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Abstract

The *nigropunctatus* group of Antillean geckoes is considered to include the species *S. nigropunctatus, S. torrei, S. cinereus, S. intermedius, S. docimus* (new species), *S. ruibali,* and *S. armasi.* Of these, all are Cuban with the exception of Hispaniolan *S. cinereus.* The problematical species *S. alayoi* is considered a subspecies of *S. nigropunctatus,* and *S. torrei ocujal* is considered a subspecies of *S. nigropunctatus.* Variation, distribution, and ecological information are presented on all species and subspecies in this and other groups discussed herein. The species *S. nigropunctatus* is considered basal, with two evolutionary lines: *S. torrei* and *S. cinereus* on one hand, and *S. intermedius, S. docimus, S. armasi,* and *S. ruibali* on the other. Of these derived species, *S. ruibali* is considered the most advanced and the most aberrant of the group.

Competition with more advanced sphaerodactyls of the *notatus* group is considered as important in the present distribution of *nigropunctatus* group members; extreme differences in size between Bahamian *S. nigropunctatus* and *S. notatus* allow for co-existence of these two species in the Bahama Islands, and the establishment of human settlements along the southern Cuban coast has helped in the abundance of some members of this group in that area.

Variation and distribution of two members (*S. celicara* Schwartz and Garrido is not discussed, since there is no new information on that taxon) of the *notatus* group, *S. notatus* and *S. bromeliarum,* are given, and a total picture of the *notatus* group in the Antilles is presented. Evidence suggests that the group was orginally Hispaniolan, from which center invasion took place to Puerto Rico, where there was extensive radiation, and to Cuba, where there has been little radiation.

Sphaerodactylus ramsdeni is also discussed in detail. The affinities of this species remain incertain, but it is suggested that *S. ramsdeni* may be most closely related to Jamaican *S. goniorhynchus,* although the evidence is slight. It is probable that *S. ramsdeni* is a remnant of an old *Sphaerodactylus* stock whose relationships are now obscured.

Details of the variation and distribution of *S. argus* and *S. elegans,* both on and outside Cuba, are discussed. The former is considered to be a Jamaican adventive that has not differentiated from its Jamaican parent population. *Sphaerodactylus elegans,* on the other hand, may be divided into two distinct subspecies, one on Cuba (and presumably the southern Florida Keys — *S. e. elegans)* and the other on Hispaniloan (*S. e. punctatissimus).*

Futher problems regarding Cuban *Sphaerodactylus* are mentioned; the suggestion is made that the roster of Cuban *Sphaerodactylus* is as yet incomplete. A discussion of the relative paucity of Cuban species of *Sphaerodactylus* is presented, and a rationale for this peculiar situation is suggested. Uncertainties concerning mainland and Antillean relatives of some Cuban forms, plus the centering of the *nigropunctatus* group on Cuba and the absence of a North American *Sphaerodactylus* fauna make it difficult to re-enforce the concept of plate tectonics in regards to this genus on Cuba.

The *nigropunctatus* group

The *nigropunctatus* group of Cuban geckos includes 6 named species: *nigropunctatus* Gray, *torrei* Barbour, *intermedins* Barbour and Ramsden, *alayoi* Grant, *ruibali*

Grant, and *armasi* Schwartz and Garrido. There is also one Hispaniolan species, *S. cinereus* Wagler. Thomas and Schwartz (1966a) reviewed the entire group with the exception of *S. armasi* which was then undescribed. They referred to the group as the *"decoratus"* group, a designation that has been shown to be erroneous (Thomas and Schwartz, 1974), since *decoratus* Garman is antedated by *nigropunctatus* Gray.

Of the six Cuban species included of the *nigropunctatus* group, *torrei, alayoi, ruibali,* and *armasi* are known only from Oriente Province. *S. nigropunctatus* also occurs in Oriente Province but has an apparently isolated population in the Sierra de Cubitas in north-central Camagüey Province (and in addition occurs in the Bahama Islands where it is widespread on the Great Bahama Bank, the Cay Sal Bank, and Rum Cay). *S. intermedius* likewise occurs in Oriente Province but has a disjunct population in northern Habana and Matanzas provinces. Thus, all 5 Cuban *nigropunctatus* group members occur in Oriente Province, with 2 of them having populations outside that region; there is an additional species (*S. cinereus*) in the Haitian portion of Hispaniola.

Although we have examined more Cuban material (873 specimens) of this group of species than was available to Thomas and Schwartz (1966a), there still are unresolvable problems. The details of the distributions of *S. torrei* and *S. nigropunctatus,* as well as their ecologies, in southern Oriente Province remain to be clarified. Apparently the 2 species are partially sympatric (or even syntopic) there.

Even more puzzling has been the status of *S. alayoi.* Despite the facts that Charles T. Ramsden lived in the city of Santiago de Cuba and managed coffee properties between that city and Guantánamo and its vicinity, and that we have examined all of the Ramsden-collected material, there are only 6 specimens of *S. alayoi* included among them. Thomas and Schwartz (1966a: 14-15) stated, "The status of *S. alayoi* is more questionable to us than that of any of the other species . . . it is possible that *alayoi* is a local pattern variant (it has been found nowhere else) or a very circumscribed race of *S. decoratus* [= *s. nigropunctatus*] in the region of the Bahía de Guantánamo." This same view was expressed by Lando and Williams (1969: 176). We are severely handicapped in our assessment of the status of this still-somewhat problematical form: the type-locality is the United States Naval Base, where good collections of *Sphaerodactylus* have been made, without encountering further specimens of *S. alayoi;* and since the junior author has not taken the species outside the Naval Base, and there are so few specimens in the Ramsden material. Since *S. nigropunctatus* occurs on the Naval Base, where it is well represented by specimens, it seems unlikely that *S. alayoi* is a mere pattern variant of that species. When female specimens of *S. alayoi* and *S. nigropunctatus* are compared directly, one has little hesitancy in determining taxon. This emphasizes the distinctness of the two forms, and it is not usual for a local pattern variant in *Sphaerodactylus* to be very different from the "normal" condition.

Another unresolved possibility with *S. alayoi* is that the type-locality is misstated and that the original material (which consisted of 31 specimens; Grant, 1959a:49) has been incorrectly assigned to locality. Militating against this interpretation is that Grant himself apparently collected the holotype and Lt. Andrew Spielman collected most of the paratypes, all assumably on the Naval Base. But, correspondence between Wilmer Tanner and Dr. Spielman indicated that his insect-control activities were not confined to the Naval Base, and that he traveled some distance while collecting. Thomas (1968) discussed the question of the type-locality of *S. alayoi* in

detail; Spielman's letters stated that the type-material of *S. alayoi* in all likelihood came from the "Guaso Hydro Plant" located about 24 km N of the city of Guantánamo in a rather mesic situation. But since there has been no new material from this immediate area added recently to collections, we are still reluctant to amend the type-locality or to be definitive on the status of *s. alayoi*. We obviously also know very little of its distribution.

Thomas and Schwartz used no trinomina in their discussions of the Cuban *nigropunctatus* group members with the exceptions of 2 subspecies of *S. torrei (ocujal* Thomas and Schwartz, *spielmani* Grant) and 3 of *S. nigropunctatus (lissodesmus* Thomas and Schwartz, *granti* Thomas and Schwartz, *strategus* Thomas and Schwartz). Although *S. intermedius* has a grossly disjunct distribution, the material from Oriente was too limited to assess the possible differences.

All members of the *nigropunctatus* group except *S. cinereus* occur on Cuba. The group may be defined as follows: 1) size moderate-to-large; maximum size 40 mm snout-vent length in both males and females; 2) dorsal scales small, almost granular but keeled and imbricated, to granular, and without a middorsal zone of small granular scales; 3) dorsal scales with hair-bearing scale organs only (indeterminate in *S. armasi* and the new species described herein); 4) throat, chest, and ventral scales smooth, the ventral scales cycloid; 5) internasal scale usually 1; 6) supralabial scales to mid-eye usually 4 (occasionally modally 3 or 5); 7) escutcheon short to long anteroposteriorly and rarely extending as far as the knee laterally; 8) sexual dichromatism usually very pronounced; 9) males either unicolor (as preserved), stippled, vermiculate, faintly spotted, or heavily, boldly, and irregularly spotted with dark brown to black, this spotting in one species limited to the head, the male pattern variable both between and within populations; 10) females usually crossbanded and at times with pale and dark-edged ocelli included in the bands; head pattern dark lineate on a pale ground, but this condition much reduced at times or obscured; 11) ontogenetic variation absent with juveniles having the adult female pattern (exception: *S. ruibali* populations from east of the Bahía de Guantánamo, in which some juveniles are male-patterned).

Thomas and Schwartz (1966a), on the basis of evolution of female head pattern and scale shape, suggested that the most primitive member of the *nigropunctatus* group is *S. nigropunctatus*. Assuming they are correct, the *nigropunctatus* group may be divided into two complexes: (the first is more primitive and has the broadest distribution): *nigropunctatus, torrei, alayoi,* and Hispaniolan *cinereus,* which we may call the *nigropunctatus* complex after its first-named member, and *intermedius, ruibali,* and *armasi* (as well a new species described herein) as the *intermedius* complex. The implications of this arrangement will be discussed later.

The *nigropunctatus-torrei-alayoi* problem

Before proceeding with the taxonomic accounts, we must reiterate some basic problems with members of this trio of species. Cuban subspecies of *S. nigropunctatus,* in contrast to some Bahamian, almost always have 3 dark-edged body bands, plus a nuchal band (= collar) in females; these bands are all dark-edged and clear centrally and additionally include a pair of pale but dark-edged ocelli, usually at least in the collar. *S. torrei* females (as the species was defined by Thomas and Schwartz, 1966a) has either 2 or 3 solid dark body bands and is non-ocellate in the 2-banded subspecies

(*torrei, spielmani*) but has many ocellar remnants or at least irregularly pale centers to the body bands and the collar in the 3-banded subspecies (*ocujal*). Thomas and Schwartz admitted they were uncertain in their association of the name *ocujal* with *S. torrei* (which, otherwise, would be a readily definable species with two bands); the 3-banded condition of *ocujal* would seem to ally it much more closely to *S. nigropunctatus* which in Cuba usually has three bands. Female *S. alayoi* have 3 body bands plus a collar; ocelli are absent except in the collar, and the bands are vividly distinct and clear centrally. Further discussion of the problems involving *S. alayoi* has already been noted in some detail.

The situation with males is somewhat more complex. In *S. nigropunctatus,* various subspecies have been partially diagnosed on the basis of whether the males are spotted or not. These spots in *S. nigropunctatus* are large, conspicuous, and randomly scattered over the dorsum (although they may develop on the body prior to the head, or *vice versa,* without apparent correlation with size). One extra-Cuban subspecies of *S. nigropunctatus* is never spotted (*flavicauda* Barbour), whereas another (*porrasi* Schwartz) is always spotted. The other Bahamian subspecies (*nigropunctatus, gibbus* Barbour, *decoratus* Garman) are at times strongly modally either spotted or unspotted; *gibbus* is almost always spotted whereas *decoratus* and *nigropunctatus* have spotted individuals as well as unspotted ones in their populations.

In their definitions of the Cuban subspecies of *S. nigropunctatus,* Thomas and Schwartz (1966a) partially diagnosed *granti* as having spotted males, *strategus* unspotted males, and *lissodesmus* unspotted males. Only one male *lissodesmus* was then known, and we have seen no additional material. We have seen additional material of *granti* and *strategus,* and although Thomas and Schwartz were essentially correct in their observations, the condition in *strategus* is not absolute: of 38 male *strategus,* 12 show some spotting on the dorsum and of these 12, 7 have only a very few dots.

Male *S. torrei* are never spotted, although they are brightly colored in life (gray to tan bodies with heads and tails bright yellow). The above statement applies to the subspecies *torrei* and *spielmani;* male *ocujal,* however, are spotted, and in fact two specimens mentioned by Thomas and Schwartz (1966a) from Santiago de Cuba only provisionally associated with *S. t. ocujal* are males, one completely spotted dorsally, the other with only the head spotted. Male *S. t. ocujal* were defined as spotted and additional material generally confirms this statement. Thus, *S. t. ocujal* differs from other subspecies of *S. torrei* in having three body bands in females (2 in the subspecies *torrei* and *spielmani*) and in often having spotted males (completely and always unspotted in *torrei* and *spielmani*). It is precisely in these two characteristics that *S. torrei* (2 body bands, unspotted males) differs from *S. nigropunctatus* (3 body bands, males often spotted).

Part of the problem with the affiliations of *ocujal* was the very few specimens o the entire complex available from Santiago de Cuba, the type locality of *S. t. torrei* From the Ramsden collections has come a long series of geckos from his home in Vista Alegre, a suburb of Santiago de Cuba, as well as additional specimens from elsewhere in the city itself. Remarkably, Vista Alegre specimens are almost all *S. torrei* (= females with 2 body bands). Specimens from elsewhere in the Santiag area include unspotted male *S. torrei,* and many (15 of 25) spotted males. There i only 1 female-patterned juvenile (and no females) from the entire series from th Santiago de Cuba area, including Vista Alegre; it has 3 body bands and thus diffe

from local *S. t. torrei* with 2 body bands. It is amazing that there are no adult 3-banded sphaerodactyls from the Santiago area. There are 4 males from immediately west of the Bahía de Santiago, of which 75% are spotted; of 18 males from east of the bay, 39% are spotted.

These specimens suggest to us that *ocujal* is properly to be considered a subspecies of *S. nigropunctatus,* rather than of *S. torrei,* and that the two species are sympatric or at least closely allopatric in the environs of the city of Santiago de Cuba. The almost complete absence of female-patterned *S. nigropunctatus* from this region is indeed puzzling, and we can offer no answer except that it is due to the vagaries or selectivity of collecting. Certainly we would be more secure in our interpretations of the relationships of *ocujal* if there were undisputed 3-banded female specimens from Santiago de Cuba.

We already have noted the multiple problems involved with *S. alayoi.* Aside from the very basic questions of whether this is a taxon distinct from *S. nigropunctatus,* its type-locality, and its distribution, is the also almost unresolvable one of the appearance of male *S. alayoi.* Thomas and Schwartz (1966a) allied 5 males from the paratopotypic series with typical female *S. alayoi,* as well as 2 additional males, the latter on the basis of remnant female patterns. It is futile to speculate further on adult male pattern in *S. alayoi;* there are simply too many uncertainties involved with this taxon to be even vaguely certain about anything!

TAXONOMIC ACCOUNTS

Sphaerodactylus nigropunctatus Gray

Sphaerodactylus nigropunctatus Gray, 1845, Cat. lizards Brit. Mus.: 168.

Type-locality — "South America;" restricted by Thomas and Schwartz, 1974, J. Herpetology, 8(4):356, to Nassau, New Providence Island, Bahama Islands.

Holotype — Brit. Mus. Nat. Hist. 1946.8.24.81 (examined by authors).

Definition — A Cuban and Bahamian species of *Sphaerodactylus* characterized by the combination of: 1) large size (males and females to 40 mm snout-vent lengths); 2) dorsal scales granular to swollen, rounded to acute and slightly imbricate, sometimes with conical or papillate scales, especially on the posterior flanks; faint keeling present in many specimens, especially in the lumbar region; large hair-bearing scale organs (3 hairs) present on posterior edge of scales, 41-71 between axilla and groin; 3) scales around body at midbody 52-89; 4) usually 4 (in one subspecies 3) supralabials to mid-eye (range 3-5); 5) modally 1 or 2 (by populations) internasal scales; 6) escutcheon in males 5-11 x 6-27, generally rather compact and usually not extending to behind knees; 7) sexually dichromatic: males either unicolor dark to yellowish brown to bluish gray, tail and head more yellow, or as just described but with pattern of dark brown to black spots, these either large and conspicuous and covering all dorsal surfaces (including head) or restricted to various body areas (for example, head only and not on remainder of body; or on body but not on head — these conditions probably at least in part due to ontogenesis); females prominently crossbanded with a dark nuchal band (= collar), this collar distinctly darker than the 3, 4, or 5 body bands in Bahamian subspecies, of the same intensity as the body bands in Cuban subspecies, the collar and 3 (or 3/4) bands dark-edged with pale ocelli included (or not) at least

in the collar and in some to all of the body bands; head pattern in females dark trilineate (one median, and a pair of canthal dark stripes), the lines (usually) meeting a dark postocular band; a dark auricular band that includes the ear opening preceding the collar.

Sphaerodactylus nigropunctatus lissodesmus Thomas and Schwartz

Sphaerodactylus decoratus lissodesmus Thomas and Schwartz, 1966a, Brigham Young Univ. Sci. Bull., 7(4):12.

Type-locality — Sierra de Cubitas near Banao, Comagüey Province, Cuba.

Holotype — MCZ 57344 (examined by authors).

Sphaerodactylus nigropunctatus lissodesmus: Thomas and Schwartz, 1974, J. Herpetology, 8(4):357.

Definition — A Cuban subspecies of *S. nigropunctatus* characterized by the combination of: 1) females with 3 light brown body bands with dark brown edges fading into the color of the band and not abruptly set off from it; 2) ocelli indistinct or lacking in all bands; 3) auricular band joined or approximated to dark facial area by 2 or 3 "bridges" of pigment near the dorsal midline; posterior light head interband distinctly wider than auricular band; snout not heavily pigmented, the pigment extending onto underside of head along margin of lower jaw instead of to midline; 4) males unspotted; 5) modally 4 supralabials to center of eye. (The definitions of subspecies of *S. nigropunctatus* are slightly modified from those given by Thomas and Schwartz, 1966a).

Variation — *S. n. lissodesmus* was described from an adult male and female from the Sierra de Cubitas in northern Camagüey Province. We have not seen any additional material. The male has a snout-vent length of 30 mm and is just assuming the unicolor (= non-banded) condition, and the female has a snout-vent length o 29 mm. Counts on the two specimens are: paramedian dorsal scales axilla to groi 49-53; ventral scales axilla to groin 31-36; scales around body at midbody 79-84 supralabials to center of eye 4; internasals 1 or 2; fourth toe lamellae 11-12; escut cheon uncountable.

The single male, despite its large size, still shows faint remnants of the femal banding and is completely without dotting or spotting. The female, on the othe hand, is boldly patterned as described in the definition of the subspecies. Mos characteristic is the absence of pale, dark-edged ocelli in any of the bands (althoug there is a single pale and not dark-edged "ocellus" on the right side in the colla and another on the left side in the first body band. The head pattern is unique i the species in its configuration of the trident-like cephalic lines and their arrang ment in reference to the auricular band (see Thomas and Schwartz, 1966a; fig. 8 The clarity of the bands and their distinctness are also unusual within the specie All in all, *S. n. lissodesmus* is very distinctive as far as pattern is concerned.

Remarks — *S. n. lissodesmus* appears to be an isolate of *S. nigropunctatus* limit to the Sierra de Cubitas (Fig. 1). The nearest records for the species (Los Ballenat Nuevitas — 65 km to the east) are quite dissimilar to *S. n. lissodesmus,* as is al the single specimen from Cayo Coco, some 110 km to the northwest. The appare

rarity of *S. n. lissodesmus* in the well-forested uplands of the Sierra de Cubitas is puzzling, but neither of us has succeeded in securing more specimens of this species there. It should be recalled that we have previously (Schwartz and Garrido, 1981) made reference to the absence in these same mountains of *S. scaber*. Both species prefer mesic wooded situations, especially with a profusion of limestone rocks and other ground cover for retreats. It is possible that *S. nigropunctatus* has prevented the colonization of the Sierra de Cubitas by *S. scaber* (the 2 species are not known to be sympatric anywhere), but if this is the case, one might logically expect that *S. n. lissodesmus* would be more abundant than it appears to be in these mountains.

Specimens examined — Camagüey Province, Sierra de Cubitas near Banao (MCZ 57344-45).

Sphaerodactylus nigropunctatus granti Thomas and Schwartz

Sphaerodactylus decoratus granti Thomas and Schwartz, 1966a, Brigham Young Univ. Sci. Bull., 7(4):10.

Type-locality — Banes, Oriente Province, Cuba.

Holotype — BYU 17233 (examined by authors).

Sphaerodactylus nigropunctatus granti: Thomas and Schwartz, 1974, J. Herpetology, 8(4):357.

Definition — A Cuban subspecies of *S. nigropunctatus* characterized by the combination of: 1) moderate size (males and females to 32 mm snout-vent lengths); 2) females with 3 uniformly colored brown body bands with sharp dark edges and with prominent dark-edged ocelli usually in each band, including the collar; bands not prominently edged with light or with posterior light flecks; throats prominently marbled in majority of specimens; 3) head pattern with a median dark line and a pair of canthal dark lines, all joined to a dark band behind the eyes; pale band between postocular band and auricular band distinctly narrower than auricular band; 4) males spotted dorsally and often also on the throat.

Variation — We have examined a total of 145 *S. n. granti,* of which we have taken all counts on 70, and on the remainder only counts of supralabials and internasals. Largest male (BYU 17192) 32 mm snout-vent length, largest females (BYU 17209, BYU 17218, BYU 17265) 32 mm. Smallest juveniles (MCZ 57340, MCZ 57342) 14 mm. Scale counts on 70 specimens (except for supralabials and internasals) are: paramedian dorsal scales axilla to groin 41-66 ($\bar{x}$ = 54.3); ventral scales axilla to groin 26-41 (34.1); scales around body at midbody 57-89 (75.5); supralabials to eye center 3-5 (M_0 = 6 – 66%); internasals 0-3 (M_0 = 1 – 85%); fourth toe lamellae 7-13 (M_0 = 10); escutcheon 5 – 10 x 8 – 17.

The long series of *S. n. granti* is remarkably uniform in those characteristics that distinguish the subspecies. The collar and 3 body bands that are usually ocellate (although ocelli may be absent in the most posterior 1 or 2 bands), the trilineate dark head pattern and dark snout, the cephalic lines joining with the postocular band, all are relatively constant in females. Males are regularly spotted, the spotting varying in number and intensity but not necessarily correlated with snout-vent length. The spotting seems to arise at the time of transition form the juvenile (= female) banded pattern; MCZ 57339, for instance, shows remnants of the female

pattern but with distinct spots present along the old band margins; the snout-vent length is 27 mm. The male dorsal dotting is correlated with equally dotted throats, the throat dotting of about the same intensity and density as that of the dorsal surface of the head. A common variant is absence of dorsal head spotting and concomitant throat spotting. One specimen (IZ 38, with a snout-vent length of 24 mm) has a well developed and prominent escutcheon but still has all female pattern details dorsally and lacks any sort of spotting. Juveniles are crossbanded with dark (although the band centers are a little paler) with pale interspaces. A pair of tiny pale ocelli occurs in the collar in these small specimens. Occasional adult females have a dorsal band count of 3/4, due to asymmetry of the band development on each side.

There is a single small specimen (snout-vent length 21 mm) from Cayo Coco in the Archipiélago de Sabana-Camagüey off the northern Camagüey coast, as well as a short series (4 adult males, 3 adult females, 1 juvenile) from the Cayos Los Ballenatos in the Bahía de Neuvitas off Nuevitas, also on the northern Camagüey coast. The Cayo Coco lizard does not differ appreciably from mainland specimens (although *S. nigropunctatus* is unknown from the adjacent coast of Camaqüey and in fact the nearest mainland record of *S. n. granti* is near Playa Santa Lucía, some 160 km to the southwest).

The Ballenatos series likewise is fairly typical of *S. n. granti*. However, it is specimens from this series that set the lower parameters for dorsal, ventral, and midbody scale counts for the subspecies; in general their counts fall toward the lower extreme of the subspecies. All adult males are distinctly and discretely dotted on the back but lack head and throat dotting; the "texture" of the dorsal dots is very comparable to that of some Bahamian subspecies with dotted males — dots widely spaced and large, rather than small and crowded. Both conditions, however, occur in other *S. n. granti*. Finally, 1 female (IZ 4732 — snout-vent length 30 mm and not the largest female *S. n. granti* nor the largest Ballenatos female) shows a peculiar breaking up of the dark band edges into discrete dark dots, and the collar ocelli have large irregular heavy dark borders. Ocelli in the body bands are obliterrated to form dark intraband dots, but the interband spaces are clear. It is likely that this peculiar pattern is part of the ontogenesis of this isolated population and also that the Los Ballenatos lizards are nameworthy, but the series is small and the differences are not sufficiently consistent to name these lizards. A larger female (IZ 4736 — snout-vent length 31 mm) does not show the peculiarities of the above-noted female and seems typical, as preserved, of adult female *S. n. granti* from elsewhere on the mainland.

Comparisons — *S. n. granti* can be at once distinguished from *S. n. lissodesmus* by the very different head patterns in females, and the presence of spotted males in the former in contrast to (presumably) unspotted males in the latter. Female *S. n. lissodesmus* are virtually non-ocellate in contrast to ocelli in the collar and body bands of female *S. n. granti*. All scale counts of the 2 *S. n. lissodesmus* are included within the ranges of these counts in *S. n. granti*. Although there are no records of *S. scaber* from the same localities noted for *S. n. granti,* if the 2 occur together in eastern Camagüey Province, they can easily be differentiated by the much larger dorsal scales and the median dorsal zone of granules in *S. scaber;* the female patterns although similar, are in actuality quite distinct. The maximum expression of ocelli in *S. scaber* is in the nuchal band, never in the body bands. Male *S. scaber* are never

heavily and prominently dotted dorsally.

Remarks — The distribution of *S. n. granti* apparently includes the Archipiélago de Sabana-Camagüey from at least Cayo Coco eastward (Schwartz and Thomas, 1975:158, noted specimens of the species from Cayo Francés, Cayo Santa María, Cayo Caimán del Faro, and Cayo Las Brujas which we have not examined in detail but which presumably are assignable to *S. n. granti;* these records would extend the range of the species far to the west along the Las Villas *cayería*) to the Cayos Los Ballenatos in the Bahía de Nuevitas, and thence still further eastward to the vicinity of Playa Santa Lucía in extreme northeastern Camagüey Province; the subspecies then extends along the northern Oriente coast (Gibara, Vita, Banes, Ensenada de Moa) and inland (Holguin, El Jobo, Marcané), skirting the bases of the montane massifs (Sierra de Nipe, Sierra del Cristal) in this region, to Monte Líbano (about 20 km northeast of Guantánamo). Specimens from the vicinity of the city of Guantánamo have been interpreted as intergradient between *S. n. granti* and *S. n. strategus* (Fig. 1). It seems likely that *S. n. granti* will be encountered between El Jobo in the west and Monte Líbano in the east. The situation in the vicinity of the city of Guantánamo is very complex (see beyond).

Specimens examined — Camagüey Province, Cayo Coco (IZ 4196); Cayo Los Ballenatos (IZ 4732-39); 7 km S Playa Santa Lucía (MCZ 57339-43); 13 km S Playa Santa Lucía (MCZ 57340-42); 15 km S Playa Santa Lucía (MCZ 59316); *Oriente Province,* 1 km W Gibara (IZ 4282-83); Caletones de Gibara (IZ 4289); Vita (IZ 25); Banes (BYU 17192-268, BYU 22889-920 + 2 untagged specimens); Cruz P. Sierra, Banes (IZ 216, IZ 241); Las Calabazas, Holguin (MCZ 36941-42); Holguin (IZ 38); El Jobo, near Bayamo between Holguin and Bayamo (IZ 329); Marcané (AMNH 61604-10); La Aguada, Ensenada de Moa (IZ 41); Monte Líbano (MCZ 14665). A specimen (MCZ 21960) from "Cuba" has been considered *S. n. granti;* we have examined it. It is a male that is dotted on the neck but not elsewhere. It is *S. nigropunctatus,* but it does not agree with our assessment of *S. n. granti,* and we leave it unassigned subspecifically.

