 31 mm), dorsal scales with only hair-bearing organs, high number of midbody scales (38 to 50, mean 43.1 ± .27). Dorsum of males gray or tan to brown, usually without any darker dorsal scales

but occasionally with a few scattered dark scales; head contrastingly colored either with dark brown or black vermiculations on a pale gray to pinkish- or purplish-gray ground color, or brightly colored in ochre, orange, or rich reddish-brown, and virtually patternless except for a few diffuse dark nuchal dots and an indistinct occipital spot; scapular patch and ocelli always very small, often both absent; throat heavily marbled black on a yellow to yellow-orange ground color. Females yellowish-tan to dark brown with a pair of dorsolateral and a pair of lateral brown stripes and a median series of about four or five brown blotches which may be much fragmented and salt-and-pepper in effect; dark head pattern composed of a preorbital reversed V, a pair of postorbital lines, usually constricted at the level of the occipital spot but continuing to join the nuchal spot posteriorly, all the head lines irregular and scalloped in outline on a gray ground color; scapular patch fairly large but variable in extent, rarely reduced or absent, and including two pale cream ocelli; throat variable but usually with some dark markings, less extensive than those of males, on a whitish or yellowish ground. Iris yellow to pale yellow.

REMARKS: The nominate subspecies of *S. macrolepis* occupies a wide range throughout the islands between Puerto Rico and the Anegada Passage. Although it has been reported from relatively few of these islands, it is presumed to be far more widespread than the reports indicate.

The coloration of a series from St. Croix in life follows: Males—dorsal ground color gray to yellowish-brown with a few dark scales sprinkled over the back, or with merely a few dark scale edges or no dark scales whatsoever; head usually grayish with heavy dark vermiculations which represent the typical female head pattern much obliterated by additional black pigment; the nuchal spot is absent, and the dark head vermiculations end abruptly on the neck; ocelli white, connected by a rudimentary V-shaped scapular black patch; both scapular patch and ocelli sometimes completely absent (fig. 4a); throat yellow with faint dark marbling or white with heavy dark marbling, the dark pigmentation stopping abruptly at the same nuchal level as the dorsal head markings; venters white; underside of tail pale yellow. A very few males from St. Croix have the head unmarked dorsally and more or less unicolor with the yellowish-brown body. Females—dorsal ground color gray with a pair of lateral stripes on the lower sides just above the limbs, a pair of dorsolateral stripes, enclosing between them a series of four or five median dark blotches, which in turn may be much fragmented giving a rather irregularly patterned median dorsal area; scapular patch fairly large

and dark-edged enclosing a pair of cream ocelli, but patch occasionally absent; tail yellowish dorsally with light crossbars proximally; throat whitish with some faint, usually lateral, dark markings; head gray with a bold but irregular dark brown pattern consisting of a preocular reversed V which additional dark pigment on the snout may make very irregular, an irregular and much scalloped pair of postorbital lines constricted at the level of the occipital spot which approach and sometimes join the nuchal spot; a few specimens have some dark pigment in the gray areas on the head. A dark canthal line passes through the eye and along the neck, where it usually joins the lateral line. The ventral ground color is gray to pinkish, the underside of tail orange to yellowish.

We have seen living specimens of S. *m. macrolepis* from 13 islands (other than St. Croix) from Culebra to Anegada and find that, except for the head color and pattern of males, little variation is evident in dorsal patterns and color. The major intrapopulation differences are the frequencies of brightly-colored headed males.

Grant (1931: 205-07) diagnosed S. *danforthi* as follows: "Pronounced sexual dichromatism. Adult averages 50 mm. Squamation as in S. *macrolepis*. Males less marked and females more than in S. *macrolepis*. The outstanding character is the vividly speckled throat, black and white, stopping abruptly at the neck." He then proceeded to discuss two categories of males, "males, red-head phase" and "males, speckled-head phase". Later (1932c: 37-38) he recorded the species from Vieques and described the population as "a two-color-phase male form". Grant found no intermediates between the two phases on Culebra, but on Vieques "all intergrades were found". Whether he meant by this that the entire population was intergradient between *danforthi* and *macrolepis* or whether the entire gamut of intergradient possibilities was encountered is unknown. Still later Grant (1937: 520) reported S. *danforthi* from Anegada, where "some males had lemon-yellow heads, others the typical orange-red heads." He made no mention of males with patterned heads. Finally Grant and Beatty (1944) recorded S. *danforthi* from St. Croix on the basis of four specimens from four localities. They also noted the widespread occurrence of S. *macrolepis* on St. Croix, with 330 specimens from 35 localities.

The type of S. *danforthi* (MCZ 34403) is a male with a patterned head. So far as we can determine, the pattern of Culebra males does not differ from that of males from St. Croix, or for that matter from specimens from elsewhere within the range of S. *m. macrolepis*. Of 36 males from Culebra, 8, including all the largest males, have

plain (brightly colored in life) heads, and the balance have patterned heads. Grant (1931: 206) noted that 22 percent of his sample of 67 males were in the plain-headed phase, whereas the balance were patterned. Obviously, from the data presented by Grant and Beatty above, the bright-headed males are uncommon on St. Croix, which our recently collections there substantiate. In a series of 28 males from Virgin Gorda, 11 had yellow and patternless heads and throats, and the others had some yellow on the heads plus patterning. Most of the males collected at Lloyd's Pond on Tortola had the heads yellow-orange or rich brown, without pattern; only one of the series had the head gray with black vermiculations as in typical *macrolepis*. Another male had the head ground color yellow, but retained the black head markings; this specimen would be "intermediate" between *danforthi* and *macrolepis*. On Beef Island most males had ochre heads and yellow to yellow-orange throats. Only a very few had the patterned *macrolepis* type head or showed the transitional stages between this and the ochre-headed condition.

We regard the bright-headed males as a stage in the ontogeny of male *S. m. macrolepis*; as females and young males have patterned heads it seems logical to consider the bright-headed males as "super-males"—possibly breeding adults or males approaching old age. The varying incidence of this condition in populations from various islands is of interest, but cannot be construed as showing the occurrence of two species. The fallacy of such interpretation is that one is left with a certain, albeit often small, percentage of "intergrades," "intermediates" or "hybrids" in most samples large enough to have various ontogenetic stages. As there is no other difference between *danforthi* with patterned heads and *macrolepis*, we consequently regard *S. danforthi* as a synonym of *S. m. macrolepis*.

VARIATION: 90 specimens of *S. m. macrolepis* from several islands throughout the range (Culebra, St. Croix, St. Thomas, Virgin Gorda, and Anegada) have a maximum snout-vent length of 30 mm in males, 31 mm in females and show the following scale counts: dorsal scales axilla to groin 18-26, mean 22.5; ventral scales axilla to groin 21-31, mean 25.2; midbody scales 38-50, mean 43.1; escutcheon 3-8 X 11-28; internasals 0-3, mode 1; fourth toe lamellae 9-12, mode 9. There are regularly 3 supralabials to mid-eye. Usually the gular scales are keeled and the chest and ventral scales are smooth. However, some variation occurs; in a series of 18 specimens from Culebra, 7 have no keels on the gular, chest, or ventral scales, and 4 Culebra lizards have only some of the gular scales keeled. In 20 from St. Croix, only 3 have some of these scales keeled, while 5 of 20 from St. Thomas

and 6 of 20 from Virgin Gorda have some of the scales keeled. One Virgin Gorda *macrolepis* has some of the chest scales keeled as well, and in 2 of 13 Anegada specimens only some of the gular scales are keeled, and 3 have the keels on some of the chest scales.

The absence of internasals is apparently unique to Virgin Gorda *S. m. macrolepis*; 5 of 84 Virgin Gorda lizards have this condition, which occurs in none of the 258 specimens examined from other islands. The mean numbers of dorsal scales in axilla to groin distance likewise vary between islands, ranging from a low of 21.7 on Culebra to a high of 23.5 on Virgin Gorda. The mean of 22.2 on Anegada, the easternmost island inhabited by *S. m. macrolepis*, is intermediate between the two extremes. The same situation applies to midbody scales, where the means range from a low of 41.0 on Culebra to a high of 44.8 on Virgin Gorda; once again Anegada, with a mean of 42.1, is intermediate between the two. The subspecies reaches a maximum snout-vent length of 30 mm in males (St. Croix and Virgin Gorda), and of 31 mm in females (St. Croix). Maximal sizes for specimens from other islands are somewhat lower, the smallest being those of Anegadan lizards where the largest male has a snout-vent length of 22 mm and the largest female 26 mm; however, the series is small (7 males, 3 females). St. Thomas and Culebra *macrolepis* are only slightly larger, males having a snout-vent length of 27 mm, females 26 mm (43 examined). The apparent smallness of Anegada lizards suggests an approach toward the smaller *S. m. parvus* from the northern Leeward Islands, but Anegada specimens show no *parvus* scalation or pattern characteristics. The slight variations that *S. m. macrolepis* shows between islands in male head color and in scalation and size are random and present a crazy-quilt configuration that does not lend itself to nomenclatorial treatment on any single character or combination of characters.

A single hatchling from Tortola has a snout-vent length of 12 mm and lacks a white or gray tail tip. In color and pattern juveniles resemble females and show the same variation. Noteworthy is the rather small size at which the male dorsal pattern and patterned head is assumed, males with snout-vent lengths of as little as 18 mm being readily identified as such on the basis of the unicolor dorsum.

S. m. macrolepis occurs from sea level to a known elevation of 750 feet at Rose Lodge, Tortola, and probably reaches even higher levels. It is a common inhabitant of wooded situations, both highland and low, especially where leaf-litter covers the ground, and is unusually plentiful in the ruins of Danish plantation houses and wooded estates on St. John. We encountered this gecko rather rarely on

Tortola except on the eastern end where we took numbers in palm trash piles in a coastal coconut grove. On Beef Island an abandoned coconut grove yielded a large series, and a few were seen in the more open scrub. Seagrape stands were a favored habitat on Buck Island. On Virgin Gorda S. *m. macrolepis* is widespread, although most readily collected in coastal coconut trash. Grant and Beatty (1944) indicated that *macrolepis* on St. Croix has a general distribution except for the "eastern extremity"; we secured no specimens there east of Milord Point on the west side of Great Pond Bay. The species occurs on St. Croix from coastal coconut groves and dry maritime woods to upland woods.

