



Young Aruba Whiptail (*Cnemidophorus arubensis*) from Aruba sitting on a tonalite block (a type of andesite rock). Distinguishing the sexes is difficult in young and subadult animals. When males become larger, they change color from yellow-brown or light brown to gray and blue. In an animal of this size that would be noticeable, thus the lizard in the picture is very likely a female.

The Teiid Lizards of Aruba, Curaçao, Bonaire (Dutch Caribbean), and the Península de Paraguaná (Venezuela)

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Photographs by the author.

Herein I discuss the larger teiid lizards of the genera *Ameiva* and *Cnemidophorus* on the Dutch Leeward Islands (Aruba, Curaçao, and Bonaire) and those on the nearby Península de Paraguaná in Venezuela. Lizards in the genus *Cnemidophorus* are generally called “Whiptail Lizards” or “Racerunners,” whereas those in the genus *Ameiva* are called “Jungle Runners.” The genera differ in the number of rows of ventral scales and in the structure of the bones in the tongue. However, in some DNA analyses, *Ameiva* and *Cnemidophorus* do not separate clearly. Some members of the Neotropical “*C.*” *lemniscatus* species group appear to be more closely related to some species of *Ameiva* and *Kentropyx* than to many species of *Cnemidophorus* (Reeder et al. 2002).



Map showing the locations of Aruba, Bonaire, and Curaçao in relation to the Paraguaná Peninsula of Venezuela.

Both *Ameiva* and *Cnemidophorus* are diurnally active lizards that constantly forage to find food such as insects, other arthropods, carrion, and sometimes plant material. On occasion, they can even be cannibalistic. *Ameiva ameiva* will eat fruit, and *C. lemniscatus* has been observed eating the flower petals of cacti in the genus *Opuntia* (Mijares-Urrutia et al. 1997). Surprisingly, some island varieties of *Cnemidophorus*, such as *C. arubensis*, *C. ruthveni*, and *C. murinus* are to a large degree herbivorous. The colon in *C. murinus* is larger than in other species of Whiptails and is clearly adapted to a herbivorous diet (Dearing 1993). Herbivory in lizards is relatively unusual and is often associated with an increase in body size. The fact that these island *Cnemidophorus* are largely herbivorous enables them to reach much higher population densities than would otherwise be the case in an arid environment with insufficient numbers of insects and other arthropods to maintain such high population densities of relatively large lizards.

The Península de Paraguaná has a surface area of approximately 2,612 km² (without the isthmus connecting the peninsula to the mainland), Aruba

is about 190 km², Curaçao 444 km², Klein Curaçao 1.2 km², Bonaire 282 km² (including Klein Bonaire with 7 km²). At various times during its history, Paraguaná was an island. In the late Pleistocene or early Holocene, it became connected to the mainland by a narrow strip of dunes. During the ice ages, when sea levels were much lower, it was part of the South American mainland. Aruba might at one time have been connected to the mainland; if this was the case, it was quite long ago and lasted only a relatively short period of time. Alternatively, it might always have been an island, but at times separated from the mainland by only a very narrow strait (van Buurt 2005). Curaçao and Bonaire were never connected to the mainland.

These various degrees of isolation were conducive to the development of endemic species and subspecies. Aruba has three endemic reptiles, *Cnemidophorus arubensis*, *Phyllodactylus julieni*, and the Aruba Rattlesnake, *Crotalus unicolor*. *Anolis lineatus* is endemic to Aruba and Curaçao. Curaçao and Klein Curaçao have the endemic *Cnemidophorus murinus murinus*, whereas *C. murinus ruthveni* is endemic to Bonaire and Klein Bonaire. The snake *Liophis triscalis* is endemic to Curaçao. The geckoes *Phyllodactylus martini* and *Gonatodes antillensis* are endemic to Curaçao and Bonaire, and *G. antillensis* also is found on Klein Curaçao. Paraguaná has one endemic reptile, the sphaerodactyline *Lepidoblepharis montecanoensis*, which is found in the Reserva Biológica Montecano (Markezich and Taphorn 1994).

