



Relationships among West Indian skinks (*Mabuza* sp.) are poorly understood, and two or more species might occur in the Lesser Antilles. Skinks may always have been rare on St. Vincent, but diurnally active, ground-dwelling lizards are vulnerable to predation by mongooses. This lizard was photographed in the mongoose-free Grenadines, where the species is more abundant.

An Annotated Checklist of the Amphibians and Reptiles of St. Vincent, West Indies

Michael L. Treglia

Department of Natural Resources, Cornell University, Ithaca, New York 14853, USA

A Note on Conservation

Many of the world's species of reptiles and amphibians are threatened with extinction. Although most species discussed here remain abundant on St. Vincent, many conservation issues need to be addressed. The chytrid fungus is decimating frog populations throughout Central America, and at least some of the amphibians on St. Vincent would be susceptible to this epidemic, if it were to reach the island. Also, snakes on St. Vincent are routinely killed by local people who believe they are dangerous.

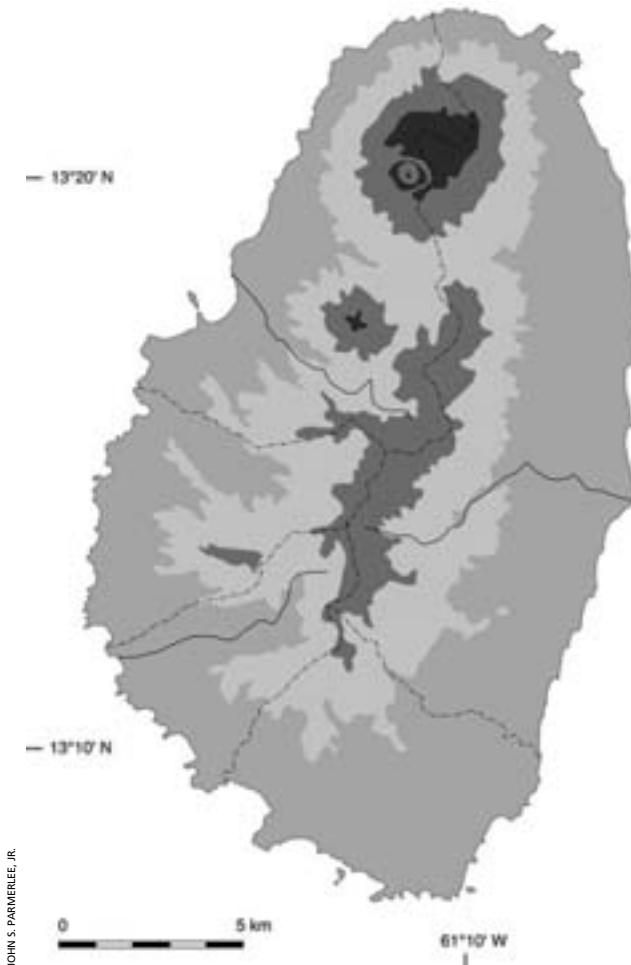
Finally, while the introduction of *Anolis sagrei* onto St. Vincent does not appear detrimental to the native species at this time, other invasions, such as that of the mongoose (*Herpestes javanicus*) have had dire consequences. Public education is the most important preventative measure against these problems: Travelers need to be taught about chytrid and how to avoid transporting it to uninfected areas; local people need to learn that all St. Vincentian snakes are harmless; and everyone needs to learn about the problems that almost invariably accompany invasive species, and how to prevent and minimize invasions.

"In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught."

Baba Dioum, 1968

Frogs (Amphibia: Anura)

Bufo marinus (Linnaeus 1758). Anura: Bufonidae. Cane Toad (Marine Toad). Probably introduced. This large toad (maximum female SVL = 225 mm) is the only toad on St. Vincent. It has a brown dorsum and "warts" all over its body. It was probably introduced intentionally to control insect populations in sugarcane plantations, but it could have arrived as a natural migrant from the mainland. These toads have been introduced throughout tropical regions of the world, and have become pests and



JOHN S. PARMERLEE, JR.