S. m. macrolepis requires comparison only with the races *mimetes* from Puerto Rico and *inigoi* from Vieques: *macrolepis* is distinguishable at a glance from all other subspecies by virture of the usually blotched dorsum of females and the densely patterned heads and throats of males, or by the bright-colored heads of males if they are without pattern. Male *macrolepis* differ from male *mimetes* in lacking remnants of a head pattern and the bold dark head spotting. The bold head pattern without constrictions and scalloping and the lineate dorsal pattern of female *mimetes* separate the females of the two races. The difference in the mean numbers of midbody scales, *mimetes* 36.1 and *macrolepis* 43.1, are statistically significant (table 1). The absence of knob-like scale organs on the dorsal scales of *macrolepis* also separates this race from *mimetes.*

The scale organs likewise differentiate *macrolepis* from *inigoi*—the latter has both knob-like and hair-bearing organs, the former only hair-bearing organs. As previously pointed out, *inigoi* resembles *macrolepis* in many details of color and pattern. Male *inigoi* always have brightly colored, unpatterned heads and unpatterned throats; *macrolepis* males have patterned heads and throats until the bright-colored head condition is reached. Even when the upper surface of the head is virtually patternless, as in *inigoi* as well, the throat is still patterned with dark, an extremely rare condition in *inigoi.* The difference in the means of midbody scales, *inigoi* 36.8, *macrolepis* 43.1, are statistically significant. The modal number of fourth toe lamellae is 9 in *macrolepis,* 10 in *inigoi.* The dorsal scales between axilla and groin are 18 to 26, mean 22.5 in *macrolepis,* 17 to 21, mean 18.6 in *inigoi.*

SPECIMENS EXAMINED: *St. Croix*: ASFS V3268-82, 2 mi. S Lavallee; ASFS V3615-24, ca. 0.4 mi. E Lavallee; ASFS V3284-300, Cane Bay; ASFS V3304-16, 1.0 mi. W Cane Bay; ASFS V3414-17, 2 mi. S Fredericksted; ASFS V3421, Annaly; ASFS V3318-20, 2 mi. NW Annaly; ASFS V3426-32, 1 mi. E Annaly; ASFS

V3433-36, 2 mi. E Annaly; ASFS V3341-43, Fountain; ASFS V3552-59, 2 mi. NW Orange Grove; ASFS V3625-28, Anguilla; ASFS V3317-26, Milord Point (west side of Great Pond Bay); *Culebra*: ASFS V4133-37, Dewey; ASFS V4138-39, ca. 1 km W Dewey; MCZ 34403 (type of *S. danforthi*), 34404-12 (total 57 specimens), no other locality; *Cayo Luis Peña*: MCZ 34424-33 (13 specimens); *Culebrita*: MCZ 42370; *St. Thomas*: ASFS V7270-77, 0.5 mi. SW Mandal; ASFS V7278-88, 1 mi. SW Mandal; ASFS V7318-28, Dorothea; ASFS V8022-33, 2.7 mi. NW Charlotte Amalie; *Water Island*: ASFS V7419-22, east side; *Buck Island*: ASFS V7466-68; *Hans Lollick Island*: ASFS V7453, east side; *St. John*: ASFS V7488-89, Calabash Boom; ASFS V7491-503, Windberg ruins; ASFS V7565-83, Frederickdal ruins; *Tortola*: ASFS 7679-80, east side Sea Cow Bay; ASFS V7692-94, V7905-11, Pasea Hall Estate; ASFS V7751, Rose Lodge, 750 feet; ASFS V7873-94, V7937, Jackass Gut; ASFS V7961-75, V8073, Lloyd's Pond; *Beef Island*: ASFS V7747-50, V7761-805, western end; *Guana Island*: ASFS V3947-68, White Bay; *Great Camanoe Island*: ASFS V3983-V4001, between Lee Bay and Cam Bay; *Peter Island*: ASFS V7846-69, Little Harbour; *Virgin Gorda*: ASFS V3660-63, Pond Bay; ASFS V3653-57, V3691-92, ca. 0.5 mi. N Pond Bay; ASFS V3682, between Little Dix Bay and Savana Bay; ASFS V3718-19, southeastern part of island, inland from Copper Mine Bay; ASFS V3723-29, just north of Garden Rock; ASFS V3747-48, Mahoe Bay; ASFS V3756-83, V3817-50, inland margin of Salt Pond back of St. Thomas Bay; *Anegada*: ASFS V3925-33, vicinity of The Settlement; MCZ 12260-63, no other locality.

Sphaerodactylus macrolepis parvus King

Sphaerodactylus macrolepis parvus King, 1962, Bull. Fla. State Mus., Biol. Sci., Vol. 7, no. 1, p. 16. Type specimen UF 10034.1.

TYPE LOCALITY: 2.5 mi. W, 0.25 mi. N Phillipsburg, St. Martin.

DISTRIBUTION: The Lesser Antillean islands of Anguilla, Dog, St. Martin, St. Barthélemy, and Tintamarre (fig. 5).

DIAGNOSIS: A subspecies of *S. macrolepis* characterized by a combination of very small size (maximum snout-vent length 23 mm in each sex; King, 1962: 16, recorded 24 mm), dorsal scales with hair-bearing organs only, high number of midbody scales (44-54, mean 48.4 ± .77); not markedly sexually dichromatic, dorsal ground color varying between pale pink, tan and brown, with scattered dark brown scales giving a vague salt-and-pepper effect; black scapular patch moderate in size to small or absent, with a pale buff border and enclosing two buff to cream ocelli, the patch slightly more prominent in life in females than males; heads washed with yellow; throat yellow speckled with brown in males, yellow to orange on base of throat in females with chin usually cream to very pale yellow and somewhat speckled with brown; tails pale yellow to dull orange below; ventral ground color creamy white; iris golden to bronzy orange. Juveniles have underside of tail coral; head pattern diffuse and much fragmented and often very obscure, but consisting of a dark preocu-

lar V, a pair of postorbital dark lines which approach each other and form an incomplete dark U behind the occipital spot which may be obscure or may have a median anteriad extension toward the interorbital area.

REMARKS: We have 16 specimens of *S. m. parvus* from the islands of Anguilla, St. Martin, and St. Barthélemy. These agree well with King's description and diagnosis in size, color, and scalation. In addition to the scale counts given above, the escutcheon is composed of 4-6 X 12-17 scales (King's data for escutcheon size are 4-7 X 19-25) and there are from 0-3, mode 1, internasals. Two tiny juveniles (snout-vent lengths 12 and 13) are colored like adults except for the coral underside of the tail.

King (1962: 18) took specimens under rocks in a cave on Anguilla, and on St. Martin in leaf litter under rocks in a cave and under rocks from a stone wall. We found ours on St. Martin in leaves on scrubby hillsides near the ocean, where we also saw others we did not collect in rock piles inhabited also by *S. sputator* Sparrman, on Anguilla under rocky talus at the base of trees in littoral scrub, and on St. Barthélemy in piles of dead *Opuntia* in a pasture adjacent to mangroves. An egg from St. Martin measured 6.0 mm X 4.5 mm (King, 1962).

S. m. parvus hardly requires comparison with any other subspecies. From the Puerto Rican and Vieques races, it differs in having only hair-bearing organs on the dorsal scales, in being much smaller, and in having a higher mean of midbody scales (48.4) than that of any other race (table1). The races *stibarus, phoberus, mimetes, ateles,* and *inigoi* show no overlap of midbody scales with *parvus*. Differences in pattern need not be repeated; the lack of marked sexual dichromatism in *parvus* is of itself definitive.

Compared with its neighbor to the west, *S. m. macrolepis,* the only other subspecies which also has only hair-bearing organs on the dorsals, *parvus* is much smaller and less bulky. The head pattern in *macrolepis* is much more conspicuous than in *parvus* females, and no *parvus* males show either the monochromatic or heavily patterned heads of male *macrolepis*. Female *macrolepis* have the scapular patch much larger and more prominent than female *parvus*. The throats of both sexes of *macrolepis* are more heavily pigmented than those of *parvus*. Midbody scales in *macrolepis* vary between 38 and 50, mean 43.1, whereas in *parvus* the midbody scales range from 44 to 54, mean 48.4. The slightly higher means of *parvus* in counts of dorsals and ventrals, and the 10 versus 9 modal number of fourth toe lamellae are also suggestive.

Specimens examined: *Anguilla*: ASFS X132, X195, Rendezvous Bay; *St. Martin*: ASFS 19928, Mullet Pond; *St. Barthélemy*: ASFS X265-77, Baie de St. Jean.

Sphaerodactylus monensis Meerwarth

Sphaerodactylus macrolepis var. *monensis* Meerwarth, 1901, Mitt. Naturh. Mus. Hamburg, vol. 18, p. 20.

DEFINITION: A species of *Sphaerodactylus* with very large, acute, strongly keeled, flattened, imbricate dorsal scales axilla to groin 23-32; no area of middorsal granules or granular scales; dorsal scales with hair-bearing organs, each with one hair along the free posterior edge of each scale; throat scales varying from smooth (rarely) to keeled, chest scales smooth to completely keeled, ventral scales smooth (usually) to keeled anteriorly, rounded and imbricate (axilla to groin 22-32). Scales around midbody 42 to 51. Dorsal scales of tail keeled, acute, imbricate and flat-lying; scales beneath tail smooth, rounded, enlarged midventrally; internasals 1 to 3 (mode 1); 3 upper labials to mid-eye; escutcheon (fig. 11b) short and compact medially with extensions onto the underside of the thighs but never reaching the knees (4-7 X 9-18). Color pattern not sexually dichromatic, chocolate to gray-brown above and gray to yellowish below, with dark brown dorsal markings varying from isolated dark scales to almost a dorsal dark reticulum composed of individual darker scales; a black scapular patch, prominently outlined by very pale gray and including an irregular and often transversely elongate pair of very pale gray ocelli; a prominent dark sacral U, at times followed by a paler and concomitant U; head pattern not bold, consisting of a pair of dark brown preocular lines on the snout (which are usually joined to form a reversed V), a pair of brown postorbital lines which proceed posteriorly and become lost in some vague nuchal blotching but which may join and enclose a grayish-brown occipital diamond which is usually incised medially by a vague dull brown occipital spot; nuchal spot absent (fig. 4b); throat immaculate pinkish-gray; iris color brown to gray-brown. Habitus moderate; snout short and rather broad. Maximum snout-vent length 30 mm in both sexes.

TYPE LOCALITY: Isla Mona.

DISTRIBUTION: Isla Mona; not as yet known from Isla Monito (see Rolle *et al*, 1964: 322).

REMARKS: We have outlined the nomenclatorial history of *S. monensis* in the discussion of *S. macrolepis*.

The amount of dorsal dotting is variable, some specimens being almost without any dorsal pattern (ASFS V6435) and others having it rather conspicuous (ASFS V6437). The scapular patch is variable

in extent, often invaded anteriorly by the grayish-brown or chocolate ground color, and the ocelli are likewise variable, in some cases the two ocelli being joined to form a single enclosed transverse dash. The scapular patch is invariably outlined by a prominent pale gray border. The head pattern is generally very subdued and difficult to determine, as the posterior head and neck are variously marbled and mottled with brownish on the lighter ground, and the postorbital lines become lost in this irregularly mottled area. In other specimens of both sexes, the postorbital lines meet behind the vague occipital spot and form a pale occipital diamond which may include the slightly darker spot. The spot may be joined to the dark posterior edge of the diamond, thus incising the pale area. The sacral U is present and prominent in both sexes and juveniles; it is often outlined posteriorly by a pale clear concomitant tan to brownish U. The tail may be unicolor, have a pair of dorsal longitudinal lines, or may even be spotted with darker.

By virtue of its lacking any sexual dichromatism, *S. monensis* is quite distinct from *S. macrolepis*. The head pattern, such as it is, is easily derivable from that of *S. macrolepis*, although it is much fainter and more diffuse. The head seems shorter and broader than that of *S. macrolepis* as well. In having a broadly pale-bordered scapular patch, *S. monensis* resembles the eastern subspecies *S. m. grandisquamis*. Without adequate material of *S. macrolepis* from Puerto Rico, it is not surprising that various authors considered *monensis* a synonym of *macrolepis*.

