Herpetofauna of Cayo Romero (North-Western Cuba), a new locality for Aristelliger reyesi (Sauria, Sphaerodactylidae)

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Abstract. We present a herpetofaunal inventory of Cayo Romero, Cuba, including natural history comments on each occurring species. Records were obtained by visual encounter surveys along four transects of variable lengths. We recorded six reptile species and no amphibians. This site constitutes a new locality for Aristelliger reyesi, the second known so far and the first key locality. Data on morphology and coloration of the new A. reyesi specimens conform to those of the original description. We propose that this new population is a very recent human introduction.

Keywords. Reptiles, Aristelliger reyesi, Anolis sagrei, Cayo Romero, tourism, conservation.

Introduction

Cayo Romero is a very small (0.17 km²), nearly oval, low lying island (max. elevation ca. 1 m), located 6.5 km east of Punta de Morlas, at the northeastern end of the Península de Hicacos, Matanzas Province, Cuba (Fig. 1). The main habitat form is mangrove forest (Rhizophora mangle, Rhizophoraceae), which is more abundant in the island’s eastern half and surrounds it almost entirely. The island’s interior features isolated coastal shrubs of varying sizes, as well as coconut palms, especially in the western half. The soil is sandy and includes seashell fragments of various sizes. Sunlight is generally intense, with relatively little shade provided by plants. The key has economic importance from its use as a nature tourism destination, for which only the island’s western half is used under the name “Isla Paraiso” (in English, Paradise Island). Despite its ecotourism appeal, no inventories of flora or fauna have been made. As a consequence of our lack of knowledge, even given the potential environmental impact from tourism, conservation priorities remain unknown. Herein we present an inventory of the Cayo Romero herpetofauna with comments on the natural history of each species. We also discovered a small population of the Cuban endemic gecko Aristelliger reyesi on Cayo Romero, which is the second locality known for this species.

Figure 1. (Top) Map of Cayo Romero (arrow), Cárdenas Municipality, Matanzas Province, Cuba. (Bottom) Satellite image of Cayo Romero. Transect routes are designated by numbers. Wooden buildings are outlined in red. Black bar = 125 m.
Materials and Methods

We conducted visual encounter surveys along four transects (T) of variable length (T1 = 200 m, T2 = 245 m, T3 = 230 m, T4 = 215 m) in the western half of the key (Fig. 1, bottom). Two transects were in mangrove forest (T1, T4), the others in the concentration of coastal bushes and coconut palms (T2, T3). The survey was conducted during two visits, and each transect was completed by one or two observers. During the first visit (7 August 2012) we surveyed T1 from 2000–2200 h and T2 from 2200–0000 h (two observers). During our second visit (8 August 2012), T3 was surveyed from 0800–1000 h, and T4 from 1000–1200 h (one observer). We also interviewed local workers to determine the presence of widely distributed but perhaps unobserved herpetofauna (e.g., anurans, marine turtles, snakes, and all anoline ecomorphs, including the Chamaeleolis clade). In our ecomorph characterization we follow the terminology of Losos (2009).

The unexpected presence of Aristelliger reyesi prompted us to focus our observations on this species in order to ascertain correct identification. Data for twelve variables were obtained from A. reyesi adults, with a 0.1 mm precision for caliper measurements: snout-vent length (SVL, distance from the snout to the distal point of the cloacal opening), head length (HL, distance from the snout to the occiput), head width (HW, at level of parietals), number of supralabial scales (SS), number of infralabial scales (IS), number of subdigital lamellae of the forth finger (SL), number of dorsal granules in the snout to center-of-eye distance (DG, number of scales on a line of the same length as the distance from the snout to the pupil), number of ventral scales in the snout to center-of-eye distance (VS, similar to DG but on the on the abdomen instead of on the dorsum), number of dorsal scales on the snout (DSS, counted in the midline from the posterior edge of the rostral scale to a line connecting the anterior margin of the eyes across the head), number of loreal scales (LS), number of postmental scales (PS), number of internasal scales (INS), and number of postnasal scales (PNS). Data for Leiocephalus carinatus and Cyclura nubila SVL were obtained from Rodriguez-Schettino (1999).

Results

All six reptile species found on Cayo Romero were lizards. Of these, only Aristelliger reyesi is a Cuban endemic. This was also the only species active by night. No amphibians were observed or heard.

