

TWO NEW GECKOS (*SPHAERODACTYLUS*) FROM THE SIERRA MARTIN GARCIA OF HISPANIOLA

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ABSTRACT: *Sphaerodactylus ladae* and *S. perissodactylus* are described from xeric habitats on the south slope of the Sierra Martin Garcia in Hispaniola. The affinities of *S. ladae* are unclear. Pattern and dorsal scale structure ally *S. perissodactylus* with *S. streptophorus* and its relatives: *S. cryphius*, *S. omoglaux*, *S. armstrongi*, and *S. nycteropus*.

Key words: Reptilia; Sauria; Gekkonidae; *Sphaerodactylus ladae*; *Sphaerodactylus perissodactylus*; Hispaniola; Dominican Republic

DURING a recent trip to the southern Dominican Republic, we collected at the base of a relatively small isolated mountain range, the Sierra Martin Garcia. We were surprised to encounter, among a series of *Sphaerodactylus leucaster* Schwartz, two specimens that could not be assigned to any known species. Despite intensive collecting the following day at the same locality, we were unable to secure additional specimens of this species. Ten months later, we returned to the site, an area of inhospitable lowland xeric scrub, and obtained more specimens, including females and a juvenile, confirming that we had discovered a distinctive new species.

Between those two collection dates, R.T. found a single specimen of an almost equally puzzling sphaerodactyl during a brief ascent into the Martin Garcia. On our return to the area in 1985, S.B.H. obtained a series, confirming that we were dealing with another undescribed species.

In both instances, the prime objective of the fieldwork was to obtain tissue samples for biochemical comparisons. Some specimens were therefore dissected, tissue was removed and frozen, and the carcass was preserved for morphological study. Field notes, and in some cases selected measurements and counts, were taken on the specimens to be processed for biochemical analysis. Paratypes that have had tissue removed are indicated with an asterisk. Tissue samples from one specimen of the first species and five specimens of the second species are currently being stored in an

ultra-cold freezer in the laboratory of Dr. Richard Highton, University of Maryland.

In the account below, the following abbreviations are used: RT (Richard Thomas field series), SVL (snout–vent length), and USNM (United States National Museum of Natural History, Smithsonian Institution).

For the first of these species, we propose the name

Sphaerodactylus ladae sp. nov. Fig. 1A,B

Holotype.—USNM 258722, from 3.0 km by road east of Canoa (measured from junction with the Santo Domingo-Barahona highway), Barahona Prov., Dominican Republic (18°20'16" N, 71°08'11" W), 10 m, 16 June 1985, one of a series collected by S. Blair Hedges and Richard Thomas.

Paratypes.—USNM 258723*, USNM 258724–728, paratotypes.

Diagnosis.—A moderate-sized *Sphaerodactylus* with large, keeled, flattened, distinctly imbricate, mucronate dorsal scales, and a distinctive dorsal pattern of alternating lines of dark and light spotting in females (Fig. 1A) and juveniles, and of interrupted dark lines in males (Fig. 1B); and no scapular patch or ocelli.

Description.—A moderate-sized sphaerodactyl, reaching a known SVL of 27 mm. Rostral scale broad, rounded, cleft behind, with a small, flattened central area not set off by a distinct ridge; modally one internasal (one specimen with three); mod-

