



RICHARD SUDAK

An adult female Grenada Treeboa (*Corallus grenadensis*) from Pearls, Grenada. This individual has a dorsal ground color of dingy yellow and olive green dorsal markings.

The Shared History of Treeboas (*Corallus grenadensis*) and Humans on Grenada: A Hypothetical Excursion

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Studying reptiles under pristine conditions in the West Indies is virtually impossible today. That said, and because of previous and ongoing development in the Antilles, investigating reptilian ecology in the context of human activity has become increasingly important. Although we can now document how a particular species is responding to an altered environment, we can make only educated guesses as to how it responded pre-historically. Here, based on 20 years of observing Grenada Bank Treeboas (*Corallus grenadensis*), I offer largely hypothetical suggestions regarding the impact of humans on *C. grenadensis* throughout their shared history. When I have data (e.g., on human population density, land use, treeboa natural history) I include it, but much of what follows is conjecture. Pearls, a site close to the windward (eastern) coast in St. Andrew Parish, has been important archaeologically and, by chance, as a primary source of information on the natural history of treeboas, so I focus on that site for some of my hypothetical history.

Pre-human Habitation and Pre-Columbian Period

Typically associated with forest edges, the distribution of *Corallus grenadensis* on Grenada prior to the arrival of humans probably was restricted to natural margins of lakes, rivers, coastlines, and other natural breaks in the distribution of forests, including

those resulting from hurricanes and other natural disturbances. These snakes fed largely on native lizards, especially *Anolis aeneus* and *A. richardii*, both of which also are most abundant along edges, and murid rodents of the genus *Oryzomys*, and were preyed upon by raptors (e.g., *Buteo platypterus*).

Treeboas on Grenada have had a shared history with humans for at least 4,000 years, and possibly longer. Caribbean Archaic sites (ca. 3000–400 BC) are rare and relatively small. These early arrivals were primarily fisher-foragers with an emphasis on marine foods (Newsom and Wing 2004). Treeboa distribution on Grenada likely changed little during this period. If small forest clearings were made, suitable edge habitat may have increased, thereby providing additional treeboa habitat. Treeboas did, however, gain a new enemy, and they almost certainly were killed when encountered by human invaders.

Ceramic-age (400 BC–1500 AD) people established permanent settlements, planted crops, and managed animals. As they probably practiced shifting cultivation to create agricultural plots for manioc and other crops, this “would have resulted in the first major anthropogenic disturbance and disruption of the natural forests and vegetation...” (Newsom and Wing 2004). This presumably would have increased treeboa habitat by increasing the abundance of edge situations. During 0–500 AD (Haviser 1997),



RICHARD SADDAK

A treeboa (*Corallus grenadensis*) with an essentially patternless yellow dorsum from Pearls.



KY HENDERSON

With a dorsal ground color of taupe, this treeboa exhibits the predominant dorsal color that occurs at Pearls.



RICHARD SAIDAK

When foraging for anoles, *Corallus grenadensis* will cruise slowly over leaf and branch surfaces while tongue-flicking, presumably in order to locate the scent of a now-sleeping lizard.



ROBERT POWELL

The smaller of the two anole species that are native to Grenada, *Anolis aeneus* is virtually ubiquitous on the island.



ROBERT POWELL

Like its smaller congeneric, *Anolis richardii* is also widespread on Grenada, occurring from sea level to the highest elevations on the island.

Pearls was a large, 60.7-ha site (Newsom and Wing 2004) on rich agricultural land (Bullen 1964) and a center of Saladoid culture on Ceramic-age Grenada. Although early human activity at Pearls probably altered habitats, large-scale deforestation was unlikely. Likely, a large area would have been cleared for the village with gardens surrounding it. They would have been cleared and planted for 4–5 years, and then allowed to return to secondary forest before they were cleared again (perhaps 20 years later) using a slash-and-burn technique (W. Keegan, in litt., 6.XI.2008). Thus, a waxing and waning of potential treeboia habitat would have been associated with early settlements. Evidence of opossums (*Didelphis marsupialis*) has been recovered from cultural contexts at Ceramic-age sites (Pregill et al. 1994). They were likely introduced during this period, and are known to prey on *C. grenadensis* (Henderson 2002).

The 15th–17th Centuries

At the time of “discovery,” the human population density of the Lesser Antilles was estimated to be about 5/km² (Newsom 1976). Initial attempts at colonization of Grenada by the French occurred in 1609 and again in 1638; both were unsuccessful, due largely to the hostile behavior of Island Caribs (Brizan 1984). The first successful attempt was in 1650, also by the

French. Ultimately, the island was ceded to England in 1763. Large-scale deforestation on Grenada was unlikely prior to the first successful colonization, and *C. grenadensis* distribution may not have been significantly different than during pre-discovery or late Ceramic periods. Although the arrival of Europeans may not initially have had a negative effect on the habitat and distribution of *C. grenadensis*, it did have a potentially deleterious impact on the boa's trophic ecology. The earliest arrivals from Europe were certainly responsible for the introduction of Black Rats (*Rattus rattus*), consequently contributing to the extinction/extirpation of the two species of native Rice Rats (likely *Oryzomys*), almost certainly the primary pre-discovery prey for adult treeboas. Rice Rats have been recovered from Ceramic-age cultural sites on Grenada, indicating that humans also included them in their diets (Pregill et al. 1994) — and this too may have contributed to their disappearance. To date, however, no evidence indicates that Rice Rats and Black Rats co-existed on Grenada. Mona Monkeys (*Cercopithecus mona*) were introduced to Grenada sometime between the late 17th and 18th centuries during the height of the slave trade (Glenn 1998); the monkeys are known to at least molest treeboas.