St. Vincent (29 x 18 km, 344 km²) is one of the volcanic Windward Islands of the Lesser Antilles.



JOHN S. PARMERLEE, JR.

The Cane Toad (*Bufo marinus*) was probably introduced intentionally on St. Vincent to control insect populations in agricultural fields.

major threats to native frogs, with which they compete and on which they feed. *Bufo marinus* is found throughout the St. Vincentian lowlands in a wide variety of habitats that include urban situations and various moist to dry low-elevation forests. This species is a generalist predator, feeding on nearly any animal it can fit in its mouth. During daylight hours they are commonly found under cover, but at night they can be seen in the open, along or on roads and under streetlights, foraging and calling. All toads secrete toxins from skin glands, especially the parotoid glands on the backs of their heads, and persons handling *B. marinus* should wash their hands thoroughly to mitigate the chance of adverse reactions.

Eleutherodactylus johnstonei (Barbour 1917). Anura: Leptodactylidae. Johnstone's Frog (Lesser Antillean Frog). Introduced. These small frogs (maximum female SVL = 35 mm) have become established on many West Indian islands (and elsewhere), largely as a consequence of human-mediated transport. Dorsal coloration is generally some shade of brown, but other markings are highly variable. While generally occurring in mesic forests, *E. johnstonei* can be heard calling (a high-pitched whistle) throughout the night even in urban areas. During a three-week stay in June 2006, we were never out of earshot of calling males. These frogs are most abundant in the lowlands, although they reach the island's highest elevations, where they may pose a threat to endemic *E. shrevei*, which are absent from the lowlands (although we cannot say with any certainty whether or not *E. johnstonei* is responsible for their absence).

Eleutherodactylus shrevei (Schwartz 1967). Anura: Leptodactylidae. Saint Vincent Frog. Endemic. These small frogs (maximum female SVL = 40.1 mm; male = 28 mm) are morphologically similar to *E. johnstonei*, from which they can be readily distinguished by the presence of bright red color on the thighs and often on the belly. These frogs are generally found at higher elevations (> 300 m) and are abundant on the highest peaks (~980 m), even at the rim of La Soufrière, a volcano active as recently as 1979. Above the elevations where *E. johnstonei* is common, *E. shrevei* is nearly ubiquitous. It is primarily crepuscular and may be heard calling at dusk and into the early night. The call is comprised of short, loud clicks. Although the range



ROBERT POWELL

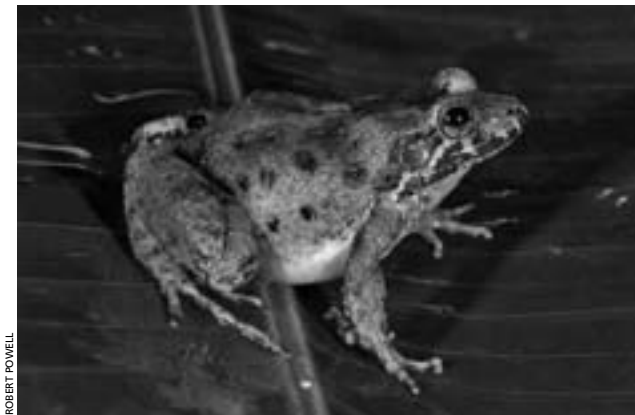


ALONDRA DIAZ

Introduced Lesser Antillean Frogs (*Eleutherodactylus johnstonei*) are ubiquitous in the lowlands, although they reach the island's highest elevations, where they may pose a threat to endemic *E. shrevei*. During a three-week stay in June 2006, we were never out of earshot of calling males.



Saint Vincent Frogs (*Eleutherodactylus shrevei*) may be particularly vulnerable to the chytrid fungus, if it becomes established on St. Vincent.



Windward Ditch Frogs (*Leptodactylus validus*) are endemic to the Lesser Antilles, where they occur on the Grenada and St. Vincent island banks.

of *E. shrevei* prior to the introduction of *E. johnstonei* is unknown, *E. shrevei* may be restricted to higher elevations by anthropocentric habitat alterations combined with competition from the more fecund, invasive *E. johnstonei*. This species, found nowhere else, may be particularly vulnerable to the chytrid fungus, if it arrives on St. Vincent.

