REPTILES & AMPHIBIANS

New Records and Natural History of the Escambray Twig Anole, *Anolis garridoi* (Squamata: Dactyloidae)

Tomás M. Rodríguez-Cabrera[1], Javier Torres[2], and Ruben Marrero[3]

[1]17885 SW 267th St., Homestead, Florida, 33031, USA
(tomasmichel.rodriguez@gmail.com; https://orcid.org/0000-0001-5905-4730)
[2]Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, Kansas 66045, USA
(javiertorres@ku.edu [corresponding author]; https://orcid.org/0000-0002-7873-3250)
[3]Libertad No. 301, Reparto Santo Suárez, Diez de Octubre, La Habana 10500, Cuba (rubencasamiglis@gmail.com)

Abstract.—The Cuban endemic Escambray Twig Anole, *Anolis garridoi* (Squamata: Dactyloidae), was known only from a limited geographic range of less than 10 km^2 in the vicinity of the type locality at Topes de Collantes, Guamuhaya Massif, central Cuba. The ecology and behavior of this species is poorly known and the number of photographs in life very limited. Herein we report *A. garridoi* from seven new localities, extending its geographic range by more than 60 km and its elevational distribution to 30–1,140 m. We provide baseline data on habitat use, thermal niche, and behavior of the species at Pico San Juan Ecological Reserve. We also describe the juveniles of this species for the first time and provide additional morphometric data for adults. Finally, we present a collection of quality photographs of live individuals of this species illustrating different color patterns and behaviors.

Cuba is the Caribbean island with the highest diversity of lizards of the genus *Anolis* (Dactyloidae), only closely matched by Hispaniola (Powell and Henderson 2012; Uetz et al. 2022). At the same time, Cuba is one of the areas where research on anoles have been intensely conducted. It would be fair to expect that knowledge in this group is quite vast, however, many species remain largely unknown, even their basic natural history. Lack of data on some species might be associated with them inhabiting remote areas, such as mountains. About 30% of the 64 species of anoles occurring in Cuba are mostly associated with mountain ecosystems and at least 15 of them exist nowhere else (Rodríguez Schettino et al. 2013).

Such is the case of the Escambray Twig Anole, *Anolis garridoi* (Fig. 1), a virtually unknown species restricted to mountain ecosystems. It was originally described from Topes de Collantes, Guamuhaya Massif, in central Cuba. More than 30 years after the collection of the holotype in 1991, fewer than 20 individuals have been collected and/or observed (Rodríguez Schettino 2012). All of them were found in association with submontane evergreen forest and restricted to a

Fig. 1. The Escambray Twig Anole (*Anolis garridoi*) is a montane species found exclusively in the Guamuhaya Massif in central Cuba. These individuals are in dark color phase. Photographs © Rosario Domínguez.

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v29i1.18113

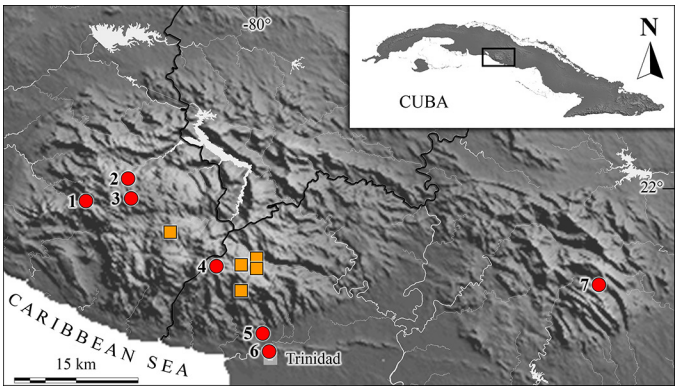

Fig. 2. Distribution of the Escambray Twig Anole (*Anolis garridoi*) in the Guamuhaya Massif and immediate vicinity in central Cuba. Orange squares represent records from the literature (Díaz et al. 1996; Cajigas Gandia et al. 2020) and red circles represent new records from this study: (1) Vegas de Mataguá, (2) Las Playas, (3) Pico San Juan and surroundings, (4) road to Hacienda Codina touristic center, (5) near El Cubano touristic center, (6) northern suburbs of Trinidad, and (7) near La Sabina field station in the Lomas de Banao Ecological Reserve.

limited geographic range of less than 10 km^2 in the vicinity of the type locality (records of this species were little more than 3 km from each other), between 700–800 m asl (Díaz et al. 1996; Rodríguez Schettino 1999c, 2012; Rodríguez Schettino et al. 2013) (Fig. 2). More recently, Cajigas Gandia et al. (2020) reported an adult male from "Camino de Centro Cubano 2 (previously known as El Porvenir)" (857 m asl), 9.4 km NW of Los Helechos Hotel at Topes de Collantes. Because of its restricted distribution, the species was first listed as Vulnerable by Rodríguez Schettino and Chamizo Lara (1998) and by Rodríguez Schettino (1999a), then as Critically Endangered in the Libro Rojo de los Vertebrados de Cuba (Rodríguez Schettino 2012), and finally as Endangered on the IUCN Red List of Threatened Species (Fong 2021).