Grant (1931: 211) reported taking specimens under trash on the ground, and Schmidt (1928: 74) noted that he had collected four (of which three specimens were collected at night) among limestone boulders; two were taken beneath pieces of coral on the flat southern terrace. Heatwole (1961: 33) found *S. monensis* under leaf litter at two localities, and under debris near the lighthouse. The senior author found *S. monensis* extremely abundant; most of our recent material was collected on the southwestern terrace. The situations where these lizards were encountered varied from moderately mesic woods to xeric scrub; many were seen in palm trash and even in open *Casuarina* plantings among the "needles". *S. monensis* is also moderately abundant in the scrub and scrubby woods on the limestone platform.

SPECIMENS EXAMINED: MCZ 13480, MCZ 34558-75, Isla Mona; ASFS V6435-62, ASFS V6502-04, ASFS V6568-78, Anclaje Sardinero; ASFS V6489-92, Uvero Desembarcadero; ASFS V6542-47, between Anclaje Sardinero and Uvero Desembarcadero.

Sphaerodactylus roosevelti Grant

Sphaerodactylus roosevelti Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 203, figs. 4-5.

TYPE LOCALITY: Near Parguera, Puerto Rico.

DISTRIBUTION: The southwestern coast from Cabo Rojo to Punta Ventana and on Caja de Muertos (figs. 1 and 5); probably the island of Vieques (Grant, 1932c). This is the first record for Caja de Muertos. The species is most abundant in the littoral zone and is found sparingly in the xeric hills about three kilometers inland east of Guánica. It may extend slightly farther east than Punta Ventana, but it does not appear to reach Ponce. The Vieques record is probably correct; Grant based it on a hatchling of uncertain identification. A juvenile specimen (MCZ 36666), whose "Virgin Island" locality may well be mis-copied for Vieques Island, is probably the specimen Grant recorded. It is unquestionably a *roosevelti*. The bright yellow coloration Grant noted agrees with the color we recorded for a single hatchling (ASFS V9005). The egg size Grant mentioned, 9 X 7 mm, agrees with our data for two *roosevelti* eggs (8.2 X 6.3—6.6 mm).

DEFINITION: A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales (axilla to groin 19-25, mean 21.0); no area of middorsal granules or granular scales. Hair-bearing scale organs (one hair) only present on distal edge of scale. Ventrals smooth, including gulars with one exception and chest scales, rounded and imbricate (axilla to groin 19-27, mean 23.6). Scales around midbody 35-43, mean 37.7. Internasals 0-3, mode 1; upper labials to mid-eye 3, 2 or 4 abnormally. Dorsal scales of tail keeled, acute, imbricate and flat-lying; scales beneath tail smooth, rounded, enlarged midventrally. Fourth toe lamellae 9 to 12, mode 11. Escutcheon (fig. 11c) compact with virtually no extension onto thighs (3-6 X 8-17). Color pattern of females a series of six brown longitudinal lines on body, the median two of which extend onto head as postocular stripes; ground color light gray to tan; scapular ocelli prominent, white and black edged, confined to paramedian stripes; no scapular patch (fig. 4c). Pattern of males much faded, usually only faintly evident; coloration pale purplish tan to fleshy tan, venter white. Iris golden to golden brown. Habitus stout; snout broad and short. This is the largest of Puerto Rican *Sphaerodactylus*; of 93 specimens the 52 largest vary from 33 to 39 mm snout-vent (males 33-39, mean 36.0; females 33-38, mean 35.2).

REMARKS: This species inhabits the extreme xeric part of Puerto Rico. It is most abundant in littoral situations such as in piles of palm

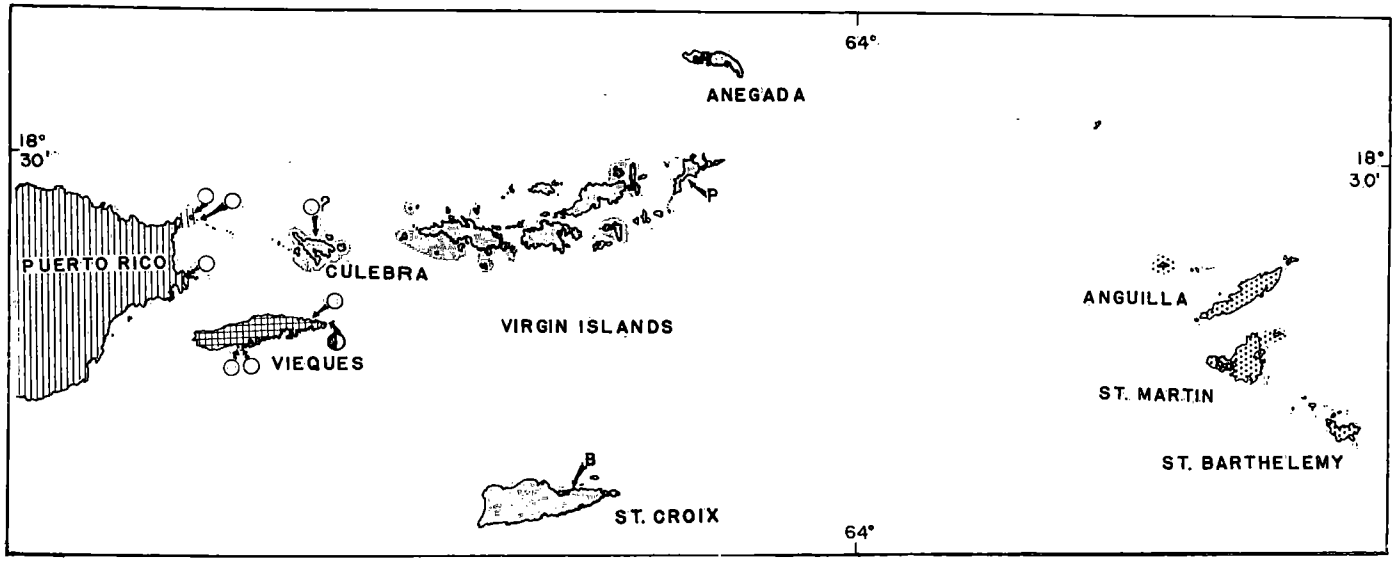

FIGURE 5. Distribution of *Sphaerodactylus*. *S. macrolepis* on Puerto Rico (no details of subspecies shown), vertical lines; *S. macrolepis inigoi*, crosshatching; *S. macrolepis macrolepis*, fine stippling; *S. macrolepis parvus*, coarse stippling; *S. nicholsi townsendi*, open circles (questionably recorded from Culebra); *S. roosevelti*, semi-solid circle; *S. parthenopion*, P; *S. beattyi*, B.

trash in *Cocos* groves, or among the dead leaves in the *Coccoloba* fringe. It also occurs in scrub or xeric woods a short distance inland, but less commonly than in the littoral situations. It was not encountered in the Sierra Vermeja or the xeric country west of Yauco in the foothills of the Cordillera Central. Caja de Muertos is quite dry and is more similar to the Guánica region than to the immediately adjacent mainland. Therefore the distribution of *S. roosevelti* appears to be primarily that area south of the Valle de Lajas which at one time was doubtless a peninsula or chain of offshore keys (Thomas, MS).

S. roosevelti and *S. macrolepis* are allopatric; the record of *macrolepis* for Ensenada (Schmidt, 1928) appears to have been based on specimens referable to *roosevelti* (AMNH 13811) and *nicholsi* (AMNH 13813). *S. roosevelti* does occur with *nicholsi* in this region, although the latter is of wider distribution in Puerto Rico.

SPECIMENS EXAMINED: ASFS V5551, 0.5 km N Cabo Rojo lighthouse; ASFS X4238-45, 1 mi. N Cabo Rojo lighthouse; ASFS V5562-63, 2 mi. S Pole Ojea; ASFS X4228-30, X4251-52, 3 mi. SW Ensenada; AMNH 13811, Ensenada; ASFS V4684-87, 6.7 km NE Guánica; ASFS V5641-42, 7.3 km E Guánica, 600 feet; V5615-32, V5729-52, V9005, 8.5 km SE Guánica; ASFS X4266-79, X4679-80, 9 km SE Guánica; ASFS X4288-92, 10 km SE Guánica; ASFS V5583-86, Punta Ventana; MCZ 66451, ASFS V4752, Caja de Muertos; MCZ 36666, "Virgin Island" (= Vieques Island?).

Sphaerodactylus klauberi Grant

Sphaerodactylus klauberi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 207, fig. 13.

TYPE LOCALITY: El Yunque, Puerto Rico.

DISTRIBUTION: Broadly speaking, the higher elevations of Puerto Rico (fig. 7); actually about all that can be said is that it avoids the coastal lowlands. It is an inhabitant of mesic regions from elevations of 300 feet near Rosario to 4,000 feet and probably higher. It occurs in the mesic parts of the Pepino Hills; the specimen from Camp Buchanan (MCZ 34512), if the locality is correct, may be a low elevation record. The species has not been taken in the Sierra de Panduras where the habitat is appropriate but where the closely related *S. gaigeae* occurs.

DIAGNOSIS: A species of *Sphaerodactylus* having moderate to small, acute to rounded, strongly keeled, flattened, imbricate dorsal scales (axilla to groin 23-32); no area of middorsal granules or granular scales. Hair-bearing organs (one hair) present on distal edge of scale. Ventrals including throat and chest scales partly to entirely keeled,

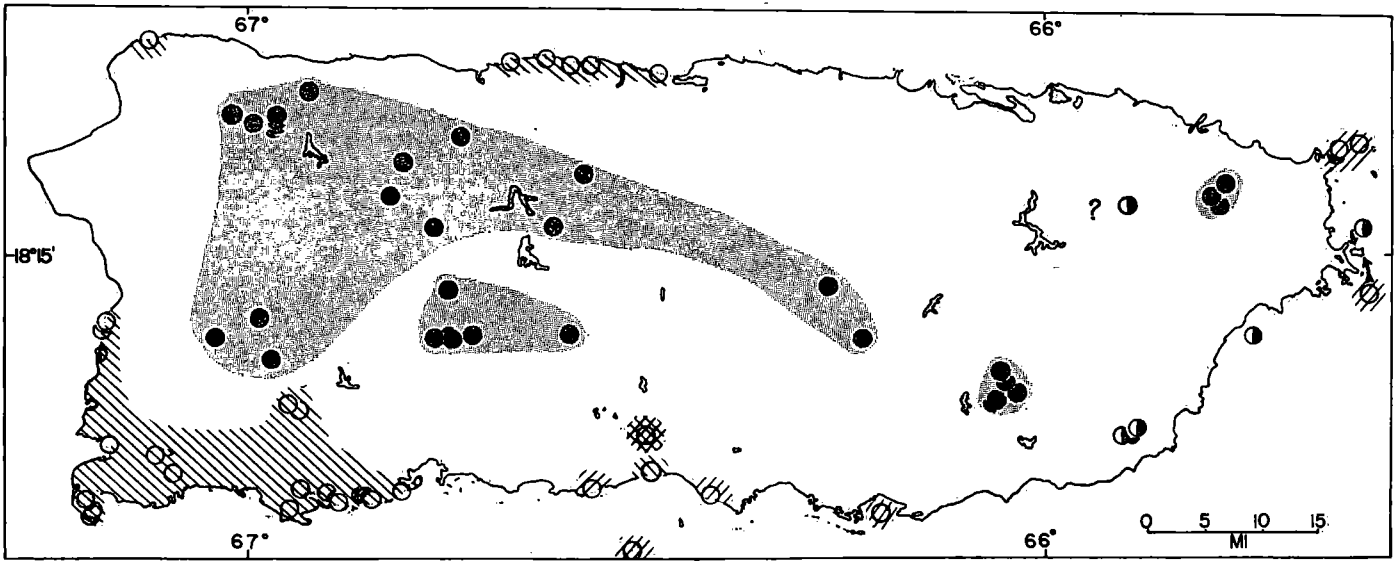

FIGURE 6. Puerto Rico, showing ranges of S. *klauberi* (solid symbols), S. *gaigeae* (semi-solid symbols), and S. *nicholsi* (hollow symbols). Range of S. *klauberi* stippled, shown as four discrete areas as discussed in text. S. *gaigeae* from south of Canóvanas is questioned. Races of S. *nicholsi*; S. *n. nicholsi*, diagonal lines from upper left to lower right; S. *n. townsendi*, diagonal lines from lower left to upper right; overlap of symbols in south-central Puerto Rico indicates sample of presumed intergrades.