Leptodactylus validus (Garman 1888). Anura: Leptodactylidae. Windward Ditch Frog. Native. This moderately sized frog (maximum female SVL = 51.5 mm; male = 42.9 mm) was recently

separated from the more widely distributed *L. wagneri* and is endemic to the Lesser Antilles, where it occurs on the Grenada and St. Vincent island banks. Considerably larger than the other anuran species on the island, it is easily distinguished from both species of *Eleutherodactylus* by the lack of expanded toe-tips. *Leptodactylus validus* is gray to brown with variable markings, and usually has a distinct fold of skin on either side of its back. As the common name suggests, these frogs often are associated with ditches (and small streams) throughout the lowlands, but its islandwide distribution is not well known.

Lizards (Reptilia: Squamata)

Ameiva ameiva (Linnaeus 1758). Squamata: Teiidae. Neotropical Ground Lizard. Origin unknown. The origin of these relatively large lizards (maximum male SVL = 149 mm; female = 141 mm) on St. Vincent is uncertain. They are native to the Grenada Bank (which includes the Grenadines) and much of the Neotropical mainland. They are habitat generalists throughout the range, with a strong preference for open areas, where they exploit abundant sunlight to maintain high body temperatures during active periods. *Ameiva ameiva* is known from only two sites on St. Vincent (Barrouallie on the leeward side of the island and Georgetown on the windward coast). The history of populations on the island is unclear, with the unusual distribution a possible consequence of extirpation from other lowland habitats (possibly attributable to mongoose predation) or the result of separate introductions, probably from one of the Grenadine islands, where the species is abundant.



MARK DE SILVA



ROBERT POWELL



JOHN S. PARMERLEE, JR.



DAVID STEINBERG



JOHN S. PARMERLEE, JR.



JOHN S. PARMERLEE, JR.

Neotropical Ground Lizards (*Ameiva ameiva*) are known from only two sites on St. Vincent (Barrouallie on the leeward side of the island and Georgetown on the windward coast). The unusual distribution is a possible consequence of extirpation from other lowland habitats (possibly attributable to mongoose predation) or the result of separate introductions.

Anolis griseus (Garman 1888). Squamata: Polychrotidae. Saint Vincent Tree Anole. Endemic. These large anoles (maximum male SVL = 136 mm; female = 86 mm) are primarily arboreal and observed 2–8 m above the ground, with females and juveniles slightly lower than males. *Anolis griseus* is widely distributed throughout the island, but rare or absent where vegetation is sparse. Although habitats used by *A. griseus* overlap somewhat with those of the other native anole, *A. trinitatus*, it can be distinguished by its larger size. It is usually some shade of gray or gray-brown with a mottled dorsum and green or yellow tinges sometimes present on the limbs and face. The dewlap is dirty

white or light gray. The diet of *A. griseus* is highly variable, and includes berries, small invertebrates, and occasionally smaller anoles.

The diet of *A. griseus* is highly variable, and includes berries, small arthropods, and occasionally *A. trinitatus*.

Anolis sagrei (Dumeril and Bibron 1837). Squamata: Polychrotidae. Cuban Brown Anole. Introduced. These moderately sized anoles (maximum male SVL = 70 mm; female = 46 mm) are the only brown anole on St. Vincent (although *A. trinitatus* is dichromatic and occasionally may be brown). They have stocky bodies, and a diamond or mottled dorsal pattern is usually present. Dewlaps are a deep brick red. First documented on St. Vincent in 2005, *A. sagrei* was presumably introduced within

the previous two or three years with shipments of building materials from Florida, where it is well-established. Populations occur near the docks in Kingstown and Campden Park and in the Montrose neighborhood, where they presumably arrived with construction materials. All of these sites consist of dramatically disturbed, open habitats with sparse, generally low vegetation and rubble, which these lizards readily exploit. *Anolis sagrei* does occur with the similarly sized *A. trinitatus* in many of these areas,