Few color graphic representations of *A. garridoi* exist in the literature. One of the paratypes (AMNH 96499) was illustrated by Schwartz and Henderson (1985: 52, Plate II-3) before the description of *A. garridoi*, and was referred to therein as *A. angusticeps*. A picture of an adult individual first appeared in Rodríguez Schettino et al. (2003) (republished in Rodríguez Schettino 2012). Losos et al. (2012) also published a picture of this species as an example of a Greater Antillean Twig Anole (republished in Yong 2013). Another picture appears in the online database Caribherp (Hedges 2022). Recently, one of the authors (TMRC) uploaded a picture to The Reptile Database (http://www.reptile-database.org). A few other photos appear on some web sites (e.g., https://mahlerlab.com/photos/#jp-carousel-204; https://sites.google.com/site/kuscarji/vrste-kuscarjev/polychrotidae; https://www.butterfliesofcuba.com/reptiles.html; https://www.anoleannals.org/2017/10/16/anole-photo-contest-2017-call-for-submissions). The juvenile of this species is unknown (Rodríguez Schettino 1999c), but according to the body proportions and overall color pattern, the picture of *A. garridoi* in Caribherp apparently corresponds to a juvenile of this species (see Results).

The aim of this work is to fill some gaps in the information about *A. garridoi*. Specifically, we provide new records of the species that extend its geographic and elevational ranges, with accompanying baseline information on its natural history and behavior. We also describe the juvenile of this species for the first time, and provide some color variations and morphometric data of adults.

Materials and Methods

We collected the lizards and the associated data during several expeditions between 2010 and 2019 to the Guamuhaya Massif and vicinity. In November 2010 and February 2015, we made two field trips to the city of Trinidad and nearby areas in Sancti Spíritus Province. We made six trips to the area comprising the Pico San Juan Ecological Reserve and other localities across the Trinidad Heights in Cienfuegos Province in November 2013, February, June, and August 2014, February and August 2015, and June 2018. The Pico San Juan Ecological Reserve includes most of the highest peaks in the Guamuhaya Massif, including the maximum elevation in the west-central region of Cuba, Pico San Juan at 1,140 m asl (21.98959, -80.14745). Finally, we made 12 expeditions between 2014 and 2019 to the Lomas de Banao Ecological Reserve in the Sancti Spíritus Heights, near the easternmost region of the Guamuhaya Massif, but found *A. garridoi* only during one of them (March 2019).

Data collection.—We collected habitat data at Pico San Juan Ecological Reserve mainly during the day, walking along a 1-km-long transect starting on the southern slope of Pico San Juan and then running in a northwestward direction at elevations of 970–1,100 m asl; although some lizards were collected outside this transect as well. The lizards were captured by hand or lasso. For every lizard observed we recorded time, sex, age (i.e., juvenile, adult), body temperature, air temperature, substrate temperature, type of substrate, type of perch (i.e., twig, branch, trunk, leaf), perch height and diameter, plant type (tree, shrub, grass, fern, vine), canopy coverage, activity, vegetation type, elevation, coordinates, and individual variables (see below).

We took body measurements and perch diameters with a caliper to the nearest 0.05 mm; for other measurements of vegetation we used a measuring tape to the nearest 1.0 mm. We measured canopy coverage with a crown densitometer, body mass with a Pesola® spring scale (accuracy = 0.1 g), body temperature with a Yokogawa® TX10 Series Portable Digital Multi-Thermometer, and substrate and air temperatures with a Thermofocus® 0700 Infra-Red Thermometer. We recorded coordinates and elevation using a GPS Garmin® eTrex; datum for all coordinates is WGS 84.

Abbreviations used in this work are as follow: SVL = snout-vent length, HL = head length (distance between snout and anterior margin of the ear), HW = head width (at temporal level), SL = snout length (distance between snout and the anterior margin of the eye), RHL = relative head length (HL/SVL), RHW = relative head width (HW/HL), and RSL = relative snout length (SL/HL). Because of our small sample size, we were limited to basic statistics for comparisons; values are given as means ± one standard deviation (SD) and range. Most of the specimens were deposited in the herpetological collection of the Instituto de Ecología y Sistemática (CZACC), Havana, Cuba, and some photographic vouchers were deposited in the Herpetology Digital Archives at the University of Kansas (KUDA).

Results

We recorded data for 28 *A. garridoi*: 21 from Pico San Juan Ecological Reserve (8 males, 6 females, 7 juveniles), 1 adult female from Las Playas, 2 adult males from Vegas de Mataguá, 1 adult female from Trinidad, 1 adult female from El Cubano touristic center, 1 female from the road to Hacienda Codina touristic center, and 1 adult female from the Lomas de Banao Ecological Reserve. Not all the studied individuals were collected, thus only a representation from each locality was vouchered in Appendix 1.