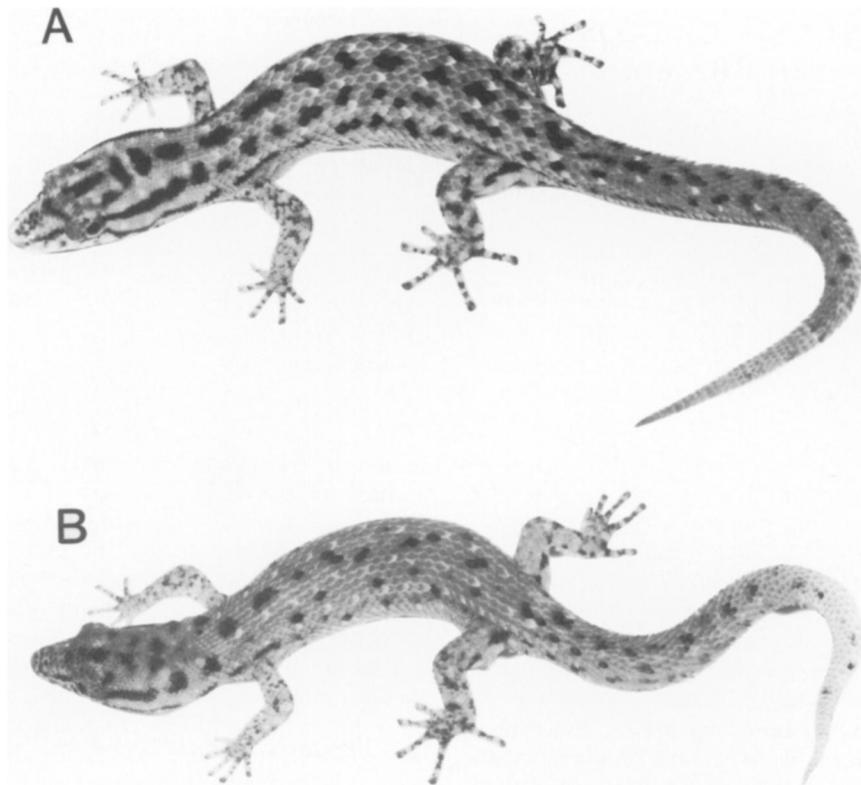


FIG. 1.—*Sphaerodactylus ladae*: (A) adult female (USNM 258722), holotype; (B) adult male (USNM 258723), paratype.

ally two postnasals (one with 1/1); labials 3/3 to mid-eye; snout scales broad, subhexagonal, juxtaposed, smooth to weakly keeled, becoming narrower, subimbricate, and more strongly keeled on frontal region, thence smaller, shorter (subhexagonal) on occiput and onto neck, enlarging abruptly at midneck and becoming essentially isomorphic with dorsal body scales; dorsal body scales large, flattened, strongly keeled, acute (extensively mucronate), and strongly imbricate, 19–23 axilla to groin ($\bar{x} = 20.5$), with about six single-hair bearing scale organs along distal edge; dorsal scales of tail narrow, acute, raised, strongly keeled, and imbricate. Ventral scales: a large pair of postmentals (one with a third, small postmental) followed by large, hexagonal, juxtaposed keeled (or smooth) scales grading into small, flat, smooth, imbricate

gular scales, enlarging abruptly at mid-neck and becoming essentially isomorphic with ventral scales; ventral scales flat, smooth, rounded to acute, imbricate, 22–25 axilla to groin ($\bar{x} = 24.0$); scales around midbody 36–43 ($\bar{x} = 40.0$); ventral caudal scales larger than dorsal caudals, but acute, smooth, flat, and imbricate; ventral caudals somewhat enlarged at intervals but no distinctly differentiated enlarged median row. Escutcheons large (7–10 scales long) with virtually no extensions onto thighs (8–9 scales wide). Basic color pattern (females and juveniles): Ground color gray-brown to tan; a series of seven dark (dark brown to black) broken lines extending from head along length of body and onto tail; dark palpebral and interocular marks converging on occiput to form middorsal "line" (series of spots or line fragments); upper

TABLE 1.—Comparison of *S. ladae* with large-scaled *difficilis* complex species. Scale count ranges from Schwartz (1977, 1983), Schwartz and Thomas (1977), and Thomas and Schwartz (1983). Means and other statistics are not given, because the ranges encompass various, often differentiated, populations. Except for *S. cochranae*, *S. lazelli*, and *S. ladae*, data are from more than 50 specimens of each species. Esc = escutcheon. For ventral caudals, E = enlarged midventral row, SE = slightly enlarged, NE = not enlarged. For escutcheon, C = central (no extension onto thighs), K = extension along thigh to knee, K- = extension partway along thigh but not to knee; + = present, - = absent, ± = present or absent, J = present only in juveniles.

	Dorsal scales	Ventral scales	Midbody scales	Scapular		Ventral caudals	ESC
				Patch	Ocelli		
<i>ladae</i>	19–23	23–25	36–43	—	—	NE	C
<i>clenchi</i>	33–48	27–36	53–71	—	+	E	K
<i>cochranae</i>	20–23	20–26	38–41	—	—	SE	?
<i>difficilis</i>	22–33	24–35	37–50	±	±	E, SE	K
<i>lazelli</i>	20	25	42	+	+	E	K
<i>ocoae</i>	27–35	27–38	45–57	J	J	SE	K
<i>randi</i>	27–39	27–37	45–57	±	±	NE	K-
<i>savagei</i>	21–31	25–38	34–50	+	±	SE	K-
<i>zygaena</i>	21–28	21–31	38–52	—	—	SE	K