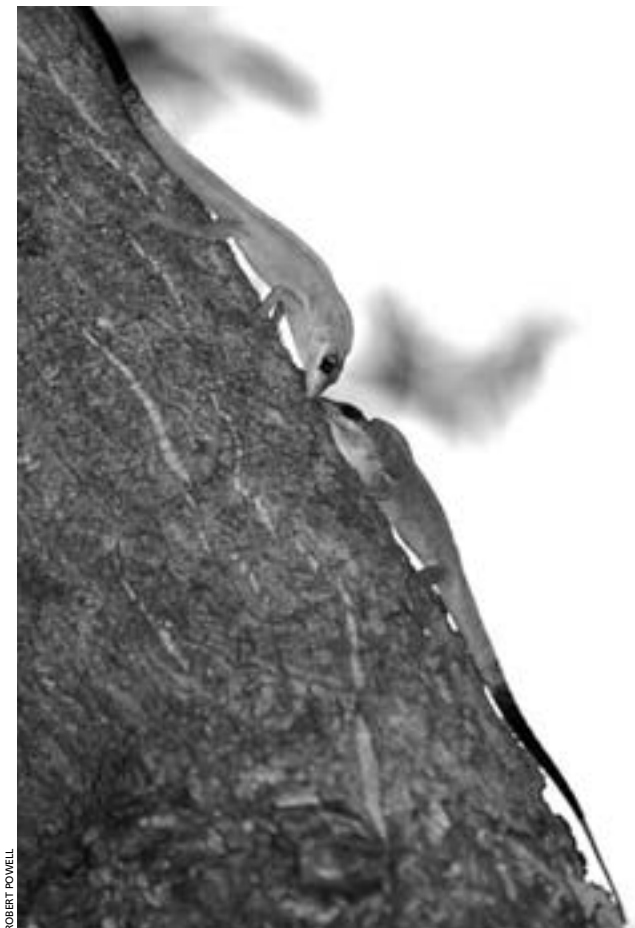


ALEJANDRO SÁNCHEZ



CHRISTOPHER MALLERY

Recently introduced Cuban Brown Anoles (*Anolis sagrei*) currently are restricted to dramatically disturbed, open habitats with sparse, generally low vegetation and rubble.



Male Saint Vincent Bush Anoles (*Anolis trinitatus*) are intensely territorial. The male (middle) responds to an intruder before the resident and intruder face-off (bottom).

but the presence of *A. sagrei* has had little observable effect on native species to date, although *A. trinitatus* may be forced to use higher perches in the presence of *A. sagrei* (similar to the effects on *A. carolinensis* in the southeastern United States). Long-term effects of the invasion of *A. sagrei* are not yet clear.

Anolis trinitatus (Reinhardt and Lütken 1863). Squamata: Polychrotidae. Saint Vincent Bush Anole. Endemic. These moderately sized anoles (maximum male SVL = 74 mm; females = 57 mm) are nearly ubiquitous throughout St. Vincent, found in all but the most heavily disturbed, sparsely vegetated habitats. Populations have become established on Trinidad, primarily in suburban or urban gardens and similar artificial habitats. Perches range from ground level to 2 m, with males often perching higher than females and juveniles. Coloration varies from bright green to yellowish green, or even blue with occasional grayish mottling. Dewlaps are usually yellow, but individuals at some locations have white dewlaps. These anoles primarily consume a variety of small invertebrates, often including a large number of ants.

Gymnophthalmus underwoodi (Grant 1958) Squamata: Gymnophthalmidae. Smooth-scaled Worm Lizard. Presumably native. These small, ground-dwelling lizards (maximum SVL = 43 mm) have smooth scales and are some shade of brown or grayish brown. They seem to prefer relatively dry, open habitats where they forage for small invertebrates in leaf litter. This is an all-female species, with eggs developing without fertilization (parthenogenesis). This reproductive mode can facilitate colonization of new areas, as only one individual is necessary to establish a population. Populations occur on the Neotropical mainland and are known from a number of Lesser Antillean islands. Although some of the latter are undoubtedly attributable to human-mediated transport, others may have been established as a consequence of natural over-water dispersal, presumably on flotsam. These lizards are abundant in suitable habitats throughout the island.