Aruba

The Aruba Whiptail Lizard (*Cnemidophorus arubensis*) is locally called Kododo. Used for both males and females, this old Caquetío name is also used on Bonaire for *C. ruthveni*. *Cnemidophorus arubensis* is a common lizard found practically everywhere. Males are gray or gray with some brown



“Paw-waving” behavior in a young Aruba Whiptail (*Cnemidophorus arubensis*) from Aruba. In the Honduran Bay Islands, similar behavior in *C. lemniscatus* is responsible for the local name “Shaky-Paw.”



Cunucu Arikok, characterized by large tonalite blocks (a type of andesite rock) that are typical over much of the Aruban landscape.



Rainbow Whiptails (*Cnemidophorus arenivagus*) have been introduced in Aruba, where they have gradually extended their range in the southeastern part of the island; this one was photographed in the area around Vader Piet.



Ameiva bifrontata in Aruba vary in color; usually they are light khaki-brown, which gives them their local name “Koffie cu lechi” (= coffee with milk). A bit of light green and some blue on the sides is often hardly noticeable. A mite can be seen on the jaw of the individual in the top photograph. This mite probably belongs to the family Trombiculidae (Chigger Mites). The individual in the bottom photograph is a bit more grayish and has some faint stripes on the lower back. Such markings are better developed in *A. bifrontata* from the Paraguaná Peninsula; individuals from there also have noticeably more blue on their sides.

and have white dots with a fine blue edge. Males also have blue patches on the hindlimbs and have blue tails. Females are brown or khaki-brown and have similar dots, but no blue tails. The blue colors in males vary in brightness, with sexually dominant males brighter. While probably true in the other island Whiptails, this is particularly notable in this species.

Whiptails stop now and then and wave a front limb in the air. This behavior, which takes place when they are confronted with a possible threat (even a human being), is probably comparable to head-bobbing in iguanian lizards such as iguanas and anoles. It may signify something like “don’t waste your time trying to catch me, I have already spotted you.” However, if one approaches an individual too closely, it will not wave its leg, presumably in order to avoid undue attention. This signaling behavior also might be employed during sexual overtures to a female or when confronting another male. Front paw-waving behavior is quite frequent in *C. arubensis* but less so in *C. ruthveni* and even less frequent in *C. murinus*. Arubeans say that their lizard is friendlier.

The Rainbow Whiptail Lizard (*Cnemidophorus arenivagus*) was introduced on Aruba around 1950, when it was discovered near the oil jetties in San Nicolas (Lammarée 1970). At the time, it was described as *C. lemniscatus*. When Markezich et al. (1997) described a new species from Paraguaná and named it *C. arenivagus*, they implied that the lizard on Aruba would be the same species. While working on the Dutch version of my *Field Guide to*

the Amphibians and Reptiles of Aruba, Curaçao and Bonaire, which was published in 2001, and also on the English version, published in 2005, I decided against using this name and deferred judgment on this matter, mainly because the photograph of the animal in Markezich et al. (1997) seemed to have much more lateral khaki coloration than the animals on Aruba and also since the animals on Aruba came from around an oil jetty where ships were arriving from several areas where *C. lemniscatus* lives. However, G.N. Ugueto (pers. comm.) noted that the individual illustrated in Markezich et al. was atypical and not representative of the most common coloration. Furthermore, on the basis of a photograph I took at Vader Piet on Aruba in August 2008, he confirmed the identity of the species as *C. arenivagus*.

