A preliminary look at the spatial distribution of Treeboas at a site on Grenada

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FACTORS influencing the spatial distribution of snakes are poorly understood. Because of the heterogeneous nature of most (all?) snake environments, however, we can assume that they are not randomly distributed. Furthermore, as there is little indication of territorial defence of fixed areas, it is 'more appropriate to regard snakes as maintaining individual distances that vary with circumstances' (Gregory et al., 1987); i.e., the spatial distribution of snakes is dependent on the spatial and temporal distribution of resources.

The treeboa *Corallus grenadensis* (Figs. 1-2) occurs in a wide range of habitats on the Grenada Bank. Although it occasionally descends to ground level (e.g., to cross a road), virtually all of its activity (foraging, sleeping/resting, thermoregulation, etc.) is restricted to above-ground vegetation. At night, the nocturnally active *Corallus grenadensis* projects a brilliant eyeshine in a beam of light, allowing it to be seen from distances approaching 50 m. Because of the telltale eyeshine, and because *C. grenadensis* is common in some situations, it is often encountered in numbers not usually associated with snakes in the Neotropics. Although a foraging or resting treeboa can be overlooked if its eyes are covered by a sprig of vegetation, or if it is oriented in such a manner that the light beam misses the snake's eye, the eyeshine does facilitate a much higher encounter rate than if it was absent. Visual surveys of *C. grenadensis* have been conducted at a number of sites on Grenada for more than a decade (Henderson, 2002).

Here, based on the capture, measurement, and mapping of the distribution at a site on Grenada, a preliminary analysis of spatial distribution in *Corallus grenadensis* is described and discussed.

METHODS

A 440 m transect was marked-off in 10-m sections at Pearls Estate (St. Andrew Parish), a heterogeneous patchwork of mixed agriculture (mango, breadfruit, citrus, coconut, cacao, papaya), native vegetation, and relatively open areas. The site is described in more detail in Henderson (2002). Treeboa locations were recorded by distance along the trail to the nearest metre. That is, a snake captured at 3 metres into section 5 was at metre 53 of the transect. The perpendicular distance from the trail was also determined to the nearest metre. Over 11 nights in February 2002, treeboas were collected, sexed, weighed, measured, PIT-tagged, and released at the site of capture 24 hrs later. Data used here are based only on the original capture site and not on subsequent observations of marked snakes.

Snakes were divided into three size classes that correspond to an ontogenetic shift in diet the snakes undergo: <600 mm SVL (exclusively anole predators), 600-1100 mm SVL (transitional from anoles to rodents), and >1100 mm SVL (primarily rodent predators) (Henderson, 2002). The location of each snake captured was plotted to scale on graph paper and the distance to the nearest snake of the same size class, or to its nearest neighbour regardless of size class, was determined. Distances are straight-line distances and do not take into account presence or absence of arboreal corridors that undoubtedly influence the distribution, movements, and spacing patterns of treeboas and their prey.

	<600 mm SVL	**600-1100 mm SVL**	**>1100 mm SVL**
SVL (mm)	513.1 ± 11.1 443-598 (15)	813.9 ± 32.0 600-980 (14)	1164.0 ± 34.0 1130-1198 (2)
Mass (g)	21.3 ± 1.6 9-31 (15)	99.9 ± 12.2 28-171 (14)	377.0 ± 45.0 332-422 (2)
Distance 1 (m)	18.1 ± 5.8 2-71 (15)	32.8 ± 6.6 4-78 (14)	158.5 ± 2.5 156-161(2)
Distance 2 (m)	11.4 ± 2.5 2-34(15)	21.1 ± 4.9 3-59(14)	18.5 ± 2.5 16-21(2)
Distance 3 (m)	26.1 ± 3.0 7-46(15)	30.1 ± 3.8 7-59(14)	14.7 ± 3.5 8-20(3)

Table 1. Size class and spacing data for *Corallus grenadensis* at Pearls Estate. The mean ± 1 SE is followed by the range of values and sample sizes. Distance 1 is the minimum distance between snakes in the same size class; Distance 2 is the minimum distance to another snake regardless of size class; Distance 3 is the minimum distance to the nearest neighbour of a different size class.

