

Behaviour and time allotment in the West Indian snake *Alsophis rufiventris* (Colubridae)

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AT one time, eleven species of West Indian Aracors (Colubridae: *Alsophis*) occurred on more than 100 islands in the Bahama Islands, Greater Antilles, and Lesser Antilles (Henderson & Sajdak, 1996). The five that occur in the Lesser Antilles had a historical range encompassing 16 islands. This range has been reduced to nine islands, likely due to introductions of the Mongoose (*Herpestes javanicus*; Sajdak & Henderson, 1991). *Alsophis rufiventris*, one of the five Lesser Antillean species, is listed as endangered on the IUCN 'Red List of Threatened Animals' (Day, 1996). The species is endemic to the Saba and St. Christopher (St. Kitts) banks, but it has been extirpated from St. Kitts and Nevis (Barbour, 1930). Although Saba and St. Eustatius evidently support healthy populations in the absence of mongoose, these islands represent only 11% of the species' original range (Sajdak & Henderson, 1991).

The biology of *A. rufiventris* has not been studied extensively. Henderson and Sajdak (1996) included the species in their analysis of West Indian *Alsophis* diets, and, in her bioinventories of Saba and St. Eustatius, Rojer (1997a, 1997b) commented on basic ecology and distribution. Our study sought to identify components in the behavioural repertoire of *A. rufiventris* and to place these components into the context of time. Henderson and Winstel (1997) noted the paucity of

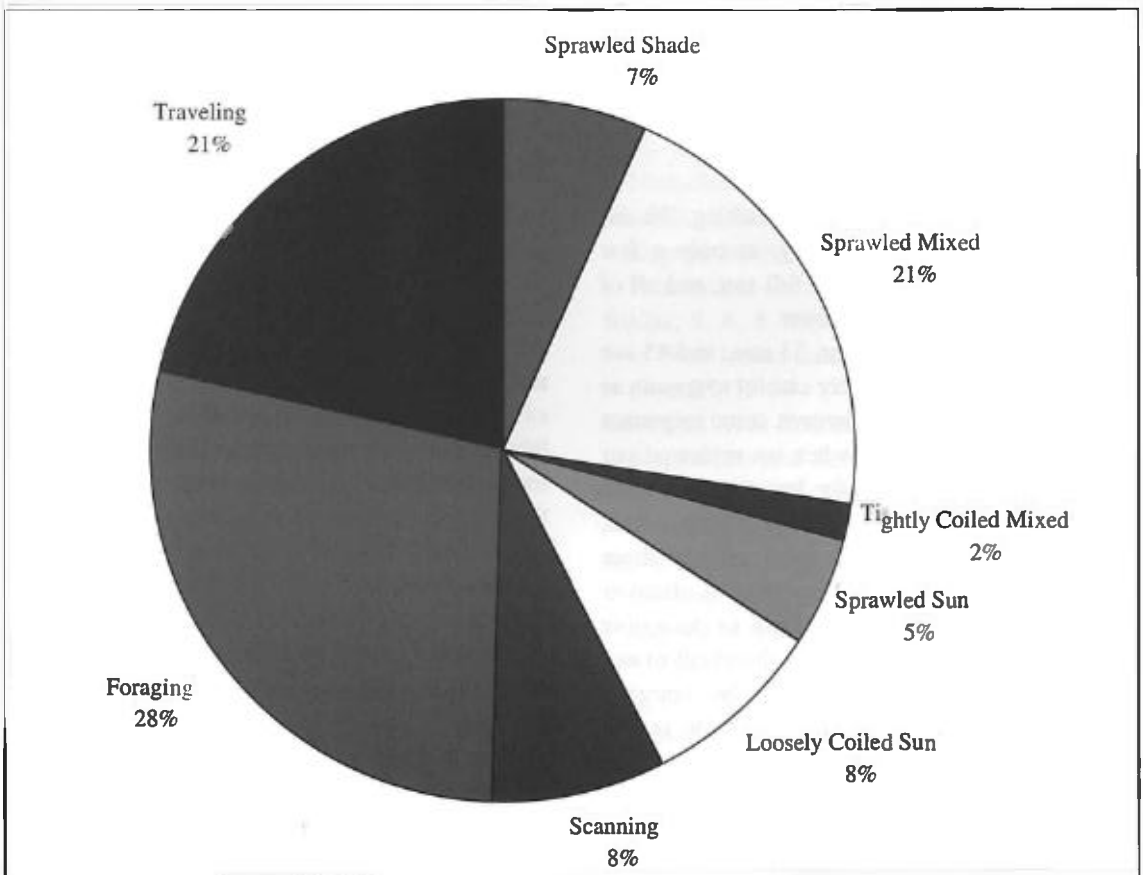
information regarding daily activity and time budgets in snakes, and the difficulties inherent with accumulating those data (e.g., ability to maintain visual contact with subjects). Although several studies have provided information on patterns of activity (e.g., Slip & Shine, 1988), fewer have provided percentages of time devoted to various activities (Henderson, 2002; Secor, 1995). Our observations, although of short duration, add to this small body of knowledge and provide groundwork for future observations of *Alsophis* ecology.