In the 1990s, these lizards were found in areas with somewhat sandy soil around San Nicolaas, Cura Cabai, Mabon, Brazil, at the location of the old airfield “de Vuist,” and on and around the Aruba Golf Club. Today, the range seems to have expanded. In 2008, I saw it at Vader Piet and it also was reported near Guadirikiri. In 2010, F. Franken (pers. comm.) saw several at Santu Largu, Savaneta. On the other hand, the “de Vuist area” has been developed for residential housing and the lizards seem to have disappeared. This species does not displace *C. arubensis*, establishing only a precarious foothold in areas with sandy soil — and even in such areas it is not very common.

On Aruba, *Ameiva bifrontata* is called “Koffie cu lechi” (= coffee with milk) in reference to its color, but the name “Vloem” or “Floem” is sometimes used as well. *Ameiva bifrontata* is predominantly light khaki-brown with a light green or grayish-green infusion on the head and front of the body. Some have questioned whether *A. bifrontata* was introduced in Aruba or whether it is indigenous. While Wagenaar Hummelinck was working



Male (top) and female (bottom) Aruba Whiptails (*Cnemidophorus arubensis*) from Aruba. As males mature, they change in color from yellow-brown or light brown to gray and blue.



A Blue Lizard (*Cnemidophorus lemniscatus splendidus*) from the Fundo San Francisco on the Paraguán Peninsula of Venezuela.

on Aruba for his dissertation in the late 1930s, he encountered this lizard only around Oranjestad, which led him to conclude that it was very likely a recently introduced animal. However, he also noted small differences between the Aruba lizards and those he had seen in Paraguana (Wagenaar Hummelinck 1940). Ruthven (1924) mentioned that *A. bifrontata* had been collected on Aruba by Cope in 1885 and also by Dr. H. Burrington Baker in 1922. Schall (1973) found *A. bifrontata* all over Aruba in the early 1970s.

Curaçao

The Curaçao *Cnemidophorus murinus* is larger than *C. arubensis* and also somewhat larger than *C. ruthveni* on Bonaire. These lizards are light gray with blue on the feet and tail and some blue on the head. Large males are locally called Blausana, Blaublau, or Blòbò, which is derived from the Dutch word blauw (= blue). Blòbò is also used as a derogatory name for the police, who have blue uniforms. In dominant males, the blue is brighter, although the brilliance of the blue seems to vary during the year. Juveniles are brown and the females remain brown, sometimes with a slight shade of gray. Females and juveniles are called Lagadishi, which is also a general name for lizard or lizards. Lagadishi is derived from either Portuguese “lagartixa” or Spanish “lagartija,” which in turn go back to Latin “lacerta.” These lizards are very common and are found practically everywhere. Female *C. murinus* lay only one large egg at a time. This also holds true for *C. arubensis* (Schall 1983) and *C. ruthveni*. Might this be an adaptation to increase the odds of young surviving in an arid climate? A similar adaptation is found in Green Iguanas (*Iguana iguana*). Clutch size is smaller but eggs are larger in females from Curaçao when compared to mainland iguanas (van Marken Lichtenberg and Albers 1993).



Male (top) and female (bottom) Curaçao Whiptails (*Cnemidophorus murinus*). Note the red mites in a mite pocket behind the hindleg and on the tail of the male. These probably belong to the family of the Trombiculidae (commonly known as Chigger Mites).



Juvenile Curaçao Whiptail (*Cnemidophorus murinus*) eating a Prickly Pear (*Opuntia* sp.) flower.



Large *Melocactus macracanthus* from Curaçao. These cacti occur on Aruba, Curaçao, and Bonaire. Note the large straight spines, unlike the recurved spines of *M. curvispinus* from Paraguana.