and lower continuous dark postocular stripes extending onto body as interrupted series of dark dorsolateral and lateral blotches, respectively (lateral line more nearly continuous); narrow ventrolateral line present, faintly indicated, or absent. Beginning on head, white or cream spots positioned between dark line fragments, the light spots tending to be aligned transversely and alternating with dark line fragments on body, thus forming a series of rings, particularly evident on neck and anterior trunk. Dark and light spotting continuing irregularly onto tail; hind limbs prominently spotted with white, less so on forelimbs. Throat lightly streaked with dark longitudinal lines converging towards midline; venter streaked or suffused with dark pigment. Males with reduced basic pattern: light spotting absent, dark head markings bold, dark spotting on body less clearly lineate. Juvenile with prominent spotting and more nearly continuous dark lines.

Data on holotype.—An adult female, 27 mm SVL, 24 mm tail (regenerated), one internasal, 3/3 supralabials to mid-eye, two postnasals, 19 dorsal scales (axilla to groin), 22 ventral scales (axilla to groin), 39 midbody scales, and 10 lamellae on 4th toe of left pes.

Comparisons.—Large, flat, keeled, imbricate dorsal scales are found in the larger

members of what Thomas and Schwartz (1983) called the *difficilis* complex. This scale form is found in some Cuban, Hispaniolan, and Puerto Rican members of the *notatus* group, of which the *difficilis* complex is a part. The dorsal scales of *S. ladae* are flat, keeled, imbricate and very large; the extreme mucronation is unique and results in longer scales and low dorsal scale counts (Table 1). Also unique are the alternating light and dark spots, the specific configuration of the lines on the head, the large divided parietal spot, and the absence of any indication of a scapular pattern. We are unsure if the lined pattern is derived from the lined pattern of the *difficilis* complex. Many members of the complex have lines, often fragmented, on the head and body. The basic head pattern of *S. clenchi* Shreve, *S. difficilis* Barbour, *S. ocoae* Schwartz and Thomas, *S. randi* Shreve, and *S. savagei* Ruibal is lineate in a distinctive fashion: three lines extend onto the head from the body; the lateral two end on the eyelid, and the median one extends onto the snout. If present, the scapular patch interrupts the lines which continue onto the trunk, sometimes increased in number. (The term "basic pattern" refers to the elaborate pattern of juveniles and females; the male pattern in sphaerodactyls is often a much simplified version.) In the basic pattern of *S. ladae*, the three

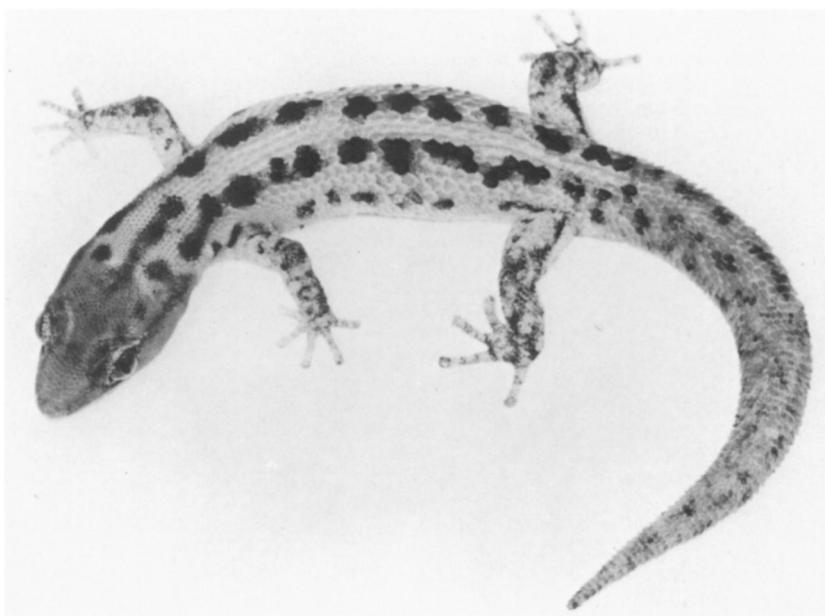


FIG. 2.—*Sphaerodactylus leucaster*, adult male from the type locality of *S. ladae*.

lines meet on the occiput and give rise to the single median dorsal line.