The 18th and 19th Centuries

The 18th century saw the onset of the plantation system and large-scale deforestation, wherein forests were largely eliminated on all but the steepest slopes of Grenada (Beard 1949). By the middle of that century, the proliferation of estates for the production of sugarcane and other crops had turned low to mid-elevations on Grenada into a mosaic of cleared land and forest patches. In 1700, with a human population of 835 (2.7/km²; Brizan 1984), three plantations were dedicated to sugar. By 1753, the population density was 43/km². By 1772, 125 of 334 estates were devoted to sugar cultivation (Brizan 1984), and those 125 estates extended over nearly 13,000 ha, accounting for 42% of Grenada's surface area (311 km²). Based on those figures, the average sugar estate was 104 ha, or roughly equivalent to the size of about 230 American football fields.

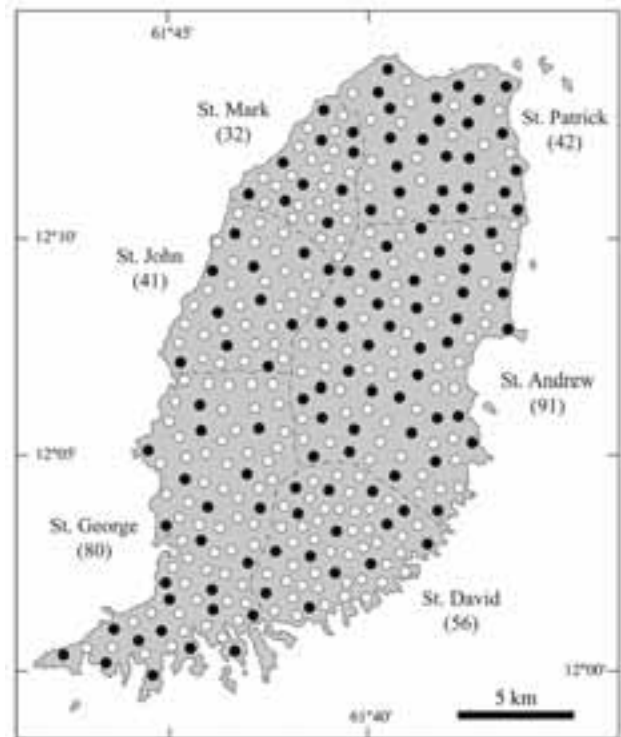
Not all of Grenada is suitable *C. grenadensis* habitat. Treeboas are uncommon or absent at elevations much above 500 m. If roughly 15% of Grenada lies above 500 m, approximately 50% of potential *C. grenadensis* habitat was lost to sugarcane cultivation by 1772. Boas were still restricted to edge situations on the extraordinarily altered island, but the sugar industry had to have had a dramatic impact on treeboa distribution. In 1824, of 342 estates, 123 were devoted to sugar. The number and distribution of estates clearly speaks to the impact they may have had on treeboa distribution. St. Andrew Parish (the site of Pearls) alone supported 91 estates, of which 40 were devoted to sugar. At the peak of sugar production, when the amount of land devoted to sugarcane was at its highest, treeboa numbers may have been at their lowest and their distribution the most contracted. Alternatively, if cane fields were surrounded by trees, even by a tree line one-tree-wide with contiguous crown vegetation, edge habitat may have increased and provided additional habitat for *C. grenadensis*.

Emancipation of slaves on Grenada occurred in 1838, and many became farmers. With emancipation, many new towns and villages were established, and, eventually, many estates were

partitioned into small holdings for former slaves. During his surveys of natural vegetation, Beard (1949) attributed the contemporary lack of rainforest tree species diversity on Grenada to the fact that most of the original forests had been eliminated during the 19th century (but certainly a great deal of deforestation had occurred during the 18th century as well).



This narrow tree line at Westerhall (St. David Parish), Grenada, was surrounded by sugarcane in April 1993, but *C. grenadensis* was nevertheless encountered in the trees.



In 1824, 342 estates dotted the landscape of Grenada. The map shows the distribution of estates by parish (the number of estates in each parish is in parentheses). The solid dots represent estates devoted to sugar, and the open dots those that opted for other forms of produce (e.g., coffee, cotton, cocoa, wood). The placement of the dots has no geographic significance other than to indicate how many estates occurred in each parish, and to convey the impact that agriculture likely had on the distribution and ecology of *Corallus grenadensis*.