Klein Curaçao

Klein Curaçao is a coral island situated 9 km southeast of Curaçao. The *Cnemidophorus murinus* here are smaller, have a larger difference in size between the sexes, and the males have brighter blue colors than those on Curaçao. Many tourists visit the island on day trips; one tour operator has a large hut onshore, the other a large roof where the tourists can enjoy some shade. These daytrips usually include a meal of barbecue



An adult male Curaçao Whiptail (*Cnemidophorus murinus*) threatening a rival, which is outside the field of view.

with salad, which is often shared with lizards. One of the operators used to feed the lizards all remaining salad, but he has stopped doing so. Possibly as a consequence of the supplemental food, lizard numbers had been increasing and densities almost certainly exceeded the natural carrying capacity of the island. When one walks around the island, one is struck by the fact that lizards near the tourist facilities are considerably larger and better fed than those in the farther reaches of the islet and that the well-fed males maintain or have especially bright blue colors. This would tend to argue against the hypothesis that bright blue colors arise as a result of poor nutrition or nutritional deficiencies. The well-fed lizards are still markedly smaller than their brethren on Curaçao, which



This lighthouse was built in 1879 after a large hurricane had destroyed the previous lighthouse on the 22/23 September 1877.



Male Curaçao Whiptail (*Cnemidophorus murinus*) from Klein Curaçao with bright aqua-blue coloration, especially on the hindlimbs; compare this picture with the more muted colors of *C. murinus* from Curaçao.

suggests that the size difference is at least in part genetically based. The lizards farther from the tourist shelters are fewer in number, live off the sparse vegetation, and they are not nearly as tame as those near the tourist facilities.

On the night of 22/23 September 1877, the storm surge of a large hurricane swept over Klein Curaçao and the lighthouse was completely destroyed. A new lighthouse was inaugurated on 7 June 1879, slightly to the south of where the original had been, and somewhat more in the middle of the island. In the past, the island had a coral ridge about 7 m high, but this ridge has since been excavated completely during phosphate mining operations. At the time of the hurricane, this ridge still partially existed. Today, Klein Curaçao is approximately 2.4 m above sea level. With sea levels rising in response to global climate change, the island is likely to be inundated completely during some future hurricane, and this could be a threat to the lizard population.

Bonaire

The Bonaire Whiptail (*Cnemidophorus ruthveni*) is slightly smaller and differs in coloration when compared to *C. murinus* on Curaçao. Previously considered a subspecies of *C. murinus* (*C. murinus ruthveni*), Ugueto and Harvey (2010) recently elevated the taxon to full species status. On Bonaire, both the names Kododo and Blausana or Lagadishi are used. The head, front legs, and posterior parts of the body of males are gray and the dots on the head are very distinct. The lower body, hindlegs, and upper tail are khaki-colored, the underside of the tail is blue. Females are brown and the flanks and hindlegs have many faint dots, resulting in a marbled appearance. As with *C. murinus* on Curaçao, these lizards are found practically everywhere.



Mating pair of Bonaire Whiptails (*Cnemidophorus ruthveni*). Note the marked male-biased sexual size dimorphism.



Male (top) and female (bottom) Bonaire Whiptails (*Cnemidophorus ruthveni*).



Agave vivipara is found only on Aruba, Curaçao, and Bonaire.