Morphometrics and morphology.—SVLs and weights of adults from Pico San Juan Ecological Reserve were 36.3–43.0 mm and 0.7–1.2 g, respectively, and those of juveniles were 20.8–28.5 mm and 0.1–0.5 g, respectively (Table 1). The female from Las Playas was 37 mm SVL and 0.8 g. The two males from Vegas de Mataguá were 39.6 and 40.3 mm SVL and 0.9 and 1.1 g, respectively. The female from Trinidad city also measured 37 mm SVL. The female from near the Hacienda Codina touristic center measured 38.5 mm SVL. The females from El Cubano touristic center and the Lomas de Banao Ecological Reserve were not measured, but they were adults (>35 mm SVL).

The juveniles from Pico San Juan Ecological Reserve had proportionately shorter and more rounded snouts and an overall wider head than adults. In our sample, the RHL was similar between adult females and juveniles, but adult males had slightly larger heads (Table 1). Adults had relatively narrower heads (0.48 ± 2.5, 0.44–0.50) than juveniles (0.52 ± 3.0, 0.49–0.56).

The interparietal scale (pineal scale) is proportionately larger in juveniles. Both adults and juveniles have tiny pale-yellow to whitish tubercle-like scales on the dorsum from the temporal region to the base of the tail, including the limbs. Males have differentiated rounded post-cloacal scales from a very early age (i.e., 20.8 mm SVL and 0.12 g), usually separated by 2–3 smaller scales. The hindlimbs are very stout and muscular in appearance, and dorsoventrally flattened in both adults and juveniles.

Coloration.—The seven juvenile *A. garridoi* collected and/or observed at Pico San Juan Ecological Reserve were very similar to adults in overall pattern (Fig. 3). Nevertheless,

Table 1. Body measurements of specimens of the Escambray Twig Anole (*Anolis garridoi*) from Pico San Juan Ecological Reserve. Values are given as mean ± one standard deviation, and range in parenthesis. Abbreviations: SVL = snout-vent length, RHL = relative head length, RSL = relative snout length, and RHW = relative head width. RHW and RSL are considered for adults and immatures, without distinguishing sexes. Linear measurements are in millimeters, mass in grams. The adult male found sleeping at night (Fig.5) was not measured or collected.

Sex/age	SVL	RHL	RHW	RSL	Mass	n
Males	39.5 ± 2.8 (36.3–43.0)	0.3 ± 0.008 (0.29–0.31)	0.48 ± 2.5 (0.44–0.50)	0.53 ± 0.01 (0.51–0.55)	0.9 ± 0.2 (0.7–1.2)	7
Females	37.5 ± 0.7 (36.5–38.0)	0.27 ± 0.007 (0.27–0.28)			0.8 ± 0.1 (0.7–1.0)	6
Juveniles	24.8 ± 3.6 (20.8–28.5)	0.28 ± 0.01 (0.27–0.29)	0.52 ± 3.0 (0.49–0.56)	0.45 ± 1.4 (0.43–0.46)	0.3 ± 0.1 (0.1–0.5)	7

Fig. 3. Juvenile Escambray Twig Anoles (*Anolis garridoi*) are very similar to adults in coloration. Photographs © R. Marrero.

Fig. 4. During the light phase, the dorsal markings are inconspicuous in adult Escambray Twig Anoles (*Anolis garridoi*). Photographs © R. Marrero (left) and Raimundo López-Silvero (right).

Fig. 5. While sleeping at night, the Escambray Twig Anole (*Anolis garridoi*) adopts a very pale grayish-white color. Photograph © T.M. Rodríguez-Cabrera.

in light phase, the dark-brown lines radiating from the eyes and the dorsal markings are always present and much more contrasting in juveniles. During the maximal light phase in adults, dorsal markings become very light-brown to yellowish-brown and inconspicuous, resulting in an overall mottled pale yellowish-gray appearance (Fig. 4). Lizards become even lighter (grayish white) while sleeping at night (Fig. 5). The two adult males observed at Vegas de Mataguá and the female from Lomas de Banao Ecological Reserve had an ochre pigmentation on the eyelids and thin dark-brown lines from the nostrils through the eyes to the temporal region (Fig. 6). The adult female from Las Playas had an unusual wide, light mid-dorsal stripe bordered by two thin dark brown dorsolateral

Fig. 6. Adult Escambray Twig Anoles (*Anolis garridoi*) from Vegas de Mataguá (left: male, CZACC 4.14675) and Lomas de Banao Ecological Reserve (right: female, KUDA 13758), showing the ochre pigmentation on the eyelids and a thin dark-brown line from the nostrils through the eyes to the temporal region. Note also the small dewlap in the female. Photographs © Raimundo López-Silvero (left) and Aslam I. Castellón (right).