Sphaerodactylus cochranae Savage and *S. zygaena* Schwartz and Thomas are lined species without scapular patterns; however, the lines are continuous, differ in details, and the head patterns are simpler (neither has light spotting). The single known specimen of *S. lazelli* Shreve has very low counts (20, 25, and 42 for dorsal, ventral, and midbody counts, respectively), but its coloration is very different from that of *S. ladae* (Schwartz, 1983). The narrowness of the smooth subcaudal scales of *S. ladae* is not unique but is unusual for the large-scaled Hispaniolan species (some non-Hispaniolan species have narrow, keeled ventral caudals).

Sphaerodactylus ladae occurs syntopically with *S. leucaster* and *S. altavelensis* Noble and Hassler, and it bears a superficial resemblance to *S. leucaster* (Fig. 2), particularly the males of *S. ladae*, which lack the white spotting of the females. It was the striking difference in snout shape, eye size, and pupil shape (*S. leucaster* is extremely blunt-snouted and has narrowly

elliptical pupils) that first told us that we were dealing with a distinct, new species. Although the pattern of *S. leucaster* is linear and superficially similar to that of *S. ladae*, the middorsal stripe is very short and ends on the neck; it is formed by the convergence of a pair of palpebral stripes. In *S. ladae*, a pair of palpebral stripes also contributes to the median stripe, but the markings are more complex with involvement of a central head marking (Fig. 1). Of the pair of postocular stripes, the uppermost contributes to the paramedian stripe, and the second to the midlateral stripe. The second postocular stripe of *S. leucaster* fades out towards the angle of the jaw, and the midlateral stripe originates just past the forearm insertion. Spotting in *S. leucaster* and the other *shrevei* group members is enclosed within (or interrupts) the dark stripes and is not between them as in *S. ladae*.

The other species syntopic with *S. ladae*, *S. altavelensis* (Fig. 3), is another member of the *difficilis* complex. It is much smaller than *S. ladae*, has higher scale counts, and a very different pattern: a bilobed dorsal



FIG. 3.—*Sphaerodactylus altavelensis*, adult male from the type locality of *S. ladae*.

cephalic figure, a weak scapular figure (including small, paired ocelli), and a nearly unicolor brown or gray dorsum with a peppering of darker scales. *Sphaerodactylus darlingtoni* Shreve (Fig. 4) occurs in the higher elevations of the Sierra Martin Garcia. It is similar in size and scale morphology to *S. altavelensis*, is brown with scattered dark scales, has a bilobed cephalic figure (different from that of *S. altavelensis*), and a prominent scapular patch (with ocelli and a narrow light patch border).

In a very general way, the light spotting of *S. ladae* resembles that of *S. argus* Gosse of Jamaica, Cuba, and mainland Central America. There is a lineate component to the pattern of *S. argus*, especially early in its development, and the lines may break up into light spots with age (Thomas, 1975), but the patterns manifested by *S. argus* never closely correspond to that of *S. la-*

dae. *Sphaerodactylus argus* is also a smaller-scaled species (dorsal scales axilla to groin 38–50, midbody counts 57–73; Thomas, 1975).

Remarks.—The type-locality of *S. ladae* is reached by a dirt road east of Canoa that leaves the Santo Domingo-Barahona highway just north of a bridge located about 1 km south of the main part of Canoa. The road follows a canal (Cano de la Surza) for a short distance and skirts a low, flat, irrigated area of corn, coconuts, and other mixed agriculture (to the south). On the north side of the road, where all specimens of *S. ladae* were taken, the land is hilly and scrubby. The type-locality is in an area of gypsum mining (perhaps no longer active) and appears to be slightly to the southeast of the region known as El Yeso (The Gypsum) on the 1:50,000 scale topographic map of that portion of the Dominican Republic.

