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Habitat Preferences and Abundance of Dwarf Geckos (*Sphaerodactylus*) on St. Eustatius, Netherlands Antilles

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ABSTRACT.—In June 2004, on St. Eustatius, Netherlands Antilles, we examined habitat preferences and abundance of the two native species of Dwarf Geckos (*Sphaerodactylus sabanus* and *S. sputator*) in two specific microhabitats: dead agave plants and leaf litter. We determined that the ratio of *S. sabanus* to *S. sputator* in leaf litter was 9:1. Based on the number of geckos disturbed while walking measured transects through leaf litter, calculated densities at high-, mid-, and low-elevation sites on the western (leeward) slope of the Quill, a dormant volcano, were 1427, 1757, 727/ha for *S. sabanus* and 159, 195, 72/ha for *S. sputator*, respectively. In contrast and based on actual counts, *S. sputator* was more abundant than *S. sabanus* in dead agave plants. Calculated densities, based on the number of dead agaves/ha, were 801/ha for *S. sputator* and 188/ha for *S. sabanus*.

KEYWORDS.—*Sphaerodactylus sabanus*, *S. sputator*, habitat associations, population densities

St. Eustatius, Netherlands Antilles, also known as Statia, has an area of 19.9 km^2 and contains three distinctly different habitat types: a northern xeric area ("Northern Hills") characterized by desert vegetation (seasonal dry forest); a central region of lowland plains ("The Cultuurvlatke") covered primarily by grasslands and developed areas; and a southern area dominated by a 600-m high dormant volcano ("The Quill") and characterized by seasonal deciduous and evergreen forests. The Quill arrests clouds, causing more rainfall on the top and upper slopes than on the plains and Northern Hills. The average temperature is 25.7 °C (De Palm 1985), except on The Quill, where it is slightly lower due to elevation and dense vegetative cover. The natural understory on The Quill and vegetation elsewhere on the island has been severely degraded by feral goats and other livestock. Historical activities such as cotton and tobacco farming also have altered the native environment.

Two species of *Sphaerodactylus* are native to Statia. *Sphaerodactylus sputator* is widely distributed across the Anguilla and St. Christopher (St. Kitts) banks, whereas *S. sabanus* is endemic to the Saba and St. Christopher banks. *Sphaerodactylus sputator* is a moderately sized dwarf gecko, with a maximum snout-vent length (SVL) of 35 mm in males and 39 mm in females; the smaller *S. sabanus* has a maximum SVL of 29 mm in males and 28 in females (Schwartz and Henderson 1991).

While collecting animals for a concurrent study on behavior, we noted that geckos were abundant in leaf litter and, based on experiences on other West Indian islands, knew that *Sphaerodactylus* could be collected in dead *Agave* plants. Because little is known about the basic biology of either species, we took the opportunity to examine distribution, habitat preferences, and population densities in two disparate habitats.

In June 2004, we counted geckos observed in leaf litter along transects on the western slope of The Quill. We walked 90 transects, ranging in length from 3.6–21.0 m, with lengths determined by topography and extent of continuous leaf litter. Transects were clustered at three elevations. The highest transects were just below the crater rim at approximately 360 m above seal level (asl), mid-elevation transects were near 250 m asl, and a third group near the base of the mountain at about 165 m asl. We walked through the leaf litter counting all *Sphaerodactylus* disturbed along a path 50 cm on either side of our transect line.

Along the Venus Baai Trail (above Wash Gut and between Gilboa Hill and Little Mountain in the Northern Hills), we dismantled dead *Agave* sp. plants, counting every gecko encountered during the process. We also counted all dead plants in three plots (50 × 50 m, 25 × 25 m, and 70 × 10 m) to determine the abundance of dead agaves. We then measured the diameters and heights of each plant to be torn apart in order to calculate the approximate volume of each agave using the formula for the volume of a cone.

We encountered 104 geckos (26 at the low-elevation site, 49 at the mid-elevation site, and 29 at the high-elevation site) while walking transects on The Quill. Independently conducted leaf litter samples that included complete removal of litter and animals in a series of small plots resulted in a 9:1 ratio of *S. sabanus* to *S. sputator*. We applied that ratio to our observations, because positive identification for each encounter was difficult when these diminutive lizards were flushed from the litter. Assuming that 90% of individuals observed along transects were *S. sabanus*, we calculated densities for *S. sabanus* of 1427, 1757, and 727/ha at low-, mid-, and high-elevation sites and, for *S. sputator*, 159, 195, and 72/ha. The higher densities at low- and mid-elevation sites probably reflected the abundance and depth of litter combined with a canopy capable of excluding nearly all direct sunlight (<15% of the surface was insolated at any time). In contrast, the low-elevation site supported few large trees and the canopy allowed considerable light penetration (≥50%).

We counted 60 geckos (47 *S. sputator*, 11 *S. sabanus*, 2 *Hemidactylus mabouia*) in 28 dead *Agave* plants. The mean number of *S. sputator* per agave (1.7 ± 0.2, 05) was significantly greater than the mean number of *S. sabanus* (0.4 ± 0.1, 0–2; Mann Whitney, $Z = -4.3$, $P < 0.0001$). The mean volume of dead agaves was 0.10 ± 0.02 m^3 (0.01–0.44 m^3, N = 23). The number of *S. sputator* was significantly correlated with agave volume (Spearman Correlation, $Z = 2.0$, $P = 0.04$), but the number of *S. sabanus* was not ($Z = 0.1$, $P = 0.91$), suggesting that *S. sputator* was more commonly encountered in larger plants, but *S. sabanus* was more or less equally abundant in both large and small agaves. Because we found both species together in 11 dead agave plants, we assumed that *S. sputator* was not excluding *S. sabanus* from larger agaves. Instead, we attribute the lack of correlation between the abundance of *S. sabanus* and agave size to the low number of individuals of that species encountered. We calculated a density of 471 dead *Agave* plants/ha, suggesting that 801 *S. sputator* and 188 *S. sabanus* per hectare were associated with dead agaves.

Both *S. sputator* and *S. sabanus* are frequently encountered in varied habitats, where they exploit a wide range of microhabitats, including rocks, human debris, trash, mollusk shells, termitaria, logs, and rock walls (Schwartz and Henderson 1991). However, in our study, the two species used the sampled habitats quite differently. Smaller *S. sabanus* was more abundant in leaf litter, whereas *S. sputator* dominated in discrete, patchily distributed cover such as that provided by the dead agaves. Leaf litter was most abundant in shaded areas that presumably were moister. In contrast, the dead agaves were on xeric slopes subjected to direct insolation during at least part of every day. *Sphaerodactylus* lizards are vulnerable to desiccation (e.g., MacLean 1985), and the smaller *S. sabanus*, with proportionately more surface area, is presumably less tolerant than the larger *S. sputator* of extremely dry conditions and lacks the ability to use xeric habitats as effectively as its sympatric congener.

Our population densities are low compared to those reported in Nava et al. (2001, *S. parvus* on Anguilla) and Rodda et al. (2001, *S. macrolepis* on Guana, British Virgin Islands). However, both of those studies concentrated on habitats in which geckos were known to be extremely abundant (rocky areas and dense leaf litter, respectively) and used methods less likely to underestimate numbers of lizards (removal of each rock or isolation and complete removal of all individuals in an area). Consequently, our estimates should be considered very conservative.

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