

Orange-bellied racer (*Alsophis rufiventris*); diet and arboreality

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The orange bellied racer, *Alsophis rufiventris* (Duméril, Bibron & Duméril, 1854), is one of four *Alsophis* species endemic to the Caribbean Lesser Antilles. Historically, it was found on St. Eustatius, Saba, and St. Kitts and Nevis but was extirpated from St. Kitts and Nevis during the 1900s, so that it is now confined to the Dutch Caribbean (Sajdak & Henderson, 1991; Savit et al., 2005). Thus, only two populations exist with a combined range of just 34 km², which is 10.9% of the known historical range (Sajdak & Henderson, 1991; Savit et al., 2005; Daltry & Powell, 2016). Despite being the most geographically widespread colubrid genus in the West Indies, little is known about the ecology of most *Alsophis* species (Savit et al., 2005; Daltry & Powell, 2016). Here, we provide new dietary and natural history information that was collected during a field study of *A. rufiventris* on St. Eustatius from September 2016 to February 2017, as well as other ad hoc observations.

From observational work the diet of *A. rufiventris* is known to include *Anolis schwartzi* (Savit et al., 2005; Heinz et al., 2005) and hatchling *Iguana delicatissima* (Debrot et al., 2013). Daltry et al. (1997) performed a preliminary faeces study on samples collected from Saba and St. Eustatius and identified *A. sabanus* and *A. schwartzi*, including one *A. bimaculatus* and one *Ameiva erythrocephala*. Although some samples likely contained remains of the only frog species that occurs on these islands, *Eleutherodactylus johnstonei*, these were not conclusive (Daltry et al., 1997). Here, we report on observational predation events involving three different prey species and their life stages, of which two are previously unpublished. Two observations were opportunistically recorded on Gilboa Hill and the Quill: a subadult *Ameiva erythrocephala* (2008; Fig. 1) and an adult *A. schwartzi* (2010), respectively. Additionally, on 8 December 2016 while conducting a transect-based study involving the capture of individuals; one snake was caught with a clutch of 15-30 eggs, from the frog *E. johnstonei*, in its mouth. The eggs were similar to those of *E. coqui* as shown in Elinson & Del Pino (2012, Fig 3 therein); in both species there is no free tadpole stage and the froglets complete development within the egg. Predation on *E. johnstonei* eggs could explain field observations reported by Heinz et al. (2005) and White et al. (2008), who documented snakes “rooting and digging in loose soil and probing small holes” (White et al., 2008), especially given *E. johnstonei* lays nests inside leaf and soil layers (Bourne, 1997).

Although commonly referred to as ground-dwelling or



Figure 1. *A. rufiventris* eating a subadult *A. erythrocephala*

terrestrial species, aquatic and arboreal behaviour has also been observed in some species of *Alsophis* (Henderson & Sajdak, 1986; Pérez-Rivera & Laboy-Rivera, 1996; Powell et al., 2015), even above 18 m (Thomas & Kessler, 1996), however, to our knowledge this behaviour is unreported for *A. rufiventris*. On many occasions on St. Eustatius we observed *A. rufiventris* in trees as high as 3 m from ground level (Fig. 2). These observations were made on the outer western and eastern slopes and inside the crater of the Quill within floral vegetation types: Myrcia-Quararibea Mountains, Coccoloba-Chionanthus Mountains and Chionanthus-Nectandra Mountains (both high and low variant) (de Freitas et al., 2014). Behaviour observed by White et al. (2008) for *A. sibonius* on Dominica, in which individuals were observed to stalk anoles resting on tree trunks at heights of ~80cm, suggests that our observations were of arboreal foraging individuals that identified prey items at greater heights. Similarly, arboreal foraging has also been described for other species of presumably ground-dwelling or terrestrial snakes (Brown et al., 2018).

Our observations suggest that *A. rufiventris* is likely to predate on many herpetofauna species, of different life stages, present on St. Eustatius (Table 1), including - given its potential for arboreal foraging - the large bodied *A. bimaculatus* that perches at heights greater than *A. schwartzi* (Roughgarden, 1995; see Daltry et al., 1997). Given the size of subadult and adult *I. delicatissima*, as

Table 1. Overview of confirmed and probable herpetofauna species in the diet of *A. rufiventris* on the islands of St. Eustatius and Saba. . C= Confirmed prey species, P= Probable prey species, X= Too large to be prey. ¹Debrot et al. (2013); ²Heinz et al. (2005); ³Savit et al. (2005); ⁴Daltry et al. (1997); ⁵This paper. Data from Daltry et al. (1997) did not include life stage information.

Prey species	Island	Eggs	Juvenile	Sub-Adult	Adult
Lizards					
<i>Anolis schwartzi</i>	St. Eustatius	P ²	P	P	C ²
<i>Anolis bimaculatus</i> ⁴	St. Eustatius	P	P	P	P
<i>Anolis sabanus</i> ⁴	Saba	P	P	P	P
<i>Ameiva erythrocephala</i>	St. Eustatius		P	C ⁵	X
<i>Iguana iguana</i>	Saba		P	X	X
<i>Iguana delicatissima</i>	St. Eustatius		C ¹	X	X
<i>Sphaerodactylus sabanus</i>	Both		P ³	P ³	P ³
<i>Sphaerodactylus sputator</i>	St. Eustatius		P ³	P ³	P ³
Frog					
<i>Eleutherodactylus johnstonei</i> ⁴	Both	C ⁵	P	P	P



Figure 2. Arboreality of an adult *A. rufiventris* at 3 m above ground in a *Vachellia macracantha*.

well as adult *A. erythrocephala*, we expect these to be physically too large to be consumed by *A. rufiventris*. In addition, the venom of *A. rufiventris* is believed to be weak and only capable of subduing smaller prey (Powell et al., 2015). Furthermore, with only one observation of *A. rufiventris* eating a hatchling/juvenile *I. delicatissima* and low recruitment within the local iguana population (van den Burg et al., 2018), we expect these predation events are rare.

Alsophis rufiventris is listed as vulnerable on the IUCN Red List of Threatened Species. This classification is based on its limited range and the likely threat of mongoose introduction, which has led to its extirpation elsewhere (Daltry & Powell, 2016). This risk is increasing due to enhanced traffic routes between these islands and larger nearby islands on which the mongoose is established. Feral and free-roaming cats pose a lesser but nevertheless potential threat as human populations expand on both islands. This is strengthened by recent observations of iguana mortality caused by feral cats, which included both hatchling and adult iguanas (van den Burg et al., in press). Before Hurricanes Irma and Maria impacted Saba and St. Eustatius in 2017 the snake was thought to be abundant

with an apparently stable population (Daltry & Powell, 2016). Using baseline data (Savit et al., 2005; Zobel, 2017), a post-hurricane population assessment in the Quill and parts of Boven National Parks on St. Eustatius is being undertaken to determine the impacts of these events on the population.

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