Family Dactyloidae

Anolis allisoni Barbour, 1928 (Fig. 2A), Cuban Blue Anole.—This species is widely distributed and common throughout central Cuba. It exhibits the morphological characteristics of a trunk-crown ecomorph. The head is long and acuminate; the legs are relatively short; tail length is greater than SVL. In its light color phase the male is green with the head blue, but this color can extend even to the groin. The female is entirely green. In the dark color phase both sexes are brown. The dewlap is purple. It is the largest of the dactyloids found in Cayo Romero.
We encountered eight active *A. allisoni* (three males, five females) along T2 and T3, all in wooden buildings. Its presence on Cayo Romero is likely due to an introduction, and its population density and ability to thrive in man-made habitats attests to the species’ ecological plasticity.

*Anolis angusticeps* Hallowell, 1856 (Fig. 2B), Cuban Twig Anole.—This species is a twig ecomorph that is widely distributed and common in Cuba. The head is long, acuminate and narrow; tail length is similar to SVL and the limbs are short. Individuals display two color morphs: striped, with alternating light and dark longitudinal stripes on flanks and dorsum of head and body (Fig. 2B), and variegated, with irregular markings on the dorsal surface of head, body, limbs, and tail. The dewlap is salmon-colored. It is the smallest of the dactyloids on the key.

We encountered three active individuals of *A. angusticeps* (one male, two females) along T3. The male was found moving downwards along a trunk of 33 cm diameter. The females were found perching horizontally on narrow twigs in the bushes.

*Anolis cf. sagrei* (Fig. 2C, D), Cuban Brown Anole.—This species is also widely distributed and common in Cuba. It belongs to the trunk-ground ecomorph. The head is short; the limbs are relatively larger than those of the other two anoles. In size it is intermediate between *A. allisoni* and *A. angusticeps*. The background color can be grey, tannish, or brown, changing to lighter or darker dependent on the color phase. It can have small rounded markings (Fig. 2C) on most of the dorsum and flanks, or possess one row of dorsal X-shaped markings. This population has a peculiar pattern of dewlap color: variegated in yellow, orange, and light red (Fig. 2C). The red color can be completely absent or the dominant color but in a sample of ten males, at least the edge and margin of the anterior half of the dewlap was always yellow. The inner scales of the dewlap can range from white to dark brown between light and dark color phases, respectively. Due to the differences in coloration, particularly in the dewlap (see Discussion), we hesitate to place this population into the highly variable species *A. sagrei* Duméril and Bibron, 1837, but pending a more detailed morphological and molecular study, we conservatively assign it to *A. cf. sagrei*.

*Anolis cf. sagrei* is the lizard with the broadest structural niche on the key. We found it during all transects, on coconut palm trunks, on the ground, on stems and branches of bushes, as well as in wooden buildings. We did not count the number of individuals of this species but during T1 and T4 the number of individuals was around ten, and during T2 and T3 it was between 15 and 20. We saw individuals perching, basking, displaying their dewlaps (Fig. 2C), fighting (males), running on the ground, feeding (small insects), and copulating.

**Family Iguanidae**

*Cyclura nubila nubila* Gray, 1831 (Fig. 3A), Cuban Iguana.—This species is widely distributed in Cuba, where only the nominal subspecies is found. It inhabits primarily coastal areas, where it can be locally abundant in rocky areas. It is diagnosed by its large size (SVL up to 745 mm in males, up to 623 mm in females), the presence of a spiked crest, and grey or brown color with black diagonal transverse chevrons in juveniles. It is easily identified by its sheer size and almost prehistoric appearance.

We encountered a total of nine Cuban iguanas along all transects, mostly resting in the shade but also basking (Fig. 3A). As rocks are nearly absent on Cayo Romero,
individuals were found sheltering in low vegetation and occupying the sandy soil. Cuban iguanas on the island are accustomed to human presence and they do not flee when a person approaches; some of them can be even touched.

**Family Leiocephalidae**

*Leiocephalus carinatus* Gray, 1827 (Fig. 3B), *Perrito de Costa, Saw-scaled Curlytail*.—This species is widely distributed and common in Cuba. It is a rather stout, robust ground lizard. Dorsal scales are imbricated, bristly, and keeled, with a pointed distal edge. In contrast, head scales are juxtaposed, non-bristly, and smooth. The tail is curled most of the time. Male size is generally larger than that of females (98.5 to 109.1 mm vs. 90.9 to 100.9 mm SVL, respectively), but sexual dimorphism is relatively slight.