Sphaerodactylus nigropunctatus strategus Thomas and Schwartz

Sphaerodactylus decoratus strategus Thomas and Schwartz, 1966a, Brigham Young Univ. Sci. Bull., 7(4):13.

Type-locality — East side of the Bahía de Guantánamo, United States Naval Base, Oriente Province, Cuba.

Holotype — MCZ 81110 (examined by authors).

Sphaerodactylus nigropunctatus strategus: Thomas and Schwartz, 1974, J. Herpetology, 8(4):357.

Definition — A Cuban subspecies of *S. nigropunctatus* characterized by the combination of: 1) large size (males and females to 35 mm snout-vent lengths); 2) females with 3 uniformly colored brown body bands with sharp dark edges and with prominent dark-edged ocelli in each band including the collar; bands not prominently edged with light or with posterior light flecks; throats prominently marbled; 3) head pattern with a median dark line and pair of canthal dark lines, all joined to a dark postocular band; pale band between postocular band and auricular band distinctly narrower

than auricular band; 4) males usually unspotted; 5) modally 3 supralabials to center of eye.

Variation — The series of 88 *S. n. strategus* has the following data. Largest male (ASFS V15868) 35 mm snout-vent length, largest female (ASFS V16600) 35 mm. Smallest juvenile (ASFS V16605) 17 mm. Scale counts on the series are: paramedian dorsal scales axilla to groin 45-67 ($\bar{x}$ = 55.7); ventral scales axilla to groin 26-42 (35.2); scales around body at midbody 61-84 (70.0); supralabials to eye center 3 – 5 (M_0 = 3 – 51%); internasals 0 – 3 (M_0 = 1 – 68%); fourth toe lamellae 7 – 13 (M_0 = 11); escutcheon 6 – 10 x 8 – 23.

S. n. strategus in most ways resembles *S. n. granti;* in fact Tolson (MS) considered the former a synonym of the latter, and he may well be correct. Females have the typical collar and 3 body bands of the species; of a series 52 females and juveniles, 31 have ocelli in the collar only, 5 have them in the collar and the first body band, 10 have ocelli in the collar and the first and second body bands, and 6 have ocelli in the collar and all 3 body bands. All juveniles are included in the first category (ocelli in collar only), as well as many adults. Although these individuals resemble some *S. alayoi,* the "texture" of the bands is distinctive. Of 33 males, 23 lack any dorsal dotting; 10, on the other hand, have some dotting or spotting, varying from a few dots on the shoulders (ASFS V15149), to dotted flanks (ASFS V15148), or posterior part of the body (ASFS V15682). Five males are as dorsally dotted as are male *S. n. granti.* One male (unspotted dorsally and also without a female pattern — MCZ 141576) lacks an apparent escutcheon (*i.e.,* there is no patch of unpigmented scales anterior to the vent); the snout-vent length of this specimen is 32 mm, and thus it is close to maximum size for the subspecies. Although 3 body bands are usual for the subspecies, 6 females have an asymmetrical count of 3/4.

Comparisons — *S. n. strategus* differs from *S. n. lissodesmus* in the same ways as *S. n. granti* differs from the Cubitas subspecies. The problem is more acute in differen tiating *S. n. strategus* from *S. n. granti.* The occurrence of spotted males (albeit a small percentage) in *S. n. strategus* casts some doubt upon the recognizability of thi subspecies, since *S. n. granti* always has spotted males (although even there th degree of spotting is variable, as we have stated previously). The preponderance i our sample of unspotted males from the southern Oriente coast suggests strongl that this population is not identical with *S. n. granti* elsewhere in Oriente. Secondl although we have examined more *S. n. granti* than *S. n. strategus,* the snout-ver length of *S. n. strategus* in both sexes (35 mm) is larger than those in both sexes *S. n. granti* (32 mm). The difference may appear to be slight, but in actuality *S. strategus* is a larger lizard; that the size difference is not a sample artifact is indicat by the number of *S. n. strategus* (19) that exceed the maximum 32 mm snout-ve length of *S. n. granti.*

Meristic data on two subspecies are comparable. However, the mean of midbo scales in *S. n. strategus* (70.0) is lower than that of *S. n. granti* (75.5), desp extensive overlap of extremes. *S. n. granti* has a modal fourth toe lamellar count 10, *S. n. strategus* a mode of 11. Both subspecies have internasal modes of 1, yet t incidence of this count is higher in *S. n. granti* (85%) than in *S. n. strategus* (68 the latter subspecies has a higher incidence of 2 internasals (30%) than the forn (13%). The supralabial mode is 3 (51%) in *S. n. strategus* and 4 (66%) in *S. n. granti.*

Remarks — Aside from the question of the distinctness of *S. n. granti* and *S*

strategus, there are other problems involved with this pair of subspecies. Thomas and Schwartz (1966a:13) considered specimens from the city of Guantánamo and its vicinity as intergradient between the 2 subspecies. We have examined 52 specimens from the Guantánamo region and are left with the same impression. Maximum size for Guantánamo specimens of both sexes is 32 mm, the same as for *S. n. granti.* Males from Guantánamo include both spotted and unspotted specimens. In scutellation, means for dorsal and ventral scales (although that for ventral scales — 32.3 — is closer to *S. n. granti)* are lower than either subspecies, the mean for midbody scales (72.0) is close to that of *S. n. strategus;* the frequency of the mode of 1 internasal scale is 65%, closer to that of *S. n. strategus* than to that of *S. n. granti* (85%). In supralabial scales, the mode is 4 (56%), whereas *S. n. granti* has a stronger mode (66%) than does *S. n. strategus* (51%) in this count. Although the material from the vicinity of the city of Guantánamo and to the south is not absolutely intermediate between the two adjacent subspecies and is in general closer to *S. n. strategus* (as might be expected on geographic grounds), still it does seem to combine their characters.

A second problem in the distribution of *S. n. strategus.* This subspecies has been known only from the area of the U.S. Naval Base to the east side of the Bahía de Guantánamo; but Thomas and Schwartz (1966a) noted its occurrence at Caimanera on the west side of the bay. There have been no records for the species west of the bay on the Naval Base, but Tolson (MS) noted the taking of 6 specimens in the Fort Conde-Playa Hicacal area. We have been able to isolate 4 of these specimens, and they include 1 male (without dotting), 2 females, and 1 juvenile. In addition, there are other specimens in the IZ and USNM that bridge the geographic gap between these isolated Naval Base specimens west of the bay and the city of Guantánamo. Thus *S. nigropunctatus* is now known to have an apparently very limited distribution to the west of the Bahía de Guantánamo. But even more important is the fact that all localities *east* of the bay are also from *west* of the Río Guantánamo (*i.e., S. nigropunctatus* occurs here only between the river and the bay), at localities such as Caimanera, Las Pailas, Boca de Jaibo, and Casita de las Drogas. Thus it now appears that there is a thin tongue of *S. nigropunctatus* that extends to the coast between the Río Guantánamo and the Bahía de Guantánamo, this tongue terminating at the Fort Conde-Playa Hicacal area.

The situation in the vicinity of the city of Guantánamo is made even more complex by the problems already noted concerning *S. alayoi.* If we interpret Dr. Spielman's notes correctly, and the original material of *S. alayoi* came from the more mesic area near the Guaso hydroelectric plant, it seems likely that it represents a subspecies of *S. nigropunctatus* and that its genetic effects may also be felt in the Guantánamo-and-vicinity sample. Fortunately, among the Ramsden specimens are some with accurate locality data that we can associate with *S. alayoi;* these are from east of the city of Guantánamo (but still within the xeric Cuenca de Guantánamo) and, since there is no direct evidence that the type-locality as stated (U.S. Naval Base) is correct, it seems appropriate to consider *S. alayoi* a well-marked subspecies of *S. nigropunctatus,* so far known with certainty only from the region about San Carlos (see beyond).

Specimens examined — Oriente Province, U.S. Naval Base, east side (MCZ 68132, MCZ 81110-11, ASFS V6243-47, ASFS V6256-60, ASFS V6262, ASFS V6275, ASFS V15146-60, ASFS V15674 (Fisherman's Point), ASFS V15675-86, ASFS V15688-90, ASFS V16595-602, ASFS V16604-05, IZ 3971-74, USNM 192787 (9 specimens),

USNM 192798, MCZ 141574-76 (2 mi. N Navy Exchange), MCZ 146385-89 (Sherman Ave. and Cable Beach Rd.).

Intergrades between *S. n. granti* and *S. n. strategus: Oriente Province,* Guantánamo (BYU 17183-91, USNM 59004, USNM 63218, MCZ 8508, MCZ 13482-83, UMMZ 90632 (2 specimens), IZ 214, IZ 238); Loma de la Herradura (IZ 4630); Boca de Jaibo (IZ 193-94); Carretera de las Drogas, bank of Río Guantánamo (IZ 226); Casita de la Drogas, bank of Río Guantánamo (IZ 226); Caimanera (USNM 59221-31, USNM 59195-97); road to Cerro de Guayabo (IZ 199); Las Pailas (IZ 218, IZ 224, IZ 231-32, IZ 235, IZ 237, IZ 239-40, IZ 242); Guantánamo district (IZ 190); U.S. Naval Base, west side of bay, in the Fort Conde-Playa Hicacal area (ASFS V15756, ASFS V15763-64, ASFS V15772).

Sphaerodactylus nigropunctatus alayoi new combination

Sphaerodactylus alayoi Grant, 1959a, Herpetologica, 15(1):49.

Type-locality — "Guantánamo Naval Base, U.S.N., Oriente, Cuba."

Holotype — UIMNH 44251 (examined by authors).

Definition — A Cuban subspecies of *S. nigropunctatus* characterized by the combination of: 1) moderate size (males to 31 mm, females to 33 mm snout-vent lengths); 2) females with 3 bands between axilla and groin; dark body bands only slightly more than twice the width of light (cream to tan) interspaces; dark bands sharply demarcated with wide dark borders and relatively narrow light central portions, no dark spotting and rarely dark-edged ocelli present; ocelli usually present in collar, not prominently dark-edged, transversely elongate; ocelli seldom present in body bands, not conspicuous and not dark-edged; postocular and auricular bands generally darker and more solid than body bands; 3) a median and a pair of canthal snout lines joining postocular band; ventrally, head bands usually continue across throat; 4) males unicolor or with faint female band remnants or dotted; 5) modally 3 supralabials to center of eye.

Variation — The series of 39 *S. n. alayoi* has the following data. Largest male (UIMNH 44242) 31 mm snout-vent length, largest female (UIMNH 44216) 33 mm. Smallest juveniles (UIMNH 44233, UIMNH 44235) 16 mm. Scale counts on the series are: paramedian dorsal scales axilla to groin 43-61 ($\bar{x}$ = 56.1); ventral scales between axilla and groin 30-39 (35.1); scales around body at midbody 66-83 (75.9); supralabials to eye center 3-5 (M_0 = 3 – 73%); internasals 0-3 (M_0 = 1 – 56%); fourth toe lamellae 8-12 (M_0 = 11); escutcheon 5 – 8 x 9 – 12.

We have repeatedly in the present paper mentioned the many problems that are involved with the name *S. n. alayoi*. We are uncertain of so many things concerning this name that we deal with it in a very tentative manner; but to allow *S. n. alayo* to stand as a separate species seems to emphasize its "distinctions" unnecessarily That there is somewhere in southern Oriente a population of *Sphaerodactylus* tha is distinctive from all others is certain. That it does not occur on the U.S. Nava Base is rather well affirmed, although it does seem to occur just north of tha installation at the village of Boquerón. Thus, it is indeed possible that it occur marginally on the northern edge of the Naval Base. We doubt strongly that th holotype and the long series of paratypes came from the Naval Base as Grant averre rather, it seems reasonable that at least some (most ?) of them came from the Guas

hydroelectric plant on the very southern slopes of the Sierra del Guaso, as Dr. Spielman stated. But there are no further specimens from that region. However, among the Ramsden material are 3 adult females, 1 male, and 2 juveniles for the vicinity of San Carlos, some 8 km east of the city of Guantánamo that we assign to this taxon. This locality (if we are to take the records precisely) is not in more mesic upland areas of the Sierra del Guaso but is rather within the xeric Cuenca de Guantánamo.

Female *S. n. alayoi* are distinctive in that the bands are strongly dark-edged with relatively narrow pale centers and usually without ocelli. In well preserved specimens, one is struck by the vividness of the body bands — they seem to be much more distinct and clear than body bands in, for instance, *S. n. strategus*. The head pattern is very similar or identical to that of *S. n. granti* and *S. n. strategus,* but it too seems more vivid than in the other related subspecies.

The situation with males is even more uncertain. Of the single San Carlos male, we can only state, because of its discoloration, that it appears to have remnant female bands overlaid by dark dots along the band edges. Thomas and Schwartz (1966a:14) had the same problem; they stated that males assigned to this taxon were "becoming unicolor but have some banded pattern remnants; others show some degree of spotting." Thus, our San Carlos male falls within the parameters stated by them.

Comparison — Female *S. n. alayoi* are distinguished from females of the other subspecies on the basis of head pattern (*lissodesmus*) and clarity of body bands without ocelli (*granti, strategus*). There is no problem in telling *S. n. alayoi* females from those of the other Oriente populations — the condition of the body bands (clear, somewhat paler centrally, usually without ocelli) differentiates the females from those of *S. n. granti* and *S. n. strategus*. The situation with males has been noted above. As far as scutellation is concerned, *S. n. alayoi* has a slightly higher mean (56.1) than *S. n. granti* (54.3) and *S. n. strategus* (55.7) in dorsal scales. In midbody scales, *S. n. alayoi* also has a higher mean (75.9) than *S. n. granti* (75.5) and *S. n. strategus* (70.0), although it is obviously closer to that of *S. n. granti* than to that of *S. n. strategus*. The internasals are modally 1 in all 3 populations; however the incidence is lowest (56%) in *S. n. alayoi,* compared with *S. n. granti* (85%) and *S. n. strategus* (68%). The high frequency of the incidence of 3 supralabials is distinctive; 83% of the supralabial series have this count. The frequency of 3 supralabials is 31% in *S. n. strategus*.

Remarks — It appears that *S. n. alayoi* is a subspecies occurring on the lower southern slopes of the Sierra del Guaso and into the easern portion of the Cuenca de Guantánamo and extending as far southeast of the Bahía Guantánamo as Boquerón (Fig. 1). Thomas and Schwartz (1966a:15) segregated one female (UIMNH 41232) from the paratypic series as *S. "decoratus"* and also assigned 2 specimens (MCZ 69438, MCZ 69400) from the Naval Base to *S. n. alayoi* . We consider the male specimen as a slightly aberrant *S. n. alayoi;* MCZ 69438 and MCZ 69440 are *ruibali*. The 2 MCZ males are from the Naval Base, and the female is only questionably so (since it is part of the paratopotypic series upon which much doubt has been cast). If we are correct in our assumption that material from San Carlos is *S. n. alayoi,* a locality removed only 8 km from a known locality for *S. n. strategus* and *S. n. granti,* it is not surprising that perhaps occasional specimens of *S. n. alayoi* would show some influence from the Guantánamo population. On the other hand,

UIMNH 44232 may indeed be *S. n. strategus* from the Naval Base that has inadvertently been confused with the paratypic series that came from elsewhere. Chaos reigns in all aspects of the distribution and other facts concerning *S. n. alayoi!*

Specimens examined — Oriente Province, " Guantánamo Naval Base" (UIMNH 44215-38, UIMNH 44240-44, MCZ 61230-31); Boquerón (USNM 81822-23); San Carlos (IZ 168, IZ 205); El Corojo de San Carlos (IZ 188, IZ 191, IZ 198, IZ 202).

Sphaerodactylus nigropunctatus ocujal new combination

Sphaerodactylus torrei ocujal Thomas and Schwartz, 1966a. Brigham Young Univ. Sci. Bull., 7(4):16.

Type-locality — Ocujal, Oriente Province, Cuba.

Holotype — USNM 138015 (examined by authors).

Definition — A Cuban subspecies of *S. nigropunctatus* characterized by the combination of: 1) females with 3 dark bands only slightly broader than pale interspaces; numerous, very small, not dark-edged ocelli in dark bands; 2) median dark snout line not extending to postocular band; 3) males usually spotted; 4) size large (males to 35 mm, females to 34 mm snout-vent lengths); 5) modally 4 supralabials.

Variation — The series of 42 *S. n. ocujal* consists of 27 males, 10 females, and 5 juveniles. Largest male (IZ 318) 35 mm snout-vent length, largest female (USNM 29759) 35 mm. Smallest juvenile (IZ 32) 15 mm. Scale counts on the series are: paramedian dorsal scales between axilla and groin 42-61 ($\bar{x}$ = 51.7); ventral scales between axilla and groin 22-38 (31.1); scales around body at midbody 52-81 (67.2); supralabials to eye center 3-5 (M_0 = 4 – 88%); internasals 0-2 (M_0 = 1 – 93%); fourth toe lamellae 9-14 (M_0 = 10); escutcheon 5 – 11 x 9 – 27.

In juveniles and females, there are postocular and auricular bands, a collar, and 3 body bands; these bands in juveniles are solid, and the third body band may be incomplete but still indicated (IZ 32). With increasing size, all bands become increasingly hollowed and multiocellate so that in the largest females (MCZ 42487, IZ 39 the banding is much less prominent than in juveniles and subadults, and the multipl ocelli in each band are a prominent feature. The illustration in Thomas and Schwart (1966a: fig. 13) shows the adult female holotype, and other full adults are precisel comparable. One juvenile (IZ 266) with a snout-vent length of 19 mm is peculiar i that it superficially appears to lack any banding, but bands are present althoug very faint, persumably due to length of perservation. Thomas (1968:60) gave col notes from a color transparency of a female (IZ 1112 — snout-vent length 28 mr as "dorsal ground color . . . tan on head and tail (lighter on the tail); the bands . dark brown and the interband spaces on the body . . . dirty tan to brown with light tan edging to the dark bands. The two small ocelli of the collar are white; the oce of the body bands are a grayer off-white."

It is the males that we associate with *S. n. ocujal* that give the most problen Obviously, males from that area (Cabo Cruz to west of the Bahía de Santiago; F 1) from which we have 3-banded females can logically be assumed to be associa with these females; no other banded gecko (except one related to *S. intermedius* described later in the present paper) is known from this region. We have see males from this region and all are dotted. Therefore, it seems reasonable that n

S. n. ocujal are dotted. But in addition, as we previously pointed out, we have a long series of geckos from Santiago de Cuba and the *east* side of the Bahía de Santiago which can only be associated with *S. n. ocujal* (since there are no adult female *S. nigropunctatus* from this region and only one tiny juvenile — IZ 21). The nearest records to the east for *S. nigropunctatus* are from east of the Río Guantánamo (the situation we have just described under *S. n. strategus)*. Although the dominant gecko in the Santiago area appears to be *S. torrei,* it is 2-banded in females and the males are never spotted. Therefore, we have little choice but to assume that all dotted (and some undotted) Santiago males are *S. n. ocujal.* Of the Santiago males, 11 are dotted, at times heavily, and with the dotting on the throat as well, whereas 12 are plain dorsally and without dots. Dotted males range in snout-vent length from 28 mm to 35 mm (and thus include the largest male), and plain males range from 23 mm to 32 mm in snout-vent length. One other peculiarity of these males is that 7 appear to lack escutcheons (IZ 24, IZ 254, IZ 283, IZ 296, IZ 20, IZ 272, IZ 4622); these 7 males are all unspotted and have snout-vent lengths between 23 mm and 32 mm. Even if these specimens are in reality male *S. torrei* (which has unspotted males), males of the species have well-developed escutcheons at these sizes and still show faint female crossbands. The situation is most puzzling, and we admit to taking the easiest way out of a dilemma.

Female *S. n. ocujal* differ from all other subspecies of *S. nigropunctatus* in having the median snout line unattached to the postocular band and without the pigmental "bridge" present in *S. n. lissodesmus.* As far as scutellation is concerned, *S. n. ocujal* has low means of dorsal scales (51.7) and of midbody scales (67.2), lower than any other subspecies. *S. n. ocujal* also has the highest incidence (88%) of 4 supralabials to eye-center and of 1 internasal (93%). The escutcheon in males involves more scales laterally (as many as 27) than any other Cuban subspecies, although the rule is a typically compact escutcheon as in other subspecies of *S. nigropunctatus.*

Remarks — We have already commented upon why we regard *ocujal* as a subspecies of *S. nigropunctatus* rather than of *S. torrei.* We have been swayed in part by the Santiago de Cuba dotted males and in part by the dotted males within the range of female *ocujal.* Finally, the presence of 3 body bands would seem to ally *ocujal* with *S. nigropunctatus.* One feature against this assignment is the fact that, in all the subspecies of *S. nigropunctatus* (with the exception of *S. n. lissodesmus*), the median dark snout line is confluent with the postocular band, whereas this is not the case in *S. n. ocujal* but is the case in *S. t. spielmani* (but not in *S. t. torrei,* with which *S. n. ocujal* is apparently sympatric in the Santiago de Cuba region).

What is badly needed now is adult female *S. nigropunctatus* from the region about Santiago. The extremely peculiar hiatus of records between Santiago on one hand and the Río Guantánamo on the other (precisely in the area where *S. torrei* is the dominant banded gecko) is puzzling. It may well be that this hiatus is real, and that under undisturbed conditions (*i.e.,* non-ruderal) the two species cannot co-exist; their apparent sympatry in the region about Santiago de Cuba may be due to the changed ecology and habitats made available there by the influence of humans.

Specimens examined — Oriente Province, Niquero (IZ 44); Playa las Coloradas, Niquero (IZ 1142); Belie (AMNH 32301); 6.4 km N Cabo Cruz (UMMZ 90727); Verreón (IZ 32, IZ 36, IZ 39); Puerto Portillo (USNM 81827-28); Ocujal (USNM 138015); 1.6 km E Ocujal (USNM 138016); coast south of Pico Turquino (MCZ 42487);

near Pico Turquino (MCZ 50152, MCZ 84397); Guama (USMN 29759); Sierra Maestra (IZ 39); Santiago de Cuba (CAS 39285-87, IZ 3999); Santiago de Cuba, Ciudamar and Morro Castle (IZ 20, IZ 24, IZ 277, IZ 292, IZ 318, IZ 324, UMMZ 90726); Santiago de Cuba, El Gallito (IZ 281); Santiago de Cuba, Vista Alegre (IZ 21); Cinco Reales, east side, Bahía de Santiago (ASFS V28449, IZ 254, IZ 266, IZ 296-97, IZ 272); Santiago de Cuba, Justisí (IZ 4622); Culandrillo, El Cobre (IZ 307); Siboney (ASFS V28450, IZ 4472).

Sphaerodactylus torrei Barbour

Sphaerodactylus torrei Barbour, 1914, Mem. Mus. Comp. Zool., 44(2):260.

Type-locality — Santiago de Cuba, Oriente Province, Cuba.

Holotype — MCZ 6916 (examined by authors).

Definition — A Cuban species of *Sphaerodactylus* characterized by the combination of: 1) large size (males to 38 mm, females to 39 mm snout-vent lengths); 2) dorsal scales small, granular, swollen, erect (especially on sides where the appearance is papillate), and weakly imbricate; a few large hair-bearing scale organs (3 hairs) along posterior edge of scale; faint keeling present to absent, 39-61 between axilla and groin; 3) scales around body at midbody 53-83; 4) usually 5 (but often 4) supralabials to mid-eye, the fifth supralabial usually much smaller than the fourth but still enlarged; 5) modally 1 (0-3) internasal scale; 6) escutcheon in males 5 – 14 x 8 – 24; 7) sexually dichromatic: males unicolor gray to tan dorsally with head and tail yellow to almost orange, venter tan; females tan to gray dorsally with 2 dark brown body bands, usually solid but tending to become somewhat paler centrally with increasing size; collar similar to body bands; ocelli absent in collar and body bands; female head pattern composed of a pair of dark canthal lines (or totally dark lores) and a median snout line, the latter joining or not with the postocular line (which may be reduced or absent), the differences depending upon the subspecies; dark head bands typically end abruptly on underside of throat or continue completely across, not forming extensive marbling, or fading out; a small but distinct dark mental spot; venter light; tail banded like body.

Sphaerodactylus torrei torrei Barbour

Sphaerodactylus torrei torrei Thomas and Schwartz, 1966a, Brigham Young Univ Sci. Bull., 7(4):16.

Definition — A subspecies of *S. torrei* characterized by the combination of: 1) darl body bands wider than pale interband spaces; 2) median snout line extending post eriorly to join with well developed postocular band; 3) high frequency of dorsa keeling in adults; 4) high modal number (13) of fourth toe subdigital lamellae; 5 low mean (65.8) of scales around body at midbody.

Variation — The series of 128 *S. t. torrei* (of which we have taken the complet complement of counts on 62 specimens, and counts of only internasals and supral bials on the remainder) shows the following. Largest male (UMMZ 90721) 38 m snout-vent lengths, largest female (IZ 23, IZ 58) 39 mm. Smallest juvenile (IZ 33 15 mm snout-vent length; a hatchling (IZ 332) has a snout-vent length of 16 m

Scale counts on 62 specimens (except for supralabials and internasals) are: paranedian dorsal scales axilla to groin 39-59 ($\bar{x}$ = 48.9); ventral scales axilla to groin 25-39 (32.1); scales around body at midbody 53-83 (65.8); supralabials to eye center 4-6 (M_0 = 5 – 50%); internasals 0-2 (M_0 = 1 – 96%); fourth toe lamellae 8-15 (M_0 = 13); escutcheon 5 – 10 x 8 – 23.

S. t. torrei is quite consistent in characteristics. Males are never spotted or dotted, and, as adults, are exceptionally handsome lizards with their yellow heads and tails, and gray to tan bodies. Females are likewise consistent in having 2 dark body bands, these solid in juveniles and subadult specimens but tending toward some paler following with increasing size, the paler band centers never strongly contrasting with the band edges. Ocelli are absent in both the collar, which is like the body bands in color and contrast, or in the body bands. There is a dark postocular band, continuing under the throat, to which are joined both the canthal lines (or the dark loreal area) and the median snout line, to form a trilineate head pattern. The body bands are not distinctly narrower than the pale interspaces and are either wider than the interspaces or just as wide.

Several specimens are peculiar or anomalous in different ways. Two females (*i.e.*, they lack escutcheons; MCZ 84373-74) with snout-vent lengths of 32 mm are patternless like males. One male (IZ 15 — snout-vent length 31 mm) is female-patterned but has the escutcheon well developed. Males between 33 and 35 mm snout-vent lengths show the transition between the female banded and the male unicolor condition in that faint dark bands can be ascertained on the back. One male (IZ 289) with a snout-vent length of 29 mm already has the escutcheon present and is patternless dorsally. In females, the second dark body band may be incomplete middorsally, the 2 band-halves (right and left) are staggered (IZ 258, IZ 282).