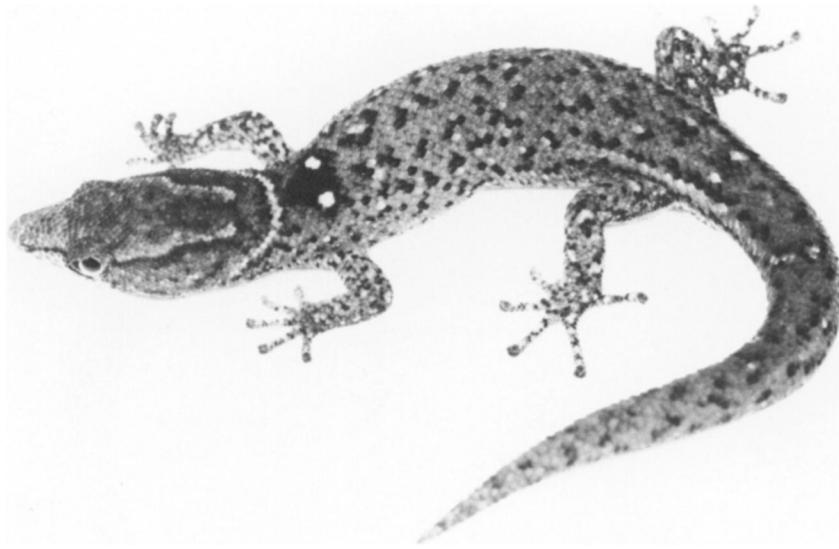


FIG. 4.—*Sphaerodactylus darlingtoni* from 0.2 km N, 13.7 km E Canoa (airline distance).

Sphaerodactylus ladae is the least common of three syntopic species at the type-locality. This suggests that the type-locality may not be optimal habitat, or that the species is seasonally abundant. The agave-cactus scrub of the type-locality is probably a degraded xerophytic formation that results when many of the woody trees have been removed for charcoal manufacture. This scrub is very extensive in this part of southern Hispaniola, being nearly continuous as far east as Bani; it extends west through the Valle de Neiba (but not continuously) into the Cul de Sac Plain of Haiti, but we have found no *S. ladae* at other similar sites where we used the same searching methods with equal intensity (we searched principally by overturning and breaking apart dead agave plants, and to some extent, the matted clumps of wire grass).

Etymology.—In honor of a reliable companion who steered us into many otherwise inaccessible areas in Hispaniola.

For the other new species of gecko we propose the name

Sphaerodactylus perissodactylus sp. nov.
Fig. 5

Holotype.—USNM 258729 from 0.1 km S, 13.5 km E Canoa (airline distance, measured from junction with the Santo Domingo-Barahona highway), Barahona Province, Dominican Republic (18°20'39" N, 71°01'59" W), 400 m, 19 June 1985, one of a series collected by S. Blair Hedges and Richard Thomas.

Paratypes.—USNM 258730–733, same data as holotype; RT 9242, 0.1 km N, 13.7 km E Canoa (airline distance), Barahona Province, Dominican Republic (18°20'57" N, 71°01'51" W), 500 m, 10 March 1985, collected by Richard Thomas.

Diagnosis.—A small- to moderate-sized *Sphaerodactylus* with very small dorsal scales, a very large, pigmented escutcheon, and a color pattern of: two inwardly curved, dark-edged, light postocular stripes that outline a light cephalic figure; a postauricular and postaxillary narrow light ring and light caudal transverse marks or chevrons (Fig. 5).

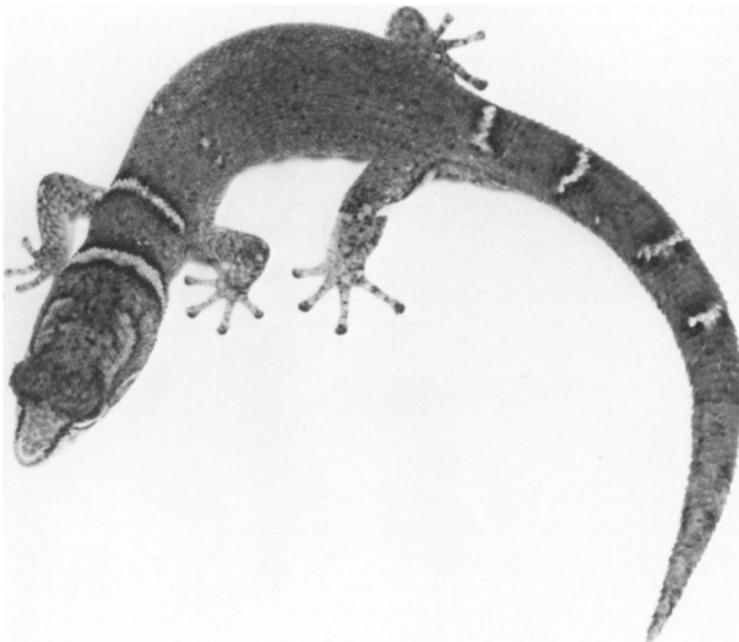


FIG. 5.—*Sphaerodactylus perissodactylus*, adult male (USNM 258729), holotype.