We encountered seven curlytails along T2 and T4. They were found mostly immobile, in alert posture (forelimbs extended with the head high), and moved rapidly to their shelters when the observer approached. Individuals are usually found on rocky surfaces, but since Cayo Romero almost lacks rocks, curlytails live on the compacted sand and take refuge in galleries they construct at the base of the low vegetation, probably using the roots of bushes as a frame. They can be also found associated with the rustic wooden trails (walkways constructed to allow easy walking access for tourists) and when detected by a potential predator may hide in the crevices between planks.

**Family Sphaerodactylidae**

*Aristelliger reyesi* Diaz and Hedges, 2009 (Fig. 4), *Cuban Croaking Gecko*.—This species can be easily distinguished because is the only lizard in the key that lacks eyelids and has vertical pupils. Other anatomical traits are its small size (see below), the presence of small granular scales on the dorsum, a post-ocular curvature of the labial commissure, caudal autotomy very close to the vent, and all digits clawed with subdigital undivided lamellae among others. The coloration pattern also distinguishes this species from all other lizards on Cayo Romero.

On 7 August 2012, we collected five individuals between 2000 and 2330 h, and on the following day a sixth individual was collected at 0830 h, all by Javier Torres and Jesús Pascua during T2 and T3 (23.18146° N, -81.05378° W; datum: NAD27). Four individuals were collected on the same plant (*Avicennia germinans*: Verbenaceae), three from the trunk and the only juvenile specimen from the upper side of a leaf. Another individual was collected on a branch of a second *A. germinans* 15 m away from the first. The individual found during the day was moving downwards on a column of a wooden building. Morphological data for the adults (in mm) were SVL = 46.9–51.9, HL = 11.6–13.1, HW = 8.8–10.2, SS = 7–8, IS = 5–7, SL = 9–11, DG = 30–35, VS = 11–16, DSS = 15–16, LS = 11–14, PS = 2, INS = 2, PNS = 2–3.

The color pattern of the juvenile is as follows: the brown dark lateral stripe begins in the postnasal region, passes the loreal, is interrupted by the eye, but extends discontinuously to the groin. It is darker in the postocular and suprascapular regions and fades toward the inguinal area. As in some adults, this stripe can fork starting from the suprascapular region. It is more conspicuous in the juvenile due to the greater contrast with the background coloration, which is lighter than in the adults. The dorsal part of the head does not possess the ochre coloration of the adults, but rather maintains the same light brown coloration of the proximal half of the dorsum. Although Díaz and Hedges (2009) outlined that both sexes have white supralabial scales (see their Fig. 1B), brown color splotches can be observed on some
of these scales; this pattern exists in the individuals on Cayo Romero. In the parietal region, the juvenile has an X-shaped mark, similar to that found in adults but more conspicuous. It also has two dark spots associated with the occipital region. Adults have a preorbital yellow line that is less evident and whitish in the juvenile. The limbs have a light brown background (dark in the adults) with dark splotches that extend to the digits. The middorsal pattern consists of transverse bands that arise in the suprascapular region and end on the tail; these are brown and more pronounced in the juvenile. In adults, they are of the same ochre coloration as the dorsal part of the head. Toward the posterior half of the dorsum, the bands become a zigzag pattern that fuses in its angles with the intermittent lateral bands, forming ocelli that reach the base of the tail. In the juvenile, the transverse bands darken and alternate with well-defined white bands towards the posterior half of the tail. Although Díaz and Hedges (2009) outline that a caudal pattern cannot be defined in adults, our preserved specimens have a pattern of light rhomboid figures on a dark gray ground color. The adults can change their color from light to dark depending on the substrate. Most of these traits can be observed in Fig. 4.