Comparisons — *S. t. torrei* appears to be sympatric with *S. n. ocujal* in the city of Santiago de Cuba. Females of the 2 species can be easily distinguished by the presence of 3 ocellate body bands and an ocellate collar in *S. n. ocujal*. The distinct median snout line and its mental spot in female *S. t. torrei* do not occur in *S. n. ocujal* (in which the median snout line does not connect to the postocular band). Males are less easily distinguished, although male *S. t. torrei* are never spotted, whereas this is the modal condition in *S. n. ocujal*. If not spotted, male *S. n. ocujal* have the heads more orange than yellow, are smaller (to 35 mm rather than to 38 mm), modally have 10 (rather than 13) fourth toe lamellae, and modally have 4 (rather than 5) supralabials to mid-eye. These differences are either obvious in life (color) or modal, but that the investigator may have problems in dealing with faded or long-preserved specimens. The persistence of the female pattern in adult (= with esctucheons) male *S. t. torrei* and not in adult male *S. n. ocujal* will help in distinguishing males of the two species.

Remarks — *S. t. torrei* occurs along the southern Oriente coast (and slightly inland at Dos Bocas) from the city of Santiago de Cuba east to Playa Juraguá, east of Daboney (Fig. 2). The range is thus rather compact, and there are many specimens (most, in fact) from the city of Santiago itself. Outside the city (where *S. t. torrei* occurs in trash piles, stone walls, within buildings), *S. t. torrei* has been collected in mid coastal forest under natural debris. Apparently *S. t. torrei* and *S. nigropunctatus* occur syntopically in Santiago de Cuba, since there are several instances of specimens having precisely the same locality data. However, the long series from, for example,

Vista Alegre, a Santiago suburb, and elsewhere suggests that *S. torrei* is the more abundant of the 2 within the city itself.

Specimens examined — Oriente Province, Santiago de Cuba (AMNH 42546, AMNH 42583-90, UMMZ 90728-29, UMMZ 90631, MCZ 6916-17, MCZ 84370-74, MCZ 19771, IZ 21, IZ 26 (2 specimens), IZ 37, IZ 45, IZ 57, IZ 302, IZ 1210, IZ 4533, ASFS V26968); 4 km N Santiago de Cuba (AMNH 83594-96 + 3 specimens; AMNH 94260 (2 specimens), AMNH 94261, AMNH 94263); Santiago de Cuba, church of San Francisco (UMMZ 90724 (2 specimens), IZ 319, IZ 330); Santiago de Cuba, Vista Alegre (IZ 1-3, IZ 6-9, IZ 12-16, IZ 18, IZ 19 (2 specimens), IZ 22, IZ 23 (2 specimens), IZ 25, IZ 27, IZ 30, IZ 32, IZ 35-36, IZ 40, IZ 43, IZ 46-47, IZ 51-52, IZ 58, IZ 255, IZ 258, IZ 263-65, IZ 270, IZ 276, IZ 280, IZ 282, IZ 285-86, IZ 293, IZ 295, IZ 298, IZ 300-01, IZ 308, IZ 310, IZ 313, IZ 325, IZ 332-35, ASFS V26963-67, ASFS V26970) Santiago de Cuba, Morro Castle (IZ 317); Santiago de Cuba, Ciudamar (IZ 304); Dos Bocas, El Caney (IZ 23, IZ 31, IZ 314); El Modelo, El Caney (ASFS V26969); Cuabitas (IZ 289); Jutisí (IZ 4619); El Güao, on Bahía de Santiago (IZ 4, IZ 8, IZ 11, IZ 28 IZ 37, IZ 42, IZ 44, IZ 49); Siboney (AMNH 17721, IZ 303); Siboney, Río Carpintero (IZ 3454); Juraguá (IZ 3453); Playa Juraguá, 5.8 km E Siboney (AMNH 94252 (3 specimens)).

Sphaerodactylus torrei spielmani Grant

Sphaerodactylus spielmani Grant, 1958, Herpetologica, 14(4):225.

Sphaerodactylus torrei spielmani: Thomas and Schwartz, 1966a, Brigham Young Univ. Sci. Bull., 7(4):18.

Type-locality — Guantánamo, Oriente Province, Cuba; emended by Thomas, 1968 Herpetologica, 24(1):59, to east side of Río Hatibonico, about one-quarter mile inland approximately 10 miles west of the western side of the mouth of the Bahía de Guantánamo, Oriente Province, Cuba.

Holotype — UIMNH 44105 (examined by authors).

Definition — A subspecies of *S. torrei* characterized by the combination of: 1) dark body bands narrower than pale interband spaces; 2) median snout line reduced to short dash on the tip of the snout, and postocular band absent, reduced to lateral remnants, or constricted medially; 3) dorsal keeling reduced or absent in most specimens; 4) low modal number (11) of fourth toe subdigital lamellae; 5) high mean (72.7) of scales around body at midbody.

Variation — We have taken complete counts on 71 of the 153 specimens of *S. spielmani* available to us; on the remainder we have counted only supralabials and internasals. Largest male (UIMNH 44120) snout-vent length 38 mm; largest female (UIMNH 44207, ASFS V15169, ASFS V15721, IZ 3969) 37 mm. Smallest juvenile (UIMNH 44158, ASFS V15766) 15 mm snout-vent length. Scale counts on 71 specimens (except for supralabials and internasals) are: paramedian dorsal scales between axilla and groin 45-61 ($\bar{x}$ = 53.2); ventral scales between axilla and groin 27-3 (32.9); scales around body at midbody 61-79 (72.7); supralabials to eye center 3- (M_0 = 4 or 5 – 48% in each case); internasals 0-3 (M_0 = 1 – 97%); fourth toe lamellae 8-15 (M_0 = 11); escutcheon 6 – 14 x 12 – 24.

Like *S. t. torrei, S. t. spielmani* females are very consistent in their color and

pattern. The dark body bands are solid in young and subadult specimens but tend to become more hollow in large adults. The bands are invariably narrower than the pale interbands. The median snout line is reduced to a short longitudinal dash, and the postocular band is absent or much reduced, or strongly constricted medially, the 2 canthal lines ending abruptly posterior to the eyes. A few females have a more or less complete postocular band, but this is not the usual condition. Tolson (MS) noted that 75% of the specimens examined by him had slender extensions of the postocular band onto the throat. Grant (1958) commented that some specimens had a black dot on the sacrum "without the evidence of forming a band." Tolson (MS) also noted that he had taken specimens that had the beginning of a third band at the hindlimb insertion. These latter conditions are exceptional. Male *S. t. spielmani* are like *S. t. torrei* males; males (with escutcheons with snout-vent lengths of 28 mm to 32 mm) are still female-patterned.

Comparisons — Female *S. t. spielmani* differ from *S. t. torrei* in 2 very obvious ways — the narrow dark dorsal bands and the short dash-like snout line. The reduction or complete absence of the postocular line likewise is distinctive. Males (as preserved) of the 2 subspecies are indistinguishable. *S. t. spielmani* has a higher mean of midbody scales (72.7) than *S. t. torrei* (65.8), although the extremes (53-83) in *S. t. torrei* completely enclose those of *S. t. spielmani* (61-79). The ranges of fourth toe lamellae are the same (8-15) in the 2 subspecies, but the modes are different (13 in *S. t. torrei,* 11 in *S. t. spielmani*); in fact, only 13 of 71 *S. t. spielmani* have counts of 13, the modal condition in *S. t. torrei.* The bimode of 4 or 5 supralabials in *S. t. spielmani* (each with a frequency of 48%) differs from the mode of 5 scales (51%) in *S. t. torrei.*

S. t. spielmani occurs with *S. nigropunctatus* (*granti* X *strategus*) and *S. ruibali.* From both these species, *S. t. spielmani* differs locally in much longer snout-vent length (males to 38 mm, females to 37 mm versus ± 32 mm and 30 mm in both sexes of *S. ruibali,* and 32 mm in both sexes of local *S. nigropunctatus*). *S. ruibali* females are not contrastingly banded, and males of this species are vermiculate or stippled dorsally, not unicolor (as preserved). In life, male *S. ruibali* lack the brightly colored heads of male *S. t. spielmani.* Female *S. nigropunctatus* are ocellate and 3-banded, in contrast to non-ocellate and 2-banded female *S. t. spielmani.* The head pattern in female *S. nigropunctatus* is distinctly trilineate and much less clear than the bilineate (and with a short snout dash) and distinct female head pattern in *S. t. spielmani.* Male *S. nigropunctatus* may be spotted, a condition not observed in male *S. t. spielmani.* Non-dotted male *S. nigropunctatus* are best differentiated from male *S. t. spielmani* by their size, since males of the latter, at about the maximum size of male *S. nigropunctatus,* still retain conspicuous remnants of their juvenile banding.

Remarks — The known distribution of *S. t. spielmani* encompasses only about 16 km of coast, from the restricted type-locality to the west side of the Bahía de Guantánamo on the U.S. Naval Base (Fig. 2). There are no indisputable records of the species from the city of Guantánamo, the stated type-locality. Tolson (MS) noted that *S. t. spielmani* was commonest in open xeric forest 400 m inland. They were found there under rotted logs, under loose bark and dead leaves at the bases of trees; others were secured under rocks at the foot of the limestone escarpment at Chapman Beach, in an abandoned pumphouse, and 1 male was secured about 2 m up on the trunk of a large tree.

S. t. spielmani is not known to occur on the east side of the Bahía de Guantána where its niche is filled by *S. n. strategus* (recall that *S. nigropunctatus* is rare wit the range of *S. t. spielmani* just west of the Bahía de Guantánamo). There additionally no records of *S. torrei* between the restricted type-locality in the and Playa Juraguá in the west, a distance of about 50 km. We expect that the spe may occur within this area and remains uncollected there, since the proper habi are present, but this may not be the case. Although we have no hesitancy in con ering *torrei* and *spielmani* subspecies, they are quite distinct in many pattern det it may well be that they do not intergrade in the intermediate area whence specin are now unknown, and that these two isloated populations have diverged to a spe level. Only intensive collecting in the intervening area will reveal the real situatic

Specimens examined — (Note that all records from "Guantánamo" are comple unverified by recently collected material, and these specimens probably came either the restricted type-locality or perhaps from the west side of the Bahí Guantánamo on the U.S Naval Base.) *Oriente Province,* "Guantánamo" (BYU 17 66, UIMNH 44104-45, UIMNH 44152-213, USNM 140270-73, UMMZ 90632 (2 s mens), MCZ 59142-46, MCZ 01232-33); U.S. Naval Base, west side of Bahí Guantánamo (various localities) USNM 192789 (3 specimens), USNM 192805, A V15044, ASFS V15088, ASFS V15167, ASFS V15169, ASFS V15721-24, A V15726, ASFS V15728-36, ASFS V15745, ASFS V15759-62, ASFS V15765-66, A V15672-73, ASFS V16328, ASFS V16384, IZ 3696-70).

Sphaerodactylus intermedius Barbour and Ramsden

Sphaerodactylus intermedius Barbour and Ramsden, 1919, Mem. Mus. Comp. 47(2):211.

Type-locality — Sierra de Hato Nuevo between Hato Nuevo (Martí) and Saba de la Palma, Matanzas Province, Cuba.

Holotype — MCZ 12305 (examined by authors).

Sphaerodactylus decoratus drapetiscus Schwartz, 1958, Proc. Biol. Soc. Washin 71:29. *Type-locality* — 2 mi. (3.2 km) E Playa de Guanabo, Cueva de Rinc Guanabo, Habana Province, Cuba. *Holotype* — AMNH 77759 (examine authors).

Definition — A Cuban species of *Sphaerodactylus* characterized by the combir of: 1) moderate size (males to 36 mm, females to 35 mm snout-vent lengths); 2) scales small, granular and juxaposed to swollen, rounded and slightly imbr weakly keeled, 45-56 between axilla and groin; 3) scales around body at mi 60-77; 4) usually 4 (3-5) supralabial scales to mid-eye; 5) modally 1 (0-2) inte scale; 6) escutcheon in males 5 – 8 x 8 – 11; 7) sexually dichromatic: males yellowish tan dorsally with large defined dark brown to blackish spots; head g color distinctly more yellowish than body; ground color of tail bright yellow; f head band and facial markings united to produce dark head markings that er behind ear; two dark-edged light postocular stripes, one proceeding diagonall ventrolateral surface of throat, fading out on a level with ear, the other proc diagonally upwards and over temporal area, and usually joining its mate on o side to form a U-shaped light cephalic figure; loreal and median snout stripes p

he latter forked posteriorly before joining interocular area; collar present, heavily lark-edged and light-centered, but only very rarely with any evidence of ocelli; body ands 3 or 4 (occasionally 4/5), sometimes broken on posterior part of body or faint n young specimens, prominently dark-edged and somewhat sinuous; dorsal ground olor yellowish gray, brightest on neck and shoulders; head ground color pale yel- owish gray; collar black-edged with yellowish gray center which has a few scattered ellow dots just posterior to the anterior black edge; body bands black-edged becoming ray posteriorly, centers of bands always with a few scattered yellow dots; upper urfaces of limbs yellowish gray, flecked and mottled with tan; venter grayish with ray flecking on infralabials and throat.

Variation — Largest male 36 mm (AMNH 77760), largest female 35 mm (AMNH 1367) snout-vent lengths. Smallest juvenile (MCZ 57450) 16 mm. Scale counts on ıe series of 20 specimens are: paramedian dorsal scales axilla to groin 45-56 ($\bar{x}$ = 1.7); ventral scales axilla to groin 27-37 (33.6); scales around body at midbody 60-77 9.6); supralabial scales to center of eye 3-5 (M_0 = 4); internasals 0-2 (M_0 = 1); urth toe lamellae 5-13 (M_0 = 8); escutcheon 5 – 8 x 8 – 11.

The 5 males, of which one, IZ 2261, is so darkened that details cannot be determined, e irregularly and boldly spotted with dark brown to blackish on a yellowish tan ound. There are remnants of a dark median snout line that is elongate triangular ıd ends anterior to the interocular area, and a dark canthal line, not extending to the temporal region. One specimen (IZ 1141) has the posterior spotting less ear than other males; it is the smallest male (snout-vent length 28 mm), suggesting at the full assumption of the male pattern is achieved between snout-vent lengths 28 mm and 31 mm.

There are 6 juveniles and female-patterned subadults with snout-vent lengths of mm (MCZ 57450) to 25 mm (IZ 25), including the holotype and paratype (MCZ 726); these lizards show basically the female pattern: a pale nuchal band, edged th dark brown to blackish, followed by a darker (but even darker-edged) nuchal lar without ocelli, with 3 dark-edged body bands (although the posterior 1 or 2 faint in older specimens, they can be ascertained with some care). The head ttern in these specimens is basically dark with a pair of pale canthal lines that ve inward and join each other on the occiput, giving a U-shaped pale cephalic ure and enclosing within the U a dark snout-area as well as a dark occipital ion. There is also a pale line from the eye, extending diagonally and ventrally oss the postocular region to end near the angle of the jaws.

In the 9 adult females, the juvenile pattern is intensified in that the pattern sists of a pale nuchal band, followed by a dark-edged nuchal collar without ocelli, urn followed by 3 complete dark-edged body bands. The pale cephalic figure is arged at the expense of the dark pigmented areas, so that the head is now basically nquelineate: 1) a middorsal dark snout line; 2) a pair of dark canthal lines that end across the occiput and stop short of the anterior edge of the pale nuchal k-edged band; and 3) a pair of dark canthal-postocular lines. Extending from the ventrolaterally is a dark-edged pale line. Although juvenile and adult female d patterns may sound dissimilar, the adult pattern can be derived from that of juvenile by expansion of the pale cephalic U. The body bands are usually 3; they distinct and show little obliteration or fragmentation (see comments below, ever), and rarely are their right and left halves staggered. The posteriormost d may be somewhat less intense (AMNH 81367). The most exceptional of the

females is AMNH 94550 in which all postaxillary bands are fragmented and obscure, and the head pattern likewise shows additional dark pigment so that the head lines are less clear than in other females. The latter female is shown in Thomas and Schwartz, 1966a: fig. 21B; the usual female pattern is fig. 21A. Although 3 crossbands on the body is the customary number, one specimen has an irregular count of 4/5 due to incomplete fusions and staggering of the right and left band-halves. Dorsal photographic views of a female, male, and juvenile are shown in Schwartz, 1958: fig. 1.

Comparisons — No other similarly-patterned gecko occurs sympatrically with *S. intermedius*, so far as known. Juvenile *S. elegans* MacLeay are crossbanded. In fact for many years *S. intermedius* was considered to be a synonym of *S. elegans*, since it is generally similar to, but in actuality very different from, the *"S. elegans"* phase (= juvenile banded pattern) of *S. elegans*. Female *S. intermedius* are easily differentiated from female *S. nigropunctatus* and *S. torrei;* in the former, the cephalic pattern is much more simple and the collar and 3 body bands are usually ocellate, whereas in the latter there are only 2 body bands and the head pattern is simple and very distinct. Male *S. intermedius* are always boldly spotted with dark brown to black. Male *S. torrei* are never spotted or dotted. Male *S. nigropunctatus* (most especially true of *S. n. granti* which is closest geographically to *S. intermedius* but with a hiatus of about 300 km) may be spotted or patternless. Spotted male *S. nigropunctatus* can be differentiated from male *S. intermedius* in that the latter has remnants of a median snout line that is an elongate triangle and ends anterior to the interocular area.

Remarks — The series from Cueva de Rincón de Guanabo was taken from talus and rubble at the base of low limestone cliffs near the ocean. The specimen from 16.8 km NE Matanzas was secured from the leaf and stone rubble at the base of a small tree on an otherwise cleared and open beach. Most records for *S. intermedius* are coastal or near-coastal (Fig. 3). Barbour and Ramsden (1919) cited specimens of *"S. torrei"* from Cotorro and Camoa; it seems unlikely that these specimens represent *S. torrei;* probably they are *S. intermedius*, but we have been unable to locate them in either Cuban or American collections.

Specimens examined — *Habana Province,* 3.2 km E Playa de Guanabo, Cueva de Rincón de Guanabo (AMNH 77759-63. AMNH 77765, AMNH 81367-71, AMNH 94264, MCZ 57450); *Matanzas Province,* Matanzas (UMMZ 78486, ANSP 163 16.8 km NE Matanzas (AMNH 94550); Playa de Allende (IZ 1141); Pinos de Cama (IZ 2261); Loma Fine, Cárdenas (IZ 3772); Sierra de Hato Nuevo between H Nuevo (Martí) and Sabanilla de la Palma (MCZ 12305, MCZ 13726).

Sphaerodactylus docimus new species[1]

Holotype — MCZ 8510, an adult female, from Cabo Cruz, Oriente Province, C collected by Thomas Barbour in 1913.

Paratypes — USNM 81670, Río las Puercas, Oriente Province, Cuba, P. Bar 29 August 1930; CAS 39299, same locality as holotype, T. Barbour, February, 191

[1]Garrido and Jaume (1984:100) used the name *"Sphaerodactylus epizemius"* Schwartz and Garrido. This action caused *nudum* to be created, since that taxon was to be described in the present paper. These authors gave only an informal des of the lizard without designating a holotype or any other type-material. In addition, the name is misspelled and is mean It seems preferable to bestow on this lizard an entirely new name (not merely the correct spelling of that used prev by Garrido and Jaume). We have done so accordingly here, and *S. "epizemius"* is to be considered a *nomen nudum* hereafte

Associated specimen — IZ 4620, Jutisí, Santiago de Cuba, Oriente Province, Cuba.

Definition — A Cuban species of *Sphaerodactylus* characterized by the combination of: 1) moderate size (females to 30 mm snout-vent length; males unknown); 2) dorsal scales small, granular to juxtaposed and swollen, rounded and slightly imbricate, very weakly keeled, 53-62 between axilla and groin; 3) scales around body at midbody 80-88; 4) 4 supralabial scales to mid-eye; 5) modally 1 (1-2) internasal scale; 6) escutcheon in males unknown; 7) males unknown; females (based on 3 specimens, all long preserved; but see Barbour and Ramsden, 1919:pl 2, fig. 1, where the holotype of *S. docimus* is erroneously stated to be the holotype of *S. torrei*) banded, the dark bands not obviously associated as edges of pale-centered crossbands but doubtless this is the case; apparently a pale nuchal crossband bordered anteriorly and posteriorly by dark edges, a dark band at the level of the forelimb insertion, plus 4 posterior dark bands, all probably representing the edges of 3 pale-centered crossbands; head pattern diffuse and not clear, but without a central dark snout line; a pair of dark canthal lines and pale remnants of a diagonal line from the eye toward the angle of the jaws; a vague occipital crossband. (Thomas and Schwartz, 1966a:21, examined 2 of the specimens of *S. docimus* and noted their resemblance to *S. intermedius*. They also pointed out that, despite the age of the specimens, they possessed the distinctive head pattern of *S. intermedius*, including the "double postocular stripes which are but faintly visible." This head pattern is no longer (1980) obvious but its former presence indicates an even closer relationship to *S. intermedius*).

Description of holotype — An adult female with a snout-vent length of 30 mm; tail missing; 57 dorsal scales between axilla and groin; 37 ventral scales between axilla and groin; midbody scales 84; fourth toe lamellae 9; supralabial scales to mid-eye 4/4; 1 internasal scale. Pattern: Head vaguely smudged with tan and no clear head lines or markings other than a canthal line on each side (see, however, comments by Thomas and Schwartz, 1966a, noted above); a vague dark occipital band, followed by 2 dark crossbands on the neck, the more posterior of these the wider; this in turn followed by a second dark band over the axillae (these latter 2 dark bands presumably the anterior and posterior borders of a pale collar); 4 diffuse dark body bands, presumably the remnants of anterior and posterior dark borders of 2 light-centered body bands; the most posterior portion of the dorsum with some dark marbling or dotting which probably represent the remnants of a third (sacral) band; a pale and slightly dark bordered line from the eye diagonally to the angle of the jaws.

Variation — The 3 adult females have snout-vent lengths between 26 mm and 30 mm; the associated specimen is a juvenile with a snout-vent length of 18 mm (see discussion beyond). Scale counts of the series of 3 specimens are: paramedian dorsal scales axilla to groin 53-62 ($\bar{x}$ = 57.3); ventral scales axilla to groin 34-44 (38.3); scales around body at midbody 80-88 (84.0); supralabial scales to center of eye 4; internasals 1-2 (M_0 = 1); fourth toe lamellae 9-12 (no mode).

The 2 paratypes do not differ in details of coloration (all appear to be somewhat faded) or pattern from the description of the species or the holotype. None shows any of the dark crossbands more clearly or boldly than the holotype, and a head pattern is non-existent except for the pale diagonal postocular line and the dark canthal lines. The general impression of *S. docimus* is that it is a stocky, broad-headed, and broad-snouted form.

Comparisons — Thomas and Schwartz (1966a:21) first pointed out the presence of

an *intermedius*-like sphaerodactyl in the Cabo Cruz region, far removed from th main body of that species in northern Habana and Matanzas provinces. They wer reluctant, however, to name this Oriente population, based on 2 old specimens. W have encountered a third lizard which is unequivocally associated with the form 2, and it seems pertinent to name this population, which has not been collected sin 1920, despite both authors having visited the Cabo Cruz region without securir additional specimens. Although Thomas and Schwartz suggested that the Cabo Cr lizards might best be regarded as subspecies of *S. intermedius*, (because of the the visible double postocular stripes), the differences between them, even in long pr served specimens, as well as the geographic hiatus between their ranges, sugges to us that *S. docimus* should be regarded as a full species. We can make no commen on possible color differences between *S. intermedius* and *S. docimus*. But they diff in that the pattern is more blurred in the latter. Dorsal scales are smaller (53-6 in *S. docimus* than in *S. intermedius* (45-56), with different means (57.3 versus 51.7 and there is no overlap of midbody scales (60-77 in *S. intermedius* versus 80-88 *S. docimus*), although there will doubtless be some overlap in this count with mo specimens of the latter species.

S. docimus is probably sympatric with *S. n. ocujal* (Fig. 2). That subspecies typical has 3 body bands which are ocellate with multiple ocelli, as well as an ocellate colla Although male *S. docimus* are unknown, they may be spotted (in which case th will be difficult to differentiate from local male *S. n. ocujal*) or they may be patter less. Although both *S. docimus* and *S. nigropunctatus* are apparently 3-banded, th presence of ocelli in the collar and body bands of the latter will distinguish the from non-ocellate female *S. docimus*. Female *S. torrei* have 2 body bands as well a distinctive vivid head pattern; we assume that female *S. docimus* in life a 3-banded, and that they lack a distinct head pattern.

Remarks — The single associated specimen is a juvenile. It is not from the Ca Cruz region; its locality is not mapped due to our uncertainty. Its basic pattern one of crossbands of which there seem to be 2 on the body (the specimen is rath poorly preserved) and there is a postocular dark stripe that is a continuation of t dark canthal line on each side, the 2 postocular lines joining via a dark bridge acr the occiput. We cannon associated this lizard with any other Oriente species a only tentatively place it here. Militating against its association with *S. docimus* the fact that the typical light diagonal postocular-jaw angle line is now not obvious.

The name *docimus* is from the Greek for "remarkable," an allusion to the existen of this *intermedius*-like species so far removed from its closest relative and to t fact that it has not been re-collected in nearly half a century despite visits by seve herpetologists and collectors to the Cabo Cruz region.

Sphaerodactylus ruibali Grant

Sphaerodactylus ruibali Grant, 1959b, Herpetologica, 15(1):53.

Type-locality — United States Naval Base, Guantánamo, Oriente Province, Cuba

Holotype — UIMNH 44145 (examined by authors).

Definition — A Cuban species of *Sphaerodactylus* characterized by the combinat of: 1) moderate size (males to ± 32 mm, females to 30 mm snout-vent length);

dorsal scales small, obtuse to rounded, only slightly swollen, smooth, moderately but uniformly imbricated, 40-64 between axilla and groin; 3) scales around body at midbody 62-82; 4) usually 4 (3-5) supralabials to mid-eye; 5) modally 1 (1-2) internasal scale; 6) escutcheon in males 5 – 10 x 11 – 28, the escutcheon scales often pigmented; 7) sexually dichromatic but relatively weakly so; males dorsally yellow-brown to gray with fine brown speckling or vermiculations, venter light gray, tail yellow above and below with fine dark mottling above; females dorsally tan to light brown with at least one pair of dark brown nuchal bands, the remainder of dorsum more or less tippled or speckled with brownish to dark grayish, tail dull yellow with some dark mottling or vermiculations; 2 small white sacral ocelli present or absent (by population) in both sexes; venter light gray, underside of tail dull yellow; iris color light gray or gray in life; head without a median dark stripe or interocular dark area but with a dark canthal stripe which continues as an inferior postocular stripe to level of ear where it meets with a dark transverse head stripe that passes behind ear; at times also superior postocular stripes for a short distance on top of head and these stopping before meeting transverse head stripe.

Variation — We have pointed out elsewhere (Schwartz and Garrido, 1974:338) that specimens of *S. ruibali* from west of the Bahía de Guantánamo differ from those taken from the east of that embayment. The western population is being named by Peter J. Tolson (MS), so that our description and comments below are sufficiently generalized to take into consideration both populations. Additionally, most specimens of the western population in the ASFS are badly dehydrated, so that our comments upon them are necessarily very limited. Although we have examined a series of 72 *S. ruibali,* of which 24 are from west of the Bahía de Guantánamo, of these 24, only 5 are in sufficiently good condition to allow us to make the full suite of counts and measurements.