Fig. 7. An adult female Escambray Twig Anole (*Anolis garridoi*) from Las Playas (CZACC 4.14676) with an unusual mid-dorsal stripe. Photographs © J. Torres.

stripes from the occipital region and extending to the sacrum (Fig. 7). The interior of the throat is black in both juveniles and adults (Fig. 8). The iris is light-brown or straw-colored (Fig. 9). Both adults and juveniles are capable of undergoing rapid color changes from a light (pale yellowish-gray) to a dark (reddish-brown) phase in response to factors that include potential threats and intraspecific interactions.

Dewlaps of the 10 males observed were relatively large for a twig anole and were dark reddish-orange grading to a yellow central spot at the base and with large internal pale yellow to whitish scales (Fig. 9). Adult females have a reddish-orange to yellowish vestigial dewlap (Fig. 6). This character showed very little variation (Fig. 9).

Behavioral observations.—*Anolis garridoi* uses its coloration and behavior to go unnoticed. In the proximity of a potential predator it moves slowly to the opposite side of the twig, always keeping an eye on the origin of the threat ("squirreling"). In addition to squirreling, these lizards often remain motionless while aligned with twigs and with the venter in full contact with the substrate. In this situation, the limbs are tight against the body and, especially in adults, the broad basal region of the tail couples perfectly with the inner surface

Fig. 8. The black interior of throat is a distinctive character of the Escambray Twig Anole (*Anolis garridoi*) that is shared with the closely related Turquino Twig Anole (*A. guazuma*). Photographs © Raimundo López-Silvero (left) and R. Marrero (right).

Fig. 9. Adult male Escambray Twig Anoles (*Anolis garridoi*) showing variation in dewlap coloration. Photographs © Raimundo López-Silvero.

Fig. 10. Background-matching crypsis in an adult (left) and a juvenile (right) Escambray Twig Anole (*Anolis garridoi*) combined with masquerading by adjusting to the irregularities of the substrate. Photographs © R. Marrero.

of the hindlimbs, partially covering them (Figs. 1, 4, 6, 10, 11). If any movement occurs during this stage, it is very subtle and with the body strongly adpressed against the substrate, adopting all the irregularities of a particular surface while crawling (Fig. 11). If a potential predator gets too close, the anoles may jump, but apparently only as a last resort. Most of the time, the lizards we observed could even be touched gently several times before they decided to flee by crawling along the branches or by jumping to neighboring vegetation or to the ground.

All the animals we found were solitary, except two juvenile males (23 and 24 mm SVL, 0.2 g and 0.25 g, respectively) that occupied the same branch 275 cm above the ground. These individuals were engaged in aggressive display toward one another (Fig. 12). During the display they kept their bodies arched upward and compressed laterally, with snout tips in contact with the substrate (bark), and tails undulating continuously. Also, the dewlap apparently is important for territorial displays of males from an early age. Some small males that we considered immature (i.e., 28.5 mm SVL and 0.35 g) already had well-developed dewlaps.

Habitat use.—The majority of lizards from Pico San Juan Ecological Reserve were active by day (between 1000–1620 h) on twigs (12 of 19), branches (4 of 19), and trunks of shrubs (3 of 19), and mostly associated with open secondary vegetation alongside mountain paths (Fig. 13) (the exception was a male found sleeping on a twig at night; Fig. 5). Mean canopy coverage was 63.5 ± 25.6 % (40–100%). Perch heights were 110–275 cm (males: 196.3 ± 31.2 cm; females: 155.6 ± 43.8 cm; juveniles: 188.6 ± 64.6 cm). Perch diameters were 3–30 mm (males: 8.8 ± 8.8 mm; females: 11.6 ± 6.8 mm; juveniles: 13.1 ± 11.7 mm). The female from Las Playas was 2.5 m above ground level (perch diameter 11 mm) in secondary vegetation about 3 m from a stream. One of the males from Vegas de Mataguá was about 2 m above the ground (perch diameter 8 mm) and the other 1.5 m above the ground (perch diameter 10 mm), both in secondary vegetation alongside a road. The female from suburban Trinidad was on a wall surrounding a yard > 2 m above the ground. The female from El Cubano touristic center was 2.4 m above the ground (perch diameter 15 mm) in secondary vegetation near the Caballero River, a tributary of the Guaurabo River.

Fig. 11. An adult female Escambray Twig Anole (*Anolis garridoi*) from El Cubano touristic center (KUDA 13761) masquerading by adjusting to the irregularities of the substrate combined with background-matching crypsis. Photograph © T.M. Rodríguez-Cabrera.

Fig. 12. Immature male Escambray Twig Anoles (*Anolis garridoi*) in territorial display. Photograph © Raimundo López-Silvero.

Fig. 13. Typical open habitats dominated by secondary vegetation inhabited by Escambray Twig Anoles (*Anolis garridoi*) at Pico San Juan Ecological Reserve. Photographs © T.M. Rodríguez-Cabrera (left) and Raimundo López-Silvero (right).