RESULTS AND DISCUSSION

Small, anole-eating *Corallus grenadensis* are, on average, spaced closer to one another than are those treeboas in a transitional size class or those that are exclusively rodent predators (Table 1). The mean minimum distances between treeboas of different size classes were statistically significant (ANOVA, F = 32.51, $P = 0.0001$). Significant differences occurred between the largest size class and the two smaller size classes, but not between the two smaller size classes (Tukey's Studentized Range Test, $P < 0.05$). Those results are tempered somewhat by the fact that the largest size class has only two values. While working at Pearls in February 2002, we were not able to capture every snake encountered because of the height at which they were foraging or resting in tree crowns. However, we could determine that most of those that were out-of-reach were of small to medium size (<1000 mm SVL). Only one large snake (>1100 mm SVL) was encountered that we could not capture and it was 156 m from the nearest point at which we captured another large (>1100 mm SVL) treeboa, and we included it in our distance analysis.

Within the smallest size class, the nearest neighbour was in the same size class 80.0% of the time, for the middle size class it was 57.1%, and 0.0% for the largest snakes. Mean distances between different size classes regardless of the size class of the nearest neighbour were not statistically significant (ANOVA, F = 1.73, $P = 0.1951$). Likewise, mean distance to the nearest neighbour of a different size class was not significant between different size classes (ANOVA, F = 1.93, $P = 0.1634$) (Table 1). Perhaps most striking is the proximity of large snakes to smaller snakes compared to the distances between individual large snakes.

It is to be expected that over the 11 nights we conducted our work, some redistribution of the snakes would have occurred. However, based on past observations at other sites on Grenada, we know that treeboas will often stay in a localized area for several days to weeks. This is especially true of small *Corallus grenadensis* (Henderson, 2002).

Small snakes which prey on ecologically ubiquitous lizards (*Anolis aeneus* and *A. richardi*) that occur at very high population densities (e.g., Roughgarden et al., 1983) occur in closer proximity to one another than snakes in size classes that prey occasionally to almost exclusively on rodents. Data on rodent population densities are lacking, but they are certainly not as ubiquitous or numerous as the two species of *Anolis*. Although snakes in the smaller size classes are more numerous than those in the largest size class, their spatial pattern could be altered in such a way that they could be spaced farther apart. However, the fact that anoles are so plentiful probably precludes the need for that. Large *Corallus grenadensis* are not common, prey on a less plentiful trophic resource, and, seemingly, distribute themselves accordingly.

Fig. 1. *Corallus grenadensis* from Spring Gardens Estate, St. Andrew Parish. Photograph © R.A. Sajdak.

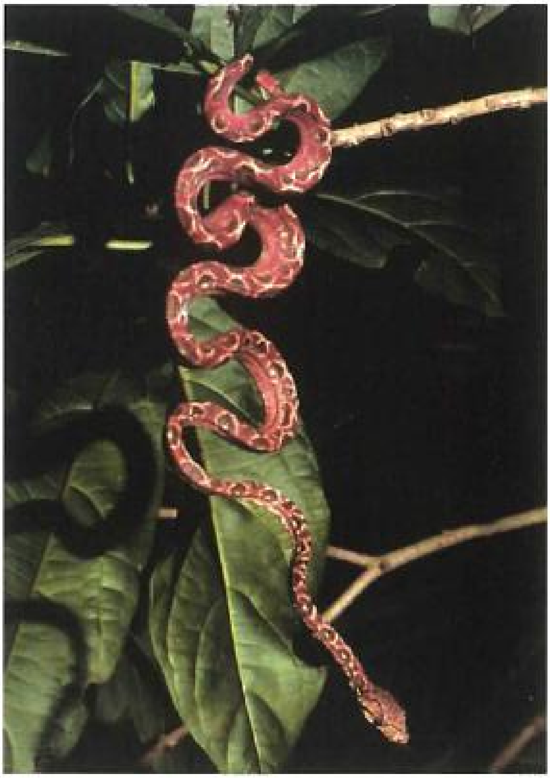

Fig. 2. *Corallus grenadensis* from Pearls, St. Andrew Parish, Grenada. Photograph © R.A. Sajdak.

A foraging snake needs to avoid conspecifics when they negatively impact its foraging success (Gregory et al., 1987). If maintenance of individual distances is a factor in the foraging behavior of *Corallus grenadensis*, then a foraging treeboa should avoid an area currently in use, or recently used, by a conspecific because that conspecific has possibly caused a resource depression in the immediate vicinity (Charnov et al., 1976; Gregory et al., 1987). Gregory et al. (1987) suggested that solitary foraging would 'be achieved by mutual avoidance without the risk and expenditure of energy involved in territorial defense, provided that appropriate signals could be transmitted and received'. The 'appropriate' signals are currently unknown, but olfaction is a likely candidate.

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