Largest male ± 32 mm (UIMNH 44246 — holotype), largest females 30 mm (MCZ 67380, USNM 192677) snout-vent lengths; smallest juveniles (MCZ 68935, MCZ 145387, ASFS V15168) 14 mm snout-vent length. Scale counts from the series of 72 specimens are: paramedian dorsal scales axilla to groin 40-64 ($\bar{x}$ = 50.6); ventral scales axilla to groin 30-43 (34.5); scales around body at midbody 62-82 (71.6); supralabials to center of eye 3-5 (M_0 = 4); internasals 1-2 (M_0 = 1); fourth toe lamellae 9-12 (M_0 = 11); escutcheon 5 – 11 x 11 – 28.

Males are among the most drably patterned and colored of members of the *nigropunctatus* group. They are generally speckled brownish or grayish on a tan to gray ground; the heads are unlined except for a dark brown canthal stripe that is dull and inconspicuous (see illustration in Thomas and Schwartz, 1966a:fig. 19A).

Females are somewhat more boldly patterned (especially those from west of the Bahía de Guantánamo). Eastern females have a pair of dark brown nuchal bands which are presumably homologous to the edges of a pale nuchal band, although such a pale band does not occur in living *S. ruibali*), followed by a third dark brown band posterior to the forelimb insertions; the remainder of the dorsum is speckled or vermiculate with dark brown. The basic female head pattern consists of a dark loreal stripe which may continue as a temporal stripe posterior to the eye and which usuallly abouts against or joins the first of the nuchal dark crossbands, and a vague dark cephalic U from the eyes onto the occiput; there is no median snout stripe or dark interocular area. In females from west of the Bahía de Guantánamo, the dorsal pattern is banded with about 4 or 5 dark crossbands, these not enclosing pale areas

but rather having vague dark speckling or vermiculations beween them.

The juveniles are peculiar. Of 5 juveniles from east of the bay, 2 (MCZ 68934-35 are female-patterned dorsally with anterior nuchal banding; 3 others (MCZ 145386 88) are male-patterned dorsally and have the head and body uniformly stippled an without any band indications. Snout-vent lengths for the 5 juveniles vary betwee 14 and 16 mm. A single juvenile (ASFS V15168 — snout-vent length 14 mm) a well as a slightly larger specimen (ASFS V15822 — snout-vent length 20 mm) fro west of the bay, are female-patterned. Since sex in *Sphaerodactylus* can be ascertaine with certainly (without disection) only with the assumption of the adult patter with its concomitant development of the male escutcheon, we cannot be certain c the sex of these juveniles, but it seems likely that *S. ruibali* juveniles hatch wit the pattern of their respective sexes already evident. This is a most unusual situatio in that all other members of the genus have juveniles with female pattern (or wit a pattern radically different from adults of both sexes as in *S. elegans*), this patter becoming more obscure and ultimately replaced by the adult pattern in males an becoming more pronouced in adult females.

Comparisons — *S. ruibali* males are easily differentiated from males of all oth *nigropunctatus* group members in their absence of any definitive markings, eith on the head or body. The generally speckled or vermiculate dorsum and virtuall patternless head are in strong contrast to the situation in male *S. intermedius* i which the males are spotted with dark brown to black and have a dark median sno line. Male *S. docimus* are unknown. Female *S. ruibali* are not contastingly cros banded and lack the head patterns of female *S. intermedius, S. docimus, S. torr* or *S. nigropunctatus*. Although males of the last 2 species are or may be patternle dorsally, none of them is speckled or vermiculate.

Remarks — *S. ruibali* is now known from just west of the Bahía de Guantánam east to Baitiquirí (Fig. 4); all localities are coastal or nearly so. Thomas and Schwar (1966a) noted that specimens collected on the U.S. Naval Base were taken in "a exposed area where they were found under scattered rocks and in a rather thin a spotty covering of leaves." Grant (1959b) stated that the type-series had been collect in grassy hills at about 92 m elevation. Lando and Williams (1969:172) noted t taking of *S. ruibali* under demolished brick masonry near the ocean. More recent taken material by both of us confirms that *S. ruibali* is a xerophile; it is most readi encountered under human debris or rocks in xeric situations. It is sympatric wi *S. nigropunctatus* (which is a mesophile) and in part with *S. armasi,* which al appears to be a xerophile. *S. ruibali* and *S. armasi* occur sympatrically at Tortugi and overlap geographically between that locality and Imías. What the ecologi differences between the 2 species are in the area of sympatry remain unknow Likewise, the lack of specimens or records of *S. ruibali* further west than just w of the Bahía de Guantánamo on the Naval Base is extremely puzzling. In this lat area, *S. ruibali* is at least locally sympatric with *S. torrei* (on the U.S. Naval Bas *S. torrei* is a larger gecko and appears to inhabit more shaded (although still xe situations, such as coastal forests or ravines. It too, however, has been taken un human debris. In this general region also occur *S. notatus* and *S. elegans;* the lat species is most often encountered in edificarian situations and *S. notatus* is wi spread, occurring in both mesic and xeric areas.

Specimens examined — *Oriente Province,* U.S. Naval Base, west (leeward) sid

bay (ASFS V15043, ASFS V15168, ASFS V15757-58, ASFS V15737-38, ASFS V15755, ASFS V15773, ASFS V15821); Chapman Beach (ASFS V15671, ASFS V15739-44, ASFS V15769-70, ASFS V15822-24); Girl Scout Camp (ASFS V15767-68); 3.2 km W Leeward Point (USNM 192677); U.S. Naval Base, east (windward) side of bay (UIMNH 44246-68, MCZ 67380-81, MCZ 68733-35, ASFS V15826-29, ASFS V15161, ASFS V15701-05, UMMZ 110181); Windmill Beach (MCZ 141577-79); Sherman Ave. and Cable Beach Road (MCZ 145385-89; between Cable Beach and old lighthouse (MCZ 145384); Camp Bulkeley (ASFS V15830); Río Yateras (USNM 178921-22); Loma de Mocambo, between San Antonio del Sur and Imías (IZ 3513); Baitiquirí (IZ 3511-12).

Sphaerodactylus armasi Schwartz and Garrido

Sphaerodactylus armasi Schwartz and Garrido, 1974, Proc. Biol. Soc. Washington, 87(30):339.

Type-locality — Cabo Maisí, Baracoa, Oriente Province, Cuba.

Holotype — IZ 4089 (examined by authors).

Definition — A Cuban species of *Sphaerodactylus* characterized by the combination of: 1) moderate size (males to 28 mm, females to 30 mm snout-vent lengths); 2) dorsal scales small and almost granular, slightly keeled dorsolaterally, 45 to 60 between axilla and groin; 3) scales around body at midbody 62-89; 4) usually 4 (3-5) supralabials to mid-eye; 5) modally 1 (0-2) internasal scale; 6) escutcheon 3 – 11 x 6 – 21; 7) sexually dichromatic: males pale tan (as preserved) with very fine darker tan to brownish stippling, no lineate head pattern in full adults but 2 males with coarse brown to black head spotting, extending onto (but less dense) the throat; females brownish gray to tan dorsally, with a series of 5 pale bands which are derived from a series of anterior-to-posteriorly elongate pale ocelli that are fused with each other laterally, each band bordered anteriorly and posteriorly by dark gray to black edging, these bands scalloped or irregular to conform with the fused nature of the pale band-centers; a prominent pair of pale postsacral ocelli; head pattern lineate and complex, with a pair of canthal-postocular dark lines, these fusing with a dark occipital band, the canthal portion of this line often expanded so as to blacken the entire parietal region; occasional females have a vague dark occipital U included between the canthal-postocular lines; juveniles are patterned like females, but the pattern more regular and less diffuse.

Variation — Of the series of 18 specimens (7 males, 9 females, and 2 juveniles), the largest males have snout-vent lengths of 28 mm (IZ 4625, IZ 4615), the largest female (ASFS V28442) a snout-vent length of 30 mm; the smallest juvenile (IZ 4534) has a snout-vent length of 18 mm. Scale counts on the series are: paramedian dorsal scales axilla to groin 45-60 ($\bar{x}$ = 51.5); ventral scales axilla to groin 29-41 (34.4); scales around body at midbody 62-89 (72.7); supralabials to center of eye 3-5 (M_0 = 4); internasals 0-2 (M_0 = 1); fourth toe lamellae 7-12 (M_0 = 11); escutcheon 3 – 11 x 6 – 21.

Males are as described in the definition; they are relatively undistinguished and pale tan with fine darker tan to brownish stippling and without a distinct lineate head pattern. One male (IZ 4581 — snout-vent length 22 mm) shows a transitional stage between the female-patterned juvenile condition and the dotted or stippled

adult male condition in that crossbands are still vaguely indicated but are overlai (or fragmenting ?) by individual dots, and the interspaces between the dark band are likewise filling in with dark dotting; the escutcheon (7 x 21) indicates that thi is indeed a male. Two other males (IZ 4615 — snout-vent length 28 mm; IZ 4093 - snout-vent length 25 mm) have the heads spotted with very dark brown to blac spots in strong contrast to the balance of the dorsum which is dotted with dark ta and brownish; these 2 males likewise have scattered and random dark brown t black spots on the throats. Since 1 of these males is maximally sized for that se: we assume that the adult male condition involves very dark head spotting; the othe largest male (IZ 4625) shows no indication of the dark head spotting, nor do othe males with snout-vent lengths between 25 mm and 28 mm.

Females and juveniles show little variation other than that described for th species. The dorsal dark crossbands may be less distinct (IZ 4614), but the hea pattern remains regular and unobliterated; the presence of a pair of postsacral pa ocelli is typical of all females. The 2 juveniles (snout-vent lengths 18 and 20 mn are like the females except that the dorsal pattern is more diagrammatic.

Comparisons — No other species of the *nigropunctatus* group has males with heac (only) with very dark spotting and faint dorsal tan to brownish dotting on the dorsur Thus, male *S. ruibali,* with which *S. armasi* is presumably at least partially sympatri are easily distinguished since the former has no dark head pattern and the back stippled, flecked, or vermiculate with darker tan, rather than being discretely dotte Females are distinctive on the basis of having 5 dark bands with at least the nuch band showing many included and confluent ocelli; the same condition is obvious i all body bands in some specimens (ASFS V28142). The persistence of the posteri body bands in some female *S. armasi* resembles the complete body banding of fema *S. ruibali* from west of the Bahía de Guantánamo; but eastern *S. ruibali* have th posterior portion of the body bandless and thus are quite dissimilar from female *armasi.* Means of dorsal scales and midbody scales are higher in *S. armasi* than *S. ruibali,* and the ventral scale mean is slightly lower, but there is overlap in a counts. Modalities of other counts are identical. The same comments may be mac concerning scale counts between *S. armasi, S. intermedius,* and *S. docimus;* at lea *S. intermedius* reaches a larger size than *S. armasi. S. intermedius* females are muc more vividly banded than are female *S. armasi* and have a much more complex hea pattern. Females of *S. torrei* and *S. nigropunctatus* are vividly crossbanded and ha patterned lineate heads. Male *S. nigropunctatus* are either patternless unicolor preserved) or are spotted dorsally; male *S. torrei* are never spotted and are pla (unicolor in preservative). *S. armasi* is not known to be sympatric with either these 2 species, but if they occur together there should be no problem in distinguishi them.

Remarks — *S. armasi* is known only from the extreme southeastern Oriente coa from Tortugilla (where it is apparently sympatric with *S. ruibali* which it seems outnumber there) east to Cabo Maisí (Fig. 2). This region is extremely arid, so seems obvious that *S. armasi* is a xerophile. The type-series was taken in associati with the xerophyte *Agave. S. armasi* is sympatric also with *S. notatus;* the 2 speci are easily distinguished on the basis of different pattern (*S. notatus* is not bande and scale size (*S. notatus* has much larger and imbricate scales in contrast to t granular scales of *S. armasi*).

Specimens examined — Oriente Province, Cabo Maisí (IZ 4089, IZ 4093-94, NMC 15849, ASFS V28442-43); Imías (IZ 4534, IZ 4623-25); Tortugilla (IZ 4532, IZ 4579-83, IZ 4613-15).

Discussion

In the introduction, we suggested that the members of the Antillean *nigropunctatus* group of geckos might be profitably divided into 2 complexes: 1) the *nigropunctatus* complex (including *nigropunctatus, torrei, alayoi,* and *cinereus*), and 2) the *intermedius* complex (including *intermedius, ruibali,* and *armasi*). Since we have modified the status of *alayoi* and described *S. docimus* in the present work, we regard the *nigropunctatus* complex as being composed of *nigropunctatus, torrei,* and *cinereus,* and the *intermedius* complex by *intermedius, docimus, ruibali* and *armasi.*

All members of the group inhabit Cuba with the exception of *S. cinereus;* this species is known only from the Haitian portion of Hispaniola (Thomas and Schwartz, 1966a:20) despite apparently suitable conditions elsewhere. Additionally, all records of *S. cinereus* are from the historical Hispaniolan north island (*sensu* Williams, 1961) and the Haitian Cul de Sac plain that now separates the two paleoislands.

All Cuban members of the group occur in Oriente Province with the exception of *S. intermedius* which has a limited distribution along the northern coast of Habana and Matanzas provinces. In fact, with the exception of *S. nigropunctatus,* all other species are limited to Oriente Province itself. *S. nigropunctatus* not only extends into northern Camagüey Province at least as far west as Cayo Coco, but also occurs in the Bahama Islands where it is widespread on the islands of the Great Bahama Bank, the Cay Sal Bank, and Rum Cay (which lies adjacent to the Great Bank but on a bank of its own). Additionally, those species that occur only in Oriente Province often have very restricted distributions: *S. docimus, S. torrei* (with 2 distinctive subspecies that appear not to be in contact with each other), *S. ruibali,* and *S. armasi* all are very limited in geographical distribution. The only species that is widespread in Oriente and indeed widespread on Cuba is *S. nigropunctatus.* Its absence from the western half of Cuba is puzzling since the number of species of geckos in western Cuba (*S. notatus, S. elegans, S. scaber, S. oliveri*) would not seem to exclude *S. nigropunctatus* from that region. Assuming that *S. nigropunctatus* is a mesophile, then much of western Cuba would seem suitable for it; this is most especially true in that the distribution of two of the western and central Cuban geckos (*S. scaber, S. oliveri*) are themselves restricted; these 2 species are basically mesophiles also. The two remaining species (and these are the very species that are common not only in western Cuba but also in the east) are *S. notatus* and *S. elegans.* Both are common and have wide ecological tolerance, from shaded mesic forest to xeric beaches and open areas. Both also occur in Oriente.

Thomas and Schwartz (1966a) suggested that the small-scaled forms of *phaerodactylus* are more primitive than the large-scaled species. In this statement they were following Barbour (1921) and King (1962). We find no reason to dispute this assessment of intrageneric phylogenetic trends. If this is true, then the *nigropunctatus* group is, because of its small scales, a primitive group. So likewise is *S. elegans,* whose relationships are probably close to the *nigropunctatus* group, but which, because of its peculiar (not only for the group but also for the genus) ontogenetic pattern and color change (from banded young to unicolor adults in both sexes), has not been included by us or others in the present group. The highly successful

Cuban *S. notatus* belongs to a group that centers in Hispaniola and Puerto Rico; in fact all Puerto Rican and most Hispaniolan *Sphaerodactylus* are members of this group. Since *notatus* group members are large-scaled, we can logically assume that they are advanced sphaerodactyls. If these assumptions are correct, then the *notatus* group has evolved on Hispaniola and Puerto Rico and has invaded Cuba with a single successful and island-wide species (*S. notatus*) and in addition has given rise to 2 other satellite species (*S. bromeliarum* Peters and Schwartz, *S. celicara* Garrido and Schwartz) in Oriente Province. *S. notatus* has also invaded the North American mainland where it occurs in southern Florida and the Florida Keys, and the Swan Islands in the western Caribbean, as well as both the Great and Little Bahama Banks (but not islands south of the Crooked Island Passage). There is a derived *notatus* group species (*S. inaguae* Noble and Hassler) on the island of Great Inagua and another (*S. underwoodi* Schwartz, related to Hispaniolan *S. difficilis* Barbour) on the Turks Islands. Other species of *Sphaerodactylus* south of the Crooked Island Passage seem not to be related to the *notatus* group. We emphasize all the above distributional data to show that the advanced members of the genus in the Antilles (namely, the *notatus* group) are very successful both in distribution and in species diversity throughout the islands.

We can contrast the situation of the more primitive members of the *nigropunctatus* group with that of the *notatus* group. Of the *nigropunctatus* group, only *S. nigropunctatus* has what might be considered a broad geographical distribution. But even it is absent from some areas (western Cuba) that seem suitable for it. All other species have in effect relict distributions, as if they have become increasingly restricted in the areas they occupy by more successful (advanced) species — in this case *S. notatus*. For some reason, *S. elegans* (which must also be considered primitive) has been unaffected by invasion of *S. notatus*. Although one has the feeling that *S. elegans* is often (not only in Cuba, but in Hispaniola, and Florida — where it has been introduced by man) closely associated with man and his works, still *S. elegans* is encountered with some frequency in non-urban situations. It may well be that *S. elegans* has benefited greatly from human activities on Cuba and Hispaniola; we are not implying that this species has been saved from extinction by human intervention, but rather that what might have been a precarious situation for *S. elegans* has been made less so through human activities. There seems little doubt that at least *S. torrei* has benefited from human intervention in Cuba (note our comments on the abundance of material for Santiago de Cuba and its immediate vicinity, in contrast to the number of specimens from elsewhere). This may be most especially true of those species that are xerophiles; in arid habitats (such as the southern Oriente coast) these small lizards must lead, in undisturbed areas, a difficult existence. The establishment of less rigorous situations (namely, the building of villages or towns or cities) would seem very beneficial to their success. One concrete example of this is the situation with *S. nigropunctatus* on the U.S. Naval Base. Thomas, Tolson, and the senior author all noted that *S. n. strategus* is very abundant in the mesic and well-watered nursery on the east side of the Bahía de Guantánamo, whereas elsewhere it is very much less common in arid areas. The existence of the Naval Base itself has been helpful in offering havens to those species that inhabit this hostile xeric zone, and the nursery has been even more beneficial for that 1 species (*S. nigropunctatus*) that is more mesic-adapted and less of a xerophile.

Let us first consider the 3 members of the *nigropunctatus* complex. Of them, *S.*

nigropunctatus is the most widespread in Cuba and has evolved 5 subspecies. Note that in the Bahamas, on those islands inhabited by *S. nigropunctatus*, the only other gecko occurring with it naturally is *S. notatus*. We are thus, in the Bahamas, dealing with 2-gecko islands, where one member of the pair is primitive and the other advanced. Co-existence is possible due primarily to the wide ecological tolerance of *S. notatus*. There is little doubt that the 2 species compete to some extent, since both are found in mesic situations there; but the size differences between Bahamian *S. nigropunctatus* and Bahamian *S. notatus* are rather striking — all Bahamian subspecies of *S. nigropunctatus* reach larger snout-vent lengths than do any of the Cuban species, and Great Bank Bahamian *S. notatus* is small compared with other *S. notatus* subspecies (Schwartz, 1966). Thus differences of overall size in the Great Bank geckos are intensified when compared with their relatives elsewhere.

If we consider *S. nigropunctatus* as the basal member of the group, then the 3-banded and ocellate pattern of females and unicolor or spotted males likewise must be considered the primitive condition. Gradual flattening of scales likewise can give us some clues to relationships within the group, and Thomas and Schwartz (1966a) noted the possible transitions of head patterns in females, with *S. nigropunctatus* having the most primitive pattern.

There seem to have been 2 lines of evolution from basal *S. nigropunctatus*. One of these includes band reduction to 2 bands (these bands very obvious and not fragmented or diffuse) and loss of ocelli. These conditions occur in *S. torrei* and *S. cinereus*. The greatly simplified head pattern on both these species is a reduction of the *S. nigropunctatus* head pattern. Not only do the 2 species resemble each other in female body pattern, but the male coloration likewise is very similar (see Ober, 1971, for a description of male *S. cinereus* in life). Thomas and Schwartz (1966a:24) noted that, of the Cuban members of the group, *S. torrei* has less keeled scales than any other, and that *S. cinereus* lacked keeling completely. The distribution of *S. torrei* suggests that it is a species that is becoming increasingly restricted in distribution, whereas that of *S. cinereus* suggests that it is a relatively recent adventive to Hispaniola from Cuba, and that it has not been able to compete successfully (in terms of a broad distribution) with already resident (more advanced) species. In general terms, the *torrei-cinereus* pair suggests lack of success, for 2 different reasons.

The second line of evolution from *S. nigropunctatus* is completely Cuban. Of the included members (*intermedius, docimus, ruibali, armasi*), *S. intermedius* retains the 3 body bands of *S. nigropunctatus* but has almost lost ocelli, although there are rarely ocellar remnants present in the collar. *S. docimus* seems closely related to *S. intermedius,* although its distribution is widely separated from the former; it too has (apparently) retained 3 body bands but has completely lost ocelli. *S. armasi* has 2 body bands (although the most posterior third body band is discernible), and it has retained ocelli (in fact, in some pattern details, *S. armasi* resembles *S. n. ocujal*). On the other hand, *S. ruibali* has lost body bands (as such) completely but has retained their dark edges to give (in females, most especially from west of the Bahía de Guantánamo) a dark crossbanded appearance. *S. ruibali* has also lost ocelli. We thus interpret the sequence of species in this evolutionary line as: *S. intermedius* and *S. docimus* as a primary dichotomy, with a secondary dichotomy (from *S. intermedius*) as *S. armasi* (the more primitive) and *S. ruibali* (the more advanced) of the 2 derived species. The relationships between *S. intermedius* and *S. ruibali,* although the female body patterns are very different, are affirmed by the resemblance between

the female head patterns. These are more complex and more like each other than those of any other *intermedius* complex members (or indeed any other *nigropunctatus* group members).

Since most of the species in the *intermedius* complex occur in southern Oriente Province, and *S. intermedius* itself occurs far removed from them along the northern Cuban coast in Habana and Matanzas provinces, we conclude that some pro-*intermedius* ancestor was once more widespread in central and eastern Cuba. With changing conditions (and competition from more advanced members of the genus ?), this widespread stock has been split into 2 fragments. One of these fragments led to modern *S. intermedius,* a species that has retained 1 primitive character (3 body bands) and has almost lost another (ocelli). The other fragment became restricted to the xeric southern Oriente coast, there to give rise to a sequential west-east series of species (*S. docimus, S. ruibali, S. armasi*). These 3 species are almost allopatric, except that *S. ruibali* and *S. armasi* occur sympatrically for a limited area east of the Bahía de Guantánamo between Tortugilla and Imías. Between them, these 3 species occur along the entire xeric southern Oriente coast with the exception of much of the region between Cabo Cruz and the Bahía de Santiago, and between the Bahía de Santiago and the extreme western edge of the Bahía de Guantánamo. It is precisely these 2 hiatuses that are filled by, in the first case, primitive *S. nigropunctatus,* and in the second, by divergent *S. torrei.* Thus, this entire southern coast has one or another species of the *nigropunctatus* group, whether it is a primitive basal member, a divergent member, or an advanced member. It is even more intriguing to note that in that area where 3 of the *nigropunctatus* group members occur sympatrically (the west side of the Bahía de Guantánamo), the advanced *S. ruibali* and *S. torrei* are more abundant than the primitive *S. nigropunctatus,* which here has a limited distribution between the Bahía de Guantánamo and the Río Guantánamo. Even in the artificial situation of a city (Santiago de Cuba), the more primitive *S. nigropunctatus* seems to be far less successful than the more advanced and divergent *S. torrei.* The only other geckos known from this coastal region are *S. notatus* and *S. elegans;* both are widespread and successful. All other Cuban sphaerodactyls occur either to the west (*S. scaber, S. oliveri*) or in the uplands of Oriente Province (*S. ramsdeni, S. celicara, S. bromeliarum*), in ecological situations that this southern coast does not afford.

The *notatus* group; *Sphaerodactylus ramsdeni*

By far the most diverse and widely distributed of the Antillean groups of *Sphaerodactylus* is the *notatus* group. In contrast to the *copei* group and the *nigropunctatus* group (see Schwartz and Garrido, 1981), the *notatus* group is only peripherally Cuban, although the type-species (*S. notatus* Baird) occurs on Cuba, as well as on the Bahamian Great and Little banks and the Swan Islands in the western Caribbean, and on the continental mainland in extreme southern Florida and the Florida Keys. Most species (16) in the group are Hispaniolan; these can be grouped together as the *difficilis* complex. Puerto Rico ranks second (11 species) and in fact all Puerto Rican *Sphaerodactylus* can appropriately be considered members of this complex, which may be termed the *macrolepis* complex. Only 3 species are Cuban (*S. notatus, S. celicara, S. bromeliarum*).

Although the above statements are basically true, it should be noted that the *difficilis* complex has invaded the southern Bahama Islands (Great Inagua) and the Turks Islands. Members of the *macrolepis* complex occur not only on Puerto Rico

also on Isla Mona and Isla Monito (*S. micropithecus*) in the west to the Lesser
illean island of St. Barthélémy in the southeast, including the Virgin Islands.
ıs the *notatus* group extends from the Swan Islands and Cuba in the west to St.
thélémy in the east. In reference to the listing of species below, we point out
t various authors (King, 1962; Shreve, 1968) have suggested that some (or at
es many) of the included forms that we consider species (in general following
wartz and Thomas, 1975) be regarded as subspecies of *S. notatus*. Such action
something to recommend it, but it tends to obscure basic affinities and places
)hasis on insular allopatry, which, *per se,* seems no absolute reason for considering
graphically vicarious forms to be included under 1 (or a few) species. Accordingly,
follow a more conservative course and consider each of the following taxa as full
ies. In many cases (where, for instance, taxa that were considered subspecies
heir describers) further collecting has shown that these populations are not
patric but are sympatric; the evidence for species-status is unequivocal.

he Cuban members of the *notatus* complex include *notatus, celicaras,* and
neliarum. The members of the Hispaniolan *difficilis* complex (including outlier
ılations) are: *difficilis* Barbour, *altavelensis* Noble and Hassler, *armstrongi* Noble
Hassler, *clenchi* Shreve, *cochranae* Ruibal, *cryphius* Thomas and Schwartz, *dar-
toni* Shreve, *inaguae* Noble and Klingel, *lazelli* Shreve, *nycteropus* Thomas and
wartz, *ocoae* Schwartz and Thomas, *omoglaux* Thomas, *randi* Shreve, *savagei*
eve, *streptophorus* Thomas and Schwartz, *underwoodi* Schwartz, and *zygaena*
wartz and Thomas. For comprehensive treatments of some members of this com-
, the reader is referred to: Shreve, 1968; Schwartz, 1968, Thomas and Schwartz,
7; and Schwartz and Thomas, 1977. A detailed evaluation of members of the
cilis complex is in Schwartz and Thomas, 1983.