acute, and imbricate (axilla to groin 24-34); scales around midbody 42-67; internasals 1-6, mode varies with population; upper labials to mid-eye 3, 2 abnormally. Dorsal scales of tail acute, imbricate, and flat-lying; scales beneath tail smooth, rounded, enlarged midventrally; fourth toe lamellae 9-13; escutcheon (fig. 11d) large with extensions well onto thighs (3-7 X 14-27). Color generally dark brown; body with irregular darker and lighter spots and mottling; scapular pattern present in most specimens; patch black, well developed or diffuse and broken; paired ocelli white to light gray. Head pattern complex; light brown postocular stripes extend onto neck, frequently joined by transverse stripe which may be scalloped in center; a dark transverse occipital spot joins laterally with dark stripes which pass posteriorly over eyelids, leaving a light, bilobed cephalic figure; other light and dark vermiculations may be present (fig. 7a); sacral pattern U-shaped; throat black and gray mottled or uniform light gray; venter and underside of tail typically orange or reddish pink or yellow, but may be gray; iris orange. Habitus moderately stout; snout broad and short. Size varies geographically (see below); the largest specimen is 37 mm snout-vent.

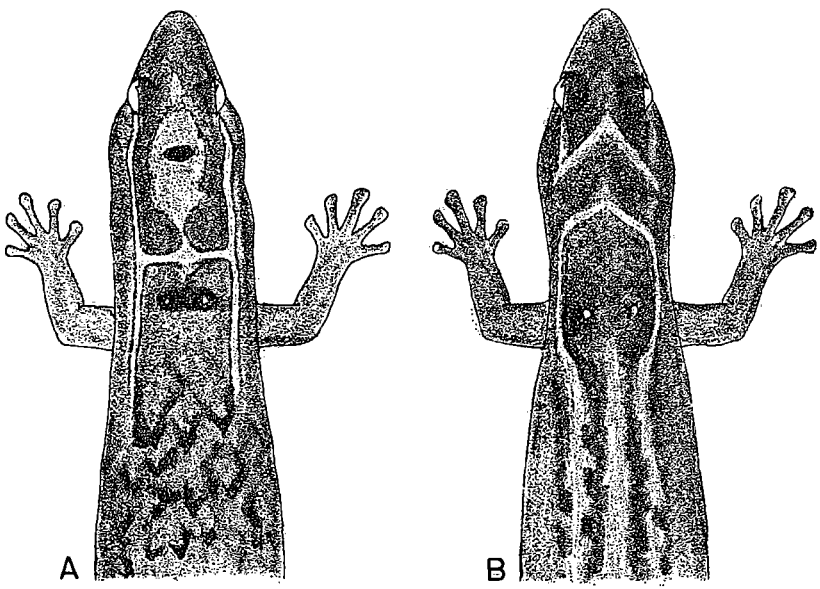

FIGURE 7. A, *S. klauberi*, anterodorsal view, combination of ASFS V4558, 30 km N, 3.1 km E Ponce, and V4946, ca. 20 km SE Cidra, Puerto Rico. B, *S. gaigeae*, anterodorsal view, male, ASFS X4050, 2.5 mi. SW Yabucoa, 800 feet, Puerto Rico.

REMARKS: Rather striking geographical variation in three characters, size, number of internasals, and size of dorsal scales, is discussed with reference to four geographical samples (tables 2, 3). The lizards of the northern limestone region and the northern and western parts of the Cordillera Central (sample I) have from 2 to 6 internasals with a mode of 3; size small to moderate; dorsal and midventral scale counts comparatively low (table 3); less than 50 percent of the specimens have entire keeling of the ventral scales. The specimens from the southern part of the Cordillera Central (sample II), which includes some of the higher elevations on the island, are strikingly larger lizards; internasals from 1 (mode) to 3; dorsal scales axilla to groin 27 to 32; midbody scales 50 to 67; their ventral scales are all entirely keeled. Were it not for the presence of two other samples from farther east, sample III from Guavate, and sample IV from El Yunque, there would be little question of the nameworthiness of the two populations. However, the other two samples, III and IV, are intermediate between samples I and II in size and dorsal scale counts (table 3); their internasals are more like those of Sample II (table 2). No color or pattern differences are manifest between the populations.

TABLE 2. INTERNASALS IN SAMPLES OF *S. klauberi*

		Internasals					
Samples	N	1	2	3	4	5	6
I	159		32	97	19	10	1
II	24	14	3	7			
III	11	3	4	4			
IV	19	17	2				

SPECIMENS EXAMINED: I. ASFS V5306-26, 7.0 km S Mora, 800 feet; ASFS V5220-44, 7.2 km SE Quebradillas, 900 feet; ASFS V5182-84, 1 km. S Pueblito de Ponce; ASFS V5166-78, 1.5 km S Pueblito de Ponce; ASFS V5158-61, 2 km S Pueblito de Ponce, 800 feet; ASFS V3228-38, 2 mi. S Pueblito de Ponce, Bosque de Guajataca; ASFS V4530-41, 3 mi. N Lares; ASFS V5150, 9.6 km S, 1.6 km E Mora, 800 feet; ASFS V5913, 18.8 km SW Arecibo, 800 feet; ASFS V5866, 3 mi. W Las Llanadas, 600 feet; ASFS V5985-95, 2.5 km SW Florida; ASFS V5286-87, 1.5 km SW Rosario, 300 feet; ASFS X4253-57, 13.8 km N Sabana Grande, 2900 feet; UMMZ 73594, Maricao; ASFS V5917, 7 km E Lares, 1200 feet; ASFS X4458-72, X4495-507, V4503-18, 17.7 km (= approx. 8 km. straight line distance) NE Utuado, 1100 feet; ASFS V6203-26, 2 km NE Barranquitas, 2100 feet; AMNH 12988-90, 13034, 13036, 13142, 13192-94, 13196, 13198, Aibonito.

II. ASFS V5974-76, 4.1 km NE Villa Pérez, 2200 feet; ASFS V5982, 9.1 km S Villa Pérez, 2900 feet; ASFS V6192, 10.5 km SSE Villa Pérez, 2900 feet; ASFS V6192, 10.5 km SSE Villa Pérez, 2900 feet; ASFS V4633, 10.6 km SSE Villa Pérez, Monte Guilarte, 3400 feet; ASFS V6198-204, 1.8 km S Adjuntas; ASFS V4557-60, 30 km N, 3.1 km E Ponce, 3500 feet - 3800 feet.

III. ASFS X7573-75, Bosque de Guavate, 8 km SE Las Cruces, 2080 feet; ASFS V4827-28, 18.8 km NNE Guayama, 2000 feet; ASFS V4839, 18.6 km NNE Guayama, 2000 feet; ASFS V4943-46, ca. 20 km. SE Cidra; UMMZ 124805, Bosque Guavate, nr. Prison Camp.

IV. MCZ 34473 (type), 34474-80 (paratypes), UMMZ 73595 (4 paratypes), El Yunque; UMMZ 73596 (2), Ranger's Cabin, El Yunque; UMMZ 73598 (3), Ranger's Cabin Luquillo Mt. (= El Yunque); ASFS X1189-90, 12 km S Palmer, 2500 feet.

TABLE 3. RANGES AND MEANS FOR THREE CHARACTERS OF FOUR GEOGRAPHICAL SAMPLES OF *S. klauberi*

Samples	Dorsal scales	Midbody scales	Adult size*
I	N=93	N=94	N=99
	25.6 (23–32)	53.3 (42–55)	26.9 (26–29)
II	N=22	N=22	N=15
	29.0 (27–32)	56.0 (50–67)	34.3 (33–37)
III	N=9	N=8	N=7
	27.6 (23–30)	53.0 (48–57)	31.9 (31–34)
IV	N=16	N=16	N=11
	26.2 (23–29)	50.4 (46–55)	31.5 (31–35)

* The upper half of the size classes (one millimeter) of the sample.

Sphaerodactylus gaigeae Grant

Sphaerodactylus gaigeae Grant, 1932, Jour. Dept. Agri. Puerto Rico, vol. 21, no. 4, p. 508, fig. 5.

TYPE LOCALITY: Mountains near Yabucoa, Puerto Rico.

DISTRIBUTION: Grant (1932a, 1932b) indicated the range of this species as being only the "mountains between Maunabo and Yabucoa." Since, it has been recorded from Cayo Santiago (Heatwole, Sade and Hildreth, 1963), and we obtained a specimen on Isla Piñeros. It appears, however, that the situation is not so simple. There is a series of specimens (MCZ 34436, 34438-40, 34443) from 10 km S Canóvanas, which should be on the western slopes of the Sierra de Luquillo. This is a considerable range extension from the vicinity of Yabucoa. According to Grant's own fieldbook he collected only one *gaigeae* at 10 km S Canóvanas (*in litt.*, Norman Hartweg to Ernest

Williams). Because of the frequent and irresolvable confusion that surrounds the Grant collections, we prefer to regard this locality for *gaigeae* as questionable. The reliable localities for this species then are the Sierra de Panduras, Cayo Santiago, and Isla Piñeros (fig. 6).

DEFINITION: A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales axilla to groin 20-30, mean 23.0; no area of middorsal granules or granular scales; hair-bearing scale organs (one hair) present on distal edge of scale; gular scales keeled, chest scales variably keeled, ventrals unkeeled in all but one specimen examined, which had incomplete ventral keeling; ventral scales acute to rounded and imbricate, axilla to groin 23-28, mean 24.8; scales around midbody 42-52, mean 45.6; dorsal scales of tail keeled, acute, imbricate and flat-lying; scales beneath tail smooth, rounded, enlarged midventrally; internasals 1-4, mode 3; upper labials to mid-eye 3; fourth toe lamellae 9-11, mode 10; escutcheon (fig. 11e) of moderate size with extensions onto thighs to behind knee (3-5 X 16-21). No sexual dichromatism; general coloring dark brown; dorsal pattern of darker scales or groups of scales on brown ground color or two rows of dark-edged light (buff) ocelli which continue onto tail as a dark stripe scalloped by light areas; scapular pattern faint or absent, consisting of slightly darker brown patch with two small ocelli; pattern on head and neck consists of two anteriorly pointed light chevrons. The anterior one is derived from the light area between the dark supraciliary stripes and the nuchal dark spot of the pattern basic to the group and the posterior one from the light anterior margin to the scapular patch (fig. 7b). In a few specimens the chevrons are much expanded and continuous with the light postocular stripe. Venter light but tends to be much invaded by dark pigment; throat nearly uniform pale yellow or with dark brown streaking; undersides of tails dull orange; iris golden. Habitus moderate, snout short. Size moderate; the 15 largest specimens of 31 vary from 22 to 25 mm snout-vent, mean 22.9.