Description.—A small- to moderate-sized sphaerodactyl, maximum known SVL 23 mm (female), males to 22 mm. Snout slightly downcurved at tip, rostral partly cleft behind with a small flattened, semi-circular area tapering slightly towards the tip and demarcated by a slight ridge; internasals large, roughly pentagonal and paired (one specimen with one internasal), supranasals large; an upper, large, elongate postnasal and a lower, rounded postnasal; supralabials 3/3 to mid-eye; snout scales cobblelike, juxtaposed and weakly keeled, grading into subimbricate frontals, then small juxtaposed scales in parietal area, becoming more flattened and imbricate on neck and essentially isomorphic with dorsal scales past mid-neck; dorsal scales small, rounded to subacute, slightly swollen, weakly keeled, and weakly imbricate, 38–45 ($\bar{x} = 41.8$) axilla to groin, each with 3–4 double-hair bearing scale organs on edge (around apex); no area of middorsal gran-

ules; dorsal caudal scales smooth, flattened, acute to rounded; gular scales large, smooth, juxtaposed anteriorly, grading into smaller scales at midthroat and becoming somewhat imbricate; ventral scales flattened, more imbricate, acute to rounded, and smooth, 30–36 ($\bar{x} = 33.3$) axilla to groin; scales around midbody 57–66 ($\bar{x} = 61.6$); escutcheon large, 6–8 scales long (mode), 18–23 scales wide and extending well onto venter and onto thighs to near knee; 10 (mode) or 11 lamellae on 4th toe of pes; tail with enlarged midventral row of smooth flattened, more or less cycloid scales.

Coloration: bilobed dorsal cephalic figure defined by medially hooked (at level of occiput) light upper postocular stripes; lower postocular stripe on each side fading out near ear opening; labial stripes extending onto throat and becoming faint; a narrow, light boldly dark-edged, transverse ring, angled rearward, extending

from one ear opening to the other; a second light, transverse, immediately prebrachial ring, similar to the first, crossing neck just in front of forearm insertion or angling slightly posteriad and crossing over scapular region; trunk between postaxillary stripe and groin uniformly colored (tan to brown) with random peppering of darker scales or with 1–3 additional transverse light rings, each complete, partial, or indicated by a series of small, light ocelli (sometimes only one or two); a light postsacral transverse bar, and a series of about five, rear-pointing, dark-edged light caudal chevrons or transverse dashes.

Data on holotype.—An adult male, 21 mm SVL, tail 19 mm (posterior 7 mm regenerated), two internasals, 3/3 supralabials, 41 dorsal scales axilla to groin, 34 ventral scales axilla to groin, 61 midbody scales, 10 lamellae on 4th toe of left pes, escutcheon 8×23 ; both neck rings present and well-marked; only one postaxillary ring, not complete, indicated by four transversely aligned, faint ocelli; tail with one basal, transverse, dark-edged light mark, and three similarly pigmented chevrons.

Distribution.—Known only from a narrow altitudinal zone (400–500 m) on the southwest slopes of the Sierra Martin Garcia.

Comparisons.—*Sphaerodactylus perissodactylus* appears to belong to the *difciliis* complex, and specifically to the group of species including *S. armstrongi* Noble and Hessler, *S. cryphius* Schwartz and Thomas, *S. nycteropus* Thomas and Schwartz, *S. omoglaux* Thomas, and *S. streptophorus* Thomas and Schwartz. These are small to moderate-sized sphaerodactyls with similar dorsal scale structure and similarities in pattern (Table 2). The pattern elements often include a bilobed head figure set off by short postocular stripes and various kinds of transverse neck or scapular stripes, and often body ocelli (Thomas and Schwartz, 1983). Markings resembling the neck and scapular rings of *S. perissodactylus* are sometimes present in *S. armstrongi*, *S. cryphius*, and *S. streptophorus*, but never as well