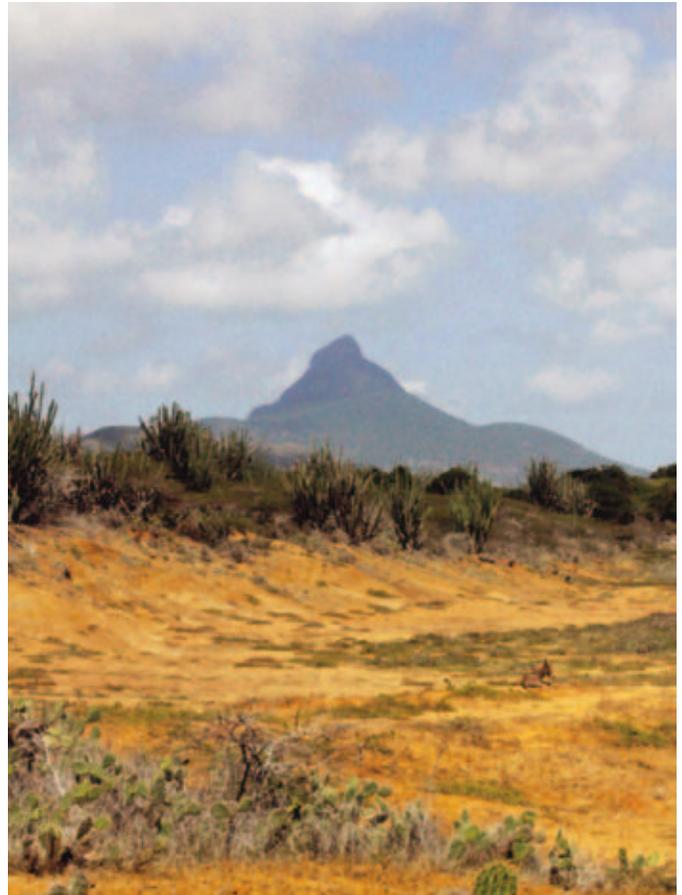
Brandaris, at 241 m the highest hill in Bonaire, is in the Washington/Slagbaai National Park.



An endangered Yellow-shouldered Amazon (*Amazona barbadensis*) feeding on a Candelabra Cactus (*Cereus repandus*) in Bonaire.

Península de Paraguaná

Looking south from Willemstad on Curaçao on a clear day, one can see Puerto Cumarebo and follow the coastal range west to Coro, and sometimes, even farther west, one can make out the Cerro de Sta. Ana on Paraguaná. On such days, this hill, with an elevation of 844 m, can be seen even more clearly from Banda Abau, the western part of Curaçao. The Cerro de Sta. Ana often can be seen more clearly from Aruba, and the Fila de Montecano, a lower range of hills about 240 m high, to the north of the



Cobalt-blue Blue Lizards (*Cnemidophorus lemniscatus splendidus*) occur in a region called Sisibaucó, which lies to the south of the little village of Miraca. The peak in the background, the Cerro de Sta. Ana with an elevation of 844 m, is the major defining landmark of Paraguaná. In clear weather, it can be seen from both Curaçao and Aruba.

Cerro de Sta. Ana is usually visible. I had always wanted to visit Paraguaná, but although I had traveled in Venezuela extensively, had visited Coro twice, and had read a lot about Paraguaná, I had not been there before. In July 2010, an old wish came true and I flew to the Las Piedras International Airport near Punto Fijo in Paraguaná, directly from Curaçao. The flight takes about 35 minutes in a Bandeirante turboprop.

Ameiva bifrontata is found in eastern Colombia, northern Perú, Aruba, and Venezuela (including Isla de Margarita and Los Testigos). Male *A. bifrontata* on Paraguaná have blue coloring on their sides and dark brown dorsal strips; in contrast, the bluish lateral coloration is either absent or almost unnoticeable and the dorsal stripes are poorly developed in *A. bifrontata* from Aruba.

The distribution of *Ameiva ameiva* includes Panamá, most of tropical South America, Trinidad and Tobago, and the St. Vincent and Grenada island banks in the West Indies. *Ameiva ameiva* on Paraguaná occurs in the dry tropical forests of the 16-km² Reserva Biológica Montecano, where they differ from those elsewhere — and have provisionally been assigned to *A. a. praeignis*. The status of this subspecies, however, is uncertain (G. Ugueto, pers. comm.), as meristic characteristics have not been studied. Consequently, this population could turn out to be a different subspecies or even a separate species (E. Infante-Rivero, pers. comm.). Large individuals in this area are largely blue (Markezich et al. 1997) and are locally called “Lagarto azul” to distinguish them from the smaller *C. lemniscatus splendidus*, which, among other names, is called “Lagartija azul” (using the diminutive lagartija). Unfortunately, during my visit I did not see these large blue lizards, which provides me with a convenient reason to return.