The female from Hacienda Codina touristic center was on a twig (perch diameter < 10 mm) of a bush growing by a road about 2 m above the ground. The female from Lomas de Banao Ecological Reserve was sleeping at night (1030 h) on a twig (perch diameter < 10 mm) 2.5 m above the ground next to a mountain path surrounded by secondary forest.

Thermal activity.—Nine of the individuals observed at Pico San Juan Ecological Reserve (1 male, 2 females, and 5 juveniles) where basking when found at 1000–1415 h with body temperatures of 24.8–32.3 °C (vs. 21.8–23.9 °C in non-basking animals). Exceptions were two individuals (1 male, 1 female) with high body temperatures (29.3 and 31.6 °C) that apparently had just finished basking when captured at 1122 and 1200 h. Air temperatures were 23.2–30.2 °C and substrate temperatures 20.8–30.2 °C. Body temperatures of basking lizards ranged from 1.0 °C below to 5.5 °C above air temperature, and 2.5–4.7 °C above substrate temperatures. Body temperatures of non-basking lizards were 0.1–3.6 °C below air temperature and from 0.1 °C below to 1.3 °C above substrate temperature; exceptions were the two individuals mentioned above that apparently had just finished basking, with body temperatures 0.1–6.4 °C above air and 2.1–3.0 °C above substrate temperatures.

Discussion

The new records provided herein increase the number of localities for *A. garridoi* from five to 12 and extend its geographic range to more than 60 km straight-line distance along an east-west axis (Fig. 2). Also, the elevational range increases from 30 m asl at El Cubano touristic center to 1,140 m asl at the meteorological radar station on Pico San Juan, the highest possible elevation in the Guamuhaya Massif (Appendix 1).

Morphometric data are similar to those obtained by Díaz et al. (1996) for specimens from the type locality. However, one of our males had a slightly larger SVL (43.0 mm) than the largest male measured by those authors (i.e., 41.8 mm). The mean SVL of females measured in this work (36.5 ± 0.03; 36.2–36.8 mm SVL) was virtually the same as that obtained by Díaz et al. (1996: i.e., 36.5 mm). All the available measurements reaffirm this species as one of the smallest Cuban anoles (see Henderson and Powell 2009 for a review).

The slender body and short, muscular limbs of *A. garridoi* seem to be adaptations that allow them to hold their bodies tight against the substrate of the twigs and branches where they live. Given its general body plan, coloration, and behavior, this species has been placed in the twig ecomorph (e.g., Rodríguez Schettino 1999b; Losos 2009). This species is sister to another twig anole, the Turquino Twig Anole (*A. guazuma*), from eastern Cuba, but they both are more closely related to several non-twig anoles (*Anolis argillaceus* and *carolinensis* groups) than to the remaining Cuban twig anoles (*Anolis angusticeps* group; e.g., Nicholson et al. 2005; Losos 2009; Poe et al. 2017).

Besides the strong similarities in body shape, coloration, and behavior between *A. garridoi* and *A. guazuma*, to the best of our knowledge, they are the only two species of anoles in Cuba with a black interior of the throat (Garrido 1983; Díaz et al. 1996) (Fig. 8). In other squamate reptiles, conspicuous unusually-colored components of the interior of the mouth usually function as anti-predation mechanisms, particularly during deimatic displays (e.g., the blue tongue in Blue-tongued Skinks, *Tiliqua* spp., Scincidae; black interior of the mouth in the Black Mamba, *Dendroaspis polylepis*, Elapidae) (e.g., Pitman 1965; Badiane et al. 2018 and references therein). However, despite the fact that *A. garridoi* readily opens its mouth when captured (Fig. 8), as most anoles do, additional observations are required to determine definitively the function of the unusually colored throat in this species and *A. guazuma*. Similarly, several species of Cuban false chameleons (*Anolis chamaeleonides* group) have dark-colored

tongues (Holáňová et al. 2012); but again, the function of this coloration is unknown.

The overall body coloration we described and that of the dewlap coincides with the original description of the species (Díaz et al. 1996). Rapid color changes in this species are best perceived when captured by hand, when the lizard suddenly adopts the dark phase (Fig. 14). Díaz et al. (1996) also mentioned color changes during aggressive displays.

Díaz et al. (1996) described *A. garridoi* as a small species with short limbs, a long snout, and a short prehensile tail (Fig. 15). Those authors also described behavior, which coincides with our observations. This is a lizard that remains motionless most of the time, with very slow movements along twigs, alternating a few steps with prolonged stops, except when catching prey (Díaz et al. 1996). In the proximity of a potential predator, it moves slowly, rotating its body to the opposite side of the twig with respect to the threat (Díaz et al. 1996). Consistent with these and previous observations, Estrada and Silva Rodríguez (1984) included *A. garridoi* within the group of "crawlers," based on its general index of locomotion (= humerus length/tibia length).