ıe Greater Puerto Rican members of the *macrolepis* complex include: *macrolepis*
ther, *beattyi* Grant, *gaigeae* Grant, *klauberi* Grant, *levinsi* Heatwole, *micro-
ecus* Schwartz, *monensis* Meerwarth, *nicholsi* Grant, *parthenopion* Thomas,
evelti Grant, and *townsendi* Grant. Although Thomas and Schwartz (1966) con-
ed *nicholsi* and *townsendi* as subspecies, recent evidence (Murphy *et al.,* 1984)
ests that this is not the case.

om the abundance of Hispaniolan and Puerto Rican *notatus* group members and
)aucity of the number of associated species on Cuba, one can logically deduce
the Cuban members are relatively recently derived from (most probably) His-
ola. From Cuba, *S. notatus* has invaded the 2 major Bahamian banks on one
l, the Swan Islands on the other. Variation in *S. notatus* has already been
ıssed in detail by Schwartz (1966). One observation derived from that study is
very peculiar distribution of *S. notatus* on Cuba, at least as far as abundance is
erned. We have examined far more Cuban and Isla de la Juventud specimens
notatus (277) than did Schwartz (80). Yet the same comment still holds true:
)tatus seems to be far more abundant in eastern Cuba (Oriente Province) than
where. Considering, for example, the fact that the senior author visited the
ern and central provinces of Pinar del Río, Habana, Matanzas, Las Villas, and
agüey many times between 1954 and 1960, he secured only 1 *S. notatus* in Pinar
Río, 2 in Camagüey, and none in Las Villas, Matanzas, or Habana provinces.
n Oriente these lizards swarm in some localities (as at the type-locality of *S. n.
us*). They are not uncommon on the Isla de la Juventud. All this might be
rued as due to the vagaries of collecting; but it should be recalled that the area

of Habana Province (including the capital city) as well as the region about Soledad in Las Villas Province were favored collecting sites for many years by a variety of collectors, not only herpetologists but others, and still the representation of specimens from the region between Pinar del Río and Camagüey is extremely poor. The major exception to this statement is a series (of which we have examined 19) taken by Bruce B. Collette in the Bosque de la Habana in 1955. This series suggests that, under "favorable" conditions, *S. notatus* may be locally common in western and central Cuba. But other than this one long series, this region is represented by very short series or single specimens from isolated localities.

The Oriente situation is just the reverse. Each of us has collected specimens of *S. notatus* in extreme eastern Cuba. Additionally, we have examined material in American and Cuban collections, the latter including those lizards formerly in the Charles T. Ramsden collection. Although Ramsden lived in Santiago de Cuba and traveled between that city and its environs and the city of Guantánamo and its environs, his own long series of *S. notatus* exceeds that of any other Oriente species. Many of the Ramsden specimens (but by no means all) were taken at his home in Vista Alegre, a suburb of Santiago de Cuba. One has the impression that Ramsden's collecting was without bias and random; if such is the case, this truly suggests that *S. notatus* is more abundant in Oriente than elsewhere.

What is even more puzzling is that there seems to be no logical reason for the abundance of *S. notatus* in the east. Western and central Cuba are equally suitable for this ecologically very tolerant lizard. Western Cuba (including the apparently very ecologically suitable Sierra de los Organos-Sierra del Rosario massifs) has 2 known species of *Sphaerodactylus: notatus* and *elegans,* both of which are islandwide. The latter is often more easily encountered in edificarian situations, although it is not rare in non-edificarian areas. In central Cuba there are other species: *intermedius* along the northern Habana-Matanzas coast; *oliveri* in southern Las Villas; *scaber* in Las Villas and Camagüey; *argus* primarily along the southern coast of Las Villas to Oriente. But each of these has a relatively to very limited known distribution. We have already (Schwartz and Garrido, 1981) commented on 2 of these species. *S. intermedius* seems to be a relictual member of the *nigropunctatus* complex, and *S. oliveri* and *S. scaber* are Hispaniolan invaders of the *copei* group. At least *S. oliveri* has reached the Isla de la Juventud (at only 1 locality but with a well defined subspecies). *S. argus,* which we have not as yet discussed in detail but which has been treated by Thomas (1975), we interpret as a relatively recent natural adventive from Jamaica, the headquarters of the *argus* group. In summary, then, eastern Cuba in Oriente Province seems to be exceptionally rich in diversity of *Sphaerodactylus,* whereas the balance of Cuba suffers from a relative paucity of species. This of course may be an artifact of collecting, and there may well be local species there that remain to be discovered; the large number of Hispaniolan *Sphaerodactylus* (not only including the *notatus* but also other groups) has been recognized only recently, with more intensive search for these small lizards. Yet many of the newly discovered Hispaniolan species are not rare — they simply occur in regions which had seldom been visited. One might also argue that Hispaniola is more ecologically diverse than Cuba (although Cuba is much the larger island). This point is debatable. Certainly there are higher mountains and lower deserts in Hispaniola than in Cuba, and there are more relatively isolated mountain ranges and lowland xeric areas than occur in Cuba. Also, Hispaniola has been historically 2 islands (Williams, 1961), and this

may help account for the species diversity on that island. But western and central Cuba are far from uniform either ecologically or physiographically, and this region offers what would appear to be a background against which *Sphaerodactylus* could have diverged into a greater number of species than is presently known. What seems most likely is that there remain to be discovered, in western and central Cuba, a relatively large number of species of *Sphaerodactylus*. These may be local or ecologically or geographically very restricted. To invoke competitive exclusion by the very successful *S. elegans* in this region as the sole (or even major) reason for the lack of species diversity of *Sphaerodactylus* and the apparent rarity of *S. notatus* in this region is implausible.

Most members of the *notatus* group are extra-Cuban, as noted above, and the group is extremely large, containing 30 Antillean species. Consequently the definition of the *notatus* group is not so easily stated as are those of the *copei* and *nigropunctatus* groups. Still, there is a community of characteristics that seem to ally these species with each other. The group may be defined as follows: 1) size tiny (maximum adult snout-vent length 17 mm in males, 18 mm in females; *S. parthenopion*) to large (39 mm in males, 38 mm in females; *S. roosevelti*); the mean maximal size for all species is 29 mm in males and 30 mm in females; 2) dorsal scales large, keeled, tectiform, imbricated, 16 to 48 between axilla and groin, and without a middorsal zone of small granules; 3) dorsal scales usually with hair-bearing organs only (exception: some subspecies of *S. macrolepis* which have both hair-bearing and knob-like scale organs); 4) gular, chest, and ventral scales variable within the group, from all scales smooth (*S. savagei, S. cryphius*) to all scales keeled (*S. klauberi*); most species have the gular scales keeled, either as the regular condition, or as an occasional variant; if the gular scales are keeled, additionally there may be some keeled scales on the chest; the ventral scales are cycloid; 5) 31 to 71 scales around body at midbody; 6) internasal scale usually 1 (major exception: *S. klauberi* which modally has 3 internasals); 7) supralabial scales to mid-eye usually 3; 8) escutcheon extremely variable, from small, central, and patchlike and not extending along the ventral surface of the thighs to the knee, to much broader (= extending to behind or near knee) than long; 9) sexual dichromatism usually very pronounced; 10) males unicolor to vaguely or even prominently lined longitudinally, with or without a dark (brown or black) scapular patch and included 1 or 2 pale (white or pale gray) ocelli, the patch often absent and the ocelli reduced or barely discernible as part of the dorsal overall dotting or ocellation; 11) females usually with a bold dark scapular patch and included ocelli, the ocelli at times lying peripheral to the patch, the patch at times outlined with pale color, or both patch and ocelli reduced or absent completely (*S. clenchi, S. cochranae, S. nycteropus, S. underwoodi, S. zygaena, S. beattyi, S. parthenopion*); 12) ontogenetic variation absent, with juveniles having the adult female pattern.

Our division of the *notatus* group into 3 complexes (*notatus, difficilis, macrolepis*) is one of convenience. It is based primarily upon the major islands (Cuba, Hispaniola, Puerto Rico) upon which the constituent members of each complex occur. Hispaniola, with the largest number of *notatus* group species, would seem the logical candidate for the center of evolution of the group, with 2 species (*S. inaguae, S. underwoodi*) having reached the southern Bahama Islands. On the other hand, the fact that all Puerto Rican geckos are members of the *notatus* group might suggest that the *notatus* group evolved there and subsequently invaded Hispaniola and then Cuba. It seems

most probable to us that the *notatus* group evolved on Hispaniola, and thence invaded Puerto Rico (which presumably had no resident species of *Sphaerodactylus,* thus allowing a major Puerto Rican radiation).

On Hispaniola itself, the fact that this island represents a fusion of 2 paleoislands (Williams, 1961), as well as the great ecological and physiographic diversity, may well account for the large number of species there. The Hispaniolan species range from extreme xeric lowlands (*S. cryphius, S. omoglaux, S. randi*) to species in the high mountains (*S. armstrongi, S. darlingtoni*), although altitudinal and ecological requirements may not be so strict as this statement implies. Additionally, the 16 Hispaniolan species (excluding *S. inaguae* and *S. underwoodi* in the Bahamas) are equally divided between the north island (*S. difficilis, S. clenchi, S. cochranae, S. darlingtoni, S. lazelli, S. ocoae, S. savagei, S. williamsi*) and the south island (*S. altavelensis, S. armstrongi, S. cryphius, S. nycteropus, S. omoglaux, S. randi, S. streptophrous, S. zygaena*); this is all the more intriguing since the north island is much larger (60,250 versus 17,000 km^2) than the south. Although we have categorized the above species as to their affinities (north or south island), we wish also to point out that some of them (*S. difficilis, S. altavelensis*) have invaded the other paleoisland. Of the entire *difficilis* complex on Hispaniola, *S. difficilis* itself has the broadest geographical distribution. Schwartz and Thomas (1983) proposed an evolutionary sequence within the *difficilis* complex, and Thomas and Schwartz (1966b) suggested a phyletic sequence in the Puerto Rican members of the *macrolepis* complex.

In both the *difficilis* and *macrolepis* complexes, there are species with extremely circumscribed known distributions. *S. roosevelti* in Puerto Rico is limited to the extreme southwestern portion of that island, for example, whereas *S. macrolepis* is not only virtually islandwide but also occurs throughout the Virgin Islands and as far south in the Lesser Antilles as St. Barthélémy. In Hispaniola, several species (*S. cryphius, S. zygaena, S. randi, S. clenchi, S. cochranae, S. ocoae, S. omoglaux, S. savagei*) likewise are limited to very circumscribed areas. This sort of situation is all the more remarkable since there are but 3 *notatus* group species known from Cuba, 1 of which is islandwide and shows little differentiation, and the others are restricted to portions of Oriente Province and apparently occupy highly specialized niches. This fact, coupled with the diversity of *notatus* group members on Hispaniola and Puerto Rico, affirms that the major Cuban member (*S. notatus*) is a relatively recent arrival from (presumably) Hispaniola, and that it has not as yet had the opportunity to "spin off" satellite species in any quantity.

TAXONOMIC ACCOUNTS

Sphaeriodactylus notatus Baird

Sphaeriodactylus (sic) notatus Baird, 1858, Proc. Acad, Nat. Sci. Philadelphia, 11:254.

Type-locality — Key West, Monroe County, Florida, U.S.A.

Holotype — unknown.

Definition — A species of *Sphaerodactylus* occurring on Cuba, the Bahama Islands, the Swan Islands, as well as on the extreme southern continental mainland in Florida and on the Florida Keys, characterized by the combination of: 1) adult size from

small to large (24 mm to 34 mm snout-vent length); 2) dorsal scales large, acute, strongly keeled, imbricate, about 10 hair-bearing scale organs, each with 1 hair only, 18 to 38 between axilla and groin; 3) scales around body at midbody 31-55; 4) usually 3 supralabials to mid-eye (range 2-4); 5) modally 1 or 2 internasal scales (see below); 6) escutcheon in males 2 – 7 x 6 – 27; 7) sexually dichromatic: males either with or without heavy head spotting on a tan to yellow ground, females with the head distinctly trilineate brown on a paler brown to tan ground; a dark scapular patch with 1 or 2 pale ocelli variably present in some populations and subspecies; 8) ventral scales smooth.

Sphaerodactylus notatus atactus Schwartz

Sphaerodactylus notatus atactus Schwartz, 1966, Rev. Biol. Trop., 13(2):166.

Type-locality — 7 mi. (11.2 km) W Aserradero, Oriente Province, Cuba.

Holotype — AMNH 92820 (examined by authors).

Definition — A Cuban subspecies of *S. notatus* characterized by the combination of: 1) moderate size (males to 30 mm, females to 32 mm snout-vent lengths); 2) low number of dorsal scales (18-27) between axilla and groin; 3) low number of scales (31-49) around midbody; 4) scapular patch and ocelli almost always absent in both sexes; 5) male heads variably dotted dorsally and throats variably dotted, the highest incidence of both these characteristics in Oriente specimens; 6) dorsum in males usually not heavily spotted; in both sexes dorsum either salt-and-pepper or without distinctive darker markings, the dorsum some shade of brown.

Variation — We have examined a total of 276 *S. n. atactus* distributed as follows: Isla de la Juventud and Archipiélago de los Canarreos — 37; Pinar del Río, including the Cayos de San Felipe — 7; Habana — 28; Las Villas — 3; Camagüey — 19; Oriente — 182. Summarizing the variation in the entire lot, we have the following data: largest males, snout-vent length 30 mm (AMNH 78349, IZ 4723, IZ 4215, IZ 183; these are from, in the above sequence, Isla de Pinos, Camagüey, and the last 2 from Oriente); largest female, snout-vent length 32 mm (IZ 108 from Oriente). Dorsal scales in axilla to groin distance 18-28; the low count is from Habana Province, the high count from Pinar del Río Province. Ventral scales between axilla and groin 17-33 (both extremes are from the Oriente sample). Midbody scales 31-49 (low count from Camagüey Province, high count from Oriente Province). Fourth toe lamellae 7-12; supralabials to eye-center usually 3/3 with occasional counts of 2/2, 2/3, 3/4, and 4/4; the greatest variation is in the long Oriente series. Internasals 0-3, the modes 2 in the west and on the Isla de Pinos, or 1 in the east. Escutcheon 4 – 7 x 7 - 26. Throat scales usually smooth but rarely keeled in Oriente specimens; chest scales smooth but very rarely keeled in Oriente specimens; ventral scales smooth.

Dorsum of both sexes some shade of brown, with or without scattered dark scales (= salt-and-pepper). Head of males trilineate in subadults (or even occasionally in adults), the pattern usually disappearing and replaced by dark dotting or spotting, this apparently also in turn disappearing to give a patternless head in fully adult males, the color often yellow or yellowish. Female dorsa like males, but head pattern persistently trilineate, although at least one large female (30 mm; AMNH 78345) from Camagüey Province shows increased interline pigment and dissolution of the

basic trilineate pattern. Scapular patch and included ocelli (1 or 2) usually absent but of most frequent occurrence in specimens from Oriente Province.

It is most pertinent to discuss the sample of *S. n. atactus* in reference to the areas from which the lizards were collected. Although these are artificial divisions, in that we have used provinces as boundaries for this discussion, there is an advantage in that the provinces are arranged in a west to east sequence and thus any trends along the length of Cuba (and the Isla de la Juventud) should be apparent. The reader should also keep in mind the fact that some critical areas (Pinar del Río, Habana, Las Villas, and Camagüey provinces) are represented by relatively few specimens, especially when compared with our long series from Oriente Province; thus, means and extremes of counts from many of the provinces are much less reliable than are those from Oriente.

Means of dorsal scales between axilla and groin vary from 20.4 (Habana) to 23.2 (Isla de la Juventud). Means of ventral scales between axilla and groin vary from 23.2 (Pinar del Río) to 28.1 (Camagüey). Means of midbody scales vary from 35.0 (Habana) to 43.3 (Camagüey). In the case of midbody scales, there seems to be a cline from low counts and means in the west and central portions of Cuba, and high counts and means in the east. The Isla de la Juventud mean, however, is high (40.4), thus reversing the trend. Fourth toe lamellae means vary from 8.9 (Habana) to 9.8 (Camagüey); the modal number of fourth toe lamellae is 9 on the Isla de la Juventud and in Pinar del Río Province. In Habana Province there are bimodes of 9 and 10, and in Camagüey and Oriente provinces, the mode is 10 (insufficient material from Las Villas Province to determine a mode). Thus, western and Isla de la Juventud specimens appear to have less fourth toe lamellae than do eastern specimens.

Supralabials to eye-center are always modally 3/3, although other counts occur randomly, with the broadest variation in the long Oriente series (from 2/2 to 4/4). The number of internasals varies between 0 (nasals in contact) to 3; of the entire series of *S. n. atactus,* only 2 specimens (1 from the Isla de la Juventud, 1 from Oriente) have 3 internasals. Absence of internasals occurs in Habana, Camagüey, and Oriente samples, the latter having the highest incidence (19 of 175 specimens). Thus, all samples have either 1 or 2 as the modal internasal condition, and this is indeed correlated with geography. In the west on the Isla de la Juventud and in Pinar del Río Province, the mode is 2 internasals, 64% in the former case, 71% in the latter. (Of little significance is that the Las Villas sample has a mode of 2; recall that there are only 3 Las Villas specimens, of which 2 have 2 internasals.) In Habana (72%), Camagüey (74%), and Oriente (78%), the mode is 1 internasal. One other interesting fact concerning internasal number is that it seems somehow correlated with both the Isla de la Juventud and other offshore islands; thus, 17 or 27 Isla de la Juventud specimens, 6 of 9 Archipiélago de los Canarreos specimens, 3 of 4 Cayos de San Felipe specimens, 2 of 2 specimens from cay west of La Habana, 2 of 6 Cayos de los Ballenatos specimens, and 1 of 1 specimen from the Jardines de la Reina, all have 2 internasals. Although the samples are of very unequal sizes, the frequency of 2 internasals varies from 62% on the Isla de la Juventud to 100% on the Jardines de la Reina (Cayo Anclitas) and on the cay west of La Habana; both the 100% samples are very small, but still they re-enforce the tendency for lizards from offshore islands or islets to have 2 internasals.

The escutcheon in males has a length of 4 to 7 scales and a width of 7 to 26 scales; the lateral extensions of the escutcheon extend to just proximal to the knees, and

those specimens with more compact escutcheons (= lower width counts) are subadults, in which the escutcheon is not fully developed and does not extend so far as in the adults.

Throat, chest, and ventral keeling is easily dismissed in specimens from the Isla de la Juventud, Pinar del Río, Habana, Las Villas, and Camagüey provinces; in the this entire area, these scales are regularly smooth. It is only in Oriente that specimens depart from the condition elsewhere. Of 118 Oriente specimens, 109 are like more western material in having all scales smooth. However, 8 lizards have some keeling or have well keeled scales on the throat, and 1 specimen has both throat and chest scales keeled (although ventrals are smooth). These specimens with keeled throat scales come from a relatively circumscribed area in eastern Oriente; localities include: Siboney; Hoyos de Sabanilla; base of Monte Iberia; shore of Río Duaba, Baracoa; Cananova, Sagua de Tánamo; bank of Rio Catañas, E of Moa; Loma de los Ajos, Cayo del Rey, Mayarí; road to La Gran Piedra. The specimen (IZ 3914) with keeled throat and chest scales is from Baracoa. The material from the above listed localities is not extensive (the maximum number of specimens does not exceed 10 in any case). The throat keeling is not constant at Siboney or Loma de los Ajos, where some specimens have keeled and other unkeeled throat scales. Still, the distribution of this variant is relatively compact. But there are a very large number of Oriente *S. notatus* that lack any indication of throat keeling. Some of the above lizards have been described as *S. celicara* (Garrido and Schwartz, 1982), but others remain as puzzling *S. notatus* with keeled ventrals.

Comparisons — *S. n. atactus* can easily be distinguished from all other Cuban *Sphaerodactylus*. It lacks the longitudinal zone of middorsal granules typcial of *S. scaber* and *S. oliveri* and has much larger dorsal scales than all other species. In addition, it is patterned like no other Cuban species, nor does it show the ontogenetic change in coloration and pattern of *S. elegans*.

Remarks — Schwartz (1966) noted the differences between the material he examined from the Isla de la Juventud (13 specimens) and the Archipiélago de los Canarreos (8 from Cayo Avalos, 1 from Cayo Cantiles). We have not seen additional material from the Archipiélago but have examined much more material from the Isla de la Juventud (37 specimens). We are still undecided as to the status of these specimens. The major way that they differ from Cuban specimens is the high incidence, as we have already pointed out, of 2 internasals. But this difference, in the absence of any other pattern or scale characteristics, makes us reluctant to separate these specimens from *S. n. atactus*. If one were to do so, then the Pinar del Río *S. notatus* (of which we have seen only 7) would have to be included with the Isla de la Juventud material, since they too, of mainland Cuban lizards, have a mode of 2 internasals, in fact a higher incidence of this condition (71%) than do Isla de la Juventud and Archipiélago specimens together (64%). The sample sizes are small, however. Although nomenclatural association at the subspecific level of Isla de la Juventud and Pinar del Río material is not without precedent in some reptiles and birds, still in this instance we are reluctant to distinguish the Pinar del Río-Isla de la Juventud material at any level. Factors which might sway us in this direction are: 1) additional material from the Archipiélago de los Canarreos; 2) more material from Pinar del Río Province; and 3) color data from life on Isla de la Juventud and Archipiélago specimens.

Ecologically, *S. n. atactus* is an extremely tolerant lizard. Specimens have been taken in open beach situations under trash, in xeric coastal woods, and on dry offshore island and islets. On the other hand, these lizards do occur in mesic forests and other suitable upland situations where the necessary cover for diurnal retreats is available. The highest altitudinal record in Cuba is from the Sierra de Trinidad (458 m), but some other localities may be higher than this. The ecological tolerance of *S. notatus* is shown equally well in the Bahamas, where the 2 subspecies there (*S. n. peltastes* Schwartz, *S. n. amaurus* Schwartz) occur not only in open littoral situations but also in coppice (= lowland forest). Although encountered in cities (note the long series from Vista Alegre, a suburb of Santiago de Cuba), *S. n. atactus* is often collected in non-urban situations. It seems not to be so confirmedly an urban lizard as *S. elegans*.

Due to its lack of ecological specificity, *S. n. atactus* has been collected sympatrically (and at times syntopically) with almost all other Cuban species of *Sphaerodactylus*. On the Isla de la Juventud at Punta del Este, the senior author collected both *S. n. atactus* and *S. o. storeyae* in the same pile of rocks. In Santiago de Cuba, it occurs with *S. elegans* and doubtless this is the case elsewhere in urban centers. In southern Las Villas near Soledad and in the Sierra de Trinidad, it occurs with *S. n. oliveri,* and near the Sierra de Najasa in Camagüey Province, with *S. scaber*. On the Jardines de la Reina it occurs with *S. argus,* and on the U.S. Naval Base in Oriente, with *S. torrei, S. ruibali,* and *S. nigropunctatus*. At Punta Maisí in Oriente, *S. n. atactus* is syntopic with *S. armasi;* both were taken under dead leaves of *Agave*. At Los Hondones in Oriente, the species occurs with *S. ramsdeni* and very near the only record of *S. bromeliarum* on El Yunque de Baracoa. There are no records for *S. n. atactus* from the ranges of *S. intermedius* or *S. docimus,* although it doubtless occurs in both areas.

Specimens examined — Isla de la Juventud, no other locality (CM 993); Nueva Gerona (IZ 4150, KU 55140); Sierra de las Casas, just W Nueva Gerona (AMNH 78347-49); Sierra de las Casas, east base (AMNH 81375-77); 1.6 km SSW Neuva Gerona, east base, Sierra de las Casas (AMNH 81372); Sierra de las Casas (IZ 4277, MCZ 11195-98); El Abra, Sierra de las Casas (IZ 4149, IZ 4468); La Victoria, Sierra de la Cañada (IZ 4275); La Cañada (IZ 4710); Paso de Piedras, *ca.* 20 km SSW Santa Fé (AMNH 78346); Punta del Este (AMNH 81373-74, IZ 3996); Cueva #6, Punta del Este (IZ 4276); Hato Nuevo, near Cerro Caudal, 6 km W Punta del Este (IZ 4728); Cocodrilo (IZ 4711-12, IZ 4729); *Archipiélago de los Canarreos,* Cayo Avalos (USNM 81767-74); Cayo Cantiles (USNM 81775); *Pinar del Río Province,* Guane (MCZ 10914); 12.2 km E Isabel Rubio (AMNH 78343); San Diego de los Baños (MCZ 7919); *Cayos de San Felipe,* Cayo Real (ASFS V20466-67, IZ 2993, IZ 2998); *Habana Province,* Marianao (UMMZ 78488, USNM 194176-80, USNM 194183-84, USNM 194186-87, USNM 194200-10); El Laguito, Marianao (IZ 1144); Reparto Alta Habana (IZ 1145); Chávez (IZ 89); Cuabales de Campo Florido (IZ 4329); Nazareno (IZ 45); cay W of channel, La Habana (USNM 81764-65); *Las Villas Province,* Soledad (MCZ 7920); electric plant, Sierra de Trinidad, 458 m (MCZ 19902, MCZ 19904); *Camagüey Province,* 19.2 km E Morón, Loma de Cunagua (AMNH 78344); Finca Santa Teresa, 9 km W Camagüey (MCZ 57319, MCZ 57346-52); Finca El Porvenir, Loma de la Yagua, 24 km SW Camagüey (AMNH 78345); Loma de San Martín, km 18, A. Rodríguez (IZ 4723-24); Cayos los Ballenatos (IZ 4731-32, IZ 4740-44); *Jardines de la Reina,* Cayo Anclitas (IZ 3172-73); *Oriente Province,* near San Ramón, W of Cam-

pechuela (MCZ 59317); Uvero (IZ 3719); coast S of Pico Turquino (MCZ 147351); 11.2 km W Aserradero (AMNH 92812-20); Los Borreros, near Charco Mono (IZ 87); Puerto Boniato (IZ 116, IZ 3460, IZ 3709); El Modelo, El Caney (IZ 55); Santiago de Cuba, Vista Alegre (ASFS V44935-41, IZ 41, IZ 53-54, IZ 61-62, IZ 65, IZ 67-73, IZ 75, IZ 78-79, IZ 82, IZ 85, IZ 90, IZ 92, IZ 97, IZ 102, IZ 215); Siboney (IZ 63, IZ 125, IZ 131, IZ 134, MCZ 13449-59); Santa María de Loreto, Ti Arriba (IZ 74, IZ 83, IZ 86, IZ 98, IZ 210); La Rosita, "Los Cuyos," Ti Arriba (IZ 137, IZ 166); Cupeycito woods, near Bayamo (IZ 93); Los Negros, Jiguaní (MCZ 8542, UMMZ 90629); Loma de los Ajos, Cayo del Rey, Mayarí (ASFS V44944, IZ 183); Cayo del Rey, Sierra de Nipe (MCZ 45701); San Benito, N of Alto Songo (IZ 94); La Isabelita de Ramsden, Alto Songo (IZ 163); Bayate (IZ 108, IZ 111, IZ 152, IZ 158-59); Guantánamo (IZ 146, IZ 151, IZ 160-61, IZ 189); Tiguabos (IZ 99, IZ 114); Monte Líbano (MCZ 8513); near Novaliches (IZ 135, IZ 142); El Toro, S of Guantánamo (IZ 88); El Güiro, SE of Guantánamo (IZ 123, IZ 129, IZ 132, IZ 136, IZ 138-39, IZ 141, IZ 143, IZ 145, IZ 149); Mt. Toro, La Victoria, Guantánamo (IZ 126); road to Cerro de Guayabo (IZ 122, IZ 156); U.S. Naval Base, Bahía de Guantánamo (MCZ 67378-79, MCZ 68730-31, MCZ 68929-30); Los Hondones (IZ 150); San Carlos (IZ 110, IZ 112, IZ 117-20, IZ 144, IZ 147, IZ 154, IZ 157, IZ 161, IZ 181, MCZ 11060, UMMZ 90628); Montecito de San Carlos (IZ 121, IZ 124, IZ 128); Patana, costa sur, Baracoa (AMNH 17718); Baracoa (ASFS V44943, IZ 84, IZ 109, IZ 3914, KU 55166, USNM 42898, USNM 69337); shore of Río Duaba, Baracoa (IZ 3782); 9 km W, 3 km S Baracoa (AMNH 83601-02); Pozo Azul, Putiales de Canjetí (IZ 4626); road to Yumurí (IZ 4217); Bahía de Taco (AMNH 83746); Moa (IZ 4654); bank of Río Cabañas, E of Moa (MCZ 59318); Cananova, Sagua de Tánamo (IZ 127, MCZ 13460-62); Banes (BYU 17167-82).