Hemidactylus mabouia (Moreau de Jonnés 1818). Squamata: Gekkonidae. Cosmopolitan House Gecko. Origin unknown, populations may represent a combination of animals that arrived naturally via over-water dispersal or human-mediated transport. These moderately sized geckos (maximum male SVL = 68 mm) function as human commensals, and are essentially ubiquitous in buildings and other artificial structures, including piles of debris. Because of their close association with humans, populations occur throughout the tropics as individuals accompany humans and their cargos. Ancestors of House Geckos originated in Africa; American populations range throughout the Neotropical mainland and the West Indies, and the species has become established in Florida and other regions. These nocturnal geckos feed on insects, and often forage around artificial lights (the "night-light niche"). The only species on St. Vincent with which *H. mabouia* might be confused is *Thecadactylus rapicauda*, which is much larger and generally lives in forested habitats.

Iguana iguana (Linnaeus 1758). Squamata: Iguanidae. Green Iguana (Common Iguana). Native. These large lizards (maximum SVL = 500 mm) are found in varied habitats that include



ROBERT POWELL

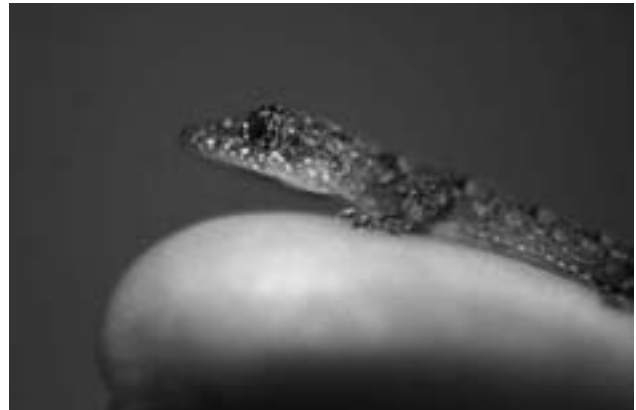
Smooth-scaled Worm Lizards (*Gymnophthalmus underwoodi*) are all females. Eggs develop without fertilization (parthenogenesis). This reproductive mode can facilitate colonization of new areas, as only one individual is necessary to establish a population.

xeric lowlands and mesic highlands, but their distribution is not well documented on St. Vincent. Where present, iguanas usually are found along forest edges that provide ready access to sunlight. Although commonly called “Green” Iguanas, these lizards are quite variable in color, ranging from bright green to grayish brown or brownish orange, often with dark transverse stripes or bars. Iguanas have large dorsal crests, and a dewlap that is typically green, but sometimes red or orange, or green with black streaks. Green Iguanas are hunted for food on St. Vincent, and a defined season exists. The apparently localized concentrations of animals may reflect differential hunting pressure.

Mabuya sp. Squamata: Scincidae. Lesser Antillean Skink (Slipperyback). Presumably native. Relationships among West Indian skinks are poorly understood, and two or more species might occur in the Lesser Antilles. Until genetic studies are available to clarify the status of populations on different islands, assignments to species are at best tentative. These moderately sized lizards (maximum SVL ~ 175 mm) have smooth, shiny scales, which are associated with small bones embedded in the skin. Primary ground color is brown. Little is known about St. Vincentian populations, but skinks are generally associated with leaf litter and assorted debris, but also may be found along rock



MARK DE SILVA



ROBERT POWELL

Cosmopolitan House Geckos (*Hemidactylus mabouia*) function as human commensals. Because of this close association with humans, populations occur throughout the tropics as individuals accompany humans and their goods.

walls and buildings. These lizards eat insects and other small arthropods. Their apparent rarity on St. Vincent may be a natural phenomenon, but diurnally active, ground-dwelling lizards are vulnerable to predation by mongooses, which have apparently caused the extirpation of some insular populations.