The overall anti-predation strategy in *A. garridoi* seems to consist of going unnoticed. Its coloration is quite variegated, at some times with lichen-like markings on the dorsum that potentially diminish the probability of detection (crypsis). Also, some of its display behaviors that break up their body shape might decrease the probability of detection (masquerade). These forms of camouflage are common across several animal groups (Stevens and Merilaita 2011) but in anoles a similar set of anti-predation strategies seem also to have evolved in their giant ecomorphological counterparts — lizards of the *Anolis chamaeleonides* group (Cajigas Gandia et al. 2022). We observed two forms of camouflage. First, crypsis by background matching, in which the animal resembles the coloration of its surroundings (Figs. 3, 4, 10, 11). We also observed masquerading, in which the animal mimics an uninteresting object; in *A. garridoi* this is mostly achieved by conforming to the shape of the perch (Figs. 10, 11). Both behaviors, crypsis by background matching and masquerading, are usually displayed in combination (Figs. 10, 11). Camouflage is combined with other forms of concealment such as "squirreling."

Our observations of this species also are consistent with those of Díaz et al. (1996) regarding territoriality and aggression toward conspecifics. This behavior apparently is present in individuals of this species at a very young age (Fig. 12). Díaz et al. (1996) mentioned that males use the dewlap during aggressive displays toward other males. Other evidence of territoriality in this species was the presence of bite marks in the nuchal regions in some adult males. Díaz et al. (1996) commented that male-male encounters occasionally "finished with movement of the resident towards the intruder, sometimes biting."

Our results on the habitat used by *A. garridoi* also are consistent with those of Díaz et al. (1996), who observed this species between 30 and 300 cm above the ground (males, 178 ± 42 cm; females, 150 ± 16 cm), and recorded perch diameters of 7–40 mm (males, 25.6 ± 6.1 mm; females, 20.0 ± 1.6 mm). Although we observed only two individuals sleeping at night, one at Pico San Juan Ecological Reserve and one at Lomas de Banao Ecological Reserve, sleeping perches seem to be similar to those used during the day (Fig. 5).

Díaz et al. (1996) mentioned that both captive and wild adults chose shaded areas and avoided direct sunlight during the morning and midday. However, according to our results, both adult and juvenile *A. garridoi* thermoregulate in direct sunlight and raise their body temperatures as much as 6.4 °C above ambient temperature. The rest of the time they seem to couple their body temperature with that of the environment (i.e., with body temperatures oscillating no more than 4 °C around air temperature).

Díaz et al. (1996) mentioned that both *A. garridoi* and *A. guazuma* are sympatric with the twig anole *A. angusti-*

Fig. 14. The Escambray Twig Anole (*Anolis garridoi*) can change rapidly from light to dark phase, which frequently occurs when captured by hand. Photograph © Raimundo López-Silvero.

Fig. 15. An Escambray Twig Anole (*Anolis garridoi*) using its prehensile tail. Photograph © Rosario Domínguez.

ceps in their type localities. However, we did not observe the other species living in sympatry with *A. garridoi*. Regarding *A. guazuma*, Garrido (1983) commented on the possibility of niche partitioning with *A. angusticeps* on Pico Turquino, Sierra Maestra, eastern Cuba, with the former occupying the highest strata in the canopy and the latter the lowest strata on trunks and branches. However, additional observations are needed to arrive at conclusions on this matter.

The new data provided herein indicate that the distribution of *A. garridoi* is more extensive than previously thought. The occurrence of this species, thought to be exclusively montane, in lowland localities around Trinidad was unexpected and suggests that it has some degree of tolerance to human disturbance. Evidence of the latter includes not only its predominant occurrence in areas associated with secondary vegetation, but also the individual found on a wall surrounding a yard in Trinidad. Threats mentioned by Rodríguez Schettino (2012), such as habitat loss attributable to tourism might not be as harmful as previously thought, since it seems able to acclimatize to living associated with secondary vegetation. Pico San Juan Ecological Reserve, where this anole appears to be relatively common, is probably the most remote and best-preserved area within the Guamuhaya Massif; even so, it includes many areas with secondary vegetation that date back to human settlements from decades ago (J.D. León, pers. comm.). Further surveys across these mountains will likely reveal new locality records and further expand the distribution of this species. Nonetheless, *A. garridoi* is a regional endemic of the Guamuhaya Massif and its immediate vicinity and should be protected.