Sphaerodactylus bromeliarum Peters and Schwartz

Sphaerodactylus bromeliarum Peters and Schwartz, 1972, Mitt. Zool. Mus. Berlin, 48(2):395.

Type-locality — western slope of El Yunque de Baracoa, above Tabajó, 15 km W Baracoa, Oriente Province, Cuba.

Holotype — ZMB 42827 (examined by authors).

Definition — A bromeliad-inhabiting species of Cuban *Sphaerodactylus* characterized by the combination of: 1) apparently moderate size (only 1 adult, a female, with a snout-vent length of 24 mm, known); 2) dorsal scales small, acute, strongly keeled, imbricate, 2 or 3 hair-bearing scale organs, each with 1 hair only, 36 to 41 between axilla and groin; 3) scales around body at midbody 56-58; 4) supralabial scales 3/3 or 4/4; 5) modally 1 internasal scale; 6) female medium brown with a more or less triangular black scapular patch with 2 small white ocelli; head trilineate with an isolated dark brown line from behind the snout to the occiput and a pair of lines from the lores through the eye across the temples to above the forelimb insertion; tail brown, slightly paler than dorsum, with a black tip, followed by a broad white band, and, in turn followed by a narrow black band, these tail features forming complete rings about the tail tip; 7) ventral scales keeled, chest scales slightly keeled laterally.

Variation — Only 2 specimens (the presumably adult female holotype and a juvenile with a snout-vent length of 19 mm) of *S. bromeliarum* are known. Combined data for these 2 specimens are: dorsals between axilla and groin 36-41; ventrals between

axilla and groin 33-34; midbody scales 56-58; supralabials to eye-center 3/3 or 4/4; internasal 1; throat scales smooth, chest scales smooth but slightly keeled laterally; ventral scales keeled; a dark triangular patch and 2 included white ocelli present; tail with tip white surrounded by black on both sides and (in the juvenile) with 2 additional more proximal white dorsal caudal dots.

Comparisons — Obviously, comparing *S. bromeliarum* with *S. notatus* is made extremely difficult because of the very few specimens of the former in comparison with the long series of the latter. That the 2 taxa are distinct we have no doubt. The keeled ventrals and high number of midbody scales (56-58 versus 31-50 in *S. n. atactus*) both serve as immediate recognition marks for the species. Although the white-and-black marking at the tail tip of *S. bromeliarum* is probably quite specific, it should be noted that a similar pattern occurs on the tail tip of juveniles of many species of the *notatus* group, where the tail is tipped with black, followed by a white band. If the original tail is retained into adulthood, adults retain the juvenile markings. This is very rarely encountered in adults of other species, since *Sphaerodactylus* practice caudal autotomy. It is possible that the very distinctive tail markings present in both specimens of *S. bromeliarum* are typical of juveniles and are retained in adults, provided there has been no tail loss during growth. Certainly no *S. n. atactus* adults regularly have this character, and it will serve well as an indicator to re-enforce identification of an adult specimen as *S. bromeliarum.*

No other Cuban species of *Sphaerodactylus* needs comparison with *S. bromeliarum;* the characteristics noted previously for distinguishing *S. n. atactus* from its Cuban congeners serve equally well for differentiation of *S. bromeliarum.*

Schwartz and Thomas (1975) recorded *S. bromeliarum* from Monte Iberia, Oriente Province; the 3 specimens we have examined herein from the base of Monte Iberia are referable to *S. celicara.*

Specimens examined — Oriente Province, western slope of El Yunque de Baracoa, above Tabajó, 15 km W Baracoa (IZ 3519, ZMB 42827).

We include here the account of *S. ramsdeni* Ruibal. This species has been very poorly known, and its affinities with other Cuban (or even Antillean) geckos remain very uncertain (see below). Since it may be a member of the *notatus* group, we include it here. As we point out in the discussion, it may indeed be more closely related to the primarily Jamaican *argus* group; thus we might better have included it with our discussion of *S. argus* Gosse in Cuba.

Sphaerodactylus ramsdeni Ruibal

Sphaerodactylus ramsdeni Ruibal, 1959, Herpetologica, 15(2):89.

Type-locality — Monte Líbano, Guantánamo, Oriente Province, Cuba.

Holotype — MCZ 8536 (examined by authors).

Definition — A Cuban species of *Sphaerodactylus* characterized by the combination of: 1) moderate size (males to 29 mm, females to 30 mm snout-vent lengths); 2) dorsal scales small, more or less granular and smooth to very slightly keeled and only barely or not at all imbricate, usually no (occasionally 1 hair-bearing) scale organ, 41-57 between axilla and groin; 3) scales around midbody 50-65; 4) modally 2 enlarged supralabials to mid-eye (less commonly 3); 5) 3 to 5 (mode 3) internasal scales; 6)

escutcheon in males 5 – 6 x 13 — 22, varying from small and compact to (in fully adult larger males) extending almost to behind the knees; 7) sexually dichromatic but very weakly so: males uniform very dark brown (chestnut) dorsally, with a pale buffy or beige loreal-postorbital line on each side and a buffy or beige diagonal line from the eye toward the angle of the jaws, the upper pale line at times continuing posteriorly over the anterior quarter of the body and bordered above by a vague darker line that is barely distinguishable from the dorsal ground color; a single tiny buffy median occipital ocellus, outlined in dark brown, at times present; a pair of brown sacral lines, outlined with darker brown, beginning just anterior to the hindlimb insertion and continuing onto the base of the tail, these lines and the entire figure often obscured completely; females colored like males and with the male sacral pattern, but head pattern somewhat more complete, composed of a beige occipital pale U, often with a single pale median occipital ocellus present but more or less continuous on either side with the occipital pale U; anterior pale stripes present as in males but at times more or less continuous along the dorsolateral portions of the trunk and joining with the pale sacral lines, the entire complex outlined with darker brown; some specimens have only a single pale occipital ocellus plus remnants of the cephalic U or appear (as preserved) to have no pattern whatsoever; 8) throat, chest, and ventral scales all smooth and cycloid.

Variation — The series of *S. ramsdeni* comprises 6 males and 6 females. The largest male (IZ 249) has a snout-vent length of 29 mm, the largest females (MCZ 3536, ASFS V28451) 30 mm. The smallest individual (AMNH 83277) is not a juvenile and has a snout-vent length of 20 mm; it is a female. Scale counts on the entire series are: dorsal scales between axilla and groin 41-57 ($\bar{x}$ = 48.1); ventral scales between axilla and groin 20-37 (26.8); scales around body at midbody 50-65 (56.7); supralabials to center of eye 2/2 (7 individuals), 2/3 (1), and 3/3 (4); internasals 3 (6 individuals), 4 (5), and 5 (1); fourth toe lamellae 7-10 (M_0 = 9 – 50%); escutcheon 5 – 6 x 13 – 22.

The color and pattern variation is as described in the definition. There is an excellent drawing in Barbour and Ramsden, 1919:Pl. 3, Fig. 1, of the holotype (although these authors misapplied the name *S. nigropunctatus* Gray to the specimen). The drawing clearly shows the pale head stripes and 3 pale occipital ocelli; the 2 lateral occipital ocelli are barely discernible today (1984). They are, however, somewhat more apparent in another female (IZ 4727) collected in 1976, and in that specimen they are obviously associated with the posterior curvature of the occipital U and are part of that figure. Two specimens (AMNH 83276-77), both females and including the smallest individual, were very dark brown when collected and had no dorsal or dorsolateral markings whatsoever — they were simply patternless dark brown lizards.

Since so very little is known about the color and pattern in life of *S. ramsdeni,* it is valuable to quote in full the color notes taken by the junior author on a female (IZ 4727): "Color general castaño oscuro. Posee dos bandas inconspicuas de color canela (más claras que el fondo del color general), que corren paralelas a cada lado de la base de la cola, extiéndose como un centímetro hacia la base del rabo y otro unto por delante de las patas atrás, aunque mas visibles en el rabo. La cola con algunas escamas salpicadas del mismo color, y otras menos diseminadas por el cuerpo. A partir de la parte posterior del cuello y hacia toda la parte central del cuerpo en la zona lateral, existen unas dos escamas juntas de color más claro (beige o crema).

Presenta una especie de collarín que parte desde detrás de las orbitas y se hace más visibles antes de llegar a la nuca donde forma una especie do herradura. Iris castaño rojizo. Partes ventrales de un castaño amarillento más palido. Rostral de color caoba brillante."

Remarks — In very general terms, *S. ramsdeni* gives the impression of being a small dark lizard with a relatively elongate body and short limbs; when preserved specimens are intermixed with those of other small dark (= long preserved) Cuban sphaerodactyls (such as *S. notatus*), wherein no pattern or color are apparent, their bodily proportions immediately distinguish them. Identification of these specimens is readily confirmed by microscopic examination: the very small, almost granular dorsal scales, the multiple internasals, the relatively tiny supraorbital spine — all serve to assure that the specimens are indeed *S. ramsdeni.*

Most specimens have come from 2 general regions: the area about the type-locality, and the Sierra de la Gran Piedra, with more specimens from the former than from the latter locality. Thus *S. ramsdeni* seems to be confined to mesic forested upland localities in southeastern Oriente Province, although its distribution is almost surely more extensive than the few specimens suggest. The 2 AMNH specimens, collected by the senior author, were taken from a pile of rocks which had been used to fill a small (1 m x 1.5 m) depression adjacent to the ruins of the French plantation house of La Isabelica. The rocks were of small diameter (less than 20 cm) and were moss-covered and had obviously been there for some time; the pile and depression were beneath a dense cover of saplings and shrubs and were thus well shaded. IZ 4727 was collected by Felino González and Alberto Valdés under a rock on a limestone hill; 1 other specimen seen at this locality escaped.

We are extremely uncertain as to the affinities of *S. ramsdeni.* Ruibal (1959:89) compared it with the Jamaican *S. goniorhynchus* Cope and Puerto Rican *S. nicholsi* Grant. In many ways the species also resembles *S. klauberi* Grant from Puerto Rico (not only in very dark dorsal coloration but also in modally having more than 1 internasal scale, the "usual" condition in Antillean sphaerodactyls). But these 3 species are all, like *S. ramsdeni,* forest dwelling forms, and aside from their dark coloration, they show little community of similarities. It appears that the upland or lowland forest ecological situations select for a cryptic dark brown color and a (more or less) lineate body pattern, and that the supposed association of these species phyletically is an example of convergence. On the other hand, it is possible that *S. ramsdeni* is indeed most closely related to *S. goniorhynchus,* a species that is widespread in Jamaica but which is in actuality composed of 2 sibling species. If so, then *S. ramsdeni* represents a very old invader from Jamaica whose distribution is now restricted to the uplands of Oriente Province in Cuba. Relationships with *S. nicholsi* or *S. klauberi* seem far less likely. One primary reason is that, assuming an invasion from Puerto Rico to Cuba, one might logically expect that a related species might occur on geographically intermediate Hispaniola. The only known high montane geckos on that island are *S. armstrongi* (which occurs on the Hispaniolan south island in the Massif de la Selle and the Sierra de Baoruco), *S. darlingtoni* (montane forests on the north island), and *S. elasmorhynchus* Thomas which occurs (only 1 specimen known) in the Massif de la Hotte. Although *S. armstrongi* and *S. darlingtoni* are upland (at least in part) forest-dwelling lizards and have the "requisite" dark brown coloration for that niche, their head and scapular patterns are dissimilar. *S. elasmorhynchus,* on the other hand, is the most distinctive of the Antillean (and

perhaps of all) *Sphaerodactylus,* since it has enlarged plate-like supranasals and postnasals (see Thomas, 1966) and an ocellate rather than lined dorsum; there is no head pattern comparable to that expressed in *S. ramsdeni,* but there is a sacral V, which might be derived from or related to the sacral lines in *S. ramsdeni.* The dorsal scales are small and granular (56 between axilla and groin). Still, *S. elasmorhynchus* is altogether too specialized to be the species intermediate between *S. ramsdeni* on one hand and either *S. nicholsi* or *S. klauberi* on the other.

Among Cuban *Sphaerodactylus, S. ramsdeni* likewise stands alone. The tiny dorsal scales immediately eliminate the *copei* group (with its large boss-like dorsals and 1 or 2 median rows of granular scales) as close relatives. The *nigropunctatus* group has small dorsal scales but usually has complex female dorsal patterns (contrasting dark and light ocellate bands), although at least 1 advanced member (*S. ruibali* Grant) is virtually patternless in both sexes. This species is xerophilic but does occur along the southern Oriente coast. The *notatus* group sphaerodactyls have large tectiform and keeled dorsal scales, many less in number than *S. ramsdeni;* they likewise primitively have a dark scapular patch with 1 or 2 included pale ocelli, and the female head pattern is basically conspicuously trilineate. Throat, chest, and ventral scales may be keeled or smooth. *S. elegans* is unique in that adults are virtually unpatterned, but juveniles have a conspicuously banded phase, so that there is a striking ontogenetic change in color and pattern; in neither adults nor juveniles does *S. elegans* resemble *S. ramsdeni. S. elegans,* on the other hand, does have small granular dorsals. Finally, *S. argus,* a presumably recent Jamaican invader, has a relatively limited distribution along the southern Cuban coast and on the southern *cayería;* it does not seem likely that *S. ramsdeni,* which is quite unlike *S. argus* in many ways and is so specialized for its forest habitat, is a direct derivative of recently arrived *S. argus.*

In summary, then, we cannot logically associate *S. ramsdeni* with any other Cuban or Antillean *Sphaerodactylus.* It may well be that *S. ramsdeni* and *S. elasmorhynchus* represent old but specialized species in the Greater Antilles whose affinities are now so obscured that we cannot assign them to any of the more widespread and more "orthodox" Antillean groups of geckos. They may represent old invasive stocks that have persisted in upland forests under relatively remote and specialized conditions.

Specimens examined — Oriente Province, Monte Líbano (MCZ 8536); Los Hondones, between Monte Líbano and Yateras (ASFS V28451-52, IZ 212, IZ 3200, IZ 4727); La Unión, Monte Líbano (IZ 234); Mata Tina and Blanquizal (IZ 219); Hoyo del Guaso, Guantánamo (IZ 249); La Gran Piedra (IZ 4531); La Gran Piedra, 3.0 km SE, 16 km NE Sevilla, 1068 m (AMNH 83276-77).

Sphaerodactylus argus and *S. elegans*

There remain 2 species of Cuban *Sphaerodactylus* that we have not previously discussed in detail. One of these, *S. argus* Gosse, has a limited distribution along the southern coast and its associated *cayería* from Las Villas Province east to Oriente Province; although the distribution is primarily coastal, there are several inland localities.

These 2 species have had different histories and affiliations. *S. argus* is a member of the *argus* group (see Thomas, 1975). This group centers in Jamaica (where *S. argus* is islandwide in distribution), but there are other Jamaican species (*S. semasiops* Thomas; *S. oxyrhinus* Gosse with 2 subspecies), and the group occurs also on the Cayman Islands (*S. argivus* Garman with 3 subspecies, 1 on each of the Cayman Islands). There is an outlier population of *S. argus* on Isla San Andrés in the western Caribbean (*S. a. andresensis* Dunn and Saxe), and the nominate subspecies has been introduced on the Islas de Maíz and in the Bahama Islands; at least the latter introduction has been presumably by man. There is also a human introduced population of *S. argus* on Key West, Florida. Thomas (1975) also suggested that *S. continentalis* Werner may be a mainland representative of the *argus* group; although we elsewhere (Schwartz and Garrido, 1981), stated definitively that this is the case, we defer to Thomas's more circumspect interpretation.

S. elegans is primarily Cuban with, as noted above, populations in western Hispaniola. The species has also been introduced by man on Key West and Boca Chica Key, Florida, where it is abundant. The group affiliations of *S. elegans* remain much in doubt. No other sphaerodactyl shows the ontogenetic pattern change of this species. We have suggested that perhaps the closest relatives of *S. elegans* are the *nigropunctatus* group. Scale number and general configuration agree rather well with that group, and in addition females of many *nigropunctatus* group species are banded (similar to juvenile *S. elegans*). In fact, adult *S. ruibali* Grant in many ways resemble adult *S. elegans* (although juveniles of the former species are not crossbanded). We have considered *S. ruibali* the most advanced member of the *nigropunctatus* group; it may well be that *S. elegans* represents a third divergent line within that group, in which the basic crossbanded pattern is present only in juveniles and is absent in adults, much as adult *S. ruibali*. We are reluctant, however, to state with complete certainty the affinities of *S. elegans,* but the above postulations are at least suggestive.

The *argus* group of *Sphaerodactylus* may be characterized by: 1) size moderate; maximum snout-vent length in males 34 mm, in females 33 mm; 2) dorsal scales moderate in size, slightly swollen, broadly angulate to rounded on posterior edges, keeled, and weakly imbricate, without a middorsal longitudinal zone of granular scales or granules; 3) dorsal scales with hair-bearing organs only; 4) throat, chest, and ventral scales smooth; 5) internasal scale usually 1 (rarely 0-3); 6) supralabial scales to mid-eye usually 3 (*S. argivus*) or 4 (other species) with a total variation of 3 to 6; 7) escutcheon variable from short, central, and compact, to extending toward the knees; 8) sexual dichromatism absent; both sexes vaguely vermiculate, lineate, dotted, or ocellate in adults, the dorsal ocelli either aligned into longitudinal lines or even fused at least middorsally to form longitudinal lines; a pair of sacral lines often present; scapular dark patch and included ocelli absent, but in some species either a very large pair of mid-lateral dark ocelli with a central pale spot, the ocelli outlined with pale (*S. semasiops*) or with a pair of pale sacral ocelli outlined with black (*S. oxyrhinus dacnicolor*); 11) ontogenetic variation weak to absent, the basic juvenile pattern in some species (*S. argus*) rather strongly and contrastingly lineate, other species less so or not at all lineate.

The group has recently been reviewed by Thomas (1975) and the above definition has been in part taken from his work. The following comments on *S. argus* are based primarily on Cuban material (of which we have examined 53 specimens); where our

data differ from those on Thomas's predominantly Jamaican material, we make appropriate comments.

TAXONOMIC ACCOUNTS

Sphaerodactylus argus Gosse

Sphaerodactylus argus Gosse, 1850, Ann. Mag. Nat. Hist., 2(6):346.

Type-locality — Jamaica.

Syntypes — British Museum (Natural History) 47.12.24.56, BMNH 47.12.24.59 (not examined by authors).

Definition — A primarily Jamaican species of *Sphaerodactylus,* occurring also in extreme southern Cuba from Las Villas Province to Oriente Province, the Islas de Maíz off Nicaragua, Isla San Andrés, and the Bahama Islands (New Providence Island; North Bimini Island), and on Key West, Florida — the last 3 localities almost certainly the result of human introduction, characterized by: 1) moderate size (maximum snout-vent length 33 mm in both males and females); 2) dorsal scales small, slightly swollen, broadly angulate to rounded posteriorly, keeled, and weakly imbricate, 2 to 3 large hair-bearing organs with 2 or 3 hairs only, 33-50 between axilla and groin; 3) scales around body at midbody 50-71; 4) usually 4 supralabials to mid-eye (range 3 to 5); 5) modally 1 internasal scale; 6) escutcheon in males 5 – 7 x 16 – 25; 7) not sexually dichromatic; juvenile pattern basically lineate with a median longitudinal pale line, followed on each side by alternating dark and pale lines, the pale lines tan, the dark lines some shade of brown, this juvenile pattern either retained dorsally or modified into longitudinal series of pale ocelli or merely completely vermiculate brown on a paler brown ground; 8) ventral scales smooth.

Sphaerodactylus argus argus Gosse

Sphaerodactylus argus argus Barbour, 1937, Bull. Mus. Comp. Zool., 82(2):114.

Sphaerodactylus argus henriquesi Grant, 1940, *Jamaica Today:* 154. *Type-locality* — Mandeville, Manchester Parish, Jamaica. *Holotype* — MCZ 44971 (not examined by authors).

Definition — A subspecies of *S. argus* characterized by the combination of: 1) an ocellate, lineate, or vermiculate body pattern; 2) juvenile pattern completely expressed and lineate; 3) no lineate sacral pattern; 4) size moderate; 5) low number of midbody scales.

Variation — Our Cuban material consists of 49 specimens which show the following: largest male (MCZ 100253) snout-vent length 31 mm, largest females (AMNH 32303, MCZ 57309) 31 mm; smallest juveniles (IZ 3150, UMMZ 65322) 13 mm snout-vent lengths; dorsal scales axilla to groin 33-49 ($\bar{x}$ = 41.0); ventral scales axilla to groin 23-32 ($\bar{x}$ × 26.9); midbody scales 50-67 ($\bar{x}$ = 55.9); fourth toe lamellae 9-13 ($\bar{x}$ = 10.9; M_0 = 11 – 31%); supralabial scales to eye center 4/4 (41 specimens), 4/5 (4), 5/5 (2); internasal scales 1-3 (M_0 = 1 – 45 specimens); escutcheon 5 – 7 x 16 – 25; throat, chest, and ventral scales smooth.

Thomas (1975) fully discussed variation in *S. argus;* most of his specimens were Jamaican. Comparison of his data with ours indicates that Cuban and Jamaican

specimens are identical in ranges of fourth toe lamellae, modal number of supralabials to eye-center, number of internasals (although some Jamaican specimens have a 0 count of internasals, a condition not encountered in our Cuban material). The range of dorsal scales between axilla and groin in Cuban specimens (33-49; $\bar{x}$ = 41.0) is very comparable to that of Jamaican specimens (38-50; $\bar{x}$ = 43.8). Jamaican *S. argus* have more ventral scales (26-37; $\bar{x}$ = 32.1) than do Cuban specimens (23-32; $\bar{x}$ = 26.9). The same is true of midbody scales (57-71; $\bar{x}$ = 63.7 *versus* 50-67; $\bar{x}$ = 55.9). None of the above scale counts appears to be significant; Thomas's data are based upon a very large number of Jamaican *S. argus,* whereas our Cuban series is much shorter.

The dorsal coloration and pattern of Cuban specimens do not differ appreciably from Jamaican lizards. The juvenile pattern is lineate; there is an ovate figure on the upper surface of the head, with a more lateral postocular line. The posterior end of the oval cephalic figure extends as a middorsal line, and the more lateral cephalic lines continue the length of the body. There is still another pale line laterally. Thus, the dorsal body pattern in juveniles consists of 4 dark brown lines alternating with 5 pale lines. This basic pattern becomes modified with increasing size. In some individuals the middorsal pale line maintains its integrity, whereas the more lateral pale lines become fragmented. Another variation is that the pale lines all become extremely fragmented to form many isolated, slightly dark-edged ocelli. Finally, even these small ocelli may disappear to give either a vaguely vermicualte (shades of tan and brown) or unicolor (tan to grayish tan) lizard without obvious pattern on the head or body.

Thomas (1975) discussed the variation in this species in great detail, and it is pointless to restate his conclusions here. The adult ocellate pattern predominantes in eastern Jamaica, whereas in western Jamaica adults are completely lineate to completely ocellate. This statement is only generally true, and it is difficult to draw a line that divides the 2 basic groups in Jamaica. Cuban specimens most closely resemble western Jamaican *S. argus,* as Thomas (1975:182) stated: "They are lineate to ocellate (but with numerous linearly arranged ocelli characteristic of western *argus*) with variegated ground color."

Comparisons — The only other recognized subspecies of *S. argus* is *S. a. andresensis* Dunn and Saxe, which occurs on Isla San Andrés in the western Caribbean. That subspecies differs from *S. a. argus* in having a flecked or vermiculate body pattern (no ocellate or lineate body patterns), a head pattern of fine light vermiculations or flecks on a dark ground, a lineate sacral pattern (always absent in *S. a. argus* but present in many other members of the group), reduced juvenile pattern, and high midbody scale counts (67-76; $\bar{x}$ = 71.1).

S. a. argus resembles no other Cuban *Sphaerodactylus.* No other species is strikingly lineate, either as adults or juveniles, and no other species may have a completely ocellate dorsal pattern in adults. The vermiculate dorsal pattern of some adult *S. a. argus* might be confused with the stippled dorsal pattern of *S. ruibali;* the 2 species are not known to overlap geographically, and the juvenile patterns are quite different. Midbody scales in *S. ruibali* are 62-82 ($\bar{x}$ = 71.6), whereas these scales in Cuban *S. a. argus* are 50-67 ($\bar{x}$ = 55.9). Both species usually have 4 supralabials to mideye. Another feature that distinguishes them is the keeled dorsal scales of *S. a. argus* in contrast to the smooth dorsal scales in *S. ruibali.*

Remarks — *S. a. argus* in Cuba occurs from Las Villas Province to Oriente Province. There are records from the mainland in Las Villas (Cienfuegos; Soledad; San Blas), Camagüey (Francisco; Santa Cruz del Sur), and Oriente (Jiguaní; 4 km N Santiago de Cuba), as well as from 5 cays in the Jardines de la Reina. Most records are coastal or slightly inland. The Jiguaní and San Blas records are the most peculiar, as Thomas pointed out. He was also uncertain that *S. argus* had reached Cuba via natural means or by human introduction. Its wide distribution on Cuba as well as in the Jardines de la Reina suggests to us that it is probably a natural invader from Jamaica whose Cuban distribution has gradually expanded inland, either through natural means or via accidental human transport. Such records as those from Jiguaní and San Blas, the latter in the mountains of southern Las Villas Province, suggest that at least some internal Cuban movement has been via human agency. If the Jardines de la Reina were the first landfall from Jamaica for any invader from that island, then it would seem merely a matter of time before the Cuban mainland was reached via one or another means; the generally coastal localities of *S. argus* in Cuba would tend to confirm this scenario.

We have also had access to a series of 50 *S. argus* (CAS-SU specimens) with the locality datum of "Cuba." There are no precise locality data nor collector for this lot of material, and we have not taken counts on the specimens. Since Chapman Grant deposited specimens in the Stanford University collection, and since he also collected in southern Las Villas Province, it is possible that these specimens are from somewhere in that province and were collected by him. What is intriguing about this lot is the relatively large number (the largest number of specimens in one series other than this is 10); this suggests that *S. argus* may be abundant at some Cuban locality. On the other hand, the CAS-SU series may represent specimens from several localities. We point this series out in order to suggest that one should not necessarily regard *S. a. argus* as rare in Cuba, despite the relatively small number of specimens with precise locality data available.