CARLOS RODRIGUEZ



MARK DE SILVA

Green Iguanas (*Iguana iguana*) usually occur along forest edges that provide ready access to sunlight. These lizards are hunted for food on St. Vincent, and a defined season exists. The apparently localized concentrations of animals may reflect differential hunting pressure.

Sphaerodactylus vincenti (Boulenger 1891). Squamata: Gekkonidae. Windward Dwarf Gecko. Native. These small geckos (maximum SVL = 40 mm) are locally abundant in leaf litter habitats that are generally moister than those occupied by *Gymnophthalmus underwoodi*. Primarily active by day, these diminutive predators feed on a variety of small invertebrates. Windward Dwarf Geckos have a brown dorsum, sometimes with a reddish cast and often with dark flecks. The venter is pale gray to purple. Light-blue rings often surround the eyes.

Thecadactylus rapicauda (Houttuyn 1782). Squamata: Gekkonidae. Turnip-tailed Gecko. Native. These large geckos (maximum SVL = 121 mm) acquired their common name because regenerated tails resemble turnips. They occupy diverse habitats ranging from dry and mesic forests and plantations to urban situations, although they are much less abundant in the latter than *Hemidactylus mabouia*. A mottled gray dorsum provides excellent camouflage against the lichens found on many forest trees. Although sometimes encountered by day, when they may emerge from refuges to bask, like most geckos, they are primarily active at night, when they forage for insects.

Snakes (Reptilia: Squamata)

Chironius vincenti (Boulenger 1891). Squamata: Colubridae. Saint Vincent Racer. Endemic. Little is known about these long, slender snakes (maximum SVL = 1070 mm). They appear to be associated primarily with rainforest habitats at moderate elevations (> 135 m), and are presumably semi-arboreal, which may provide some protection from predation by mongooses, which do not climb well. These snakes forage by day and presumably prey primarily on frogs and their eggs. This species is readily distinguished from others on the island by their uniform, slate black dorsum and a pale, dirty yellow venter. These snakes are rarely seen and may always have been rare, although predation by mongooses and habitat alteration may be responsible for their apparent scarcity.

Corallus cookii (Gray 1842). Squamata: Boidae. Saint Vincent Treeboa. Endemic. These arboreal snakes (maximum SVL = 1374 mm) are active at night and rarely seen during the day. A



ROBERT POWELL

Windward Dwarf Geckos (*Sphaerodactylus vincenti*) are locally abundant in leaf litter habitats that are generally moister than those occupied by *Gymnophthalmus underwoodi*.



ROBERT POWELL



ROBERT POWELL

The mottled gray dorsum of Turnip-tailed Geckos (*Thecadactylus rapicauda*) provides excellent camouflage against the lichens found on many forest trees.

bright red reflection is elicited from their eyes when caught in a beam of light at night. Dorsal ground color is variable, but generally ranges from reddish in juveniles, to taupe, gray, or dark brown in adults. An hourglass-shaped pattern is evident in nearly all individuals. The diet of small *C. cookii* consists almost exclusively of anoles, with larger snakes shifting to rodents. These snakes remain widely distributed in lowlands and to elevations of about 450 m. Treeboas appear to have adjusted remarkably well to many human-mediated habitat alterations, and are very common in suburban gardens. One essential habitat feature is that tree canopies be contiguous.

Mastigodryas bruesi (Barbour 1914). Squamata: Colubridae. Windward Racer. Native. These long, slender snakes (maximum



AMOS GLASGOW, SVG FORESTRY DEPARTMENT

Saint Vincent Racers (*Chironius vincenti*) are rarely seen and may always have been rare, although predation by mongooses and habitat alteration may be responsible for their apparent scarcity. This is the first published photograph of a live animal.