Acknowledgements

We thank Julio D. León, Carlos Martínez, Elier Fonseca, Paidel Gutiérrez, John Q. Pigott, Raimundo López-Silvero, and Rosario Domínguez for help in the field and/or for photographs. The administrations of the Jardín Botánico de Cienfuegos and the meteorological radar station at Pico San Juan provided logistical support during expeditions made to "Pico San Juan" Ecological Reserve. We also thank The Earthwatch Institute, the Wildlife Conservation Society (WCS), and the Sociedad Cubana de Zoología for financial and technical support during expeditions made to "Lomas de Banao" Ecological Reserve, particularly to Maikel Cañizares, Lucía Hechevarría, and Natalia Rossi (WCS), who arranged the expeditions; the many volunteers that assisted us in the field, and the staffs of the protected area for providing us with excellent treatment and accommodations. This work is in part a byproduct of project No. 170515264 ("Ecology and conservation of the threatened endemic Dwarf Boa genus *Tropidophis* in central Cuba") funded by a grant from The Mohamed bin Zayed Species Conservation Fund to the senior author.

Literature Cited

Badiane, A., P. Carazo, S.J. Price-Rees, M. Ferrando-Bernal, and M.J. Whiting. 2018. Why blue tongue? A potential UV-based deimatic display in a lizard. *Behavioral Ecology and Sociobiology* 72: 104. https://doi.org/10.1007/s00265-018-2512-8.

Cajigas Gandia, A., K. Velazco Pérez, and C. Hernández Peraza. 2020. Geographic distribution. *Anolis garridoi* (Escambray Twig Anole). *Herpetological Review* 51: 538.

Cajigas Gandia, A., J. Torres López, and T.M. Rodríguez-Cabrera. 2022. Anti-predation behavior in bearded anoles (Dactyloidae: *Anolis*, clade *Chamaeleolis*): A review. *Reptiles & Amphibians* 29: 298–304. https://doi.org/10.17161/randa.v1i1.17935.

Díaz, L.M., A.R. Estrada, and L.V. Moreno. 1996. A new species of *Anolis* (Sauria: Iguanidae) from the Sierra de Trinidad, Sancti Spíritus, Cuba. *Caribbean Journal of Science* 32: 54–58.

Estrada, A.R. and A. Silva Rodríguez. 1984. Análisis de la ecomorfología de 23 especies de lagartos cubanos del género *Anolis*. *Ciencias Biológicas* 12: 91–104.

Fong, A. 2021. *Anolis garridoi*. *The IUCN Red List of Threatened Species* 2021: e.T75091532A75171916. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T75091532A75171916.en.

Garrido, O.H. 1983. Nueva especie de *Anolis* (Lacertilia: Iguanidae) de la Sierra del Turquino, Cuba. *Caribbean Journal of Science* 19: 71–76.

Hedges, S.B. 2022. *Caribherp: Amphibians and Reptiles of Caribbean Islands*. <http://www.caribherp.org/>.

Henderson, R.W. and R. Powell. 2009. *Natural History of West Indian Amphibians and Reptiles*. University Press of Florida, Gainesville, Florida, USA.

Holáňová, V., I. Rehák, and D. Frynta. 2012. *Anolis sierramaestrae* sp. nov. (Squamata: Polychrotidae) of the "*chamaeleolis*" species group from Eastern Cuba. *Acta Societatis Zoologicae Bohemicae* 76: 45–52.

Losos, J.B. 2009. *Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles*. University of California Press, Berkeley, California, USA.

Losos, J.B., M.L. Wooley, D.L. Mahler, O. Torres-Carvajal, K.E. Crandell, E.W. Schaad, A.E. Narváez, F. Ayala-Varela, and A. Herrel. 2012. Notes on the natural history of the little-known Ecuadorian Horned Anole, *Anolis proboscis*. *Breviora* 531: 1–17. https://doi.org/10.3099/531.1.

Nicholson, K.E., R.E. Glor, J.J. Kolbe, A. Larson, S.B. Hedges, and J.B. Losos. 2005. Mainland colonization by island lizards. *Journal of Biogeography* 32: 1–10. https://doi.org/10.1111/j.1365-2699.2004.01222.x.

Pitman, C.R., 1965. Hood-spreading by the mambas of the African genus *Dendroaspis* Schlegel. *Journal of East African Natural History* 1965: 110–115.

Poe, S., A. Nieto-Montes de Oca, O. Torres-Carvajal, K. de Queiroz, J.A. Velasco, B. Truett, L.N. Gray, M.J. Ryan, G. Köhler, F. Ayala-Varela, and I. Latella. 2017. A phylogenetic, biogeographic, and taxonomic study of all extant species of *Anolis* (Squamata; Iguanidae). *Systematic Biology* 66: 663–697. https://doi.org/10.1093/sysbio/syx029.

Powell, R. and R.W. Henderson (eds.). 2012. Island lists of West Indian amphibians and reptiles. *Bulletin of the Florida Museum of Natural History* 51: 85–166.

Rodríguez Schettino, L. 1999a. Introduction, pp. 1–16. In: In: L. Rodríguez Schettino (ed.), *The Iguanid Lizards of Cuba*. University Press of Florida, Gainesville, Florida, USA.