REMARKS: *S. gaigeae* is so closely allied to *S. klauberi* the two may in reality be conspecific. *S. gaigeae* occupies a habitat in the Sierra de Panduras (where *klauberi* does not occur) very similar to that *klauberi* typically occupies elsewhere; however it also occurs in low elevation and even xeric situations on Cayo Santiago and Isla Piñeros. The colorations of the two are similar and are doubtless derivative. If the 10 km S Canóvanas locality for *gaigeae* is correct the two are almost certainly not conspecific, as this locality is possibly within the range of *klauberi*. The relationships of the two forms must be determined by future collecting.

Our specimens were collected under trash, leaves, fallen palm fronds, and tree trunks on a hillside in a moist coffee grove in the Sierra de Panduras and under a rock on a xeric, wooded hillside on Isla Piñeros.

SPECIMENS EXAMINED: MCZ 34436, 34438-40, 34443, 10 km S. Canóvanas; ASFS V5053, Isla Piñeros, MCZ 62181, Cayo Santiago; ASFS X4047-56, 2.5 mi. SW Yabucoa, 800 feet; ASFS V4968, RT 1238, 6 km SW Yabucoa, 700 feet; UMMZ 73605-06 (12 specimens), mountains between Maunabo and Yabucoa.

Sphaerodactylus nicholsi Grant

Sphaerodactylus nicholsi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 204, fig. 11. Type specimen MCZ 34578.

Sphaerodactylus townsendi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 208.

TYPE LOCALITY: Near Ensenada, Puerto Rico (3 mi. W Ensenada, Grant field data).

DISTRIBUTION: Peripheral Puerto Rico from Cabezas de San Juan south and around the island and east along the north coast at least to Playa Mar Chiquita (fig. 6). The occurrence of this form is mainly coastal but it extends inland, especially in the dry southwest as far as the Sierra Vermeja and Laguna Cartagena and to the area between Yauco and Sabana Grande.

DEFINITION: A species of *Sphaerodactylus* with moderately sized, acute, strongly keeled, flattened, imbricate dorsal scales (axilla to groin 19-27); no area of middorsal granules or granular scales; hair-bearing scale organs (one hair) only, present along free distal edge of scales; gular scales keeled or unkeeled; chest scales unkeeled; ventrals large, rounded, imbricate and smooth, axilla to groin 20-29; midbody scales 36-45; internasals 1-3; upper labials to mid-eye 3; dorsal scales of tail acute, imbricate, and flat-lying or only slightly erected; scales beneath tail smooth, enlarged midventrally; fourth toe lamellae 8-11; escutcheon (fig. 11f) moderate sized with extension onto thighs (4-7 X 9-22). No sexual dichromatism; coloring brown to tan with darker brown spotting or dark-edged ocelli; light postocular stripe usually extends along flanks onto tail. Head pattern of diffuse mottling, or a light crescent which may meet postocular stripes; scapular pattern reduced but may involve dark patch of varying intensity with two ocelli, or two ocelli alone, or several small irregular ocelli; sacral pattern U-shaped and dark with light edge; caudal pattern of irregular dark mottling or ocelli; venter pale; throat pale yellow with or without dark streaking or spotting; underside of tail yellow to pale orange. Iris brown to golden orange. Habitus moderate, snout broad and

short. Size small to moderate; the largest specimen measures 28 mm snout-vent, the smallest, a juvenile, 9 mm. This species includes the smallest of Puerto Rican, but not Greater Puerto Rican, *Sphaerodactylus.*

REMARKS: This species prefers a dry habitat. In the eastern, western, and northern portions of its range it is absent from sections of coast where more mesic conditions prevail. The mesic areas have only *S. macrolepis,* usually in some abundance; in the dryer and more exposed regions *nicholsi* is abundant and *macrolepis* less so. Along the southwestern littoral the two are not sympatric.

Sphaerodactylus nicholsi as here defined includes both *nicholsi* and *townsendi,* which have heretofore been considered separate species. The evidence for their conspecificity is not entirely conclusive; one series may be intergradient, but others seem to indicate some overlap. Our reasons for considering them as one species are: 1) they show no morphological differences except in size and this is not absolute, 2) their colorations are very similar, and what differences exist are not absolute, 3) they have the same or very similar ecological preferences, 4) their ranges are similar in being the peripheral parts of the island. They are so similar in morphology and color that some specimens of *nicholsi* can not be distinguished from some *townsendi.*

Grant (1931, 1932b) used several characters to distinguish between *nicholsi* and *townsendi* as separate species: 1) ventral keeling (used variously), 2) keeling and shape of snout scales, 3) sacral pattern of parallel lines versus Y-shaped sacral pattern, 4) scapular pattern. We have found none of these differences consistent enough for even subspecific recognition. As already noted, the presence or absence of a cephalic crescent and differences in size are the only satisfactory characters.

Sphaerodactylus nicholsi nicholsi Grant, new combination

Sphaerodactylus nicholsi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 204. Type specimen MCZ 34578.

TYPE LOCALITY: Near Ensenada, Puerto Rico (3 mi. W Ensenada, field data).

DISTRIBUTION: From Playa Mar Chiquita, east of Arecibo, west and south along the coast, then east along the southern marginal region as far as Juana Díaz; range discontinuous because of interruption of habitat (fig. 6).

DIAGNOSIS: A subspecies of *S. nicholsi* characterized by the presence of a crescentic cephalic figure in 95 percent of the specimens

(fig. 8a) and a well-defined scapular patch and paired ocelli in about 46 percent, and by small size, the snout-vent length of specimens larger than the median fall in the size classes of 20-25 mm, average 21.7 mm.

REMARKS: The axilla to groin dorsal scale counts for this form range from 19 to 28 with a mean of 23.7 in 109 specimens; ventral scales axilla to groin 20 to 28, mean 24.6 in 107 specimens; midbody scales 35 to 45, mean 39.3 in 103 specimens; fourth toe lamellae 8 to 11, mode 9. The internasals show some geographic variation; specimens from the north and northwest have a modal internasal count of 2 and a high proportion with 3 (6 out of 41); those from the south and southwest have a modal count of 1, a few with 2 (15 out of 112) and only one with 3.

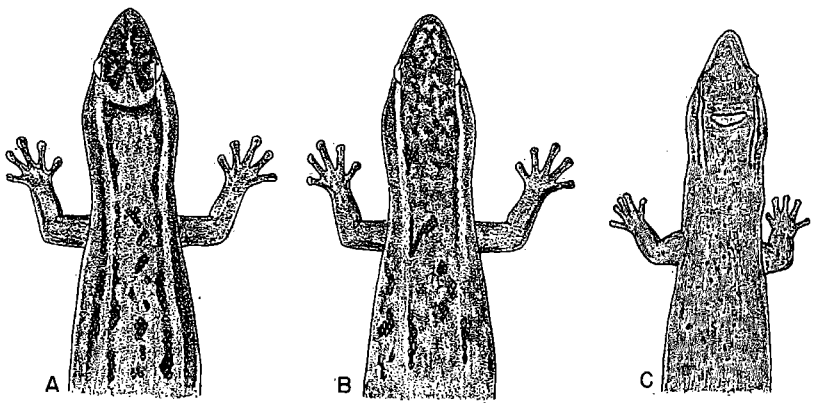

FIGURE 8. A, *S. nicholsi nicholsi,* anterodorsal view, female, ASFS X4286, 10 km SE Guánica, Puerto Rico. B, *S. nicholsi townsendi,* anterodorsal view, female, ASFS V5825, Esperanza, 2 mi. S Mercedita, Puerto Rico. C, *S. parthenopion,* anterodorsal view, female, MCZ 77211, type, hillside above Pond Bay, Virgin Gorda, British Virgin Islands.

Live specimens are brown dorsally with tan dorsolateral stripes and dark brown spotting. The crescentic cephalic figure, which may appear oval, is tan and present in all but 5 percent of the specimens, some of which are juveniles with no pattern of any kind; scapular ocelli, when present, white; black scapular patch single or broken into two parts; tails brown to orange brown with some spotting or ocellation; ventral ground color gray or flesh; throat plain gray to pale yellow or with spots or streaks of varying intensity; underside of tail yellow to pale orange or orange brown; iris golden orange to brown.

The specimens from 6.5 km S of Juana Díaz (ASFS V5699-712)

we regard as intergrades; 5 of the 14 have no cephalic crescent, a much higher proportion than in any sample of the subspecies *nicholsi;* in the other 9 specimens the figures vary from well-developed to obscure. This series could be interpreted as containing representatives of two species, and this may be eventually found to be the case. The specimens from Esperanza are pure *townsendi* in both size (they are the largest specimens of this form) and pattern, while those from south of Velázquez are equally good *nicholsi* on both counts. These localities indicate an overlap of the two forms, yet they did not occur together at either locality. The distribution of these lizards in that crucial area needs clarification by more detailed collecting. While we regard *nicholsi* and *townsendi* as conspecific, we realize that the last word has not been said about this problem.

SPECIMENS EXAMINED (all from Puerto Rico): ASFS V5968-69, Playa Mar Chiquita; ASFS X7497-98, 0.7 mi. E Palmas Altas; ASFS X7520-23, 2.8 mi. W Palmas Altas; ASFS V5891-99, 8 mi. E Arecibo; ASFS V5882-83, 4 mi. E Arecibo; ASFS V5455-76, 1 km E Ramey Air Force Base; ASFS V5500, 9.6 km SSW Mayagüez; ASFS V5504-06, 10.6 km SSW Mayagüez; ASFS V5529-32, Balneario de Boquerón; ASFS X4246-49, 1 mi. N Cabo Rojo lighthouse; ASFS V5552, 0.5 km N Cabo Rojo lighthouse; ASFS V5553-61, 2 mi. S Pole Ojea (on Cabo Rojo); ASFS X4362, Laguna Cartagena, west end; ASFS V5589-93, Sierra Vermeja, 3 km SW Maguayo; ASFS X4213-27, X4250, 3 mi. SW Ensenada; AMNH 13813, Ensenada; ASFS V5564-65, 9 mi. NW Yauco, 1000 feet; ASFS V5574-76, 8 mi. NW Yauco, 600 feet; ASFS X4206-12, Playa Caña Gorda; ASFS V4692-712, 6 km SE Guánica; ASFS V4688-89, 6.7 km SE Guánica; ASFS X4199-205, 8.4 km SE Guánica; ASFS V5633-39, 8.5 km SE Guánica; ASFS X4280-84, V4683, 9 km SE Guánica; ASFS X4286-87, 10 km SE Guánica; ASFS V5582, Punta Ventana; ASFS V5699-712, 6.5 km S Juana Díaz (*nicholsi* X *townsendi*); ASFS V5675-83, 12.2 km WNW, 1 km S Santa Isabel.

Sphaerodactylus nicholsi townsendi Grant, new combination

Sphaerodactylus townsendi Grant, 1931, Jour. Dept. Agri. Porto Rico, vol. 15, no. 3, p. 208. Type specimen MCZ 34613.

TYPE LOCALITY: Cape San Juan, Puerto Rico (NE corner Cape San Juan, field data).