Specimens examined — *Las Villas Province,* Cienfuegos (MCZ 52163-67, MCZ 00249-53); Juraguá (IZ 2256); 5 km SE Paso Caballo (AMNH 78351); Soledad (MCZ 8246, MCZ 147337, UMMZ 65322 (2 specimens), UMMZ 90633, AMNH 7306-07); San Blas, Sierra de Trinidad (MCZ 34261); *Camagüey Province,* Francisco (IZ 4469); Santa Cruz del Sur (MCZ 57309); *Jardines de la Reina,* La Tronconera, Cayo Paguama (IZ 3198, IZ 3279); Cayo Cachiboca (IZ 3226-27, IZ 3243); Cayo Juan Gría (IZ 3148-51); cay E of Boca Juan Gría (USNM 81722-25); Cayo Cabeza del Este (MCZ 7300-07); *Oriente Province,* Los Negros, Jiguaní (MCZ 8545-47); Belie (AMNH 2303-04); Cabo Cruz (AMNH 83597-600); 4 km N Santiago de Cuba (AMNH 83603).

Sphaerodactylus elegans MacLeay

phaeriodactylus (sic) elegans MacLeay, 1834, Proc. Zool. London: 12.

Type-locality — Cuba; probably the vicinity of Guanabacoa, Habana Province, according to Barbour, 1921, Mem. Mus. Comp. Zool., 46(3):231.

Holotype — unlocated.

phaeriodactylus (sic) punctatissimus Duméril and Bibron, 1836, Erp. gén., 3:405.
Type-locality — St.-Domingue. *Syntypes* — MNHN 1768 (not examined by authors).

Sphaerodactylus alopex Cope, 1862, Proc. Acad. Nat. Sci. Philadelphia, 13:499. *Type-locality* — Rivière de la Grande Anse, Dépt. du Sud, Haiti. *Syntypes* — MCZ 3343 (not examined by authors).

Definition — A Cuban and western Hispaniolan species of *Sphaerodactylus* (also introduced on Key West and Boca Chica Key in the southern Florida Keys) characterized by: 1) moderate size (maximum snout-vent length 39 mm in males, 37 mm in females); 2) dorsal scales small, slightly swollen and slightly keeled, weakly imbricate, with only a few hair-bearing organs, each with 3 hairs, on the posterior curvature of the scales, 41 to 59 between axilla and groin; 3) scales around body at midbody 49-84; 4) usually 4 supralabials to mid-eye (range 3 to 5); 5) modally 1 internasal scale; 6) escutcheon in males 4 – 8 x 19 – 37; 7) not strongly sexually dichromatic but strongly ontogenetically dichromatic; juveniles yellowish to reddish dorsally with a prominent reddish tail and limbs, the body and tail transversely banded with dark brown to almost black, this boldly contrasting pattern gradually changing between snout-vent lengths of 20 to 28 mm to one of a brown (from dark brown to pale tan or yellowish tan) dorsum, either speckled with many isolated pale whitish to very pale tan scales or not, the isolated pale scales at times confluent on the body to give a vaguely finely longitudinally striate effect; head in both sexes either concolor with the dorsum, dotted with minute pale flecks, or, in full adults, strongly streaked or vermiculate with pale tan and dark brown; in males, throat either finely stippled or coarsely vermiculate or streaked with brown, by population; 8) ventral scales smooth, cycloid.

Sphaerodactylus elegans elegans, new combination

Definition — The Cuban subspecies of *S. elegans* characterized by: 1) small adult size (both males and females to snout-vent lengths of 36 mm); 2) low number of dorsal scales between axilla and groin (41-67; $\bar{x}$ = 51.8); 3) low number of scales around body at midbody (49-82; $\bar{x}$ = 66.0); 4) transition from juvenile to adult pattern occurring between snout-vent lengths of 20 and 24 mm — all specimens 19 mm snout-vent length or less banded; and 5) throat in adult males heavily patterned with dark brown vermiculations or streaking.

Variation — We have examined 216 Cuban specimens (and 162 from Hispaniola for comparison). The Cuban material is divided geographically as follows: Isla de la Juventud — 20; Pinar del Río — 70; Habana — 62; Las Villas — 22; Camagüey — 33; Oriente — 9. The lack of Oriente specimens will be commented upon in detail later; note also that the province of Matanzas is unrepresented by specimens although certainly the species occurs there. In addition to the main island and the Isla de la Juventud, our material includes scattered specimens from the Archipiélago de Sabana-Camagüey (Cayo Francés, Cayo Conuco, Cayo Coco, as well as Cayo Caguanes), and the Jardines de la Reina (Cayo Grande). Schwartz and Thomas (1975) listed the occurrence of "*S. cinereus*" from many of these same off-shore islands.

Taking the entire Cuban series as a whole, the following variation is observed (the only counts taken on specimens less than 30 mm snout-vent length were those of supralabials to eye-center and internasals): largest male (MCZ 10845) 36 mm snout-vent length, largest female (MCZ 7625) 36 mm; both are from Pinar del Río Province; smallest juvenile 13 mm (MCZ 57218 from Camagüey Province); dorsal scales axilla to groin 41-67 ($\bar{x}$ = 51.8); ventral scales axilla to groin 24-39 ($\bar{x}$ =

29.8); midbody scales 49-82 ($\bar{x}$ = 66.0); fourth toe lamellae 8-16 ($\bar{x}$ = 12.6; M_0 = 13 - 40%); supralabial scales to eye center 4/4 (202 specimens), 3/3 (1), 3/4 (5), 4/5 (3), 5/5 (1); internasal scales 0-2 (M_0 = 1 – 95%); escutcheon 4 — 7 x 24 – 35; throat, chest, and ventral scales always smooth.

It was generally conceded (see for example Stejneger, 1917; Barbour and Ramsden, 1919; Barbour, 1921) that there were 2 distinct species of Cuban (and Hispaniolan) phaerodactyls, one of which was small and conspicuously banded dorsally and with a reddish or yellowish tan tint, most especially on the tail and limbs, and a second larger species that was unbanded, some shade of tan to brown and often with a vermiculate pale head. The former small species was called *S. elegans* and the latter *S. cinereus*. Barbour (1937) suggested that these 2 species were in actuality the same. Grant (1948) showed conclusively that *S. elegans* was the juvenile of "*S. cinereus,*" and that there was a radical change in pattern with increasing size and maturity. Grant's description of the juvenile pattern of *S. elegans* is pertinent: "A hatchling *cinereus* is light tan with narrow black crossbands; the tail coral-red which fades gradually near the center of the body . . . The first band joins the nostrils; one crosses immediately anterior to and another just behind the orbits; the next joins the ears, followed by two more across the neck and six wider ones cross the body; those on the tail fade out distally and cannot be counted. These bands are usually perfect, but occasionally two join on one side." Our observations agree well with these (which were based upon 18 juveniles from near Soledad, Las Villas Province); however, the number of dark body bands in juveniles varies between 5 and 7; the mode is 6.

In Cuban specimens, all specimens (29) to a snout-vent length of 19 mm are banded. Specimens between 20 mm and 24 mm show the transition from the juvenile banded condition to the adult "unicolor" condition. Occasional adults (1 male, 1 female, both with snout-vent lengths of 30 mm) have vague remnant crossbanding, but it is not prominent as it is in juveniles. The transition appears to be accomplished by a combination of expansion of the juvenile dark bands and additional (but less important) secondary dark bands in the interband spaces, all this dark pigment gradually becoming confluent with subsequent loss of banding in adults. Grant (1948) has a somewhat different interpretation, but his ideas are comparable to ours. Once the bands are obliterated (between 20 and 24 mm snout-vent lengths), the adult brown to tan coloration is assumed. On the body, this may be solid or with scattered numerous white scales, these scales ultimately forming a longitudinal series of fine pale lines, so that some adults appear streaked longitudinally with pale color. The upper surface of the head is either streaked or vermiculate with pale yellow to white; on the other hand many specimens show no body or head patterns, but these are usually lizards that have been long in preservative, and they are uniformly faded pale.

In males, the throat in freshly collected specimens is very dark brown, either solid or with streaking. Indications of this condition may even be detected in long preserved specimens as well, and we consider that it is a constant character as far as adult males of the Cuban population are concerned.

Intra-Cuban variation in *S. e. elegans* appears to be random and slight, both in scale counts and coloration and pattern. The largest member of each sex (snout-vent lengths 36 mm) are from Pinar del Río Province in the west; maximally sized individuals of both sexes from the other provinces and the Isla de la Juventud are 34

or 35 mm (exception: the single male from Las Villas Province — IZ 3447 — is only 31 mm in snout-vent length). The smallest juvenile has a snout-vent length of 13 mm, whereas in all other samples the smallest lizards have snout-vent lengths of 14 mm. Means of dorsal scales vary between 50.6 (Pinar del Río) and 54.1 Oriente — but recall that small sample size of Oriente lizards). Ventral scale means range from 28.3 (Oriente) to 30.7 (Isla de la Juventud and Las Villas); midbody scale means range from 63.9 (Las Villas) to 68.0 (Oriente). Fourth toe lamellae vary from 8 to 16; the mode is 13 in all samples with the exception of the Isla de la Juventud where there are bimodes of 10 and 12 (total of 7 specimens counted). Supralabial scales to eye-center are modally 4/4 in all samples, but the following variants occur: 4 Isla de la Juventud specimens have 3/4, 2 Pinar del Río specimens have 4/5, 2 Habana specimens have 3/4 and 4/5 respectively, 1 Las Villas specimen has 5/5, and 1 Camagüey specimen has 3/3. Internasal scales are modally 1 in all samples; exceptions include 1 Isla de la Juventud and 1 Camagüey specimen with 0 internasals, 4 Pinar del Río, 5 Habana, 3 Las Villas, and 4 Camagüey lizards with counts of 2. The escutcheon varies between 4 — 7 x 24 – 35 scales in length and breadth. The escutcheon is prominent, the scales without pigment, with a compact central area and 2 (often 3) rows of scales extending as far laterally as the area near the knee.

The above summary of the data for Cuban material suggests strongly that there are no obvious trends in scutellation within the populations on the island, nor on the Isla de la Juventud. The short series or isolated specimens from the various *cayerías* likewise show no variation that suggests differentiation.

Grant (1948) and Mittleman (1950) have compared Cuban and Hispaniolan "*S. cinereus*." In both cases, series were relatively short (Grant examined 93 Cuban specimens and 55 Hispaniolan lizards; Mittleman studied 65 adult Cuban specimens and 45 Haitian specimens). Grant's summary of the populations suggests that the juveniles "showed no differences; the adults seemed to average 2 mm longer in the Cuban series, but this may be due to the differences in preservation used. The Haitian series seemed to have a greater tendency to retain head and body stripes, but the difference was not significant. In both series the females retained more stripes than males." Grant's conclusions, then, suggest that the 2 populations are identical. Mittleman, on the other hand, using 4 characters (number of dorsal scales contained in the standard length; number of ventral scales contained in the standard length; number of lamellae under the fourth toe; proportionate head length) determined that the 2 populations were so distinctive that he suggested that they be regarded as separate species! No one has taken Mittleman's conclusions seriously, nor do we. One fact that casts some doubt on Mittleman's conclusions is that 3 of his characteristics are related to head length; the standard distance used for counting dorsal and ventral scales is the snout-center of eye distance, a function of head length itself. In any event, the Cuban and Hispaniolan lizards are so very similar that it would be very difficult, knowing what usually constitutes a species in the genus *Sphaerodactylus,* rationally to consider them distinct at the specific level.

We have examined 162 Hispaniolan specimens (all from Haiti) from a variety of localities including the extreme western end of the Tibruron Peninsula, the Port-au-Prince region, and the extreme north in the vicinity of Cap-Haïtien, as well as many lizards from localities geographically intermediate between these points, and varying in elevation from sea level to 763 m (Castillon, Dépt. du Sud). We have not attempted to analyze geographic variation *within* Hispaniolan *S. elegans;* such variation may

ndeed exist, although we doubt it.

The largest Haitian male *S. elegans* (ASFS V24774) has a snout-vent length of 39 mm; the largest females (of which there are 9) have snout-vent lengths of 37 mm. There are many specimens of both sexes that exceed the maximally sized males and females of Cuban *S. elegans,* and the above larger size may not be attributed to one or a very few "giant" specimens. Contrary to Grant's (1948) statement, Hispaniolan *S. elegans* reach a larger size than their Cuban relatives. The smallest Hispaniolan juvenile has a snout-vent length of 16 mm, larger than the smallest juvenile Cuban specimens. This too suggests that Hispaniolan specimens are larger at hatching than are Cuban specimens, a correlation with the larger adult size of the former. Scale counts on the Hispaniolan series are: dorsal scales axilla to groin 44-79 ($\bar{x}$ = 59.2); ventral scales axilla to groin 25-45 ($\bar{x}$ = 33.7); midbody scales 51-84 ($\bar{x}$ = 69.1); fourth toe lamellae 10-15 ($\bar{x}$ = 12.3; M_0 = 13 – 37%); supralabials to eye center 4/4 (148 specimens), 3/3 (2), 4/5 (7), 5/5 (3); internasal scales 1-2 (M_0 = 1 – 96%); scutcheon 3 – 8 x 19 – 37; throat, chin, and ventral scales always smooth. Comparison of these data with those from Cuban specimens shows that the 2 populations differ in means of dorsal scales (Cuba 51.8 ± 1.0 — twice standard error of mean; Hispaniola 9.2 ± 1.2) and in midbody scales (Cuba 66.0 ± 1.3; Hispaniola 69.1 ± 1.1). In all other counts the 2 populations are comparable except that no Hispaniolan specimen has 0 internasals (only 2 of 216 Cuban specimens have this condition).

All Hispaniolan specimens (13) to snout-vent lengths of 23 mm are banded. Transition from banded to "unicolor" pattern occurs between 25 mm and 28 mm snout-vent lengths. Four adult females with snout-vent lengths between 31 and 36 mm have vague or remnant banded patterns. Adult male Hispaniolan *S. elegans* lack the dark brown or lineate throats of Cuban males; rather, Hispaniolan males have at most some fine brown stippling on the throat. We cannot determine any differences in head or body pattern or coloration in either adults or juveniles between the 2 populations. However, the differences are of such a magnitude that it is appropriate to recognize the populations as distinct at the subspecific level. The Hispaniolan population (which, aside from occurring on Hispaniola itself, primarily in Haiti but at the Dominican locality, is found also on Ile de la Gonâve and Ile Grande Cayemite) may be called *Sphaerodactylus elegans punctatissimus* Duméril and Bibron, this subspecies is characterized by: 1) larger adult size (males to 39 mm, females to 37 mm snout-vent length); 2) high number of dorsal scales between axilla and groin (44-79; $\bar{x}$ = 59.2); 3) high number of scales around body at midbody (51-84; $\bar{x}$ = 69.1); 4) transition from juvenile to adult pattern occurring between snout-vent lengths of 25 and 28 mm — all specimens 23 mm snout-vent length or less banded; and 5) throat in adult males not heavily patterned or streaked, but rather at most finely stippled with brown.

Remarks — S. e. elegans is widespread in Cuba and on the Isla de la Juventud and occurs as well on some (probably many) of the *cayos* in the various *cayerías* adjacent to the Cuban mainland. Although specimens are encountered in natural situations, one has the impression that *S. elegans,* in both Cuba and Hispaniola, is more "at home" in urban situations, being often encountered in villages, cities, and other areas of habitation. It is often seen foraging at and after dusk near lights, feeding openly on walls on the tiny insects that are attracted to light. These lizards also may be observed in shaded situations or on dull and overcast days, foraging on house walls and in the interior of houses and hotels. The species is not restricted to

such situations, however.

One surprising fact brought out in the present study is the apparent rarity of *S. e. elegans* in eastern Cuba. Intriguingly, there are only 2 published Oriente records — Los Negros, Jiguaní, and Santiago de Cuba (Barbour, 1914); we have seen no *S. elegans* to confirm the former locality. Barbour's (1921) description of the Los Negros specimens suggests that they are *S. argus* (which is known from Los Negros). We have examined only 9 Oriente specimens; this is precisely the reverse of the situation with *S. n. atactus* which is much more common in eastern than in western Cuba. We are not suggesting that the 2 species replace one another ecologically, although both are often encountered in and about human dwellings. Of the 9 Oriente specimens, none is from within a major city (Santiago de Cuba; Guantánamo), and this is all the more surprising since it was near these very cities that Charles T. Ramsden made his collections over many years. In fact, the only Santiago-vicinity specimens are Ramsden lizards from Ciudamar, La Socapa, to the south of Santiago de Cuba. Considering that Ramsden lived at Vista Alegre, a suburb of Santiago, the absence of material from the area of his home is extremely suggestive that the species is either very uncommon there or absent entirely. It may be recalled that the common "city geckos" in and near Santiago de Cuba are *S. nigropunctatus* Gray and *S. torrei* Barbour. It may well be that these species, firmly entrenched in Santiago, may have prevented the successful invasion of that city by *S. e. elegans*. In the city of Guantánamo, *S. nigropunctatus* is the common urban gecko, and it too may have limited the invasion of that city by *S. elegans*. There are no records of *S. elegans* from the U. S. Naval Base, a site where the species might well be expected. The very abundance of species of *Sphaerodactylus* in Oriente may have had an adverse effect upon the success of *S. elegans* in that province. Also, xeric southern coastal Oriente habitats would seem much less suitable for *S. elegans,* which seems to require more mesic and shaded natural situations.

It is appropriate to mention here 4 Oriente specimens that have been previously identified as *S. elegans*. Two of these (IZ 3720-21) are from Siboney, El Caney; they are completely discolored and no details of pattern can be discerned. We suggest that they are in reality *S. nigropunctatus* males (which in life are patternless or dotted); long preserved or badly discolored *S. nigropunctatus* would be separable from *S. elegans* only with difficulty. Two other specimens (USNM 59193-94) from Caimanera, on the west shore of the Bahía de Guantánamo, likewise have been identified as *S. elegans*. These are both males with snout-vent lengths of 31 and 29 mm respectively. The larger of the 2 has a small compact escutcheon (6 x 13); the escutcheon width is much less than even the narrowest Cuban *S. elegans* (24 scales) of any size. The other male likewise has a small and compact escutcheon (8 x 10). Both now lack any sort of dorsal pattern. There are 2 possibilities, considering their provenance: 1) they are male *S. nigropunctatus,* or 2) they are males of still another new Oriente species. Their escutcheon size is comparable to that of *S. nigropunctatus* from the Caimanera area, and the former solution seems the more likely.

From its widespread occurrence in Cuba and distribution limited to western Hispaniola, we have contended that *S. elegans* is a Cuban adventive to Hispaniola, rather than the reverse. With the recognition of a Hispaniolan subspecies, we have no reason to change our opinion. Apparently *S. elegans* has been on Hispaniola long enough to diverge there into a distinctive subspecies. What is peculiar is that one might expect that the source of Hispaniolan invading *S. elegans* would be eastern

Cuba, on purely geographic grounds of proximity. This may well be true, but the rarity of eastern Cuban *S. elegans* as a source for Hispaniolan *S. e. punctatissimus* is most peculiar.

We have not examined specimens of *S. elegans* from the Florida Keys. Mittleman (1950) examined 4 specimens from Key West and concluded, on the basis of the characters used by him, that they represented the Haitian, rather than the Cuban population — a most unusual situation. Duellman and Schwartz (1958:275) did not address themselves to this problem, and they gave little data on which to base a firm conclusion. However, they examined 78 specimens, and the largest male had a snout-vent length of 33.5 mm and the largest female 35 mm. These measurements alone, in the absence of scale counts, suggest that the Floridian populations are associated with the Cuban *S. e. elegans,* the smaller of the 2 subspecies, rather than with *S. e. punctatissimus.* Such an association seems also appropriate on the grounds of proximity and the known human history of the extreme southern Florida Keys.

Specimens examined — Isla de la Juventud, Nueva Gerona (IZ 3667-68, IZ 4151, USNM 27905, USNM 27899, USNM 27906, USNM 27915); near Nueva Gerona (MCZ 11191, MCZ 11194, MCZ 147352); Rancho El Tesoro, Nueva Gerona (MFP 36); Los Indios (MCZ 11131-32, MCZ 13590, MCZ 11124-26); Jacksonville (IZ 1132); no other locality (IZ 4730); *Archipiélago de los Canarreos,* Cayo Cantiles (MFP 24); *Pinar del Río Province,* Cabo de San Antonio (MCZ 10844-45); El Veral, Guanahacabibes (IZ 1955, MFP 15); El Cayuelo, La Tumba, Guanahacabibes (IZ 4745-50); El Verraco, Guanahacabibes (MFP 37); Guane (MFP 20); Viñales (MCZ 55553); Valle de Viñales (IZ 4676); San Vicente (MCZ 555543-44); Puerto Esperanza (MFP 4, MFP 11, MFP 13, MFP 21); Pinar del Río (USNM 27980-90); San Carlos de Luis Lazo (MCZ 26947); San Diego de los Baños (MCZ 7916, MCZ 7921, MCZ 147340-47, MCZ 10834, MCZ 10910, USNM 27900, USNM 48796-98, CAS 39288-91); Herradura (MCZ 7914, MCZ 147348); Bahía Honda (USNM 27901); Guanajay (USNM 27902, USNM 27981); Mariel (USNM 27624-39, USNM 27865, USNM 27867-69, USNM 27872-74); *Habana Province,* La Habana (MCZ 7917, CAS-SU 10163, USNM 27897-98, USNM 28037, USNM 27903-04); Bosque de la Habana, Marianao (USNM 194181-82, USNM 194185, USNM 194188-89); El Laguito, Marianao (IZ 1127-28, IZ 1130, IZ 1134-35, IZ 1143, IZ 2013-14); Playa de Viriato, Marianao (IZ 1129); Marianao (IZ 1133); Granja Caimito, Bauta, Cerro de Guayabal (IZ 1136-40); Cotorra (MCZ 18918-23); Santiago de las Vegas (MCZ 8891, MCZ 147349, USNM 59819-24, USNM 58914-16); Nazareno (IZ 29, IZ 31, IZ 34, IZ 39, IZ 48, IZ 50, IZ 51); Boca Ciega, Guanabo (IZ 4703); *Las Villas Province,* Cienfuegos (USNM 58917-18); La Mila, Cienfuegos (MCZ 31907); Limones, near Cienfuegos (MCZ 18887-88); Soledad (MCZ 19470, MCZ 19923, MCZ 22718, MCZ 147350); Remedios (MCZ 5417, MCZ 147338-39); San Felipe, Arroyo Blanco (IZ 3038); Caibarien (MCZ 4409, MCZ 4747-48); Mayajigua, San José del Lago (IZ 1131); Cayo Caguanes (IZ 4477); Cayo Francés, 26 km N Caibarien (IZ 2542); Cayo Conuco (IZ 4140, IZ 4142, IZ 3447); *Camagüey Province,* El Salto de la Tinaga, Sierra de Cubitas (USNM 75860); Finca Santa Teresa, 9 km W Camagüey (MCZ 57310-18, MCZ 57320-38); 9 km W Camagüey (MCZ 59315); Cayo Coco (IZ 4197); Cayo Grande, Jardines de la Reina (USNM 1726-27); *Oriente Province,* near Pico Turquino (MCZ 50151); Ciudamar, La Socapa (IZ 56, IZ 59); Tabajó, Baracoa (MFP 29-31, MFP 34-35, MFP 39).

Discussion

We herewith complete our detailed presentation of Cuban *Sphaerodactylus*. An artificial key to the species and subspecies is included. But this should not be construed in any way that the final word on the variation, distribution, or even number of taxa of the genus occurring on Cuba is now complete. Although we have described only one new species (*S. docimus*) and no new subspecies, the problems remain manifold. To comment on a few of them, we make the following statements.

As far as the *copei* group is concerned, what are the real distributions of *S. oliveri* and *S. scaber*? What is the status of the populations in the area near San Felipe, Arroyo Blanco, in Las Villas Province (1981)? Is *S. o. storeyae* truly limited to the region about Punta del Este on the Isla de la Juventud?

Concerning the *nigropunctatus* group, what is the true status of *S. n. alayoi,* and what is its distribution? Is *S. n. ocujal* correctly associated nomenclatorially with *S. nigropunctatus?* Are *S. n. strategus* and *S. n. granti* distinct subspecies? Does *S. torrei* occur in southern Oriente between the 2 rather circumscribed areas whence it is now known? What is the appearance of male *S. docimus*? What are the detailed distributions and ecologies of *S. ruibali* and *S. armasi*?

Of the remaining taxa, we can ask the following pertinent questions. What is the significance of the Oriente populations of *S. notatus* that contain lizards with both unkeeled and keeled gular scales? What is the distribution of *S. bromeliarum,* and is it an obligate bromeliadicole? What are the affinities, either Cuban or Antillean, of *S. ramsdeni*? Why is *S. elegans* so rare in eastern Cuba and *S. notatus* common there, whereas the reverse is true in western Cuba?

Looking at the Cuban sphaerodactyl fauna as a whole, as we now know and understand it, it would seem to be composed of lizards whose lineages show the following patterns:

1) Those species-groups whose center is Hispaniolan and which are invaders from that island: *copei* group (*oliveri, scaber*); *notatus* group (*notatus, celicara, bromeliarum*).

2) Those species-groups (or species) whose center is Cuban and which have radiated to adjacent islands: *nigropunctatus* group (*nigropunctatus, torrei, intermedius, docimus, ruibali, armasi*); *elegans,* which may indeed be an aberrant member of the *nigropunctatus* group.

3) A relatively recent Jamaican invader (*argus*).

4) A species (*ramsdeni*) whose affinities *may* lie with some upland Hispaniolan, Jamaican, or Puerto Rican sphaerodactyl, and whose limited distribution (as at least now known) may reflect an old relictual pattern.

We once again reassert our conviction that there are more species of *Sphaerodactylus* as yet to be discovered on Cuba than on any other of the Greater Antillean island. The extreme paucity of species (2) in the western portion of Cuba, these species being the 2 widespread and islandwide ones (*S. notatus, S. elegans*), is extremely peculiar; this is re-enforced most especially when one considers the terrain and topography of Pinar del Río and extreme western Habana provinces — limestone mountain ranges with ample cover and "opportunity" for the presence of unknown species. The occurrence of specialized species such as *S. scaber* and *S. oliveri* in more eastern isolated ranges such as the Sierra de Trinidad and the Sierra de Najasa suggests that this ecological background is more than suitable to have spawned new species of *Sphaerodactylus*. The same might also be said of the Sierra de Cubitas, which has an endemic and geographically isolated subspecies of *S. nigropunctatus*

ɔut lacks *S. scaber* (which might be expected there) or any other endemic species.

One is struck most forcefully with the relatively small sphaerodactyl fauna of Cuba when it is compared with the faunas of Hispaniola, Jamaica, or Puerto Rico. All these islands are smaller in size; Hispaniola is more diverse ecologically than Cuba, but then Cuba is not a featureless flat plain! Still, the relative number of species of geckos on the other Greater Antillean islands is much greater (and encompasses more groups) than the Cuban fauna. If, as Darlington (1957) suggested for some groups, Jamaica and Hispaniola were the pathways of entry for *Sphaerodactylus* from the mainland (where, incidentally, the number of species is relatively small, and most appear to be relatively rare in contrast to the abundance of some Antillean species), it may well be that Cuba on one hand and Puerto Rico on the other received only a few of the invaders from the mainland. Note, however, that Jamaica and Puerto Rico, with roughly the same areal extent, have comparable numbers as far as species are concerned. Such a scenario agrees with the facts, except that the *nigropunctatus* group *centers* on Cuba but is the only group to do so. There is no known close affiliate of this group on the continental mainland.