SVL = 830 mm) are semi-arboreal, and generally are found in relatively dry habitats, which include forests and plantations. They are not infrequently encountered in gardens and other urban/suburban situations. Active by day, these snakes eat frogs and lizards, and sleep at night in trees and bushes to heights of about 5 m. The dorsal ground color is generally bluish-gray to brown, with light lateral stripes and dark eyelines. Ventral color is much lighter, but varies from white to dirty yellow. Their arboreal tendencies may protect these harmless snakes to some extent from mongoose predation, to which they are nevertheless vulnerable due to their diurnal activity.

Turtle (Reptilia: Chelonia)

Geochelone carbonaria (Spix 1824). Testudines: Testudinidae. Red-footed Tortoise. Origin unknown, populations may represent a mixture of animals that trace their ancestry to individuals arriving via natural over-water dispersal, human-mediated transport by Amerindians or early European colonists, and recently escaped or released pets. Tortoises are exploited for food and for the pet trade throughout much of their native range, which encompasses large portions of northern South America and many Lesser Antillean islands. These turtles (maximum shell length = 512 mm) are diurnal, and generally inhabit forests, although they may venture into adjacent grasslands. Their high-domed shells are characteristic of terrestrial turtles (they seem to deter many predators and also serve to reduce surface areas through which moisture is lost to the environment). Front limbs are powerful, spade-like, and capable of digging extensive burrows. Hindlimbs are columnar. Males have indented lower shells to facilitate mating. Red-footed Tortoises feed on a wide variety of plant matter, insects or other small invertebrates, and carrion. Even on islands where tortoises are common, they are rarely encountered, rendering the determination of their abundance difficult.

Acknowledgments

Students and faculty of the 2006 Avila University REU Program helped in the field and shared insights and data. Robert Powell and Robert W. Henderson commented on earlier versions of the



ROBERT POWELL



ROBERT POWELL

Saint Vincent Treeboas (*Corallus cookii*) remain widely distributed in lowlands and to elevations of about 450 m. They appear to have adjusted remarkably well to many human-mediated habitat alterations.

manuscript. Permits to conduct research on St. Vincent were issued by the Department of Forestry, St. Vincent and the Grenadines. Brian Johnson, Director, Department of Forestry, Cornelius Richards, Amos Glasgow, and especially FitzGerald Providence facilitated our efforts. Fieldwork was funded by a grant from the National Science Foundation (U.S.A.) to Robert Powell (DBI-0242589).

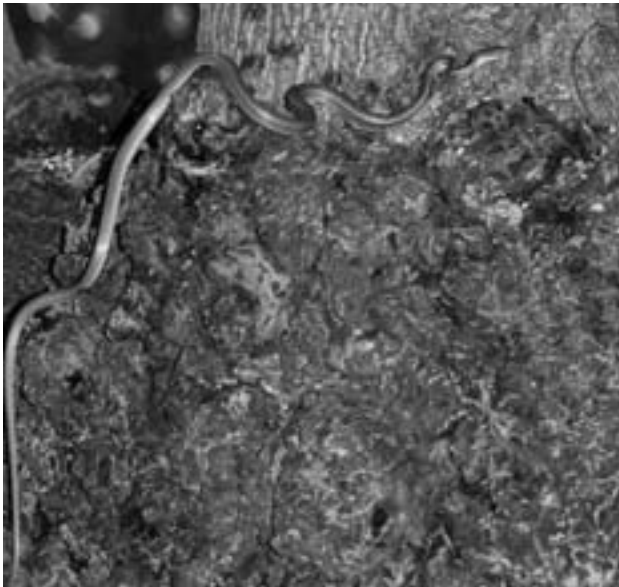
References

Accounts in the *Catalogue of American Amphibians and Reptiles* provide extensive lists of pertinent references.