developed. *Sphaerodactylus cryphius* and *S. streptophorus* have a pair of medially directed, hooked postocular stripes or some similar configuration (see Thomas, 1982: Figs. 3, 4), although in *S. perissodactylus* the head figure is more prominent and more boldly outlined than in the other species. The postaxillary ring of *S. perissodactylus* is not found in *S. armstrongi*, *S. streptophorus*, *S. cryphius*, or *S. omoglaux*; it occupies about the same position as the scapular ocelli of these four species. In two specimens of *S. perissodactylus*, it is broken at the midline and has the appearance of modified, elongate ocelli. The trunk rings of *S. perissodactylus*, when they appear as transversely aligned series of ocelli, are superficially similar to the body ocelli that are sometimes found in *S. armstrongi*. The tail pattern is distinctive, being composed of isolated, posteriorly directed chevrons, rather than chevrons or ocelli that form at constrictions in a light-edged middorsal zone. In dorsal and midbody scale counts, *S. perissodactylus* exceeds all of these species except for some populations of *S. armstrongi*. *Sphaerodactylus nycteropus* has no indication of transverse dorsal markings but instead is longitudinally lined, dorsolaterally and ventrally.

Sphaerodactylus perissodactylus occurs syntopically with *S. altavelensis* (Fig. 3), which is about the same size; the latter species has a bilobed head figure but lacks rings, and has lower scale counts (approximately 40–50 midbody scales). It may also have a faint scapular pattern, and the escutcheon is distinctly less extensive on the venter. *Sphaerodactylus darlingtoni* (Fig. 4) occurs in the uplands of the Sierra Martin Garcia (and elsewhere in Hispaniola) and extends down to about the elevation whence *S. perissodactylus* is known; the two may be syntopic. *Sphaerodactylus darlingtoni* in this area has a head pattern with a pair of narrow posterior extensions and a prominent scapular patch (with ocelli). The U-shaped, light anterior border to the patch and the head figure somewhat resemble the neck ring and head figure of *S. perissodactylus*. The trunk is dark and

TABLE 2.—Comparison of *S. perissodactylus* with the small *difficilis* complex species (Thomas and Schwartz, 1983). (+ = present, - = absent, ± = present or absent, [+] = present but different from other species.)

	Dorsal scales	Ventral scales	Midbody scales	Scapular	
				Patch	Ocelli
<i>perissodactylus</i>	38–45	24–31	57–66	—	—
<i>altavelensis</i>	20–36	22–32	38–62	±	±
<i>armstrongi</i>	29–46	25–35	49–75	—	±
<i>crypticus</i>	26–35	24–32	43–59	+	+
<i>darlingtoni</i>	24–36	24–31	48–59	+	+
<i>omoglaux</i>	30–34	27–30	51–57	—	+
<i>nycteropus</i>	30–32	27–31	54–60	—	—
<i>streptophorus</i>	25–37	24–33	41–65	—	[+]
<i>williamsi</i>	33	33	52	—	—

without rings or other prominent pattern; the sacrum is lined. The range of the dorsal and midbody scale counts falls completely below those of *S. perissodactylus*, and the escutcheon is much shorter (smaller central area).

Remarks.—The type-locality of *Sphaerodactylus perissodactylus* is reached by continuing on the road from Canoa past the type-locality of *S. ladae* for about 15 more kilometers. The road eventually reaches the coast about 13 km from Canoa at Puerto Alejandro (a map name; there is presently no settlement) and continues for about 5 km to a salina, where salt is mined. A road branches to the north from about 0.5 km west of the salt mine buildings, eventually becoming a foot-path and ascending into the Sierra Martin Garcia. It was along this path, roughly north of the salina, that we encountered *S. perissodactylus*.

The habitat in the vicinity of the type locality is semi-xeric woodlands that grade into mesic woodlands, on a limestone substrate. The series was collected under limestone rocks, rotten logs, and in leaf-litter in a small, shaded copse along with three specimens of the recently described *Lepotyphlops asbolepis* (Thomas et al., 1985). Other small terrestrial or fossorial reptiles syntopic with *S. perissodactylus* include the anguid *Sauresia agasepsoides* Thomas and the blind snake *Typhlops sulcatus* Cope, both xerophiles.

Etymology.—From the Greek, “*perissō*”, uneven, and “*dactylīos*”, ring: unevenly ringed.

Acknowledgments.—Support for the two visits to the area of the Martin Garcia by Hedges and Thomas came from NSF grant BSR 83-07115 to Richard Highton. We thank James D. Ackerman, who provided the occasion for the visit to the Sierra Martin Garcia that resulted in the discovery of *S. perissodactylus*. Albert Schwartz very helpfully loaned comparative material of *Sphaerodactylus*, and Sixto J. Inchaustegui, of the Museo Nacional de Historia Natural, has our appreciation for his helpfulness during our visits to the Dominican Republic.

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