Discussion

The three anoles recorded on Cayo Romero are the only non-endemic Cuban dactyloids (Rodríguez-Schettino et al., 2013). These species are common and widely distributed in Cuba and presumably disperse easily. The population of *A. cf. sagrei* deserves special attention because it shows some characteristics that differentiate it from *A. sagrei* populations occurring in the region around Cayo Romero, in the north of Matanzas Province (i.e., on the Hicacos Peninsula and in the city of Cárdenas) and in the city of Havana, where dewlaps are entirely red with inner and marginal yellow scales (Fig. 2D). Dewlap patterns have been considered as a prezygotic isolation mechanism (Rand and Williams, 1970). This level of dewlap color divergence has been used to differentiate subspecies and even species (Garrido, 1973). Nevertheless, given that *A. sagrei* is a very variable, widely distributed species, a more comprehensive approach using morphological and even molecular analysis would be needed to elucidate the identity and origin of this population.

The genus *Aristelliger* Cope, 1862 is represented in Cuba by the species *A. reyesi* (Fig. 4), previously known only from the Península de Hicacos, in the north of Matanzas Province (Fig. 1 top; Díaz and Hedges, 2009). This region has had a significant tourism development that continues in increase. Due to human impact on the habitat of *A. reyesi* (Fig. 5), this species was classified as “critically endangered” by Díaz and Reyes (2012).

Morphological features we observed in *A. reyesi* were within the parameters outlined by Díaz and Hedges (2009) or diverged only slightly. Adults have a similar color pattern, ear opening size and form, and relief of the dorsal and ventral scales as those described by Díaz and Hedges (2009). We did not find any distinctive phenotypic character state in this population. In fact, its individuals are so similar to those from the original description that the population on Cayo Romero was most likely introduced from the Península de Hicacos. This scenario is highly likely because Cayo Romero is a tourist destination that receives visitors from Varadero (Salazar, 2009), and also because some of the wooden material used to create the limited infrastructure that...
supports tourism, was brought from the Península de Hicacos (local workers, pers. comm.). Molecular analyses would be needed to be able to confirm this assessment. Human introduction could also be the way by which *A. allisoni* and *L. carinatus*, species that can be associated to human wooden constructions, may have been introduced to the island.

*Aristelliger reyesi* appears to be a gregarious species based on the description by Díaz and Hedges (2009), who “collected or observed 4–5 of these geckoes within an area of less than five meters” and we collected most of our series (four individuals) on the same plant. In Cayo Romero, this gecko may compete partially for the space with two other lizards, *A. angusticeps* and *A. cf. sagrei*. The three species are of similar size and were collected from the same plant but segregate temporally with the anoles active during the day and *A. reyesi* active at day and night (Díaz and Hedges, 2009; Díaz and Reyes, 2012; this paper).

Although Díaz and Hedges (2009) proposed that *A. reyesi* “was introduced by humans from its native habitat elsewhere (e.g., from another part of Cuba or from Hispaniola),” supported by the evidence that “it was found near Varadero Beach, one of the most popular tourist locations in Cuba, where this gecko has been unnoticed despite its abundance,” Díaz and Reyes (2012) and Rodriguez-Schettino et al. (2013) treated it as an endemic species without providing any new evidence. It is also surprising that Buide (1966), who worked intensively surveying reptiles in the Hicacos Peninsula, did not record this species. Even if the new population may have been introduced from Varadero, we agree that this species should be treated as endemic until evidence to the contrary emerges. Whether an endemic or introduced species, this population has great importance for conservation because it constitutes an additional reservoir that could be key for the survival of this species, given the massive deforestation of its habitat on the Península de Hicacos (Fig. 5) caused by the increase of tourism development in the area. Although this new locality offers a relief in this sense, it is also a tourist destination, albeit very controlled. Other risk factors are its small size, risk of flooding by increase of sea level and affection by hurricanes. For these reasons we consider it advisable to maintain the conservation status of “critically endangered,” as proposed by Díaz and Reyes (2012) for this species.

In the new locality, *A. reyesi* needs monitoring in order to estimate its effective population size and to identify potential threats that could affect it. In addition, it would be important to survey this region since is very likely that the species inhabits other keys near Cayo Romero.

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**References**


**Appendix**

Voucher specimens deposited in the herpetological collection of the Museum of Natural History “Felipe Poey,” Faculty of Biology, University of Havana, Cuba (MFP).

*Anolis allisoni.—*MFP 12531

*Anolis angusticeps.—*MFP 12532

*Anolis cf. sagrei.—*MFP 519–20, 524–28

*Aristelliger reyesi.—*MFP 12508–13

*Leiocephalus carinatus.—*MFP 12520–21

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