Rodríguez Schettino, L. 1999b. Morphology, pp. 17–35. In: L. Rodríguez Schettino (ed.), *The Iguanid Lizards of Cuba*. University Press of Florida, Gainesville, Florida, USA.

Rodríguez Schettino, L. 1999c. Systematic accounts of the species, pp. 104–380. In: L. Rodríguez Schettino (ed.), *The Iguanid Lizards of Cuba*. University Press of Florida, Gainesville, Florida, USA.

Rodríguez Schettino, L. 2012. *Anolis garridoi* Díaz, Estrada y Moreno, 1996, pp. 116–118. In: H. González Alonso, L. Rodríguez Schettino, A. Rodríguez, C.A. Mancina, and I. Ramos García (eds.), *Libro Rojo de los Vertebrados de Cuba*. Editorial Academia, La Habana, Cuba.

Rodríguez Schettino, L. and A. Chamizo Lara. 1998. Reptiles Cubanos con algún grado de amenaza de extinción. *Poeyana* 463: 1–8.

Rodríguez Schettino, L., C.A. Mancina, and V. Rivalta González. 2013. Reptiles of Cuba: checklist and geographic distributions. *Smithsonian Herpetological Information Service* 144: 1–96. https://doi.org/10.5479/si.23317515.144.1.

Rodríguez Schettino, L., A. Torres Barboza, and A. Hernández Marrero. 2003. Trepadores excelentes, pp. 110–127. In: L. Rodríguez Schettino (ed.), *Anfibios y Reptiles de Cuba*. UPC Print, Vaasa, Finland.

Schwartz, A. and R.W. Henderson. 1985. *A Guide to the Identification of the Amphibians and Reptiles of the West Indies* (*exclusive of Hispaniola*). Milwaukee Public Museum, Milwaukee, Wisconsin, USA.

Stevens, M. and S. Merilaita (eds.). 2011. *Animal Camouflage. Mechanisms and Function*. Cambridge University Press, Cambridge, UK.

Uetz, P., P. Freed, R. Aguilar, and J. Hošek. 2022. *The Reptile Database*. <http://www.reptile-database.org>.

Yong, E. 2013. Lookalike lizards and the predictability of evolution. *National Geographic*. <https://www.nationalgeographic.com/science/article/lookalike-lizards-and-the-predictability-of-evolution>.

Appendix 1. Material examined during this study of the Escambray Twig Anole (*Anolis garridoi*).

Cienfuegos Province: Cumanayagua Municipality: Pico San Juan Ecological Reserve: from the eastern slope of PSJ (21.98939, -80.14956; elev. 1,050 m asl) to about 700 m northwestward in straight line (21.99211, -80.15295; elev. 980 m asl), 8–15 November 2013, T.M. Rodríguez-Cabrera, R. Marrero, J.D. León, and R. López-Silvero, 4 males (CZACC 4.14663, CZACC 4.14662, CZACC 4.14665, CZACC 4.14666), 4 females (CZACC 4.14660, CZACC 4.14661, CZACC 4.14659, CZACC 4.14664), 3 juvenile males (CZACC 4.14667, CZACC 4.14668, CZACC 4.14669); around the meteorological radar station (21.98929, -80.14717; elev. 1,140 m asl), 24 August 2014, J. Torres and P. Gutiérrez, 1 male (CZACC 4.14670), 22–27 February 2015, J. Torres and R. Marrero, 2 males (CZACC 4.14672, CZACC 4.14673), 1 female (CZACC 4.14671); Vegas de Mataguá (21.98653, -80.20045; elev. 615 m asl), 15 November 2013, T.M. Rodríguez-Cabrera, R. Marrero, J.D. León, and R. López-Silvero, 1 male (CZACC 4.14675); Las Playas (22.01250, -80.15110; elev. 760 m asl), 23 August 2014, T.M. Rodríguez-Cabrera, J. Torres, P. Gutiérrez, and J.D. León, 1 female (CZACC 4.14676). **Sancti Spíritus Province:** Trinidad Municipality: road to the Hacienda Codina touristic center, Topes de Collantes Protected Natural Landscape (21.91166, -80.046575; elev. 820 m asl), 3 June 2018, T.M. Rodríguez-Cabrera, 1 female (CZACC 4.14677); northern suburbs of Trinidad (21.81056, -79.98556; elev. 70 m a.s.l), November 2010, R. Marrero, 1 female (CZACC 4.14674); near El Cubano touristic center (21.83147, -79.99332; elev. 30 m asl), 18 February 2015, T.M. Rodríguez-Cabrera, J. Torres, R. Marrero, and J.Q. Pigott, 1 female (KUDA 13761–2); Sancti Spíritus Municipality: near La Sabina field station, Lomas de Banao Ecological Reserve (21.88637, -79.60070; elev. 550 m asl), 16 March 2019, T.M. Rodríguez-Cabrera, A.I. Castellón, 1 female (KUDA 13758–60).