With the recent resurgence of interest in continental drift and plate tectonics in the Caribbean (as ably summarized by Rosen, 1975, basing his conclusions primarily on fresh water fishes), it may be pertinent here to coment upon any facts that are concordant or disagree with his hypotheses. Any detailed analysis of the entire Antillean herpetofauna in the light of plate tectonics has yet to be made; Thomas (1976) commented briefly on the situation with regard to the Antillean snakes of the genus *Typhlops*. He felt that the data for *Typhlops* might be in agreement with Rosen's model, but that the picture was incomplete and inconclusive, since so little is known concerning the mainland relatives of the Antillean Typhlopidae. Our situation is much the same; the Antillean species of *Sphaerodactylus* are becoming increasingly well known, and they fall (in general) into several well defined species-groups, some of which occur on Cuba. It should be kept in mind, while dealing with the Cuban (versus the balance of the Greater Antillean) herpetofauna, that Cuba lies on the North American tectonic plate, whereas the remainder of the Greater Antilles is associated with a separate Caribbean Plate. Thus it might be logical to assume that the history of the Cuban biota in general has been somewhat different from that of the other Greater Antilles. Such is the case, as Rosen pointed out; there is a community of fresh water fishes between North America and Cuba that does not exist between the continent and other Antillean Islands. There are but 3 species of *Sphaerodactylus (S. elegans, S. notatus, S. argus)* known from North America, of which only *S. notatus* appears to be native, has differentiated subspecifically, and has a relatively broad geographical distribution in southern Florida (*S. argus* and *S. elegans* are known only from the extreme southernmost of the Florida Keys). It would seem that, despite the fact that Cuba lies on the same tectonic plate as does North America, the movement of these geckos has been (in the single instance of *S. notatus*) *from* Cuba (or *from Cuba via* the Bahamas) *to* North America, and not the reverse. We can thus glean very little data for support of Rosen's vicariance model from this particular genus, since the evidence suggests that *Sphaerodactylus* (and its Antillean radiation) has been a local phenomenon. If we had to select a track (in Rosen's sense) for Antillean *Sphaerodactylus*, then his track C (Fig. 6) might be the most satisfactory. The paucity of species on Cuba, on the other hand, does suggest that Cuba is unrelated tectonically to the balance of the Greater Antilles.

At first glance, it would seem likely that the Cuban *Sphaerodactylus* fauna is overbalanced in favor of species whose ultimate orgins are elsewhere (Hispaniola, Jamaica); this would tend to confirm again that Cuba has had a different history from that of the remainder of the islands. But, on the other hand, the largest group represented on Cuba is the virtually endemic *nigropunctatus* group, with one outlier species on Hispaniolan (*S. cinereus*) and *S. nigropunctatus* itself extending onto the Bahama Great Bank, Rum Cay, and the Cay Sal Bank. Of the 14 Cuban species we recognize, almost half (6) are members of the *nigropunctatus* group; *S. elegans* makes a possible seventh member. As far as we are aware, there are no relatives of this group elsewhere in the Antilles (surely not on Hispaniola or Jamaica, where one might logically expect them), nor on the continental Central or South American mainland. Thus, the origin of this major group of Cuban geckos (and that group which has had the greatest divergence, both on the species and subspecies levels) remains shrouded in uncertainty. This is particularly unfortunate in this instance, since out ability to relate the *nigropunctatus* group to some other Antillean or non-Antillean species might well re-enforce Rosen's model.

Acknowledgments

In present study we have not only examined material in our respective collections (IZ — Instituto de Zoología, Museo Nacional de Cuba; ASFS — Albert Schwartz Field Series) but have borrowed most of the Cuban *Sphaerodactylus* in American collections. Material from the following has been made avilable to us by the respective curators, and we are in their debt for their courtesies: American Museum of Natural History (AMNH), Richard G. Zweifel and George W. Foley; Academy of Natural Sciences of Philadelphia (ANSP), Edmond V. Malnate; Brigham Young University (BYU), W. W. Tanner; California Academy of Sciences (CAS-SU), R. C. Drewes; Carnegie Museum of Natural History (CM), Clarence J. McCoy; Museum of Natural History, University of Kansas (KU), William E. Duellman; Museum of Comparative Zoology, Harvard University (MCZ), Ernest E. Williams and P. G. Haneline; National Museums of Canada (NMC), Francis R. Cook; University of Illinois Museum of Natural History (UIMNH), Hobart M. Smith; Museum of Zoology, University of Michigan (UMMZ), R. A. Nussbaum; National Museum of Natural History, Smithsonian Institution (USNM), George R. Zug and Ronald I. Crombie; Museum für Naturkunde, Humboldt-Universität, Berlin (ZMB), Günther Peters. In the field, we have had the capable assistance of the following, and we are very appreciative of the help that they have given us: Luis de Armas, Jorge de la Cruz, John R. Feick, William H. Gehrmann, Jr., Luis R. Hernández, Ronald F. Klinikowwski, David C. Leber, James A. Rodgers, Jr., James D. Smallwood, Barton L. Smith, James B. Strong, Richard Thomas, and George R. Zug. Peter J. Tolson not only aided Schwartz in the field but made it possible for him to collect on the U. S. Naval Base at Guantánamo Bay, an area of extreme interest and importance when studying *Sphaerodactylus*.

Artificial key to the geckos of the genus *Sphaerodactylus* in Cuba

1. One or more longitudinal rows of small granules; dorsal scales large and boss-like, 16-33 between axialla groin 2
1′. No middorsal rows of granules; dorsal scales from small and granular to large, flat, keeled, and imbricate, 18-67 between axilla and groin 4

2. Female heads dark with 3 pale lines; males unicolor or salt-and-pepper . ***scaber***
2′. Female heads pale with 4 dark lines; males finely dotted or unicolor 3

3. A pair of complete dark-edged nuchal ocelli forming a collar; dark head lines complete; males faintly dotted or unicolor ..... ***o. oliveri***
3′. A pair of incomplete dark-edged nuchal ocelli forming a collar; dark head lines with posterior portion detached; males unicolor ..... ***o. storeyae***

4. Dorsal scales small and granular to small and keeled, 33-67; midbody scales 50-89; ventrals smooth 7
4′. Dorsal scales large, keeled, tectiform, 18-41; midbody scales 31-58; ventrals smooth or keeled 5

5. Dorsal scales 18-30 6
5′. Dorsal scales 36-41; midbody scales 56-58; scapular patch and 2 included ocelli prominent; terminal white bands on tail; ventrals keeled ..... ***bromeliarum***

6. Dorsal scales 18-28; midbody scales 31-50; scapular patch and 2 included pale ocelli rarely present to absent; ventrals smooth; gular scales rarely keeled ... . ***n. atactus***
6′. Dorsal scales 21-30; midbody scales 40-51; scapular patch and 2 included pale ocelli present in females, ocelli only in males; females bilineate ... ***celicara***

7. Usually 2 enlarged supralabials to eye center and 3 to 5 internasals; dorsal ground color dark brown, with a pale cephalic figure, including a pale occipital U and/or a pale occipital spot; a pair of brown sacral lines ..... ***ramsdeni***
7′. Enlarged supralabials to eye center 3 to 5, and 1 or 2 internasals; no pale cephalic figure on a dark ground 8

8. No prominent sexual dichromatism; adult females not crossbanded 9
8′. Sexual dichromatism prominent; adult females boldly crossbanded 12

9. Dorsal pattern ocellate, lineate, or vermiculate; head pattern *not* strongly different from body pattern; dorsal scales 33-49, juveniles lineate .... ***a. argus***
9′. Dorsal pattern streaked, dotted, speckled, or unicolor, rarely vermiculate; head pattern at times distinct from body pattern; dorsal scales 40-67 10

0. Male dorsal pattern speckled or rarely vermiculate; females with at least 1 pair of dark nuchal bands, remainder of dorsum patterned like males .... ***ruibali***
0′. Male dorsal pattern streaked, dotted, or unicolor; females with or without 5 pale crossbands; heads with or without streaks or vermiculations; juveniles crossbanded 11

1. Dorsal pattern streaked, dotted, or unicolor in males; females without 5 pale crossbands; heads often vermiculate to streaked; juveniles with 5-7 (usually 6) *dark* bands between limbs ..... ***e. elegans***
1′. No dorsal pattern in males (= unicolor); females with 5 *pale* crossbands;

juveniles crossbanded like females, the crossbands resulting from the fusion of many ocelli ..... ***armasi***

12. Males unspotted; females with 2 dark body crossbands; dorsals 37-61; midbody scales 53-83; enlarged supralabials to eye center 4 or 5 13
12′. Males spotted or unspotted; females with 3 or 4 dark body crossbands; dorsals 41-67; midbody scales 52-89; enlarged supralabials to eye center 3 or 4 .. 14

13. Females with 2 dark body bands wider than pale interband spaces; median snout line attached to well developed dark postocular band ..... ***t. torrei***
13′. Females with 2 dark body bands narrower than pale interband spaces; median snout line reduced to a snout dash; postocular band reduced or absent ..... ***t. spielmani***

14. Females with 3 dark body bands and a collar that is usually ocellate; head pattern trilineate; males prominently spotted or unspotted 16
14′. Females with 3 dark body bands non-ocellate; males (in only species where males are known) prominently dark-spotted 15

15. Midbody scales 60-77 ..... ***intermedius***
15′. Midbody scales 80-88 ..... ***docimus***

16. Females with pale ocelli in collar and/or in body bands; males spotted or unspotted 18
16′. Females without ocelli in body bands; males usually spotted 17

17. Female head pattern trilineate; postocular and auricular bands darker and more solid than body bands which are sharply demarcated from pale interband spaces and are narrowly pale centrally; 3 enlarged supralabials to eye center . ***n. alayoi***
17′. Females with a trident-like dark head figure; posterior light head band wider than dark auricular band; 4 enlarged supralabials to eye center . ***n. lissodesmus***

18. Males usually unspotted; size large (to 35 mm snout-vent length in both sexes); females with sharp-edged body bands usually with dark-edged ocelli (or their remnants) in each hand and in the collar; midbody scales 61-84; usually 3 enlarged supralabials to eye center ..... ***n. strategus***
18′. Males usually spotted; size either smaller (32 mm snout-vent length in both sexes of 1 subspecies) or large (to 35 mm snout-vent length in 1 subspecies); females head pattern trilineate, with median line in contact or not with postocular band; midbody scales 52-89; usually 4 enlarged supralabials to eye center 19

19. Female head pattern complete, all lines joining postocular band; size to 32 mm snout-vent length in both sexes; all body bands and collar with distinct dark-edged ocelli ..... ***n. granti***
19′. Female head pattern incomplete, median snout line not joining postocular band; size to 35 mm snout-vent length in males, 34 mm in females; numerous very small, not dark-edged ocelli in body bands ..... ***n. ocujal***

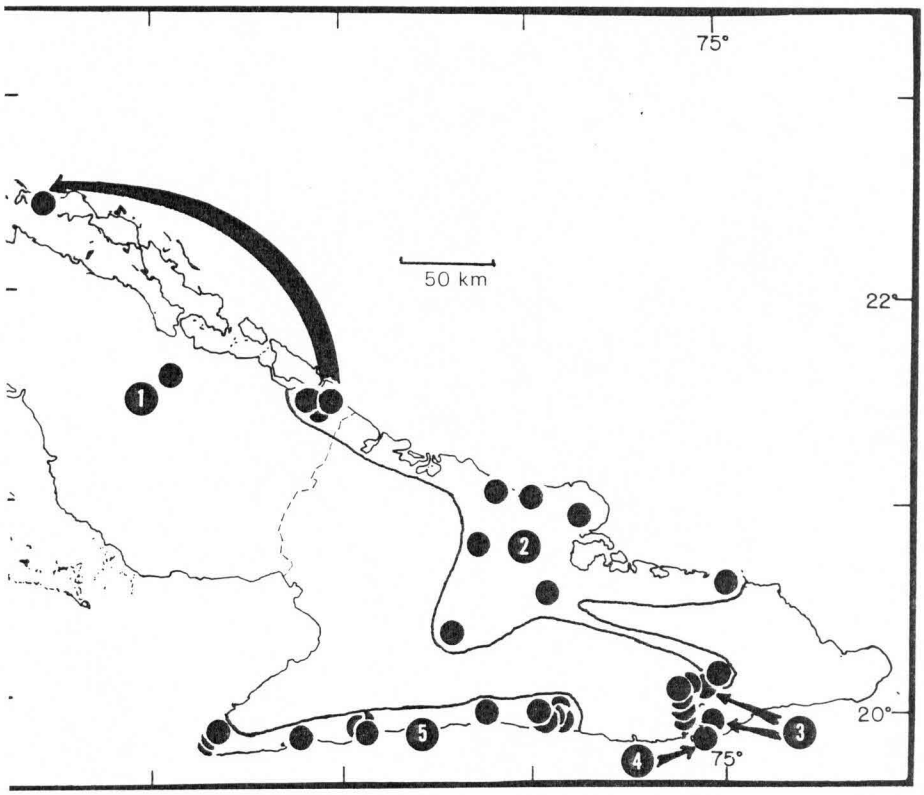

Figure Legends

ig. 1. Map of eastern Cuba, showing the ranges of the subspecies of *S. nigropunctatus,* as llow: 1) *S. n. lissodesmus;* 2) *S. n. granti;* the elongate arrow on the north coast points to an ıtlying locality for this subspecies on Cayo Coco; 3) *S. n. alayoi;* the two localities are pointed ıt by arrows; 4) *S. n. strategus;* the arrow points to the single locality; the five dots north of ıe Bahía de Guantánamo indicate area of intergradation between *S. n. granti* and *S. n. rategus;* 5) *S. n. ocujal.* In this and other maps, many localities, especially in and about urban 'eas, have been condensed for clarity.

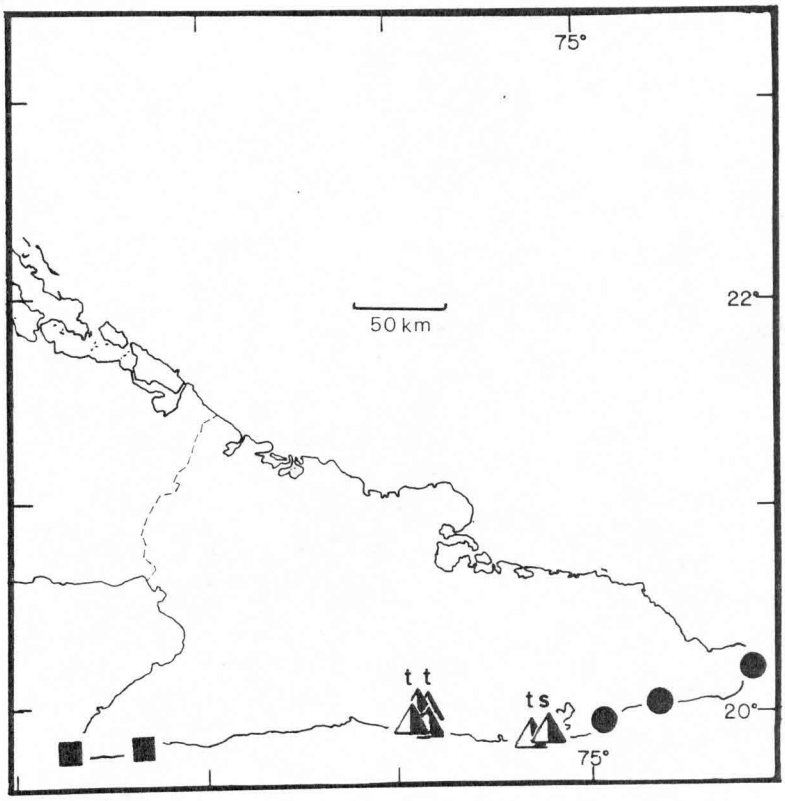

Fig. 2. Map of eastern Cuba, showing the ranges of 3 species of *Sphaerodactylus,* as follow: *S. docimus* (solid squares); *S. torrei* (half-solid triangles; tt = *S. t. torrei,* ts = *S. t. spielmani*); *S. armasi* (solid circles).

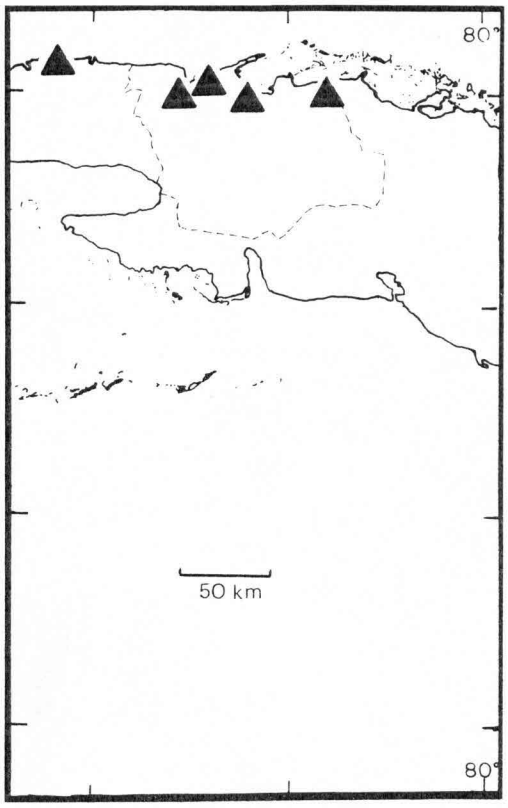

Fig. 3. Map of west-central Cuba, showing range of *S. intermedius* (solid triangles).

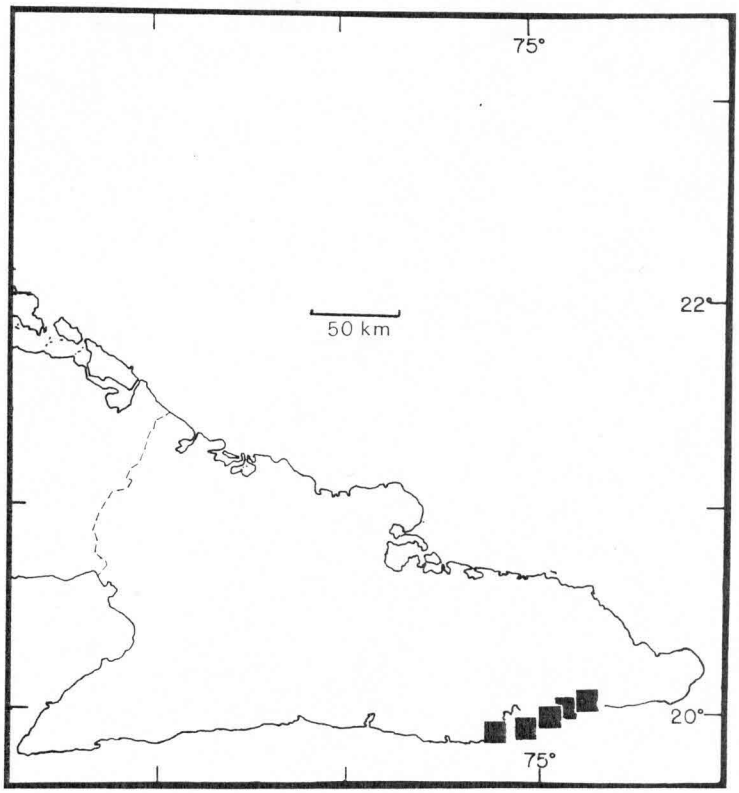

Fig. 4. Map of eastern Cuba, showing range of *S. ruibali* (solid squares).

LITERATURE CITED

Baird, S. F. 1858. Description of new genera and species of North American lizards in the Museum of the Smithsonian Institution. Proc. Acad. Nat. Sci. Philadelphia, 11:253-256.

Barbour, T. 1914. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. Mem. Mus. Comp. Zool., 44(2):209-359, 1 pl.

_____. 1921. Sphaerodactylus. Mem. Mus. Comp. Zool., 47(3):217-278.

_____. 1937. Third list of Antillean reptiles and amphibians. Bull. Mus. Comp. Zool., 82(2):77-166.

_____ and C. T. Ramsden. 1919. The herpetology of Cuba. Mem. Mus. Comp. Zool., 47(2):71-213, 15 pls.

Cope, E. D. 1862. On the genera Panolopus, Centropyx, Aristelliger, and Sphaerodactylus. Proc. Acad. Nat. Sci. Philadelphia, 13:494-500.

Darlington, P. J. 1957. Zoogeography: the geographical distribution of animals. John Wiley and Sons, Inc., New York, xi + 675 pp.

Duellman, W. E., and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. Bull. Florida State Mus., Bio. Sci., 3(5):181-324.

Duméril, A. M. C., and G. Bibron. 1836. Erpétologie générale. Paris, 3:iv + 517 pp.

Garrido, O. H., and M. L. Jaume. 1984. Catálogo descriptivo de los anfibios y reptiles de Cuba. Doñana, Acta Vert., 11(2):5-128.

_____ and A. Schwartz. 1982. A new species of *Sphaerodactylus* (Reptilia: Sauria: Gekkonidae) from eastern Cuba. Proc. Biol. Soc. Washington, 95(2):392-397.

Gosse, P. H. 1850. Description of a new genus and six new species of saurian reptiles. Ann. Mag. Nat. Hist., 2(6):344-348.

Grant, C. 1940. Notes on the reptiles and amphibians of Jamaica, with diagnoses of new species and subspecies. *Jamaica Today;* 151-157.

_____. 1948. Pattern change in Sphaerodactylus and a comparison of Cuban and Haitian series of *S. cinereus*. J. Entomol. and Zool., 40(4):69-71.

_____. 1958. A new gekkonid lizards (*Sphaerodactylus*) from Cuba. Herpetologica, 14(4):225-227, 2 figs.

_____. 1959a. A new *Sphaerodactylus* from Guantanamo, Cuba. Herpetologica, 15(1):49-53, 2 figs.

_____. 1959b. Another new *Sphaerodactylus* from Guantanamo, Cuba. Herpetologica, 15(1):53.

Gray, J. R. 1845. Catalogue of the specimens of lizards in the collection of the British Museum. Edward Newman, London:xxviii + 289 pp.

King, W. 1962. Systematics of Lesser Antillean lizards of the genus *Sphaerodactylus*. Bull. Florida State Mus., Biol. Sci., 7(1):1-52, 17 figs.

Lando, R. V., and E. E. Williams. 1969. Notes on the herpetology of the U. S. Naval Base at Guantanamo Bay, Cuba. Stud. Fauna Curaçao and Caribbean Is., 31(116):159-201.

MacLeay, W. S. 1834. A few remarks No. XIV. Proc. Biol. Soc. London, II(14):9-12.

Mittleman, M. B. 1950. Insular variation in the lizard *Sphaerodactylus cinereus*. Herpetologica, 6(3):60-66.

Ober, L. D. 1971. Redescription of *Sphaerodactylus stejnegeri* Cochran. Quart. J. Florida Acad. Sci., 33(4):244-246.

Peters, G., and A. Schwartz. 1972. Ein neuer, Bromelien bewohnender Kugelfingergecko (Gekkonidae: *Sphaerodactylus*) aus Oriente/Kuba. Mitt. Zool. Mus. Berlin, 48(2):393-399, 2 figs.

Murphy, R. W., F. C. McCollum, G. C. Gorman, and R. Thomas. 1984. Genetics of hybridizing populations of Puerto Rican *Sphaerodactylus*. J. Herpetology, 18(2):93-105.

Rosen, D. E. 1975. A vicariance model of Caribbean biogeography. Syst. Zool., 24(4):431-464.

Ruibal, R. 1959. A new species of *Sphaerodactylus* from Oriente, Cuba. Herpetologica, 15(2):89-93, 2 figs.

Schwartz, A. 1958. A new gecko of the *Sphaerodactylus decoratus* group of Cuba. Proc. Biol. Soc. Washington, 71:27-36, 1 fig.

_____. 1966. Geographic variation in *Sphaerodactylus notatus* Baird. Rev. Biol. Trop., 13(2):161-185, 3 figs.

_____. 1968. The geckos (*Sphaerodactylus*) of the southern Bahama Islands. Ann. Carnegie Mus. Nat. Hist., 39(17):227-271, 5 figs.

_____ and O. H. Garrido. 1974. A new Cuban species of *Sphaerodactylus* (Gekkonidae) of the *nigropunctatus* complex. Proc. Biol. Soc. Washington, 87(30):337-343.

_____ and _____. 1981. Las salamanquitas del género *Sphaerodactylus* (Sauria: Gekkonidae). 1. El grupo *copei*. Poeyana, 230:1-27.

_____ and R. Thomas. 1975. A check-list of West Indian Amphibians and reptiles. Carnegie Mus. Nat. Hist. Spec. Publ., 1:216 pp.

_____ and _____. 1977. Two new species of *Sphaerodactylus* (Reptilia, Lacertilia, Gekkonidae) from Hispaniola. J. Herpetology, 11(1):61-66.

Shreve, B. 1968. The *notatus* group of *Sphaerodactylus* (Sauria, Gekkonidae) in Hispaniola. Breviora, Mus. Comp. Zool., 280:1-28, 2 figs.

Stejneger, L. 1917. Cuban amphibians and reptiles collected for the United States National Museum from 1899 to 1902. Proc. U. S. Natl. Mus., 53:259-291.

Thomas, R. 1966. A new Hispaniolan gecko. Breviora, Mus. Comp. Zool., 253:1-5, 2 figs.

_____. 1968. Notes on Antillean geckos (*Sphaerodactylus*). Herpetologica, 24(1):46-60, 4 figs.

_____. 1975. The *argus* group of West Indian *Sphaerodactylus* (Sauria: Gekkonidae). Herpetologica, 31(2):177-195, 7 figs.

_____. 1976. Systematics of Antillean blind snakes of the genus *Typhlops* (Serpentes: Typhlopidae). Ph. D. thesis, Louisiana State Univ., xvi + 288 pp.

_____ and Schwartz. 1966a. The *Sphaerodactylus decoratus* complex in the West Indies. Brigham Young Univ. Sci. Bull., 7(4):1-16, 20 figs.

_____ and _____. 1966b. *Sphaerodactylus* (Gekkonidae) of the Greater Puerto Rico region. Bull. Florida State Mus., Biol. Sci., 10(6):193-260, 12 figs.

_____ and _____. 1974. The status of *Sphaerodactylus gilvitorques* Cope and of *Sphaerodactylus nigropunctatus* Gray (Sauria: Gekkonidae). J. Herpetology, 8(4):353-358, 1 fig.

_____ and _____. 1977. Three new species of *Sphaerodactylus* (Sauria: Gekkonidae) from Hispaniola. Ann. Carnegie Mus. Nat. Hist., 46(4):33-43.

_____ and _____. 1983. The *difficilis* complex of *Sphaerodactylus* (Sauria, Gekkonidae) of Hispaniola. Pt. 2. *Sphaerodactylus savagei, S. cochranae, S. darlingtoni, S. armstrongi, S. steptophorus,* and conclusions. Bull. Carnegie Mus. Nat. Hist., 22:31-60, 10 figs.

Tolson, P. J. MS. Occurrence of the *Sphaerodactylus nigropunctatus* complex of the U. S. Naval Base, Guantánamo Bay, Cuba.

Williams, E. E. 1961. The evolution and relationships of the *Anolis semilineatus* group. Breviora, Mus. Comp. Zool., 136:1-8, 1 fig.