DISTRIBUTION: From Cabezas de San Juan (= Cape San Juan) south along the east coast, then west along the south coast to just east of Ponce, localities not continuous because of incomplete collecting and interruption of habitat; also Cayo Icacos, Cayo Lobos, Isla Piñeros, Isla Vieques including Cayo de Tierra and Cayo de Afuera, Caja de Muertos, and questionably Isla Culebra (figs. 5 and 6). Grant never recorded *townsendi* from Culebra, but among a series of paratypes of S. *danforthi* (= S. *macrolepis*), many of which are untagged,

we found a single untagged specimen of S. *n. townsendi.* Whether this specimen is truly from Culebra and had passed unnoticed these many years, or whether it was inadvertently dropped among the Culebra specimens from some other untagged series, can never be determined.

DIAGNOSIS: A subspecies of S. *nicholsi* characterized by the absence of a crescentic cephalic figure and a well-defined scapular patch and paired ocelli (fig. 8b), and by large size, the snout-vent length of specimens larger than the median of all in the size classes of 23-28 mm, average 24.6 mm.

REMARKS: The axilla to groin dorsal scale counts for this form range from 20 to 28, with a mean of 24.4 in 137 specimens; ventral scales axilla to groin 22 to 29, mean 25.5 in 135 specimens; midbody scales 35 to 45, mean 39.3 in 103 specimens; fourth toe lamellae 8 to 11, mode 10; modal internasal count for this form is 1, range 1-3; 2 internasals occur with moderate frequency and 3 in only 4 of 166 specimens; no geographic variation in this count is evident.

The dorsal color of this form ranges from sandy gray to dull grayish brown or yellow-brown. Irregular darker brown mottling and spotting is present, sometimes as light centered ocelli. Light dorsolateral lines extending from eye to sacrum usually paler (buff) than the ground color but are sometimes indicated more by a lack of spotting and a massing of pigment along their edges than by a lighter color; they are present in most but not all specimens, much as in *nicholsi.* The head is patterned with fine vermiculations of darker brown on the lighter ground color. Scapular ocelli, when present, faint, irregular and asymmetrical; a dark patch may be indicated but is usually much reduced. Only a very few specimens approach the well-defined but faint paired ocelli and patch seen in some *nicholsi;* sacral pattern evident as either a light-edged pair of black parallel lines or as a light-edged black U; it is sometimes weak or absent. The caudal pattern consists of diffuse darker mottlings much as in *nicholsi.* The ventral coloring is typically uniformly dirty white to gray; throat heavily marked with black streaking and mottling to unmarked; underside of tail yellow to orange or pale orange. Iris color was recorded as golden at Cayo Icacos or brown in intergrades south of Juana Díaz.

The Caja de Muertos specimens present an interesting problem. They are like *townsendi* in color but are very small; the larger one-half of 27 specimens is included in the snout-vent classes of 22-23 mm, mean 22.3 mm, as opposed to other *townsendi* for which this range is 23-28 mm, mean 24.3 mm. Thus in size, these specimens are

closer to *nicholsi*. Caja de Muertos is opposite that portion of the mainland where *nicholsi* and *townsendi* meet and presumably intergrade. Faunistically Caja de Muertos is more closely related to the southwestern portion of Puerto Rico. We prefer to regard the Caja de Muertos population as a dwarf local population of S. *n. townsendi* rather than as a separate subspecies.

Sphaerodactylus n. townsendi generally inhabits somewhat less arid situations than *nicholsi*, whose range encompasses the most arid parts of Puerto Rico. It has been found in coastal palm groves, in sea-grape litter, and in leaf litter of xeric maritime woods. On Cayo de Tierra off Vieques specimens were collected most abundantly under rocks on the exposed, almost vegetation-free, crown of the island; the few S. *macrolepis* collected, and a few *townsendi*, were found in rocks and leaf litter beneath a large, shady tree.

SPECIMENS EXAMINED, all from Puerto Rico except as indicated: ASFS 12507, V4743-51, V4771-76, V5838-48, Caja de Muertos; ASFS V5812-27, Esperanza, 2 mi. S Mercedita; ASFS V5772-89, 1.5 km S Velázquez; ASFS V4813-25, 5 mi. W Las Mareas (south side of Bahía de Jobos); ASFS V5048-52, Isla Piñeros; ASFS X7435-69, X7945, X8236, V35, 0.5 mi. N Las Croabas; ASFS X1121-30, 0.6 mi. N Las Croabas; ASFS X1017-32, Cayo Icacos; MCZ 34488, ASFS V4047-67, V6186, Isla Vieques (Cayo de Tierra); MCZ (untagged, part of MCZ 34404-12: 57 specimens), Isla Culebra.

Sphaerodactylus parthenopion Thomas

Sphaerodactylus parthenopion Thomas, 1965, Quart. Jour. Florida Acad. Sci., vol. 28, no. 1, p. 118. Type specimen MCZ 77211.

TYPE LOCALITY: Hillside above Pond Bay, Virgin Gorda, British Virgin Islands.

DISTRIBUTION: Known only from the island of Virgin Gorda (fig. 5).

DEFINITION: A species of *Sphaerodactylus* with small, acute, strongly keeled, flattened, imbricate dorsal scales, axilla to groin 30-35, mean 32.0; no area of middorsal granules or granular scales; dorsal scales with hair-bearing (single hair) organs only; throat and pectoral scales keeled in all but one specimen, ventral scales smooth, rounded, and imbricate, axilla to groin 26-29, mean 27.9; scales around midbody 50-55, mean 51.4; internasals 1 to 3, mode 2; upper labials 3 to mid-eye, 2 unilaterally in 4 specimens; dorsal scales of tail keeled, acute, imbricate, and flat-lying (although noted in the original description as standing somewhat erect from the tail, they are more flat-lying than truly erect); scales beneath tail smooth, rounded, enlarged midventrally; fourth toe lamellae 8 (mode) or 9; escutcheon (fig. 11g)

relatively small and with only slight extension onto thighs, 3-5 X 11-13. No sexual dichromatism. Coloring deep brown with a pattern of scattered darker scales or a fine reticulum of darker pigment. A narrow, dark-edged postocular stripe extends over each temple and fades out at base of head; a dark-edged more or less oval, transverse light (yellow-brown) bar is present on the head across the occipital region; its ends may or may not reach the postocular stripes laterally; a faint preocular light bar crosses the base of the snout (fig. 8c). Ground color of tail yellowish-brown with a pattern of irregular, short, linear or clustered dark elements; ventral color grayish to cream with varying amounts of invasion of dark pigment; gular pattern of faint to bold linear markings. Habitus moderate, snout moderately long. This is the smallest species of *Sphaerodactylus*, the snout-vent length of specimens larger than the median fall in the size classes of 17-18 mm, average 17.4 mm.

REMARKS: As pointed out in the original description, this species appears most closely related to *S. n. nicholsi* although the differences between the two are rather striking. The geographical interposition of *S. n. townsendi* between the ranges of *nicholsi* and *parthenopion* suggests that *nicholsi* and *parthenopion* are more primitive peripheral members of this group of three forms and that *townsendi* has evolved since the geographic continuity of *nicholsi* and *parthenopion* was severed.

S. parthenopion inhabits rocky hillsides covered with scrubby xeric woods and is more secretive than *S. macrolepis* which occurs with it. It appears to be absent from the purely littoral localities where *macrolepis* is abundant.

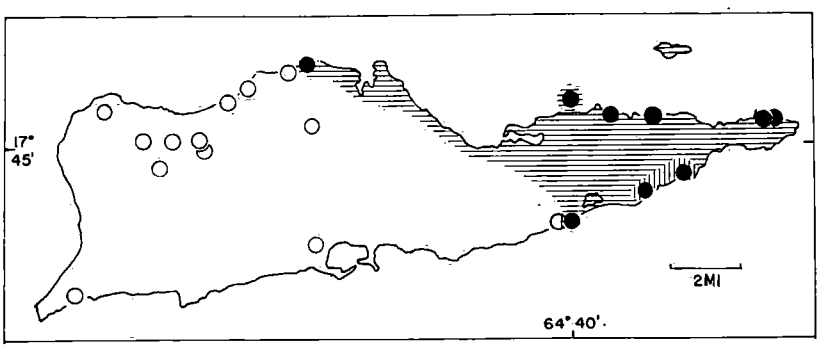

FIGURE 9. St. Croix, American Virgin Islands, showing locality records for *S. macrolepis macrolepis* (open symbols) and *S. beattyi* (solid symbols). Races of *S. beattyi*: *S. b. beattyi*, horizontal lines; *S. b. seamani*, vertical lines. Records of *S. m. macrolepis* are of specimens examined, not from the literature.

SPECIMENS EXAMINED (all from Virgin Gorda): ASFS V3658-59, AMNH 92821, MCZ 77212-14, ca. 0.5 mi. N Pond Bay; MCZ 77211 (type), AMNH 92822-24, hillside above Pond Bay; ASFS V3664, Pond Bay; ASFS V3681, KU 79852-53, between Little Dix Bay and Savana Bay; KU 79854, SW slope of Gorda Peak, ca. 500 feet. Other than the type, all specimens listed are paratypes.

Sphaerodactylus beattyi Grant

Sphaerodactylus beattyi Grant, 1937, Jour. Dept. Agri. Puerto Rico, vol. 21, no. 4, p. 508. Type specimen UMMZ 80567.

TYPE LOCALITY: ?Good Hope, St. Croix, American Virgin Islands (Grant field data).

DISTRIBUTION: The original description of *S. beattyi* gives no type locality, but states the distribution of this species as "eastern end of St. Croix." Subsequently Grant and Beatty (1944) iterated that *beattyi* occurs only east of Christiansted. Peters (1952) recorded the type locality as "Gode Hope," St. Croix, which is correctly Good Hope and is so recorded in Grant's field book for the type specimen of *beattyi* (George Zug, *in litt.*). Good Hope, however, is in the *southwestern* corner of St. Croix. Because of Grant's repeated statements that *beattyi* occurs only in the *eastern* part of the island, which our own approximately similar collecting experience confirms, we think the Good Hope locality probably is the result of a mistake in cataloguing. The field tags are no longer on the specimens, so it is impossible to determine what specimens actually pertain to what localities. The southwestern part of St. Croix is ecologically similar to the dry and low eastern portion, so it is conceivable that *beattyi* does occur there, though the evidence at present is against it. Unfortunately we were not aware of this situation during our visit and made no especial attempt to find *beattyi* in the southwest, though we did collect there. The credible locality records indicate that the range of *beattyi* is the eastern portion of the island, west only as far as Rustoptwist (1.0 mi. NE Lavallee) to the northwest of Christiansted, and on Green Cay and Buck Island.

DEFINITION: A species of *Sphaerodactylus* with small, acute to rounded, weakly keeled, slightly swollen, slightly imbricate dorsal scales (axilla to groin 34-44). A few large, hair-bearing organs (three hairs) present on the posterior face of each dorsal scale. Ventrals smooth to completely keeled, rounded, and imbricate, axilla to groin 26-36; gulars always keeled; pectorals smooth to keeled; scales around midbody 57-64; internasals 0 to 3, mode 1; upper labials to mid-eye 3; dorsal scales of tail small, acute to rounded, keeled, slightly swollen and slightly erected; scales beneath tail smooth, rounded, enlarged

midventrally; fourth toe lamellae 7 to 11, mode 10; escutcheon (fig. 11h) compact with no extension onto thighs, 4-6 X 8-12. Coloring a uniform brown or yellowish brown (juveniles) or with a more or less uniform reticulum of darker brown; head buff to cream with faint middorsal and supraocular stripes or with a bold dark trilineate pattern; sacral pattern a light Y with an elongate extension onto tail; venters grayish to yellowish gray or white; throats yellow, orange, or whitish; throats unpatterned or with light to moderate mottlings and striation; iris golden. Habitus moderate to stout; snout moderate in length. Size large, the snout-vent length of specimens larger than the median fall in the size classes of 26-30 mm, average 27.2 mm.