During the 1850s (human population density 104/km²), the economy was shifting from sugar cultivation toward cocoa, and, by 1878, the land area devoted to cacao trees surpassed that for sugarcane. By abandoning sugar for cocoa, more land was devoted to habitat that could be exploited by arboreal snakes. Nutmeg was introduced into Grenada in 1843, but not until 1860 was commercial cultivation seriously considered (Brizan 1984). Nutmeg, like cacao, provided new arboreal habitat for treeboas. Bananas also provided arboreal habitat during the 1800s, but not until the 20th century did their cultivation, along with nutmeg, really escalate. Today, orchard trees (e.g., mango, citrus, breadfruit, cacao, nutmeg) often are among the most productive habitats in which to encounter treeboas (e.g., Henderson 2002, Powell et al. 2007). If a near-optimum situation regarding the habitat for *C. grenadensis* ever existed, it might have occurred during the late 19th century when estates were prevalent on the landscape, edge habitat was likely at its peak, orchard trees were widespread, and the human population was still relatively low. Mongooses (*Herpestes javanicus*) were introduced to Grenada midway through the second half of the 19th century (Hoagland et al. 1989). As they will ascend into trees, they are likely at least occasional predators of treeboas.

The 20th and 21st Centuries

In 1901, the population density on Grenada was 204/km² (Brizan 1984). In 1961, 67,100 farmers cultivated land on Grenada (IFAD 2007); in 1962, 7,870 of 8,430 cocoa farmers managed 4 ha or less (Brizan 1984); in 1995, the number of farmers had declined to 43,400 (IFAD 2007), and 6,828 holdings of 0.4 ha or less produced bananas (Anderson et al. 2003). In 2008, approximately 7,000 farmers will produce nutmeg. In

1958, 84% of nearly 5,300 ha were committed to interplanting of banana, nutmeg, and cacao trees, with the banana plants providing temporary shade for young cacao and nutmeg plants. These figures provide some indication of the number of people involved in agriculture during the 20th century, and of the scale at which most agricultural holdings existed. The island may be best envisioned as a mosaic of small towns and villages, fields devoted to various forms of agriculture, patches of forest of one kind or another and of varying expanses, and, when flying over the island, that is exactly how it looks. Although *Corallus grenadensis* occurs over much of the island at elevations below 500 m, it occurs in enclaves separated from each other by treeless expanses.

The landscape of Grenada has changed substantially over the past half-century. Based on satellite image-based mapping, Helmer et al. (2008) calculated that between approximately 1945 and 2000, 9,784 ha were dedicated to herbaceous agriculture and mixed and woody agriculture, a 65% decrease from 1945, when 27,661 ha were devoted to the same types of cultivation — but deciduous forest, semi-deciduous forest, forest/shrub, and shrubland had increased by 716% and evergreen forest and forest/shrub (seasonal evergreen, evergreen, and cloud forest) had increased by 83%, all indications that agriculture is being abandoned and natural vegetation is reclaiming some of what was lost.

In general, these numbers would seem to bode well for *C. grenadensis*, but abandonment of certain types of agricultural activity actually might decrease available treeboa habitat. During the late 1990s and early 2000s, I often encountered 20 or more treeboas in an hour of searching at Pearls. Numbers (especially of adults) have decreased significantly over the past five years,



GOOGLE EARTH

Aerial photo of the Pearls area. Treeboas were at one time abundant in the tree-filled areas north of the abandoned runway. The patchwork nature of the landscape is conspicuously evident.



CRAIG BERG

The range of the Grenada endemic *Pristimantis euphronides* continues to contract (now less than 18 km²) due to habitat alterations and potential competition with introduced *Eleutherodactylus johnstonei*.

and this might be attributable to the decrease in human activity at the site. The absence of human activity results in trails becoming overgrown (= loss of edge habitat) and reduction in the population density of the human commensal *Rattus rattus* (the primary prey species of adult *C. grenadensis*).

Every species of frog and reptile on Grenada has, to one degree or another, been impacted by the activities of humans. Nevertheless, *Corallus grenadensis* has demonstrated an admirable ability to adapt to potentially devastating changes attributable to the relentless activity of humans devoted to altering nature. In 2007 (human population 290/km²), tourism-related development, manufacturing, and residential housing were on the increase, while farming and, I believe, optimum treeboa habitat, were in decline. Urban or built-up land or areas devoid of vegetation have increased by 1,458% between 1945 and 2000 (Helmer et al. 2008). Yet, *C. grenadensis* still persists on the grounds of upscale resorts (including foraging at the edges of lighted parking lots), still enters homes and outbuildings, and still utilizes power lines to cross from one side of a road to the other in small towns. Although *C. grenadensis* may not be as widespread or abundant as it was a century ago (or 10 years ago), one can still go out on virtually any night and eventually find one or more in one or several types of habitat.

During my first visit to Pearls 20 years ago, a young boy approached me and asked if I wanted to buy a pottery artifact that he had found. I told him no thanks, but I did briefly handle the delicate pottery figure (likely an adorno) before handing it back to him. That fleeting encounter with the small figurine provided a physical and emotional connection, albeit distant in time, with the maker of the adorno, one of Pearls' Ceramic-age inhabitants who, like me, surely had memorable encounters with *Corallus grenadensis* more than 1,000 years before my visit.

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