Scarlet Ibis (*Eudocimus ruber*) flying in to the lagoon in the Quebrada Sabría.

Locals on Paraguaná say that snakes do not like to eat the “Bizurre” or “Visure,” which are local names for *Cnemidophorus lemniscatus splendidus*, which is also called “Lagartija azul.” While photographing these animals, I was surprised that these blue lizards could be approached much more readily than the yellow-brown-green Rainbow Whiptail Lizards (*C. arenivagus*). The latter, locally called “Lagartija verde,” are found in many areas with sandy soil and can be very abundant in the dunes along the coast. In some

areas, the two species occur sympatrically, although *C. lemniscatus splendidus* is generally found nearer the center of Paraguaná, often in association with dry tropical forest. In an area near the Fundu or Villa San Francisco, where both species occur, the differences in behavior were especially obvious. Using a 300-mm telephoto lens, I could not get near *C. arenivagus*, which was quite wary, and I did not manage to take any photographs. In sharp contrast,



Melocactus curvispinus is common in Paraguaná. Note the recurved spines reflected by the species' scientific name and compare it with *M. macracanthus*, which is found in Aruba, Curaçao, and Bonaire.



An unusually colored *Cnemidophorus* from the Fundu San Francisco. This individual is quite unlike typical *C. arenivagus* found in that area, nor does it look like *C. lemniscatus splendidus*. Might it be a hybrid?

I could approach *C. lemniscatus splendidus* so closely that I could not focus and had to step back. One would not expect this latter behavior from wild mainland animals. On an island, animals often can be approached quite closely and, generally speaking, the smaller the island, the tamer the animals. This leads me to think that there might be some truth to the contention of some local residents that blue color conveys some form of protection.



A deep cobalt-blue *Cnemidophorus lemniscatus splendidus* from Sisibauco. Note the "paw-waving" behavior peculiar to some species of Whiptail Lizards.



Male (top) and female (bottom) *Ameiva bifrontata* from Camunare, 2 km NNW of Baraived in Paraguaná. Note the ticks on the right shoulder and the bluish color on the sides of the male. In male *A. bifrontata* from Aruba, this bluish color is normally absent or almost unnoticeable. Female *A. bifrontata* from Aruba often lack the dark brown stripes and dorsal triangles or they are much less distinctly expressed.



Male (top) and female (bottom) Rainbow Whiptail Lizards (*Cnemidophorus arenivagus*) from the dunes and sandy areas along the coastal road from Adicora to Coro, south of La Bocaina, Paraguaná.



Juvenile Giant Ameiva (*Ameiva ameiva*) from the Fila de Montecano National Park (Reserva Biológica Montecano) in Paraguaná. In Venezuela, these lizards are called Come Huevos (egg eater), Garipiale, Mato común, or Mato real. *Ameiva ameiva* has a large range; it is found from Panama throughout tropical South America including Trinidad and Tobago, Grenada, and St. Vincent. The lizards in Paraguaná are somewhat different from those elsewhere and have provisionally been classified as a subspecies, *A. a. praesignis* (G. Ugueto, pers. comm.), although no formal meristic evaluations have been conducted. The status of this subspecies is thus uncertain, and these lizards could represent a distinct species (E. Infante-Rivero, pers. comm.).



Large locusts called Langoston (*Tropidacris cristata*) are very common in Paraguaná.

Conservation

None of the populations of these lizards are endangered or threatened. Most acclimate quite well to the presence of humans and several populations are protected in established national parks. The most likely future threat would be new invasive species, such as a disease, a competitor, or a predator. The introduction of the Small Indian Mongoose (*Herpestes auropunctatus*), for example, has led to the extirpation or extinction of several ground-dwelling reptiles on West Indian Islands (e.g., Henderson and Powell 2009). In the case of the Klein Curaçao *Cnemidophorus murinus* population, sea level rise is a threat.

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