REMARKS: This is the most distinct species of the Greater Puerto Rican region, which no doubt bespeaks long isolation on St. Croix. Its restricted distribution on the island is due principally to its limitation to the more arid and desert-like areas, though it may be due in part to competition with *S. macrolepis,* if indeed *beattyi* does not inhabit the southwestern part of St. Croix.

Grant noted in his original description that "immature, but full grown specimens of both sexes have an elaborate pattern." Our collections show the elaborate pattern is geographically restricted to a section of the southern portion of the eastern part of the island, as it is found both in young and adults. It is not an ontogenetic trait. The heavily patterned specimens represent a distinct race; the unpatterned race is the one to which the type specimen pertains and therefore is the nominate one.

Sphaerodactylus beattyi beattyi Grant, new combination

Sphaerodactylus beattyi Grant, 1937, Jour. Dept. Agri. Puerto Rico, vol. 21, no. 4, p. 508. Type specimen UMMZ 80567.

TYPE LOCALITY: ?Good Hope, St. Croix, American Virgin Islands.

DISTRIBUTION: The eastern part of St. Croix east of Christiansted, except for a segment of the southeastern coast; northwest of Christiansted at least as far as Rustoptwist; questionably to the southwest as far as Good Hope; also Green Cay and Buck Island (fig. 9).

DIAGNOSIS: A subspecies of *Sphaerodactylus beattyi* characterized by a very faint head pattern of indistinct middorsal and supraciliary stripes which appear almost unicolor, and a generally subdued dorsal body pattern (fig. 10a).

REMARKS: The two races show no apparent scalation differences. The axilla to groin dorsal scale counts for 22 specimens of this form range from 36 to 44, mean 41.9; ventral scales axilla to groin 29 to 35,

mean 32.1; midbody scales 58 to 65, mean 61.1; 54 percent of the specimens of *beattyi* have keeled ventral scales against only 20 percent in the other race. No geographic variation is apparent in this species except in color. The color of this race is relatively drab. The cephalic pattern is present but so slightly darker than the ground color that the head appears almost unicolor. A dorsal body pattern of a brown reticulum is present in most specimens and varies from moderately prominent to faint. Throat pattern absent (mode) or very faint. A series of 17 specimens from "east end of St. Croix" (UMMZ 80783) contains both heavily patterned and unpatterned specimens. These may represent intergrades or they may be the result of pooling of localities.

SPECIMENS EXAMINED: *St. Croix*: ASFS V3600-14, 1.0 mi. NE Lavallee; ASFS V3246-49, 5 mi. E Christiansted; ASFS V3251-56, 7 mi. E Christiansted; ASFS V3568-91, 1.0 mi. W of eastern tip of island; ASFS V3561-65, ca. 0.75 mi. W of eastern tip of island; UMMZ 80783 (17 specimens, intergrades?), east end of St. Croix; ASFS V3327-51, Milord Point (west side of Great Pond Bay); UMMZ 80567 (holotype), ?"Good Hope."

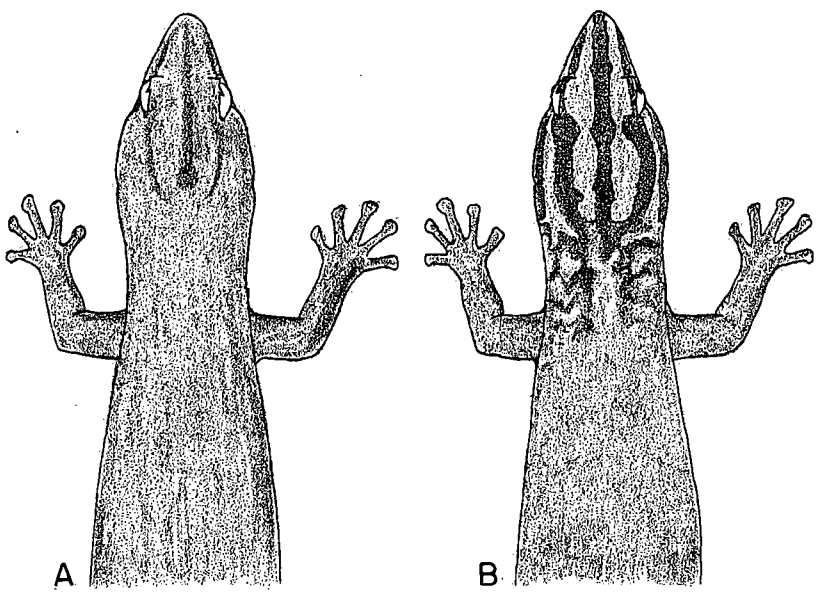

FIGURE 10. A, S. *beattyi beattyi*, anterodorsal view, female, ASFS V3564, ca. 0.75 mi. W eastern tip of island, St. Croix, American Virgin Islands. B, S. *beattyi seamani*, anterodorsal view, male, MCZ 81056, type, ca. 0.5 mi. E Mt. Fancy, St. Croix, American Virgin Islands.

Sphaerodactylus beattyi seamani new subspecies

TYPE: MCZ 81056, an adult male from ca. 0.5 mi. east of Mt. Fancy, St. Croix, one of a series collected on 7 August 1965 by David C. Leber and Richard Thomas. Original number V3502.

PARATYPES: AMNH 94204-09, ASFS V3498-501, V3540-43, KU 79917-23, MCZ 81057-62, UF 21277-82, UIMNH 56945-50, USNM 152599-600, same data as type; ASFS V3592-99, 2 mi. W Grapetree Bay, St. Croix, 8 August 1965, R. Thomas.

ASSOCIATED SPECIMENS: UMMZ 80568-71 (paratypes of *S. beattyi*), east end of St. Croix.

DISTRIBUTION: Known from ca. 0.5 mi. E of Mt. Fancy to 2 mi. W of Grapetree Bay along the southeastern coast of St. Croix. Intergradation apparently takes place at the eastern portion of the island, possibly through the discontinuity in the hills between Grapetree Bay and Tague Bay (fig. 9). Intergradation to the west must occur between Mt. Fancy and Milord Point where a large series of *S. b. beattyi* was collected.

DIAGNOSIS: A subspecies of *Sphaerodactylus beattyi* characterized by a bold, dark head pattern and by somewhat more prominent dorsal body and throat patterns (fig. 10b).

DESCRIPTION OF TYPE: An adult male with a snout-vent length of 28 mm, incomplete tail 23 mm. Dorsal scales between axilla and groin 40, ventral scales axilla to groin 32; scales around midbody 63; fourth toe lamellae 9; internasal 1; supralabials to mid-eye 3; gular scales keeled; pectoral scales partly keeled; ventrals smooth; escutcheon compact, not extending onto thighs, size 5 X 8; dorsal body color uniform tan with a very faint darker reticulum on the lower sides; ground color of head light gray; three heavy brown stripes begin on snout and proceed posteriorly onto top of head and fade out on neck; heavy brown mottling on sides of head forms a pattern of irregular lines radiating from eye; heavy but faint markings on neck fade out anterior to scapular region, laterally they are continuous with reticulum on lower sides; sacral pattern a pale Y with stem extending the length of the tail; throat flecked and mottled with dark brown; ground color of throat in life blue-gray; venter light gray; underside of tail yellow to orange; iris golden.

VARIATION: In dorsal scale counts axilla to groin the range in 22 specimens is 37 to 44, mean 39.3; ventral scales axilla to groin 26 to 35, mean 30.9, midbody scales 57 to 64, mean 61.5. Other characters vary much as recorded for the species. As noted under the nominate race, the incidence of ventral scale keeling in *seamani* is only about

20 percent. The dorsa of the paratypes vary from almost unicolor like the type to a pattern of bold brown mottling or reticulations. The cephalic pattern is very much like that described for the type in all specimens except two from 2 mi. W of Grapetree Bay that resemble the nominate race and may indicate a trend toward intergradation to the east. In boldly marked specimens the tail is also marked and the stem of the sacral Y is heavily outlined with dark pigment. The throats are much more heavily marked in most specimens of *seamani* than in *beattyi*, particularly in adults; ventral coloring is much like that described for the type except that a few specimens have a dark stippling on the venter.

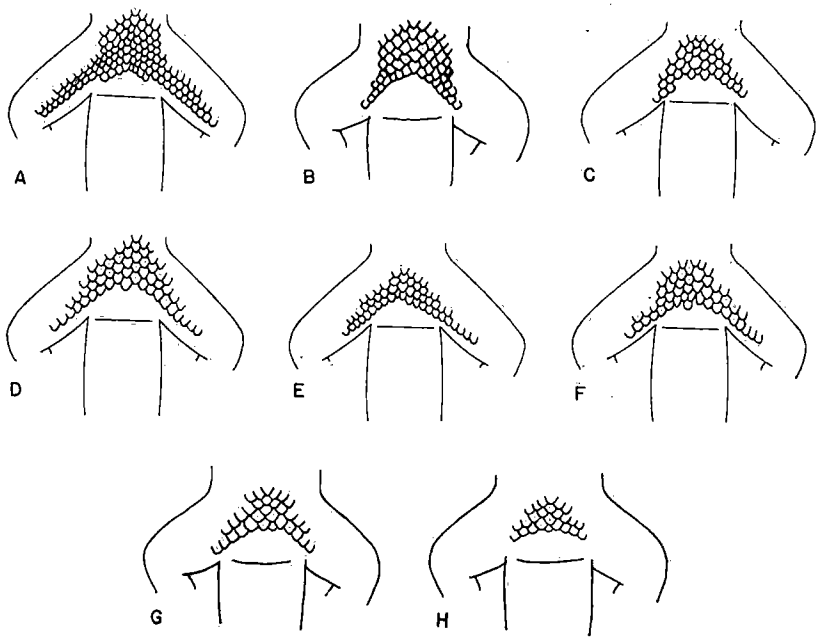

FIGURE 11. Escutcheons of Greater Puerto Rican *Sphaerodactylus*, as follows: A, *S. macrolepis phoberus*, ASFS X909; B, *S. monensis*, MCZ 34568; C, *S. roosevelti*, ASFS X4288; D, *S. klauberi*, ASFS V4507; E, *S. gaigeae*, ASFS X4050; F, *S. nicholsi nicholsi*, ASFS X4281; G, *S. parthenopion*, ASFS V3681; H, *S. beattyi beattyi*, ASFS V3574.

DISCUSSION

We feel that, with the probable exception of *S. beattyi*, the sphaerodactyls of Greater Puerto Rico represent a single radiation. Evidence in support of this is the similarity of all forms concerned in:

1. Scalation: Dorsal scales acute, keeled, flattened, no zone of middorsal granules, scales of tail flat-lying.

2. Scale organs: Hair-bearing organs are similar in kind and disposition.

3. Scapular pattern: The presence of a scapular patch and ocelli, though variously modified.

4. Head pattern: The cephalic patterns of the Puerto Rican *Sphaerodactylus* appear to be derived from a basic pattern composed of the following elements: a) supraocular stripes that join on the snout, pass over the eyelids, and extend posteriorly to encircle or fuse with the nuchal spot, b) a dark nuchal spot which may be alone or included as a darker center to a larger dark area, c) postocular light stripes between the posterior portion of the supraocular stripe and the postocular stripe; d) postocular dark stripe, which may be continuous with the dorsolateral body stripes.