- Corke, D. 1992. The status and conservation needs of the terrestrial herpetofauna of the Windward Islands (West Indies). *Biological Conservation* 62:47–58.
- Ernst, C.H. and T.E.J. Leuteritz. 1999. *Geochelone carbonaria*. *Catalogue of American Amphibians and Reptiles* (690):1–7.
- Frost, D.R. 2004. Amphibian Species of the World: An Online Reference. Version 3.0 (22 August, 2004). Electronic Database. <<http://research.amnh.org/herpetology/amphibia/index.html>>. American Museum of Natural History, New York, USA.
- Greene, B.T., R. Powell, and R.W. Henderson. 2003. *Mastigodryas bruesi*. *Catalogue of American Amphibians and Reptiles* (777):1–3.
- Hedges, B. and R. Powell. 2004. *Eleutherodactylus shrevei*. In IUCN 2004. 2004 IUCN Red List of Threatened Species. <www.iucnredlist.org>.
- Henderson, R.W. 1993. *Corallus enydris*. *Catalogue of American Amphibians and Reptiles* (576):1–6. Note that *Corallus cookii* was considered a subspecies of *C. enydris* (= *C. bortulanus*) at the time this account was written.
- Henderson, R.W. 1996. *Chironius vincenti*. In IUCN 2004. 2004 IUCN Red List of Threatened Species. <www.iucnredlist.org>.
- Henderson, R.W. 2002. *Neotropical Treeboas: Natural History of the Corallus hortulanus Complex*. Krieger Publishing Co., Malabar, Florida.
- Henderson, R.W. 2004. Lesser Antillean snake faunas: Distribution, ecology, and conservation. *Oryx* 38:311–320.
- Henderson, R.W. and G.T. Haas. 1993. Status of the West Indian snake *Chironius vincenti*. *Oryx* 27:181–184.



ROBERT POWELL



ROBERT POWELL

The arboreal tendencies of Windward Racers (*Mastigodryas bruesi*) may protect these harmless snakes to at least some extent from mongoose predation.



MARK DE SILVA



ROBERT POWELL

Lesser Antillean populations of Red-footed Tortoises (*Geochelone carbonaria*) may represent a mixture of animals that trace their ancestry to individuals arriving via natural over-water dispersal, human-mediated transport by Amerindians or early European colonists, and recently escaped or released pets. The individual in the lower photograph is a hatchling.

Henderson, R.W. and R. Powell. 1996. *Chironius vincenti*. *Catalogue of American Amphibians and Reptiles* (635):1–2.

Henderson, R.W. and R. Powell. 1999. West Indian herpetoecology, pp. 223–268. In: B.I. Crother (ed.), *Caribbean Amphibians and Reptiles*. Academic Press, San Diego, California.

Henderson, R.W. and R. Powell. 2001. Responses by the West Indian herpetofauna to human-influenced resources. *Caribbean Journal of Science* 37:41–54.

Henderson, R.W., R.A. Sajdak, and R.M. Henderson. 1988. The rediscovery of the West Indian colubrid snake *Chironius vincenti*. *Amphibia-Reptilia* 9:415–416.

Kaiser, H. and J.D. Hardy, Jr. 1994. *Eleutherodactylus johnstonei*. *Catalogue of American Amphibians and Reptiles* (581):1–5.

Powell, R. 2004. Conservation of iguanas (*Iguana delicatissima* and *I. iguana*) in the Lesser Antilles. *Iguana* 11:238–246.

Powell, R., R.I. Crombie, and H.E.A. Boos. 1998. *Hemidactylus mabouia*. *Catalogue of American Amphibians and Reptiles* (674):1–11.

Powell, R. and R.W. Henderson. 2005. Conservation status of Lesser Antillean reptiles. *Iguana* 12:62–77.

Powell, S.D., M.L. Treglia, R.W. Henderson, and R. Powell. In press. Treeboas in the West Indies: Responses of *Corallus cookii* and *C. grenadensis* to dis-

turbed habitats. In: R.W. Henderson and R. Powell (eds.), *Biology of the Boas and Pythons*. Eagle Mountain Publishing, Eagle Mountain, Utah.

Russell, A.P. and A.M. Bauer. 2002. *Thecadactylus rapicauda*. *Catalogue of American Amphibians and Reptiles* (753):1–16.

Schwartz, A. and R.W. Henderson. 1991. *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. University of Florida Press, Gainesville.

Williamson, K.E. and R. Powell. 2004. *Gymnophthalmus underwoodi*. *Catalogue of American Amphibians and Reptiles* (793):1–5.