From 13th–22nd June 2004, we conducted focal animal studies along the main access trail to The Quill, a dormant volcano on the southeastern end of St. Eustatius, Netherlands Antilles. The trail ascends the western slope from approximately 165–400 m elevation. Vegetation consists of semi-evergreen seasonal forest, but deciduous seasonal forest is present at lower elevations and dry evergreen forest occurs near the crater rim. All but the latter are dominated by *Pisonia* spp., whereas the crater rim is characterized by *Coccoloba* / *Chionanthus* stands (unpubl. data, St. Eustatius National Parks Association). *Anolis* lizards (especially *A. schwartzi*, but also some *A. bimaculatus*), presumably the primary prey of *Alsophis rufiventris* (Henderson & Sajdak, 1996), are abundant throughout the study area, especially in association with rock outcrops or slides, but also in leaf litter.

The area of The Quill in which the work was conducted was relatively devoid of undergrowth that had the potential of interfering with observing snakes for prolonged periods. This was in large part due to numerous goats that foraged over much of the island, cropping vegetation from elevations ranging from sea level to the crest of The Quill. We scanned both sides of the trail for snakes for the full line of sight, but rarely spotted snakes more than 3.0 m off the trail (although sometimes we were able to see them as far as 10 m from the trail). Upon encountering an animal that did not appear startled by our presence, we noted substrate, extent of insolation (shade, filtered light, full sun), and microhabitat. An observer would watch the snake for 15 min, until the animal was lost from view, or if we felt the animal was responding to observer presence. We noted and timed behaviours in six categories based on position, movement, and

presence or absence of tongue-flicking, with some sub-categories for clarification: (1) **Stationary**, (a) **sprawled**, stretched along the substrate, with no part of the body touching another, (b) **loosely coiled**, one or a few large coils causing the animal to touch itself in at least one place (c) **tightly coiled**, multiple or S-coils involving broad contact between body sections, (d) **scanning**, head elevated at roughly a 45 degree angle to substrate with no tongue-flicking (a similar but more pronounced behaviour has been recorded in another racer-type snake, *Masticophis flagellum*; Secor, 1995); or (2) **Moving**, (a) **foraging**, movement over substrate with tongue-flicking and short pauses to nose through leaf litter, roots, and deadfall, (b) **traveling**,

Figure 1. Behavioural time allotments in *Alsophis rufiventris* on The Quill, St. Eustatius, Netherlands Antilles.





An adult male *Alsophis rufiventris* basking in full sun on the rim of the Quill at an elevation of ~400 m
Photograph © John S. Parmerlee, Jr.

steady movement with no tongue-flicking. We did not include a 'basking' category, as only a few snakes were clearly basking in full sun, and all of these were on the rim of the crater.

We recorded a total of 5 hr, 33 min, and 45 sec of data on 27 snakes. We were careful to remain as unobtrusive as possible. However, some responses to observers were evident when we reviewed our data. Snakes might pause for less than a minute during their foraging activities, remaining still, with no tongue-flicking. At least some of these instances could have been responses to observer presence. Because we were unable to determine whether or not such pauses were the result of our presence and despite statements by Gregory (2004) indicating that snakes are not overly responsive to the presence of observers, we chose to err on the side of caution and disregarded all ambiguous observations from the data set, thereby

reducing the total observation time to 167 min and 45 sec. Although the remaining data cover a relatively short period of time, based on our subjective evaluations of *A. rufiventris* behaviour and that of congeners observed on other islands, we believe that our results accurately represent behaviour and time allocations of these snakes.

We observed individual *Alsophis rufiventris* on The Quill moving nearly 50% of the time (Fig. 1). Slightly more time was spent foraging than traveling. While stationary, most snakes were in sun-dappled shade, some time was spent loosely coiled or sprawled in full sun or shade, with most of the latter involving short pauses during foraging. We observed tight coiling only in sun/shade mosaic and loose coiling only in full sun. The vast majority of time (43%) involved resting in or moving through mixed and full shade. Of the two snakes observed loosely coiled in full sun, one was on rocks of the rim of the volcano and the second was in a patch of mostly bare ground on the slope. The majority of encounters and observations took place on the slopes, where breaks in the canopy that allowed full sun to reach the forest floor were relatively uncommon. We did not attempt to discern when a snake was stationary for thermoregulatory purposes, simply scanning the environment, or resting.

We saw snakes loosely coiled in full sun only in the morning (07:40 hrs, 09:50 hrs). We observed traveling in both afternoon and early evening and foraging at all times of day. In the middle of the day, we observed snakes sprawled in conditions of mixed lighting.

Percentages reflected by the data agree with our experiences with and observations of this and other species of *Alsophis*. *Alsophis rufiventris* is an active forager (Schwartz & Henderson, 1991), moving over and through leaf litter and along deadfall and rocks in search of prey. We observed snakes assessing their immediate environments

both chemically (tongue-flicking) and visually (scanning). For this study, the two were considered to be mutually exclusive, as tongue-flicking rarely occurred while a snake was stationary, even in the extended data set.

Of interest also were behaviours not previously documented. During one focal animal observation and again during a concurrent study, we observed tail movement involving approximately the last 8.0 cm of the tail, while the rest of the body and tail was sprawled and motionless. The motion was apparently deliberate, with the tail curled slightly and the movement mostly horizontal to the ground. Thus, the tail would flip or writhe from one position to another, with occasional pauses and vertical curls. Similar behaviours have been implicated in caudal luring (e.g., Heatwole & Davidson, 1976), but we were unable to attribute any obvious motive to these movements.

Although no record exists of this species eating sympatric ground lizards (*Ameiva erythrocephala*), we observed a snake investigating five different holes, presumably *Ameiva* burrows. The snake inserted 10–15% of its body into cavities for up to 3 min 55 sec, alternating between probing the burrow and pausing. Henderson & Sajdak (1996) noted that other species of *Alsophis* are known to consume ground lizards.

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