This basic pattern is variously modified. In some forms (*nicholsi, parthenopion, roosevelti*) certain elements seem to have been lost, while in others (*klauberi, gaigeae*) the anterior light edge of the scapular pattern has been added to produce an even more complex cephalic pattern. In some forms the dark areas of the pattern appear to have coalesced leaving as a cephalic pattern only parts of the original light ground color (cf. *nicholsi, parthenopion, klauberi, gaigeae*).

Sphaerodactylus m. macrolepis of the Virgin Islands and the Puerto Rican subspecies of *macrolepis* taken together are widespread geographically. They are less restricted in habitat and their color patterns are less modified than any other *Sphaerodactylus* in this area. For these reasons we consider these populations as being the most primitive of the living geckos of this genus in Greater Puerto Rico.

The presence of knob-like scale organs both in the Puerto Rican subspecies of *macrolepis* and *macrolepis inigoi*, which is in essence also Puerto Rican, is perhaps a key to the evolutionary history of this genus in the area. As we are convinced of the relationship of the Greater Puerto Rican forms, this can be interpreted in two ways:

1. The presence of knob-like organs is primitive. Subsequent radiation in this region involved loss of these organs in almost every case. On this basis it is assumed that on the prehistoric continuous land mass of Great Puerto Rico, differentiation between *m. macrolepis* and the Puerto Rican subspecies of *macrolepis* began with the separation of the Virgin Islands from the larger land mass. This would account for the intermediate nature of the Vieques race *inigoi*, had it

originally been intergradient but closer to the Puerto Rican races. After the separation of Vieques from Puerto Rico *inigoi* diverged even more from its parent stock. In the occurrence of *S. n. townsendi* and *S. roosevelti,* Vieques is faunistically closer to Puerto Rico.

2. The presence of knob-like scale organs is advanced. They were developed as a racial character of the Puerto Rican-Vieques populations either prior to, or after, the separation of the Virgin Islands from the Puerto Rican landmass; again the Vieques population would have been intergradient before the separation. Mona would also have to have been colonized by *Sphaerodactylus* (or separated from Puerto Rico) prior to the acquisition of knob-like organs by the Puerto Rico-Vieques population.

As a number of forms scattered throughout the West Indies have knob-like scale organs, the second alternative is less satisfying to us because it would mean that knob-like organs had arisen on separate occasions. It is easier to imagine that these organs have been lost by the derivative Greater Puerto Rican forms than that they developed independently in different forms.

Yet another alternative is that the Greater Puerto Rican sphaerodactyls are the result of two separate invasions, an older one that resulted in the species *roosevelti, klauberi, gaigeae, nicholsi, parthenopion,* and *monensis* without knob-like organs, and a relatively recent one resulting in the widespread, relatively poorly differentiated *S. macrolepis,* in which the knob-like organs have only been lost once in the Virgin Islands form, unless *monensis* be included in this invasion. The overall similarity of these species leads us to reject this possibility.

Based on alternative number one above, we may summarize the hypothetical invasion and radiation of Greater Puerto Rican *Sphaerodactylus* (fig. 12):

1. Invasion of the more or less continuous Greater Puerto Rican area by a proto-*macrolepis* species of *Sphaerodactylus.*

2. Diversification of this species into the several derivative forms:

a. *S. roosevelti* as an allopatric isolate in the southwest, probably on a peninsula or chain of offshore keys.

b. Derivation of the *nicholsi-parthenopion* progenitor as an ecologically specialized form in the arid littoral.

c. Derivation of the *klauberi-gaigeae* progenitor as an ecologically specialized form in mesic forest.

d. Isolation of the *monensis* progenitor on Mona either by

geological separation of Mona from Puerto Rico or by dispersal across the water gap.

3. Continued evolution towards the present day *macrolepis*.

4. Invasion of the northern Leeward Islands by *macrolepis* and subsequent differentiation.

5. Invasion over water to St. Croix by *macrolepis*.

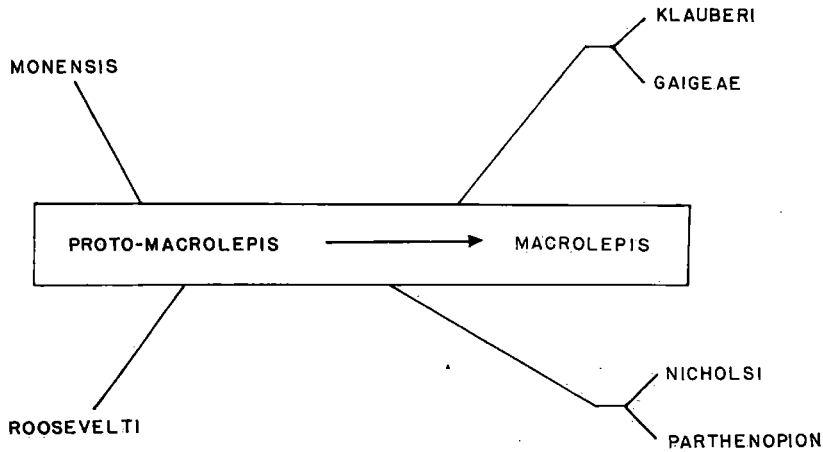

FIGURE 12. Diagram of hypothetical evolutionary relationships of Greater Puerto Rican *Sphaerodactylus*, with the exception of *S. beattyi*.

The above events are not intended to be in exact sequence; some of them would have to have taken place more or less synchronously.

We presume that *S. roosevelti* arose allopatrically by differentiation in the southwestern region, which may then have been a peninsula or chain of offshore islands. The fact that *roosevelti* occurs on Caja de Muertos and presumably Vieques suggests that its range was probably more extensive. The Vieques population might have arisen from waif dispersal; Caja de Muertos has other southwestern endemics and was certainly part of this region.

S. klauberi and its relative *gaigeae* present a different picture. We cannot imagine that they arose by allopatric isolation in the usual sense of the word, for they are associated with no easily defined area. We postulate that they differentiated altitudinally and later, possibly correlated with the reduction of extremes in elevation, became more widespread as forest species and thereby partially sympatric with *macrolepis*. In support of this it may be noted that

klauberi today reaches elevations some 1000 feet higher than are known for *macrolepis,* so the two are at least in part allopatric now.

The present distribution of *nicholsi* and *parthenopion* indicates that their progenitor was rather widespread when the Virgins became separated from Puerto Rico. There is little to indicate what might have been the isolating factor in the evolution of this group, at least geographically; perhaps it was an endemic of a southern marginal xeric region.

On Puerto Rico itself the evolution of S. *macrolepis* has resulted in the formation of six subspecies; *stibarus* from Isla Piñeros need not concern us further as it is obviously derived from *grandisquamis* of the adjacent mainland. Of the six races *ateles* and *guarionex* seem most closely related, and with them should also be placed the upland *spanius. Ateles* inhabits the xeric southwest exclusive of that region occupied by S. *roosevelti,* and *guarionex* generally the more mesic north coast and adjacent Pepino Hills. *Ateles* and *guarionex* are not known to intergrade, although such intergradation may well take place. *Spanius* is presumably a derivative of the *ateles-guarionex* pair, occupying the higher interior of the island. In the east *grandisquamis* intergrades with *phoberus,* and the latter apparently is a local derivative of the former, presumably restricted to the peninsula upon which the city of San Juan presently stands. *Grandisquamis* intergrades with *mimetes* in the southeast and *mimetes* is known to intergrade with *spanius* at Aibonito. Doubtless intergradation between all or most adjacent races of S. *macrolepis* on Puerto Rico will ultimately be demonstrated, so that present absence of intergradation should not be weighted unduly.

In summary there appear to have been three major areas of evolution of the proto-*macrolepis* stock in Puerto Rico and Vieques: 1) *inigoi-mimetes* on Vieques and southeastern Puerto Rico; 2) *ateles-guarionex-spanius* in the southwest, on the north coast east to the vicinity of Gurabo, and in the interior uplands; and 3) *phoberus-grandisquamis-stibarus* in northeastern and eastern Puerto Rico and on Isla Piñeros.

Of the Puerto Rican races only *phoberus* is not known to occur with any other sphaerodactyls. Of the remaining races, *grandisquamis, mimetes,* and *inigoi* occur sympatrically both grossly and in detail with S. *n. townsendi.* The races *spanius* and *guarionex* occur with *klauberi,* and the latter as well with S. *n. nicholsi. S. gaigeae* occurs with *stibarus* on Isla Piñeros, with *mimetes* X *grandisquamis* intergrades in the Sierra de Panduras, and with *grandisquamis* on Cayo Santiago. Finally, *ateles* occurs with S. *n. nicholsi.*

From the above, it is easily observed that the major companion of S. *macrolepis* in Puerto Rico is S. *nicholsi*, except for the races *guarionex* and *spanius* that occur in uplands or forested situations, which are occupied by S. *klauberi*. In those localities where races of S. *macrolepis* occur with S. *klauberi*, the latter is invariably the more common of the two. Syntopic (see Rivas, 1964, for definition) occurrence of the Greater Puerto Rican species of *Sphaerodactylus* is diagrammed in table 4; positive syntopy does not necessarily indicate extensive sympatry.

TABLE 4. CHART SHOWING SYNTOPIC OCCURRENCE OF THE SPHAERODACTYLS OF THE GREATER PUERTO RICAN REGION*

	monensis	macrolepis	roosevelti	klauberi	gaigeae	nicholsi	parthenopion
macrolepis	—						
roosevelti	—	—					
klauberi	—	+	—				
gaigeae	—	+	—	?			
nicholsi	—	+	+	—	+		
parthenopion	—	+	—	—	—	—	
beattyi	—	+	—	—	—	—	—

*Positive syntopy does not necessarily indicate extensive sympatry.

S. *beattyi*, like the other St. Croix endemics, is not closely related to other Greater Puerto Rican forms. It is difficult to determine whether this distinctness is due to long isolation, St. Croix having been longer isolated than the other Virgin Islands, or to colonization from another direction, or both. S. *beattyi* is peculiar in possessing large scale organs bearing three hairs, very small but keeled and imbricate dorsal scales, and a compact escutcheon. It does not appear to be related to any of the Greater Puerto Rican species, nor for that matter to those of the Lesser Antilles. King (1962) regarded numerous hairs in large scale organs as primitive. Three hairs appear to be the maximum for West Indian species (King, 1932; personal observation). Some of the other characters of S. *beattyi* also appear to be primitive. We feel that *beattyi* is a relict species long isolated on St. Croix and not closely related to surrounding species.

S. *macrolepis* is doubtless of relatively recent advent on St. Croix,

though there is no reason to suppose that it has been introduced, as Grant and Beatty (1944) postulated. The suggestion by these authors that *macrolepis* might be crowding *beattyi* out is a distinct possibility. The two are in part allopatric on St. Croix, and if *beattyi* has occupied the island a much longer time, there is no evident reason why it should not have occupied all of the island when it was alone there. It may be that with the occurrence of two species each has fallen heir to the habitat which is most suitable, although, according to the data of Grant and Beatty, *macrolepis* has invaded more of *beattyi's* domain than the reverse.

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